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$(a+b)^2 = a^2 + 2ab + b^2$

$(a-b)^2 = a^2 - 2ab + b^2$

$(a+b)^3 = a^3 + 3a$

$(a-b)^3 = a^3 - 3a$

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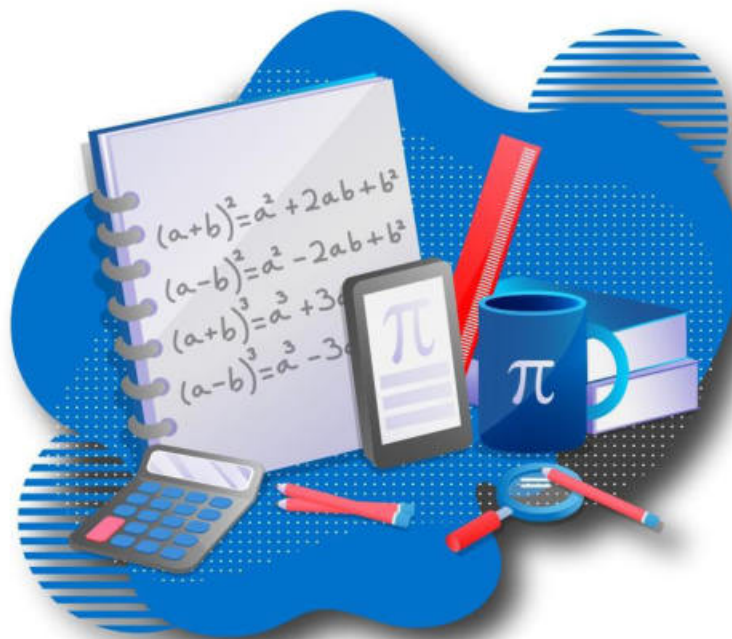
HIGHLIGHTS

- MCQ's with Detailed Solutions
- Strictly Designed as per Latest Exam Pattern
- Time Saving Tips(TST) to solve MCQ's in short time

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DR. ANSHU SURANA

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DR. ANSHU SURANA

QUANTITATIVE
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Index

Permutation & Combination

Permutation and Combination is all about counting the number of ways in a logical sense. In this chapter, we will count the possible selections, arrangements or both selections and arrangements based on the provided conditions.

FUNDAMENTAL PRINCIPLE OF COUNTING

The fundamental principle of counting is a mathematical rule that allows us to find the number of ways in which a combination of events can occur.

Basically, there are two principles of counting:

I.   Multiplication principle
II. Addition Principle

Multiplication Rules

Suppose A, B and C are three different cities. There are two means of transport viz., road and train, between city A and city B and there are three means of transport viz., road, train and air, between city B and city C.

Now, a person wants to go from A to C via intermediate city B.
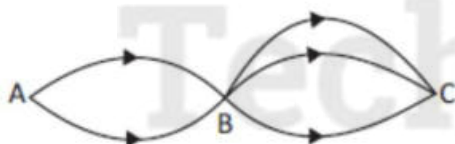
The person can reach city C from city A in the following possible ways:

I.   A to B by road and B to C by road.
II.   A to B by road and B to C by train
III. A to B by road and B to C by air.
IV.   A to B by train and B to C by road.
V.   A to B by train and B to C by train.
VI.   A to B by train and B to C by air.

Hence, the total number of possible ways are 6.

Using the multiplication rule we can get the answer very quickly. Number of options to reach from A to B = 2.

Number of options to reach from B to C = 3. Hence, the number of options to reach from A to C via B = 2 × 3 = 6.

Conclusion: If there are two things to do and there are m ways of doing the first thing and n ways of doing the second thing, then there will be m × n ways of doing both the things together.

Addition Rules

A person wants to go to office either by bus or by a cab. There are 4 different buses and 3 different cabs. The person can reach office in the following ways:

I.   By bus 1
II.   By bus 2
III. By bus 3
IV.   By bus 4
V.   By cab 1
VI.   By cab 2
VII. By cab 3

Hence, the total number of possible ways is 7.

Using addition rule we can get the answer very quickly. Number of options using bus is 4. Number of options using cab is 3. Hence, the number of options to reach office is 4 + 3 = 7 ways

Conclusion: If A and B are two mutually exclusive events i.e. when A occurs, then B doesn't occur and when B occurs then A doesn't occur, such that event A occurs in m ways and event B occurs in n ways, then either A or B can occur in (m + n) ways.

e.g. If one wants to go office by bus where there are 4 different buses or by cab where there are 3 different cabs, then total number of ways of going to office = 4 + 3 = 7.

Example 1: A showroom has 7 doors and 5 windows.

I.   In how many ways can a thief enter the showroom, if he may enter through a door or a window?

II. In how many ways can the thief rob the showroom by entering through a window and exiting through a door?

Solution:

Two events are involved: selecting a window and selecting a door. The first event can occur in 7 different ways and the second event can occur in 5 different ways.

I. Since the thief uses either a door or a window to enter the showroom, exactly one of the two events occur. By the addition rule, the thief has 7 + 5 = 12 choices to enter the showroom.

II. Since the thief enters through a window and exits through a door, both the events must occur. Therefore, by the product rule, the thief has 7 × 5 = 35 possible ways to rob the showroom.

Example 2: One can travel from a place A to a place B by 3 different buses, from place B to place C by 4 different buses, from place C to place D by 5 different buses and from place D to place E by 3 different buses. In how many ways can one travel from A to E?

Solution:

The bus from A to B can be selected in 3 ways.
The bus from B to C can be selected in 4 ways.
The bus from C to D can be selected in 5 ways.
The bus from D to E can be selected in 3 ways.
So, by the Fundamental Principal of Counting (multiplication rule), one can travel from A to E in 3 × 4 × 5 × 3 ways = 180 ways

Example 3: There are 10 multiple choice questions in an examination. First four questions have 4 choices each and the remaining six questions have 5 choices each. How many sequences of answers are possible?

Solution:

Each one of the first four questions can be solved in 4 ways, and each one of the last six questions can be solved in 5 ways. So, the total number of different sequences of answers is 4 × 4 × 4 × 4 × 5 × 5 × 5 × 5 × 5 × 5 = $4^4 \times 5^6$ = 4000000

NUMBER FORMATIONS

Basic types of problems in permutation deal with formation of numbers. We need to count all the possible numbers that can be formed from the provided digits. Problems related to number formation can be divided into two categories.

I. Repetition is allowed
II. Repetition is not allowed

Repetition is allowed

In these type of problems, digits can be repeated while forming a number. i.e. If a number is used at one's place it can again be used again at tens or hundred's place.

For example, we have to form a three digit numbers with digits 1, 2, 3 and 4. In such a case, one's place of that number can filled in 4 ways. Since repetition is allowed, ten's place can also be filled in 4 ways, and hundred's place can again be filled in 4 ways. So, total number of ways are 4 × 4 × 4 = 64 ways.

Hence, we can say that 64 such three digit numbers are possible from digits 1, 2, 3 and 4.

Repetition is not allowed

In these type of problems, digit cannot be repeated once it has been used at any place.

For example, we have to form three digit numbers with digits 1, 2, 3 and 4 wherein repetition is not allowed. In such a case, one's place of that number can be filled in 4 ways. Since repetition is not allowed, ten's place can be filled in 3 ways and hundred's place can be filled in 2 ways. So, total number of ways are 2 × 3 × 4 = 24 ways.

Hence, we can say that 24 such three digit number are possible from digits 1, 2, 3 and 4.

Note:

If nothing is mentioned about the repetition of digits, it means that repetition is allowed in it. Question will specifically point it out if repetition is not allowed.

Example 4: How many four digit odd numbers are possible from the digits 1, 2, 3, 4, 5 and 6?

Solution:

To form an odd number, unit's place needs to be filled with digits 1, 3 and 5 i.e. it can be filled in 3 ways.

Thus, ___ × 3
        (1, 3, 5)

As nothing is mentioned, we can say that repetition is allowed. So, each of the remaining places can be filled in 6 ways. i.e.

6 × 6 × 6 × 3 = 648 ways

Hence, total 648 such four digit numbers can be formed.

Example 5: How many four digit numbers greater than 4000 can be formed with digits 0, 2, 5, 7, 8 (without repetition)?

Solution:

For a four digit number greater than 4000, thousand's place needs to be filled with digits 5, 7 or 8 i.e. in 3 ways.

3 × 4 × 3 × 2 = 72 ways

Hence, total 72 such four digit numbers can be formed.

Example 6: Four digit numbers are formed by using the digits 1, 2, 3, 4, 5 with possible repetitions. How many of them are divisible by 4?

Solution:

First we make the possible combinations of last two digits such that the number is divisible by 4.

Possible combinations (12, 24, 32, 44, 52).

So, the last two digits taken as a single entity can be filled in 5 ways and the remaining two digits, each can be filled in 5 ways. i.e.

5 × 5 × 5 = 125 ways

Hence, total 125 such four digit numbers can be formed.

Example 7: Find the sum of the 5 digit numbers which can be formed from the digits 1, 2, 3, 4, 5 using each digit only once in each number.

Solution:

To find the sum of all 5 digit numbers, we find the number of times in which a digit may come at a particular place.

Let's take the digit 1 and fix it at the unit's place.

So, total number of ways i.e.

4 × 3 × 2 × 1 × 1

Hence, total 5 digits numbers in which 1 comes at unit place = 4! = 24. So, 1 comes at unit's place 24 times. Similarly, 2, 3, 4, 5 each will appear at the unit's place 24 times.

Similarly, each of the digits 1, 2, 3, 4 or 5 will appear 24 times in ten's, hundred's and thousand's place as well. Now, sum of the digits at the unit's place.

= 1 × 24 + 2 × 24 + ... 5 × 24

= (1 + 2 + 3 + 4 + 5) × 24 = 360

So, the sum of all the 5 digit numbers.

= 360 × 10^4 + 360 × 10^3 + 360 × 10^2 + 360 × 10^1 + 360 × 10^0

= 360 × (10000 + 1000 + 100 + 10 + 1)

= 360 × 11111 = 3999960

PERMUTATION

A permutation is an arrangement of a number of objects in a definite order.

Consider the three letters A, B and C. If these letters are written down in a row, there are six different possible arrangements:

ABC or ACB or BAC or BCA or CAB or CBA

There is a choice of 3 letters for the first place, then there is a choice of 2 letters for the second place and there is only 1 choice for the third place.

Thus, the three letters can be arranged in:

3 × 2 × 1 = 6 ways

In an arrangement, or permutation, the order of the objects chosen is important.

If we have **n different objects** to arrange, then:

The total number of arrangements = n!

where, n! = n(n − 1) (n − 2) (n − 3) ..... × 3 × 2 × 1

For example, 6! = 6 × 5 × 4 × 3 × 2 × 1 = 720

Suppose, we have 5 different objects and we want to find the number of possible arrangements taken 3 objects at a time. We can use the fundamental principle of counting to find the number of arrangements as:

Total number of arrangements = 5 × 4 × 3 = 60 ways

However, we can also do this type of calculation using factorials, as:

$$5 \times 4 \times 3 = \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} = \frac{5!}{2!} = \frac{5!}{(5-3)!}$$

Notice that in this case the number of arrangements

$$= \frac{(\text{Total number of objects})!}{\begin{bmatrix} \text{(Total number of objects} - \\ \text{number of objects to be arranged)}! \end{bmatrix}}$$

So, if we have 'n' different objects and we have to find the possible arrangements taking 'r' at a time then:

Total number of arrangements $= {}^{n}P_r = \dfrac{n!}{(n-r)!}$

Example 8: How many arrangements can be made out of the letters A, B, C, D and E, taking two letters at a time, if no letter can be repeated?

Solution:

By using the fundamental principle of counting,
Number of ways = 5 × 4 = 20 ways

Alternate Method:

We have 5 letters and we want to arrange two at a time, so total number of ways is ${}^{5}P_2$

$= \dfrac{5!}{(5-2)!} = \dfrac{5!}{3!} = \dfrac{120}{6} = 20$ ways

Example 9: How many different 4 digit numbers can be formed by using the digits 1, 2, 3,....9 without repeating any digit?

Solution:

By using the fundamental principal of counting, the four different places can be filled in 9 × 8 × 7 × 6
= 3024 numbers

Alternate Method:

The solution is permutation of 9 different things taken 4 at a time, which is

$= {}^{9}P_4 = \dfrac{9!}{(9-4)!} = \dfrac{9!}{5!} = 3024$

Example 10: There are six people and 3 seats. In how many ways 3 out of 6 can be seated?

Solution:

We have 6 people and we can make only 3 people sit. So,

total number of ways $= {}^{6}P_3 = \dfrac{6!}{(6-3)!} = \dfrac{6!}{3!}$

= 120 ways

Example 11: In how many ways five girls G1, G2, G3, G4 and G5 can be seated in a row as per the given conditions?

I.   There is no restriction on the seating.
II.   G1 and G2 must sit beside each other.
III. G1 and G2 must not sit beside each other.
IV.   G1 and G5 must occupy the end positions.

Solution:

I.   Number of arrangements = 56 = 5 × 4 × 3 × 2 × 1
      = 120 ways

II.   Here, we will consider G1 and G2 as one person. And there are three more girls. So, in total, we have four girls. The four girls can be arranged in 4! ways. But G1 and G2 can be arranged in 2! ways while seated together (i.e. G1G2 or G2G1).
      Thus, the number of arrangements = 4! × 2! = 48 ways

III. Here, the arrangement when G1 and G2 sit beside each other will be subtracted from the total arrangements.
      Thus, total number of arrangements = 120 − 48 = 72 ways

IV.   G1 and G5 must sit at the ends of the row. Put G1 and G5 at the ends and G2, G3 and G4 in between them.
      G2, G3 and G4 can be arranged in 3! ways while seated together. G1 and G5 can exchange places in 2! ways.
      Thus, the number of arrangements = 2! × 3!
      = 12 ways.

Example 12: In how many ways letters of the word 'BINGO' can be arranged such that

I.   All vowels are together
II.   Vowels occupy the even places
III. B and O always occupy the end places.

Solution:

I.   Consider I and O as a single unit.
      Now 4 things need to be arranged which can be arranged in 4! ways. But I and O can be arranged in 2! ways (i.e. OI and OI).

Hence, total number of arrangements = 4! × 2! = 48 ways.

II. Two vowels I and O can be at 2nd and 4th place, rest letters can be arranged in 3! ways.

Vowels can also interchange their positions in 2! ways. (i.e. _ I _ O _ and _ O _ I _)

Total such possible arrangements = 3! × 2! = 12 ways.

III. Fixing the end places with letters B and O, rest of the letters can be arranged in 3! ways and B and O can also interchange their positions in 2! ways. (i.e. B _ _ _ O and O _ _ _ B)

Total possible ways = 3! × 2! = 12 ways

Example 13: Find the number of ways in which 5 boys B1, B2, B3, B4 and B5 and 5 girls G1, G2, G3, G4 and G5 can be seated in a row as per the given conditions:

I. There is no restriction on the seating.

II. All the girls always sit together.

III. All the girls are never together.

IV. All the boys sit together and all the girls sit together.

V. Boys and girls sit at alternate positions.

VI. No two girls sit together.

Solution:

I. Total number of arrangements of 5 boys and 5 girls is 10! = 3628800.

II. When all the girls are always together, then treat them as one group. So now, we have 5 boys and one group of 5 girls and this can be arranged in 6! ways. At the same time, 5 girls in the group can be arranged in 5! ways. Thus, the number of arrangements = 6! × 5! = 86400 ways

III. Number of arrangements in which all the girls are never together = total arrangement − number of arrangements when all girls are always together = 10! − (6! × 5!) = 3542400 ways

IV. All the boys can be arranged in 5! ways and all the girls can be arranged in 5! ways. Now, we have two groups (boys, girls) and these 2 groups can be arranged in 2! ways. So, total number of arrangements = 5! × 5! × 2! = 28800 ways

V. Boys and girls sit alternately, this can be arranged like:

B1 G1 B2 G2 B3 G3 B4 G4 B5 G5

or

G1 B1 G2 B2 G3 B3 G4 B4 G5 B5

In the first case boys can be arranged in 5! and girls can be arranged in 5! ways. In the second case also, the number of arrangements is same as first case. So the total number of arrangements are = (5! × 5!) + (5! × 5!) = 28800 ways

VI. In this case _B1_B2_B3_B4_B5_, there are 6 spaces where a girl can find her seat.

From these six spaces, we have to select 5 places for girls. We need to make 5 girls sit on 6 seats and that can be done in $^6P_5$ = 720 ways. 5 boys can be arranged in 5! ways or 120 ways.

Total number of arrangements = 720 × 120
= 86400

Arrangements of n things when not all are different.

Total number of arrangements of 'n' things, taken all at a time, out of which 'p' are alike of one kind, 'q' are alike of second kind, 'r' are alike of third kind and rest are different.

$$= \frac{n!}{p!\,q!\,r!}$$

Example 14: In how many ways letters of word 'ASSASSINATION' can be arranged?

Solution:

In the word 'ASSASSINATION' there are three 'A' four 'S' two 'I' and two 'N' letters.

Total there are 13 letters. So, possible arrangements

$$= \frac{13!}{3!\,4!\,2!\,2!} = 10810800 \text{ ways}$$

Example 15: In how many ways we can arrange the letters of the word 'MUMBAI' such that:

I. All vowels are together

II. All vowels are not together

III. No two vowels are together

Solution:

I. Total number of arrangements

Vowels are A, I and U and the consonants are MMB Considering the three vowels as one set, the four things out of which two are identical (M, M) can be arranged in $= \dfrac{4!}{2!} = 12$ ways

Now, the three vowels can also be arranged in 3! ways. So, total number arrangements
= 12 × 3! = 72 ways

II. The arrangements for all vowels together will be subtracted from total arrangements to get the answer.

Total arrangements $= \dfrac{6!}{2!} = 360$ ways

Arrangements for all vowels not together
= 360 − 72 = 288 ways

III. The three consonants (MMB) can be arranged as:
_ C1 _ C2 _ C3 _
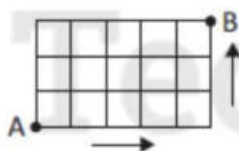
Number of ways $= \dfrac{3!}{2!} = 3$ ways

Now, 4 places for vowels can be arranged in three places in $^{4}P_{3} = 24$ ways.
So, total number of ways = 3 × 24 = 72 ways

Example 16: In the figure given below, the lines represent one way roads allowing travel only northwards or only east-wards. Along how many distinct routes can a car reach from point A to point B?

Solution:
Let an eastward step be denoted by A and a northward step be denoted by B. There are 5 steps eastward and 3 steps northward. Therefore, we are trying to find the total number of ways of arranging AAAAABBB. This is equal to

$\dfrac{8!}{5! \times 3!} = 56$ ways .

RANK OF A WORD IN THE DICTIONARY

Rank of a word is the position of that word when we arrange the words formed by alphabets that given word in dictionary order.

Let us assume that we have three letters A, B and C and the total words (meaningful or meaningless) which can be formed by these alphabets will be 3! = 6. The words will start with A, then B and then C.

The words are as follows:

1st word ABC   4th word BCA
2nd word ACB   5th word CAB
3rd word BAC   6th word CBA

So, we can say that the rank of the word BCA is 4th and similarly the rank the word CAB is 5th.

Example 17: If all the letters of the word PENCIL are arranged in an order like in the dictionary, then what will be the rank/position of the word PENCIL?

Solution:
The alphabets in alphabetical order are C/E/I/L/N/P.
Now, in the dictionary, first word will start from C.
If C is fixed at the first position, rest of the five alphabets can be arranged in 5! = 120 ways. So, we can say that there are 120 words starting with C.
Similarly, words starting with E, I, L and N will be 120 each.
Now, we will fix P in the first position and C in the second position
P C _ _ _ _
The rest 4 alphabets can be arranged in 4! = 24 ways.
Now, the words will start from
P E C _ _ _ 6 words
P E I _ _ _ 6 words
P E L _ _ _ 6 words
Now, next word will be
P E N C I L
So, the rank of the word PENCIL = 120 + 120 + 120 + 120 + 120 + 24 + 6 + 6 + 6 + 1 = 643

COMBINATION (SELECTION)

If 'r' objects are to be chosen from 'n' objects, where n r and order of choosing the 'r' objects is not important,

then such a selection is called combination of 'n' objects taken 'r' at a time and is denoted by

$$^nC_r = \frac{n!}{r!(n-r)!} \text{ where } r \leq n$$

using the formula of permutation in formula of combination, we get

$$^nC_r = \frac{^nP_r}{r!}$$

$^nP_r = r! \times {}^nC_r$

i.e. $= {}^nC_r \times r!$

So, we can say that permutation or arrangement of 'r' objects out of n objects is the selection of 'r' objects out of 'n' objects followed by the arrangements of 'r' different objects taken 'r' at a time.

| Important points about Combination |

I. $^nC_r = {}^nC_{n-r}$

II. $^nC_0 = {}^nC_n = 1$

III. $^nC_1 = {}^nC_{n-1} = n$

IV. $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

Example 18: In how many ways a committee of 6 members can be formed from 7 men and 6 women consisting of 4 men and 2 women?

Solution:

4 men can be selected out of 7 men in $^7C_4$ ways while 2 women can be selected from 6 women in $^6C_2$ ways.

Total such possible ways $= {}^7C_4 \times {}^6C_2$

$= 35 \times 15 = 525$ ways

| Difference between Permutations and Combinations |

Permutations	Combinations
$^nP_r = \dfrac{n!}{(n-r)!}$	$^nC_r = \dfrac{n!}{(n-r)!\,r!}$
$^nP_r = {}^nC_r \times r!$	$^nC_r = \dfrac{^nP_r}{r!}$
Objects have specific positions in the arrangements.	No specific position is defined for the objects.

Order of the objects matter.	Object's order does not matter.
Problems are based on: Standing/seating arrangements	Problems are based on: Group/team formations
Problems on digits	Committee formation.
Problems on word formations	Geometrical problems

Example 19: Tarita has 11 friends of whom 5 are her schoolmates. In how many ways can she invite 7 guests on her birthday such that 4 guests are her schoolmates?

Solution:

Out of the 11 friends 5 are schoolmates and 6 are non schoolmates. She has to invite 4 schoolmates and 3 non schoolmates.

4 schoolmates can be chosen in $^5C_4$ ways and 3 non schoolmates can be chosen in $^6C_3$ ways.

Hence, by the fundamental principal of counting, the number of ways in which she can invite 7 guests in $^5C_4 \times {}^6C_3 = 100$ ways.

Example 20: A committee of 7 members is to be chosen from 6 mathematicians, 4 physicists and 5 biologists. In how many ways can this be done if in the committee, there must be atleast one member from each group and atleast 3 mathematicians?

Solution:

The various cases are as follows:

Mathematicians = M, Physicists = P, Biologists = B.

Case I: 3M, 3P, 1B

Number of ways $= {}^6C_3 \times {}^4C_3 \times {}^5C_1 = 400$

Case II: 3M, 2P, 2B

Number of ways $= {}^6C_3 \times {}^4C_2 \times {}^5C_2 = 1200$

Case III: 3M, 1P, 3B

Number of ways $= {}^6C_3 \times {}^4C_1 \times {}^5C_3 = 800$

Case IV: 4M, 2P, 1B

Number of ways $= {}^6C_4 \times {}^4C_2 \times {}^5C_1 = 450$

Case V: 4M, 1P, 2B

Number of ways $= {}^6C_4 \times {}^4C_1 \times {}^5C_2 = 600$

Case VI: 5M, 1P, 1B

Number of ways = $^6C_5 \times {}^4C_1 \times {}^5C_1$ = 120

Total number of ways to select the committee

= 400 + 1200 + 800 + 450 + 600 + 120 = 3570

CIRCULAR PERMUTATION

In case of circular permutation, number of arrangements of 'n' objects on a circular table or track is given by $(n-1)!$.

Points to be Remembered

We use the concept of circular permutation only when circular table or track is empty. After fixing the position of one object for the arrangement of $(n-1)$ objects, we use the concept of linear permutation.

Number of circular arrangements = $(4-1)! = 3!$
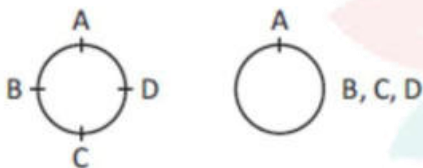
After fixing the position of A, we have to arrange B, C, D linearly i.e. in 3! ways.

Example 21: In how many ways 6 people can sit at a round table for a group discussion?

Solution:

The number of ways in which 6 people can sit at a round table = $(6-1)! = 5! = 120$ ways.

Example 22: In how many ways can 7 Englishmen and 7 Americans sit down at a round table such that no two Americans are in consecutive positions?

Solution:

If we arrange firstly 7 Englishmen around the round table, we can do it in $(7-1)! = 6!$ ways.

Once the 7 Englishmen are arranged at the round table, we now have to arrange 7 Americans around the same round table. For this, we will use the concept of linear permutation because we have 7 Englishmen already seated and table is not empty. So, number of arrangements of Americans is 7!. Hence, the required arrangements = $6! \times 7!$

Necklace from beads

Consider five beads A, B, C, D, E in a necklace or five flowers A, B, C, D, E in a garland etc. If the necklace or garland on the left is turned over, we obtain the arrangement on the right i.e., anticlockwise and clockwise order of arrangement are not different. Hence, we get arrangements as follows:
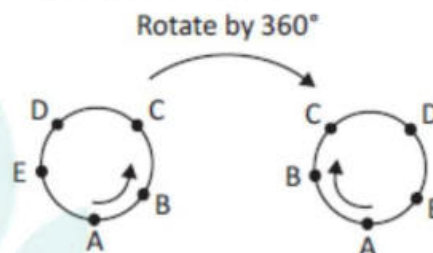
We see that arrangements in the above figures are not different. Hence, the number of circular permutations of 'n' different things taken all at a time is $\frac{1}{2}(n-1)!$.

GEOMETRICAL ARRANGEMENTS

In these type of arrangements, we find possible number of lines that can be formed from the given points by using combination method.

Number of straight lines

Minimum two points are required to form a line.

If there are 'n' points and no three points are collinear, then total number of possible lines from those 'n' points = $^nC_2$

Number of triangles

Minimum 3 points are required to form a triangle.

If there are 'n' points such that no three of them are collinear. Then, possible number of triangles from those 'n' points = $^nC_3$

Example 23: If there are 10 points such that no three of them are collinear, then what is the

I.   total number of possible lines?

II. total number of triangles?

Solution:

I.   Total number of possible line = $^{10}C_2$ = 45 lines.

II. Total number of possible triangles = $^{10}C_3$ = 120 triangles

Number of diagonals in a polygon

For a convex n-sided polygon, there are 'n' vertices, and from each vertex you can draw (n − 3) diagonals, so the total number of diagonals that can be drawn is n(n − 3). However, this would mean that each diagonal would can be drawn twice i.e. (to and fro in each vertex), so the expression must be divided by 2.

For example,

A square has $= \dfrac{4 \times (4-3)}{2} = \dfrac{4 \times 1}{2} = 2$ diagonals

A octagon has $= \dfrac{8 \times (8-3)}{2} = \dfrac{8 \times 5}{2} = 20$ diagonals

Thus, the number of diagonals in a polygon having 'n' sides is equal to $\dfrac{n \times (n-3)}{2}$.

Alternate Method:

In an 'n' sided polygon, the number of diagonals can also be given as $^{n}C_2 - n$. Since from 'n' points we can draw $^{n}C_2$ lines and subtracting the 'n' sides of the polygon from this gives the number of diagonals.

Example 24: If a regular polygon has 54 diagonals, then what is the number of sides in the polygon?

Solution:

Given that,

$^{n}C_2 - n = 54$

$\dfrac{n!}{2!\,(n-2)!} - n = 54$

$\Rightarrow \dfrac{n(n-1)(n-2)!}{2!\,(n-2)!} = 54$

$\Rightarrow \dfrac{n(n-1)}{2} - n = 54$

$\Rightarrow \dfrac{n^2 - n - 2n}{2} = 54$

$n^2 - 3n = 108$

$n(n-3) = 108$

$n = 12$ sides

SELECTION OF ONE OR MORE ITEMS

Selection of one or more items from 'n' distinct items

Previously, we were selecting a fixed number of articles from some given articles. But here, in this case, we are free to select any number of articles from 0 to 'n'.

Each thing can be selected in two ways – either it is taken (or selected) or it is not. Also, each selection may be associated with every other selection and thus the multiplication principle can be applied. The final number of ways with 'n' things would be: 2 × 2 × 2 × 2 .... which equals to 2^n. This would also include the case where no item has been selected. If we have to select atleast one item from 'n' distinct items, then the number of ways will be $2^n - 1$.

Example 25: If we have 5 distinct red balls. In how many ways we can select:

I. any number of balls from these 5 balls.
II. atleast one ball.
III. atleast three balls.

Solution:

I. Any number of balls can be selected in 2^5 i.e. 32 ways.

Alternatively we can say that

$^{5}C_0 + {}^{5}C_1 + {}^{5}C_2 + ... + {}^{5}C_5 = 2^5$

II. Now, we have to select atleast one ball.

So, we will remove one case from total cases.

So, the number of ways of selection = $2^5 - 1$

= 31 ways

Alternatively,

$[{}^{5}C_0 + {}^{5}C_1 + {}^{5}C_2 + {}^{5}C_3 + {}^{5}C_4 + {}^{5}C_5] - 1 = 32 - 1 = 31$

III. Here, we have to select atleast three balls from 5 balls.

Number of ways = $^{5}C_3 + {}^{5}C_4 + {}^{5}C_5 = 16$ ways

Alternatively,

As $^{n}C_r = {}^{n}C_{n-r}$

$^{5}C_0 = {}^{5}C_5$; $^{5}C_1 = {}^{5}C_4$; $^{5}C_2 = {}^{5}C_3$

So, $^{5}C_3 + {}^{5}C_4 + {}^{5}C_5 = \dfrac{2^5}{2} = 16$ ways

Selection of one or more items from 'n' similar items

Here, again we have to select any number of articles from 'n' similar items. If we have 3 identical red balls, then there is only one way to select no ball, one way to select one ball, one way to select two balls and one way to select three balls.

So, there are 4 ways (1 + 1 + 1 + 1) to select one or more red balls from 3 identical red balls.

Let's say that we have p + q + r.... things, out of which p alike things of one kind, q alike things of another kind and r alike things of third kind.

The p things may be selected in (p + 1) ways; for we may take 0, 1, 2, 3,...., p of them.

Similarly, the q things may be selected in (q + 1) ways and so on. Hence, the number of ways in which all the things may be selected is (p + 1)(q + 1)(r + 1).

However, this includes the case in which none of the things are being chosen and that has to be removed from the final answer i.e. [(p + 1)(q + 1)(r + 1)] − 1.

Example 26: If we have 5 identical red balls, 7 identical green balls and 9 identical black balls. In how many ways we can select.

I.   any number of balls from these 21 balls.
II. atleast one ball from these 21 balls.
III. atleast one ball of each colour.
IV. atleast 3 red, 4 green and 5 black balls.

Solution:

I.   Red balls can be selected in 6 ways (R0 to R5)
     Green balls can be selected in 8 ways (G0 to G7)
     Black balls can be selected in 10 ways (B0 to B9)
     So, total number of ways of selection
     = 6 × 8 × 10 = 480 ways

II. Now, we have to select atleast one ball. So, from the total number of ways of selection, we will remove one case in which we are not selecting any of the three balls.
     So, required number of ways = (6 × 8 × 10) − 1 = 479 ways

III. Now, we have to select atleast one ball of each colour.
     Red balls can be selected in 5 ways (R1 to R5)
     Green balls can be selected in 7 ways (G1 to G7)

Black balls can be selected in 9 ways (B1 to B9)
Total number of ways of selection = 5 × 7 × 9
= 315 ways

IV. Here, we have to select atleast 3 red, 4 green and 5 black balls.
     Red balls can be selected in 3 ways (R3 to R5)
     Green balls can be selected in 4 ways (G4 to G7)
     Black balls can be selected in 5 ways (B5 to B9)
     Total number of ways of selection = 3 × 4 × 5
     = 60 ways

GROUPING

Suppose if we have 3 distinct items A, B and C and we have to divide them in two groups of 2 and 1 items. Then, the number of ways of grouping $^{3}C_2 \times {}^{1}C_1 = \dfrac{3!}{2! \times 1!}$

Similarly, if we have 6 distinct items and we have to divide them into three groups of 3, 2 and 1 items. Then, the number of ways of grouping

$$^{6}C_3 \times {}^{3}C_2 \times {}^{1}C_1 = \dfrac{6!}{3! \times 2! \times 1!}$$

The order of groups is not important but if we have to name the groups, then the number of ways of grouping is multiplied by the factorial of the number of groups. So, if in the previous example, we have to divide the six distinct items into three groups as A, B and C.

The number of groupings

$$^{6}C_3 \times {}^{3}C_2 \times {}^{1}C_1 = \dfrac{6!}{3! \times 2! \times 1!} \times 3!$$

Here, ordering becomes important as groups have different names.

- Number of Ways in which (m + n) things, can be divided into two groups containing m and n things is

$$^{m+n}C_m \times {}^{n}C_n = \dfrac{(m+n)!}{(m)! \times (n)!}$$

- If m = n, i.e. the groups are equal, then in this case the number of different ways of subdivision are $\dfrac{(2m)!}{(m)! \times (m)! \times 2!}$ because in one way, it is possible to interchange the two groups without obtaining a new case.

Example 27: In how many ways can a deck of 52 cards be formed into 4 groups of 13 cards each?

Solution:

Here, order of the groups is not important. So, the number of ways in which 52 different cards can be divided equally into 4 groups

$$= \frac{52!}{4! \times (13!)^4}$$

Alternate Method:

Each group will get 13 cards. Now first group can be given 13 cards out of 52 cards in $^{52}C_{13}$ ways.

Second group can be given 13 cards out of the remaining 39 cards (i.e. 52 − 13 = 39) in $^{39}C_{13}$ ways.

Third group can be given 13 cards out of the remaining 26 cards (i.e., 39 − 13 = 26) in $^{26}C_{13}$ ways.

Fourth group can be given 13 cards out of the remaining 13 cards (i.e., 26 − 13 = 13) in $^{13}C_{13}$ ways. But all the four groups can be interchanged in 4! ways.

Hence, the required number of ways.

$$= {}^{52}C_{13} \times {}^{39}C_{13} \times {}^{26}C_{13} \times {}^{13}C_{13} \times \frac{1}{4!}$$

$$= \frac{52!}{13! \times 39!} \times \frac{39!}{13! \times 26!} \times \frac{26!}{13! \times 13!} \times 1 \times \frac{1}{4!}$$

$$= \frac{52!}{4! \times (13!)^4}$$

DISTRIBUTION

In distribution, we distribute articles into groups. We can have different cases that depend upon whether articles are identical or distinct. Similarly, groups can be identical or distinct.

Different things to be distributed to different groups where any group can accommodate any number of things

We need to distribute 'r' distinct items into 'n' distinct groups.

First article can be dealt in 'n' ways

Second article can be dealt in 'n' ways

Third article can be dealt in 'n' ways

And so on.

So, as each article can be dealt in 'n' ways.

Hence, number of ways = n^r

Example 28: In how many ways five different candies can be distributed amongst three kids where any kid can get any number of candies?

Solution:

Here, the first candy can go to any of the three kids and therefore the first candy can be distributed in three ways. Similarly, the second can be distributed in three ways and so on. Therefore, 5 candies can be distributed in $3 \times 3 \times 3 \times 3 \times 3 = 3^5$ or 243 ways.

Number of ways of dividing 'n' identical things among 'r' distinct groups or 'r' persons when each group can get any number

- **Number of non-negative integral solutions**

  If $x_1 + x_2 + ... + x_r = n$, where $x_1, x_2, ... x_r \geq 0$. Then the number of non-negative integral solutions = $^{n+r-1}C_{r-1}$

- **Number of positive integral solutions**

  If $x_1 + x_2 + ... + x_r = n$, where $x_1, x_2, ... x_r > 0$. Then the number of positive integral solutions = $^{n-1}C_{r-1}$

Example 29: In how many ways 21 toffees can be distributed amongst 3 children such that each kid should get an odd number of toffees?

Solution:

$x_1 + x_2 + x_3 = 21$

Now, $x_1 = 2k_1 + 1$; $x_2 = 2k_2 + 1$ and $x_3 = 2k_3 + 1$

$2k_1 + 1 + 2k_2 + 1 + 2k_3 + 1 = 21$

$k_1 + k_2 + k_3 = 9$

Now, we will find the non-negative integer solution of this equation as k_1, k_2 or k_3 can be 0.

Non-negative Integral solution = $^{9+3-1}C_{3-1} = {}^{11}C_2$

Identical things to be distributed to identical groups where any group can accommodate any number of things

In how many ways can we distribute 5 identical candies in three identical boxes?

First, let's list down the cases as:

(0, 0, 5), (0, 1, 4), (0, 2, 3), (1, 1, 3), (1, 2, 2)

So, there are 5 ways of distributing 5 identical candies in three identical boxes.

Example 30: In how many ways can we distribute 10 identical candies among 4 boxes where each box should contain atleast one candy?

Solution:

Each box should have atleast one candy. The cases will be: (1, 1, 8), (1, 2, 7), (1, 3, 6), (1, 4, 5), (2, 2, 6), (2, 3, 5), (2, 4, 4), (3, 3, 4).

So, the total number of ways are 8.

> **Different things to be distributed to identical groups where any group can accommodate any number of things**

In how many ways we can distribute 5 different candies in three identical boxes?

First, let's list down the cases as:

(0, 0, 5), (0, 1, 4), (0, 2, 3), (1, 1, 3), (1, 2, 2)

Case I: (0, 0, 5) = $^5C_5$ = 1 ways

Case II: $(0, 1, 4) = \dfrac{5!}{1! \times 4!} = 5$ ways

Case III: $(0, 2, 3) = \dfrac{5!}{2! \times 3!} = 10$ ways

Case IV: $(1, 1, 3) = \dfrac{5!}{1! \times 1! \times 3!} \times \dfrac{1}{2!} = 10$ ways

Case V: $(1, 2, 2) = \dfrac{5!}{1! \times 2! \times 2!} \times \dfrac{1}{2!} = 15$ ways

Total number of ways = 1 + 5 + 10 + 10 + 15 = 41 ways

Example 31: In how many ways can we distribute 8 different candies in 3 identical boxes such that each box contains atleast one candy?

Solution:

Each box should have atleast one candy. So, the cases are:

(1, 1, 6) (1, 2, 5) (1, 3, 4) (2, 2, 4) (2, 3, 3)

	Values			Number of Ways
	B1	B2	B3	
Case I	1	1	6	$\dfrac{1}{2!} \times \dfrac{8!}{1! \times 1! \times 6!} = 28$
Case II	1	2	5	$\dfrac{8!}{1! \times 2! \times 5!} = 168$
Case III	1	3	4	$\dfrac{8!}{1! \times 3! \times 4!} = 280$
Case IV	2	2	4	$\dfrac{1}{2!} \times \dfrac{8!}{2! \times 2! \times 4!} = 210$
Case V	2	3	3	$\dfrac{1}{2!} \times \dfrac{8!}{2! \times 3! \times 3!} = 280$

So, total number of ways = 28 + 168 + 280 + 210 + 280 = 966 ways

Exercise

Practice Exercise Level 1

1. There are 6 pairs of gloves available in different sizes. In how many ways can you choose one for left hand and one for right hand such that they are not of the same pair?
   (A) 30 (B) 20
   (C) 42 (D) 36

2. A tourist wants to go to another country by ship and return by air. He has a choice of 6 different ships to go by and 5 airlines to return by. In how many ways can he perform the journey?
   (A) 10 (B) 11
   (C) 30 (D) 60

3. In how many ways the letters of the word 'RAINBOW' can be arranged?
   (A) 5040 (B) 4050
   (C) 3040 (D) 8040

4. In the previous question, how many words begin with the letter R?
   (A) 720 (B) 360
   (C) 1440 (D) None of these

5. In question number 3, how many words are there in which R and W are at the end positions?
   (A) 120 (B) 180
   (C) 210 (D) 240

6. In how many rearrangements of the word 'RAJEEV' is the letter 'A' positioned in the middle of the two 'E's?
   (A) 120 (B) 24
   (C) 72 (D) 240

7. How many words can be made from the word 'MATHEMATICS' in which vowels are together?
   (A) 12960 (B) 120960
   (C) 15400 (D) None of these

8. If you have 3 jeans and 5 pairs of trousers, in how many ways can you wear either a jeans or a pair of trousers?
   (A) 5 (B) 8
   (C) 15 (D) 30

9. There are 3 questions in a question paper. If the questions have 4, 3 and 2 options respectively, what are the total number of possible solutions?
   (A) 9 (B) 11
   (C) 24 (D) 48

10. In a city, the bus route numbers consist of a natural number less than 100, followed by one of the letters A, B, C, D, E and F. How many different bus routes are possible?
    (A) 99 (B) 105
    (C) 600 (D) 594

11. In how many ways can two vacancies be filled from 5 men and 8 women if one vacancy is filled by a man and the other by a woman?
    (A) 13 (B) 20
    (C) 40 (D) 80

12. How many different numbers of 3 digits can be formed with the digits 1, 2, 4, 5, 7, 8; none of the digits is repeated in any of the numbers so formed?
    (A) 120 (B) 1200
    (C) 180 (D) 270

13. How many natural numbers less than a lakh can be formed with the digits 0, 6 and 9?
    (A) 242 (B) 728
    (C) 243 (D) 729

14. How many five-digit odd numbers can be formed using 1, 2, 3, 4 and 5 such that each digit is used exactly once and the odd digits occupy the odd places?
    (A) 12 (B) 20
    (C) 24 (D) 36

15. How many numbers greater than a million can be formed with the digits 5, 5, 2, 2, 1, 7, 0?

(A) 980   (B) 1080

(C) 920   (D) 1200

16. What is the number of ways of forming a 6-digit number with the digits 0, 1, 2, 3, 4 and 5, so that even digits occupy odd places?

(A) 24   (B) 36

(C) 48   (D) None of these

17. How many 5-digit numbers can be formed where no two consecutive digits are identical?

(A) $9^2 \times 8^3$ (B) 9×8^4

(C) 9^5 (D) None of these

18. How many 2-digit distinct nos. can be formed from digits 1, 2, 3, 4, 5, 6?

(A) 48   (B) 30

(C) 36   (D) 50

19. How many 3-digit odd numbers can be formed from digits?

0, 1 9

(A) 720   (B) 360

(C) 450   (D) 500

20. How many 3 digit palindrome numbers exist? (Palindrome is a number that remains the same when its digits are reversed. e.g. 16461, 292, 1331 etc.)

(A) 90   (B) 81

(C) 110   (D) 100

21. How many 3-digit numbers each less than 600 can be formed from digits: 1, 2, 3, 4, 5 and 9 without repetition of the digits?

(A) 216   (B) 120

(C) 150   (D) 100

22. How many numbers between 4000 and 9000 can be formed using the digits: 3, 4, 7 and 9.

(A) 192   (B) 128

(C) 144   (D) 160

23. How many 4 digit odd numbers can be formed using digits 0, 1, 2, 3, 4, 5?

(A) 540   (B) 144

(C) 580   (D) 160

24. A customer forgets a 4-digit code of an ATM in a bank. However, he remembers that this code consists of 3, 5, 6 and 9. What is the largest possible number of trials necessary to obtain the correct code?

(A) 48   (B) 24

(C) 30   (D) 12

25. How many 5-digit even numbers can be formed using the digits 1, 2, 3, 4, 5 exactly once?

(A) 120   (B) 48

(C) 96   (D) 24

26. How many 5-digit numbers can be formed using the digits 1, 2, 3, 4, 5 exactly once and are divisible by 5?

(A) 120   (B) 48

(C) 96   (D) 24

27. What is the number of five-digit numbers having atleast one of their digits repeated?

(A) 69760   (B) 62784

(C) 10000   (D) 90000

28. How many four-digit numbers, each divisible by 4, can be formed using the digits 1, 2, 3, 4 and 5, repetition of digits being allowed in any number?

(A) 100   (B) 150

(C) 125   (D) 75

29. A five-digit number divisible by 3 is to be formed using numericals 0, 1, 2, 3, 4 and 5 without repetition. What is the total number of ways this can be done?

(A) 122   (B) 210

(C) 216   (D) 217

30. What is the sum of all the four-digit numbers that can be formed with the digits 3, 4, 5, 7 taken all at a time?

(A) 129638   (B) 639484

(C) 126494   (D) 126654

31. If $^nP_5 = 20\ ^nP_3$, then what is the value of n?

(A) 5   (B) 8

(C) 6   (D) 4

32. 5 men and 4 women are to be seated in a row so that the women occupy the even places. How many such arrangements are possible?

(A) 2880   (B) 1440

(C) 720   (D) 2020

33. If all the letters of the word SEQUESTERED be arranged as in a dictionary, what is 50th word?
   (A) DEEEEQURSST   (B) DEEEEQURSTS
   (C) DEEEEQRSUST   (D) DEEEEQRSSTU

34. An eight-oared boat is to be manned by a crew. Out of 8 persons, there should one who can steer and rest can row. The selection has to be done from 11 persons of whom 3 can steer but cannot row and rest can row but cannot steer. In how many ways can the crew be arranged if the boat has to be rowed by equal men on both sides?
   (A) $^3C_1 \times {}^8C_4 \times {}^4C_4$ (B) $^3C_1 \times {}^{11}C_7 \times 8!$
   (C) $^3C_1 \times {}^8P_4 \times {}^4C_4$ (D) $^3P_1 \times {}^{11}P_7 \times 4! \times 4!$

35. How many different words can be formed from the word EXTRA if (i) vowels are together (ii) vowels are not together?
   (A) 96, 24   (B) 40, 80
   (C) 48, 72   (D) 72, 48

36. In how many ways can the 7-letters A to G be arranged so that 'B' and 'C' are always together?
   (A) 1020   (B) 1200
   (C) 720   (D) 1440

37. How many eight distinct letter words can be formed from the letters of the word COURTESY beginning with 'C' and ending with 'Y'?
   (A) 1200   (B) 840
   (C) 720   (D) 1440

38. In how many ways can the letters of the word MACHINE be rearranged so that vowels occupy only odd numbered positions?
   (A) 360   (B) 576
   (C) 432   (D) 288

39. In how many ways can the letters of the word ASCENT be rearranged such that the vowels always appear together?
   (A) 120   (B) $4 \times 4!$
   (C) $2 \times 4!$ (D) $2 \times 5!$

40. How many different four-letter words can be formed (the words need not be meaningful) using the letters of the word MATHEMATICS such that no two letters are same in the words?
   (A) $^8C_4$ (B) $^8P_4$
   (C) $4! \times 5!$ (D) 120

41. What is the number of words that can be formed using the letters of the word MISSISSIPPI such that all the four S's are together?
   (A) $\dfrac{8! \times 5!}{4! \times 2!}$ (B) $\dfrac{8!}{4! \times 4! \times 2!}$
   (C) $\dfrac{11!}{4! \times 4! \times 2!}$ (D) $\dfrac{8!}{4! \times 2!}$

42. How many words can be formed with the letters of the word 'PATALIPUTRA' without changing the relative positions of vowels and consonants?
   (A) 1800   (B) 3600
   (C) 200   (D) 1500

Directions (43-46) What are the number of permutations that can be made from the letters of the word 'SMITA'?

43. S and A occupying end places.
   (A) 12   (B) 14
   (C) 20   (D) 18

44. I always being in the middle.
   (A) 18   (B) 24
   (C) 48   (D) 36

45. Vowels occupying odd places.
   (A) 18   (B) 32
   (C) 36   (D) 20

46. All vowels are not together
   (A) 36   (B) 72
   (C) 96   (D) 60

47. How many words can be formed beginning with 'D' and ending in 'A' with the letters of the word "TUESDAY"?
   (A) 360   (B) 60
   (C) 720   (D) 120

48. The letters of the word COCHIN are permuted and all the permutations are arranged in an alphabetical order as in an English dictionary.

What is the number of words that appear before the word COCHIN?

(A) 360   (B) 192

(C) 96   (D) 48

49. There are n people in a room and each one shakes hands with everyone else. If the number of handshakes is 55, what is the number of people in the room?

(A) 11   (B) 10

(C) 27   (D) 23

50. In how many ways one can select two odd multiples of 5 from 1 to 100?

(A) 45   (B) 190

(C) 20   (D) 10

51. If six persons are selected out of ten, in how many ways a particular person will be found amongst those six?

(A) 124   (B) 126

(C) 144   (D) 84

52. In how many ways, is it possible to make a selection by taking any number of 15 fruits, namely 3 oranges, 5 apples and 7 mangoes?

(A) 131   (B) 191

(C) 68   (D) 192

53. In how many ways can 3 numbers be selected from the first 20 natural numbers such that exactly one of them is a multiple of 3?

(A) $^{20}C_3$ (B) $^{14}C_2$

(C) $^{14}C_2 + {}^6C_1$ (D) $^{14}C_2 \times {}^6C_1$

54. There are two sections in class X in a school having 18 and 15 students respectively. In how many ways can a team be selected such that there is atleast one student from each of the two mentioned sections?

(A) 2^{33} (B) $2^{33} - 1$

(C) $(2^{18} - 1)(2^{15} - 1)$ (D) $2^{18} \times 2^{15}$

55. If $^nC_{12} = {}^nC_8$, then what is the value of $^{22}C_n$?

(A) 252   (B) 231

(C) 44   (D) None of these

56. Baga is packing for a business tour. He wants to pack 5 shirts and 6 trousers from his collection of 10 shirts and 12 trousers. In how many ways can he pack shirts and trousers?

(A) $^{22}C_{11}$ (B) $5! \times 6!$

(C) $^{10}C_5 + {}^{12}C_6$ (D) $^{10}C_5 \times {}^{12}C_6$

57. In how many ways can a committee of 7 members be selected, from 8 men and 6 women, consisting of 5 men and 2 women?

(A) 840   (B) 120

(C) 1440   (D) 420

Directions (58-59) How many different selections of 6 cars can be made from 11 different cars, if

58. Two particular cars are always selected:

(A) 162   (B) 114

(C) 126   (D) 140

59. Two particular cars are never selected:

(A) 108   (B) 84

(C) 60   (D) 72

60. The governing council of an institute has 15 members and wants to hold its annual meeting. In how many ways can the council be seated around a round table if the chairman and the vice chairman of the council are always seated together?

(A) $10 \times 12!$ (B) $14 \times 10!$

(C) $13!$ (D) None of these

61. In how many ways can 24 people be seated around a circular table, if there are 13 seats?

(A) $\dfrac{24!}{13 \times 11!}$ (B) $\dfrac{22!}{14 \times 12!}$

(C) $\dfrac{23!}{13 \times 11!}$ (D) $\dfrac{24!}{12 \times 12!}$

62. In how many ways can 7 people be seated around a circular table such that two particular people are next to each other?

(A) 240   (B) 180

(C) 160   (D) 120

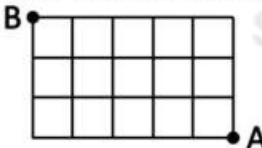63. What are the number of ways in which 12 different beads can be arranged to form a necklace?

(A) $\frac{11!}{2}$

(B) $\frac{10!}{2}$

(C) $\frac{12!}{2}$

(D) 11!

64. How many necklaces of 12 beads can be made from 18 beads of various colours?

(A) $\frac{118 \times 13!}{2}$

(B) $\frac{110 \times 14!}{2}$

(C) $\frac{119 \times 13!}{2}$

(D) $\frac{110 \times 12!}{2}$

65. In how many different ways, 5 boys and 5 girls can sit around a circular table so that the boys and girls are sitting alternately?

(A) 2880

(B) 2800

(C) 2680

(D) 2280

66. 25 people were invited to a party and were asked to sit around a round table. In how many ways two particular people can be seated on either side of the host?

(A) 23! × 2!

(B) 24! × 2!

(C) 22! × 2!

(D) 25! × 2!

67. A round table conference is to be held between 20 delegates from 20 countries. In how many ways can they be seated if two particular delegates always sit together?

(A) 3 × 18!

(B) 2 × 18!

(C) 18!

(D) 18! − 1

68. There are seven points in a plane and no three of them are collinear, then what is the number of straight lines that can be drawn?

(A) 21

(B) 42

(C) 13

(D) 14

69. How many quadrilaterals can be formed joining the vertices of a polygon of 'n' sides?

(A) $^nC_1 \times 2$

(B) $^nC_4$

(C) $^nC_4 \times 2$

(D) None of these

70. What is the maximum number of points of intersection of 6 straight lines?

(A) 30

(B) 15

(C) 28

(D) None of these

71. What is the maximum number of points of intersection of 6 circles?

(A) 30

(B) 28

(C) 15

(D) None of these

72. What is the maximum number of points at which 3 circles and 3 lines intersect?

(A) 21

(B) 9

(C) 27

(D) 3!

73. In a polygon, the number of diagonals is 54. What is the number of sides of the polygon?

(A) 10

(B) 12

(C) 9

(D) None of these

74. There is a polygon of 12 sides. How many triangles can be drawn using the vertices of polygon?

(A) 200

(B) 220

(C) 240

(D) 260

75. How many diagonals are there in a decagon?

(A) 30

(B) 35

(C) 45

(D) 20

76. How many diagonals can be formed in an octagon?

(A) 28

(B) 20

(C) 56

(D) 48

77. How many triangles can be formed in a hexagon?

(A) 15

(B) 24

(C) 18

(D) 20

78. In how many ways can a team of 11 players be formed from 6 bowlers, 4 wicket keepers and 8 batsmen to have a majority of batsmen, if atleast 4 bowlers are to included and there is one wicketkeeper?

(A) 1680

(B) 2040

(C) 1800

(D) 2000

79. A candidate has to answer 6 questions out of 10 questions, divided into two groups each containing 5 questions. He is not permitted to answer more than 4 questions from any group. In how many ways can he make the choices?

(A) 210

(B) 200

(C) 190

(D) None of these

80. Anil has 5 friends; 3 girls and 2 boys. Anil's wife also has 5 friends; 3 boys and 2 girls. In how many

ways can they invite 2 boys and 2 girls such that 2 of them are Anil's friends and two are his wife's?

(A) 45   (B) 49

(C) 35   (D) None of these

81. From 6 men and 5 ladies, in how many ways 5 people can be chosen with atleast one man?

(A) 454   (B) 461

(C) 376   (D) 462

82. In an examination paper, there are two groups, each containing 4 questions. A candidate is required to attempt 5 questions but not more than 3 questions from any group. In how many ways 5 questions can be selected?

(A) 24   (B) 48

(C) 96   (D) None of these

Directions (83-86) What is the total number of ways of selecting atleast one ring from 2 sets of:

83. 10 different rings

(A) $2^{10} \times 2^{10} \times 2$ (B) $2^{10} + 2^{10}$

(C) $2^{20} + 1$ (D) $2^{20} - 1$

84. 10 identical rings.

(A) 100   (B) 120

(C) 119   (D) 121

85. 10 different rings picking atleast one from each set.

(A) $2^{20} - 1$ (B) $(2^{10} - 1)^2$

(C) 2^{20} (D) $2^{20} - 2$

86. 10 identical rings picking atleast one from each set.

(A) 110   (B) 100

(C) 121   (D) 120

87. In how many ways can a deck of 52 cards be divided equally into four groups?

(A) $\dfrac{52!}{(13!)^4 \times 4!}$ (B) $4! \left[\dfrac{52!}{(13!)^4} \right]$

(C) $\dfrac{52!}{(13!)^4}$ (D) None of these

88. What is the number of ways, to distribute 32 different things equally among 4 people?

(A) $\dfrac{32!}{(8!)^3}$ (B) $\dfrac{32!}{(8!)^4}$

(C) $\dfrac{1}{4}(32!)$ (D) None of these

89. In how many ways 4 rings of different types can be worn in 3 fingers?

(A) 49   (B) 12

(C) 24   (D) 81

90. In how many ways can 5 prizes be given away to 4 boys, when each boy is eligible for all the prizes?

(A) 1024   (B) 20

(C) 625   (D) 540

91. What is the total number of ways in which 20 mangoes can be distributed among 4 people?

(A) $^{20}C_3$ (B) $^{23}C_3$

(C) $^{24}C_3$ (D) $\dfrac{20!}{4!}$

92. What are the number of non negative integral solutions of $x_1 + x_2 + x_3 + x_4 = 44$?

(A) $^{44}C_4$ (B) $^{43}C_3$

(C) $^{47}C_3$ (D) None of these

93. If x, y and z are positive integers, then what are the number of possible solutions of the equation x + y + z = 15?

(A) 91   (B) 136

(C) $^{17}C_{14}$ (D) None of these

94. What is the number of different ways in which 3 different cakes can be distributed among 5 children?

(A) 125   (B) 60

(C) 729   (D) None of these

95. What is the number of different ways of distribution of 10 identical balls in 3 boxes, if empty box is not allowed?

(A) 66   (B) 36

(C) 1364   (D) None of these

Practice Exercise Level 2

1. How many four-digit numbers not greater than 4000 can be formed using the digits 0, 1, 2, 3, 4 and 5 with repetition?
   (A) 1080 (B) 649
   (C) 648 (D) 1081

2. What is the sum of all the four-digit numbers which can be formed with the digits 1, 2, 3, 4?
   (A) 710400 (B) 711000
   (C) 711040 (D) 712151

3. In how many ways 6 students and 4 teachers can be arranged in a row so that no two teachers are together?
   (A) 604800 (B) 24680
   (C) 25860 (D) None of these

4. How many different license-plates involving three letters and three digits are there if the three letters appear together, either at the beginning or at the end of the license number?
   (A) $2 \times 26^3 \times 10^3$ (B) $25^4 \times 10^2$
   (C) $4 \times 25^2 \times 10^4$ (D) None of these

5. What is the number of arrangements of the letters of the word 'Maruti' if 'u' always comes before 'a'?
   (A) 60 (B) 180
   (C) 420 (D) 360

6. In the adjoining figure, the lines represent one-way roads allowing travel only northwards or only westwards. Along how many distinct routes can a car reach point B from point A?

   (A) 15 (B) 56
   (C) 120 (D) 336

7. At a meeting, eight speakers including A, B, C and five other speakers have to address the gathering such that A should speak before B and B should speak before C. In how many ways can they address the meeting?
   (A) 8! (B) $\frac{8!}{6!}$
   (C) $\frac{8!}{6}$ (D) $\frac{8!}{(6! \times 4!)}$

8. There are 20 couples in a party. Every person greets every other person except his or her own spouse. People of the same gender shake hands and those of opposite gender greet each other with a HELLO. What is the total number of handshakes and HELLOs in the party?
   (A) 760 (B) 1140
   (C) 1520 (D) 570

9. Seven people A to G have to be assigned one task each such that the first task cannot be given to A, D or G while the fourth task has to be given to one of C, F or E. In how many different ways can the allocations be done?
   (A) $9 \times 5!$ (B) $12 \times 5!$
   (C) $5! \times 3!$ (D) $10 \times 5!$

10. Out of five couples, in how many ways can the selection of three persons be done such that no couple is selected?
    (A) 28 (B) 32
    (C) 40 (D) None of these

11. There are 3 boys and 4 girls, seated around a circular table so that no two boys are together. Find the number of ways in which this can be done:
    (A) 36 (B) 120
    (C) 144 (D) 132

12. How many squares are there in a 6 × 8 rectangular board?
    (A) 91 (B) 133
    (C) 204 (D) 256

13. There is a regular decagon. Triangles are formed by joining the vertices of the decagon. How many triangles can be formed which are having no sides common to any side of the decagon?

(A) 90   (B) 70
(C) 120   (D) 50

14. There are 12 points in a plane, out of which 8 are non-collinear and the remaining points are collinear. What is the number of different triangles that can be obtained by joining any three of the points?
(A) 48   (B) 132
(C) 216   (D) None of these

15. There are 15 points in a plane out of which 4 points are on one straight-line and another 5 points are on another straight-line. The two lines are parallel and no three of the remaining 6 points are collinear. What is the number of triangles that can be formed by joining these 15 points?
(A) 441   (B) 455
(C) 213   (D) Data insufficient

Directions (16-17) Each of two different parallel lines has a number of distinct points marked on them, on one line there are 2 points P and Q and on the other line there are 8 points.

16. What is the number of triangles having 3 of the 10 points as vertices?
(A) 32   (B) 56
(C) 64   (D) 128

17. How many triangles include P but exclude Q?
(A) 64   (B) 56
(C) 28   (D) 14

18. A committee of 3 experts is to be selected out of a panel of 7 people. Three of them are engineers, three of them are managers and one is both an engineer and a manager. In how many ways can the committee be selected if it must have atleast one engineer and one manager?
(A) 33   (B) 22
(C) 11   (D) 66

19. What is the number of ways in which 21 balls can be distributed among 3 persons such that each person does not receive less than 5 balls?

(A) 28   (B) 14
(C) 21   (D) 7

20. What is the number of non-negative integral solutions to the system of equations $x + y + z + u + t = 20$ and $x + y + z = 5$?
(A) 228   (B) 336
(C) 448   (D) 528

21. There are 12 intermediate stations between two places A and B. In how many ways can a train be made to stop at 4 of these 12 intermediate stations such that no two stopping stations are consecutive?
(A) $^{15}C_3$ (B) $^{11}C_3$
(C) $^9C_4$ (D) $^9C_3$

22. How many integers between 1 and 100000 have the sum of their digits equal to 18?
(A) 8,993   (B) 5885
(C) 7315   (D) 4345

23. Mr. X wants to buy a total of 100 fruits using exactly a sum of Rs. 1000. He can buy mango at Rs. 20 per unit, apple at Rs. 5 per unit or banana at Rs. 1 per unit. If he has to buy atleast one of each fruits and cannot buy any other type of fruits, then in how many distinct ways can he make his purchase?
(A) 2   (B) 3
(C) 4   (D) 5

Directions (24-27) There are 3 pots and 4 coins. All these coins are to be distributed into these pots where any pot can contain any number of coins.

24. In how many ways these coins can be distributed if all the coins and all the pots are different?
(A) 3^4 (B) 4^3
(C) $^3P_4$ (D) $^4P_3$

25. In how many ways these coins can be distributed if all the coins and all the pots are identical?
(A) 4   (B) 6
(C) 8   (D) 1

26. In how many ways all these coins can be distributed if all coins are identical but all pots are different?

    (A) 15   (B) 16

    (C) 17   (D) 81

27. In how many ways all these coins can be distributed if all coins are different but all pots are identical?

    (A) 14   (B) 21

    (C) 27   (D) None of these

Solution
Practice Exercise Level 1

1.(A) There are 6 right hand gloves and 6 left hand gloves. For every 1 right hand glove, we have 5 left hand glove (excluding the correct pair) Then, by the fundamental principle of counting:
Number of ways = 6 × 5 = 30 ways

2.(C) The number of ways of doing the onward and the return journey is 6 × 5 i.e. 30 ways.

3.(A) There are 7 letters in the word RAINBOW and each letter is used only once. So, all the 7 letters can be arranged in 7! ways.
7! = 7 × 6 × 5 × 4 × 3 × 2 × 1
= 5040 ways

4.(A) If we fix R as the initial letter, then we have to arrange only 6 remaining letters.
Hence, required number of permutations
= 6!
= 6 × 5 × 4 × 3 × 2 × 1 = 720

5.(D) Except R and W, all the remaining 5 letters can be arranged in 5! ways and R and W can be arranged in 2! ways at the end positions.
Thus, total number of permutations = 2! × 5! = 2 × 120 = 240 ways

6.(B) Take EAE as a single group. Therefore, we have a group EAE and R, J and V.
These 4 things can be arranged in 4! ways, that is, 24 ways.

7.(B) $\underbrace{M,M,T,T,H,C,S}_{7}\,\underbrace{A,A,E,I}_{4}$
When all the vowels are together then n = 7 + 1 = 8
Required number of permutations
$= \dfrac{8! \times 4!}{2! \times 2! \times 2!} = 120960$

8.(B) A jeans can be selected in 3 ways and a pair of trousers can be selected in 5 ways. So, the number of ways of selecting either a jeans or a pair of trousers is 3 + 5 i.e. 8 ways.

9.(C) Here, question 1 has 4 options, question 2 has 3 options, and question 3 has 2 options.
Total number of solutions
= 4 × 3 × 2 = 24

10.(D) The number can be any one of the natural numbers from 1 to 99. So, there are 99 choices for the number.

The letter can be chosen in 6 ways.
Number of possible bus routes numbers are 99 × 6 = 594

11.(C) The first vacancy can be filled in 5 ways and the second vacancy can be filled in 8 ways.
So, the two vacancies can be filled in 5 × 8 i.e. 40 ways.

12.(A) Since there are 6 digits available and out of the 6 digits, we have to take only 3 digits for the arrangement. Therefore, required number of 3 digit numbers = $^6P_3 = \dfrac{6!}{3!} = 120$

6	5	4

6 × 5 × 4 = 120 numbers
We have 6 digits to fill up hundred's place and only 5 digits for ten's place and only 4 digits for unit's place since repetition is not allowed.

13.(A) The required numbers are from 1 to 99999 and these have to be formed from the digits 0, 6 and 9.
The maximum number of digits that a number can take is 5. So, logically, every digit place can be filled by the digits 0, 6 and 9 in three ways.
Thus, total number of ways = 3 × 3 × 3 × 3 × 3 = 243.
But amongst these, 00000 is also a number formed and has to be excluded as it is not a natural number.
So, total numbers possible = 243 − 1 = 242

14.(A) There are three odd places and these are to be occupied by the odd digits. The number of odd digits is 3 i.e. (1, 3 and 5).
Therefore, the odd places can be first occupied by the odd digits in 3! ways.
Now, there are two places for the even digits and there are two even digits i.e. (2 and 4).
Therefore, the even places can be occupied by the even digits in 2! ways.
Total number of ways = 3! × 2!
= 6 × 2 = 12 ways.

15.(B) The digits which we have to use only are 5, 5, 2, 2, 1, 7, 0.
In a million, there are seven digits and zero.
Fixing '1' at first place,

Total numbers possible $= 1 \times \dfrac{6!}{2! \times 2!}$

Fixing '2' at first place i.e.,

Total numbers possible $= 1 \times \dfrac{6!}{2!}$

Fixing '5' at first place i.e.,

Total numbers possible $= 1 \times \dfrac{6!}{2!}$

Fixing '7' at first place i.e.,

Total numbers possible $= 1 \times \dfrac{6!}{2! \times 2!}$

Total numbers possible are

$= \dfrac{6!}{2! \times 2!} + \dfrac{6!}{2!} + \dfrac{6!}{2!} + \dfrac{6!}{2! \times 2!}$

$= 180 + 360 + 360 + 180$

$= 1080$

16.(A)

2	3	2	2	1	1

Since, left most place can assume only non-zero even digits i.e. 2 or 4 and rest can assume all given digits.

The number of numbers

$= \underbrace{(2 \times 2 \times 1)}_{\text{even digits}} \times \underbrace{(3 \times 2 \times 1)}_{\text{odd digits}}$

$= 4 \times 6 = 24$

17.(C) Since, the first digit should assume only a non-zero value. Therefore, it can take 9 values, second digit can also assume 9 values (it cannot 7 assume the value assigned to the first digit) and so on.

Number of numbers formed

$= 9 \times 9 \times 9 \times 9 \times 9 = 9^5$

18.(B) First digit of the required number can assume all the 6 values and the second digit can assume 5 values (excluding the one which is at the first digit)

Required number of numbers $= 6 \times 5 = 30$

19.(C)

9	10	5

As the number is odd, the unit's digit can take only 5 values (1, 3, 5, 7 and 9) and as the number is a three-digit number, the hundred's place can assume 9 values (except 0).

Required number of numbers

$= 9 \times 10 \times 5 = 450$

20.(A) For a three-digit palindrome number, the digit at unit's place should be equal to the digit at hundred's place and digit at ten's place can assume any value.

9	10	1

Required number of numbers

$= 9 \times 10 \times 1 = 90$

21.(D) For a 3-digit number less than 600, then hundredth digit can assume 5 values (1, 2, 3, 4, 5) from the given digit without repetition, tenth place can assume 5 values and unit digit can assume 4 values.

5	5	4

Required number of numbers

$= 5 \times 5 \times 4 = 100$

22.(B) The number should be a 4-digit number with its first digit starting from either 4 or 7, remaining digits can take any of the 4 given digits.

Required number of numbers

$= 2 \times 4 \times 4 \times 4 = 128$

23.(A) Unit's digit of the required number can assume only 3 values i.e. (1, 3 and 5) and the leftmost digit can assume 5 values (excluding 0).

5	6	6	3

Required number of numbers

$= 5 \times 6 \times 6 \times 3 = 540$

24.(B) Largest possible number of trials = total permutations possible

Required number $= 4! = 24$

25.(B) One's place can be filled up in 2 ways (2, 4). Ten's place can be filled in with remaining 4 digits and so on.

The required numbers $= 2 \times 4 \times 3 \times 2 \times 1 = 48$ numbers

26.(D) One's place can be filled in 1 way (5). Ten's place can be filled in 4 ways, hundred's in 3, thousand's in 2 and remaining in 1 way.

Total five digit numbers $= 4 \times 3 \times 2 \times 1 \times 1 = 24$

27.(B) Total 5 digit numbers

$= 90000$

Without repetition $= (9 \times 9 \times 8 \times 7 \times 6 = 27216)$

Numbers having atleast one digit repeated $= 90000 - 27216 = 62784$

28.(C) The four-digit number formed from the digits 1, 2, 3, 4, 5 will be divisible by 4 if the last two

digits are 12 or 24 or 32 or 44 or 52. The first two can be chosen in 5 × 5 = 25 ways and the last two in 5 ways. So, numbers divisible by 4 are 25 × 5 = 125.

29.(C) Number of ways of forming numbers without '0' = 5 × 4 × 3 × 2 × 1 = 120

Number of ways of forming numbers with '0' = 4 × 4 × 3 × 2 × 1 = 96

[This time only 0, 1, 2, 4 and 5 digits will be considered so as to make the number divisible by 3]

Total number of ways = 120 + 96 = 216.

30.(D) Sum of the numbers = (3 + 4 + 5 + 7) × 6 × 1111 = 126654

31.(B) $^nP_5 = 20 \times {}^nP_3$

$$\Rightarrow \frac{n!}{(n-5)!} = 20 \times \frac{n!}{(n-3)!}$$

$$\Rightarrow \frac{(n-3)!}{(n-5)!} = 20$$

$$\Rightarrow \frac{(n-3)(n-4)(n-5)!}{(n-5)!} = 20$$

$(n-3)(n-4) = 20$

n = 8 and (n = −1 is inadmissible)

Go through options.

32.(A) There are total 9 places out of which 4 are even and rest 5 places are odd.

4 women can be arranged at 4 even places in 4! ways.

And 5 men can be placed at remaining 5 places in $^5P_5$ ways.

Hence, the required number of permutations 4! × $^5P_5$ = 24 × 120 = 2880

33.(B) The correct order of letters is D, E, E, E, E, Q, R, S, S, T, U. The number of words beginning with

$$DEEEEQR = \frac{4!}{2!} = 12$$

The number of words beginning with DEEEEQS = 4! = 24

The number of words beginning with

$$DEEEEQT = \frac{4!}{2!} = 12$$

Now, the next two words are DEEEEQURSST and DEEEEQURSTS.

Hence, the 50th word is DEEEEQURSTS.

34.(B) As one person out of 3 has to be selected who can steer:

So, number of ways = $^3C_1$

7 person have to be a choosen out of 11

= $^{11}C_7$

Now, we have 8 people and 8 seats so arrangement = 8!

Total number of ways required

= $^3C_1 \times {}^{11}C_7 \times 8!$

35.(C) (i) Let AE be one element, they can arrange themselves in 2! ways and all the 4 elements can arrange them in 4! ways.

Total number of ways

= 2! × 4! = 48

(ii) Total possible combinations = 5! = 120

If vowels are not together, number of words = 120 − 48

= 72

36.(D) Let BC be one element, they can arrange themselves in 2! ways and all the 6 elements can arrange themselves in 6! ways.

Total number of ways = 2! × 6! = 2 × 720 = 1440

37.(C) Fixing C and Y, we are left with 6 letters to be arranged between C and Y.

Required number of ways = 6! = 720

38.(B) We have 4 odd places and we have to fill 3 of them with vowels (A, E and I) and rest can be filled with the remaining alphabets.

otal number of ways = $^4P_3 \times 4!$

= 4! × 4! = 576

39.(D) ASCENT

Vowels are always together

= **AE** S C N T

5! × 2

40.(B) MATHEMATICS M, A, T, H, E, I, C, S

Total number of ways = 8 7 6 5 $^8P_4$

41.(D) SSSS M I I I I P P

$$= \frac{8!}{4! \, 2!} \times \frac{4!}{4!} = \frac{8!}{4! \, 2!}$$

42.(B) Without changing the relative position of vowels and consonants $= \frac{5!}{3!} \times \frac{6!}{2! \, 2!} = 3600$

43.(A) S/A _ _ _ A/S

Number of ways = 3 × 2 × 1 × 2 = 12

44.(B) I is fixed at middle place and the remaining letters can be arranged in 4! = 24 ways.

45.(C)

Given word SMITA. There are 2 vowels and 3 consonants. There are 3 odd places which 2 vowels should occupy.

Required number of ways
= $^3P_2$ = 6 ways

Also, remaining 3 places can be occupied by 3 constants

Required number of ways = 3!
Hence, total number of ways
= 3! × 6 = 36

46.(B) Total permutations = 5!
= 120
All vowels together IA _ _ _
= 4! × 2! = 48
All vowels are not together
= 120 − 48 = 72

47.(D) Fixing D at first place and A at the last place, remaining letters can be arranged in 5! ways.
Hence, 120 words can be formed.

48.(C) The given word is COCHIN, if we arrange them in alphabetical order then C, C, H, I, N, O
Number of words starting with CC are 4!
= 24
Number of words starting with CH are 4!
= 24
Number of words starting with CI are 4!
= 24
Number of words starting with CN are 4!
= 24
Next word is the given word COCHIN.
So, required number of words
= 24 × 4 = 96 words

49.(A) Given that number of handshakes is 55, therefore,
$^nC_2$ = 55
or $\frac{n(n-1)}{2} = 55$
or n = 11

50.(A) There are 10 odd multiples of 5 from 1 to 100 and any two numbers have to be chosen.
So, number of ways = $^{10}C_2$
= 45 ways

51.(B) As a particular person is always selected, then we have to select the other 5 people from the remaining 9 people.
Number of ways
= $^9C_5 = \frac{9 \times 8 \times 7 \times 6}{4 \times 3 \times 2 \times 1} = 126$

52.(B) Out of 15 fruits, 7 are alike of one kind, 5 are alike of the second kind and 3 are alike of the third kind.
Hence, the required number of ways
= [(7 + 1)(5 + 1)(3 + 1) − 1] = 191

53.(D) Multiples of 3 in first 20 natural numbers
= 3 , 6, 9, 12, 15, 18
Then, we have to select 1 number from these 6 numbers and 2 numbers from the remaining 14 numbers.
Number of required ways
= $^{14}C_2 \times {}^6C_1$

54.(C) The number of ways of selecting atleast one student from the first section = $(2^{18} − 1)$
The number of ways of selecting atleast one student from the second section = $(2^{15} − 1)$
Total number of ways
= $(2^{18} − 1) \times (2^{15} − 1)$

55.(B) If $^nC_x = {}^nC_y$
Then, x = y or x + y = n
n = 12 + 8 = 20
$^{22}C_{20} = \frac{22!}{20!\,2!} = 231$

56.(D) He has to select 5 shirts from 10 shirts. This can be done in $^{10}C_5$ ways. The trousers can be selected in $^{12}C_6$ ways.
Total ways of packing
= $^{10}C_5 \times {}^{12}C_6$

57.(A) Required number of ways
= $^8C_5 \times {}^6C_2 = 840$

58.(C) Since two particular cars are always selected, it means that 6 − 2 = 4 cars are to be selected out of the remaining 11 − 2 = 9 cars
So, required number of ways
= $^9C_4 = 126$

59.(B) Since two particular cars are never selected, means that 6 cars are to be selected out of the remaining 9 cars.
So, required number of ways
= $^9C_6$ = 84

60.(D) As we know that, vice-chairman and chairman have to be seated together, hence they will be considered as a single unit.
Total number of members to arranged = 13 + single unit (VC, C) = 14 units, and this single unit can arrange themselves in 2! ways. So, required ways = (14 − 1)! × 2! = 13! × 2!

61.(A) We need to select 13 people and then arrange them in a circle: $\dfrac{^{24}P_{13}}{13} = \dfrac{24!}{11! \times 13}$

62.(A) Two people are together = 6 people can be arranged in $(6-1)! = 5!$ ways. Also, the 2 people can change among themselves. So total ways = $5! \times 2 = 240$

63.(A) Total number of ways for a necklace of 12 beads = $\dfrac{(12-1)!}{2} = \dfrac{11!}{2}$

64.(C) Selecting 12 beads out of 18 = $^{18}C_{12}$

Making a necklace = $\dfrac{11!}{2}$

Total number of necklaces are

$= {}^{18}C_{12} \times \dfrac{11!}{2} = \dfrac{119 \times 13!}{2}$

65.(A) Boys are placed = $(5-1)!$
$= 4!$
Girls = $5!$ (treating them linear)
Total number of ways
$= 4! \times 5! = 2880$

66.(C) Treating 1 host and 2 people as 1 unit, we now have 23 people remaining (22 people + 1 unit) and they can be arranged in 22! Also, those two particular people can be seated on either side of the host in 2! ways.
Hence, the number of ways are
$= 22! \times 2!$

67.(B) Two delegates together can be arranged in 2! ways. Now, we have 19 distinct identities and they can be arranged around a circle in 18! ways. So, total number of ways are $2 \times 18!$

68.(A) Number of straight lines that can be drawn are $^7C_2 = 21$

69.(B) For the formation of a quadrilateral, we require 4 points or 4 vertices of a polygon of 'n' sides (or n vertices).
Required number of quadrilaterals = $^nC_4$

70.(B) Maximum number of points of intersection of 6 straight lines are $^6C_2 = 15$

71.(A) Maximum points of intersection of 6 circles are $^6C_2 \times 2 = 30$

72.(C) $(^3C_2 \times 2) + {}^3C_2 + (^3C_1 \times {}^3C_1 \times 2) = 6 + 3 + 18 = 27$

73.(B) $54 = \dfrac{n^2 - 3n}{2} \Rightarrow n = 12$

74.(B) $^{12}C_3 = 220$

75.(B) Number of diagonals
$= {}^{10}C_2 - 10 = 35$

76.(B) Number of diagonals
$= {}^8C_2 - 8 = 20$

77.(D) Number of triangles
$= {}^6C_3 = 20$

78.(A) For the possible selection, there is only one way possible i.e. 4 bowlers + 1 wicketkeeper + 6 batsmen.
Required number of ways
$= {}^6C_4 \times {}^4C_1 \times {}^8C_6$
$= 15 \times 4 \times 28$
$= 1680$

79.(B) Possible cases:

Group	Group
4	2
3	3
2	4

Required number of ways
$= (^5C_4 \times {}^5C_2) + (^5C_3 \times {}^5C_3) + (^5C_2 \times {}^5C_4)$
$= (5 \times 10) + (10 \times 10) + (10 \times 5)$
$= 200$

80.(D) Possible cases:

Anil	Anil's wife
2B	2G
1B, 1G	1B, 1G
2G	2B

Required number of ways
$= (^2C_2 \times {}^2C_2) + (^3C_1 \times {}^2C_1 \times {}^2C_1 \times {}^3C_1) + (^3C_2 \times {}^3C_2)$
$= 1 + 36 + 9 = 46$

81.(B) Atleast 1 man:
$^6C_1 \times {}^5C_4 + {}^6C_2 \times {}^5C_3 + {}^6C_3 \times {}^5C_2 + {}^6C_4 \times {}^5C_1 + {}^6C_5$
$= 461$
Atleast 1 man = Total ways − no man
$= {}^{11}C_5 - {}^5C_5 = 462 - 1 = 461$

82.(B) Number of ways = $(^4C_3 \times {}^4C_2) + (^4C_2 \times {}^4C_3)$
$= 48$

83.(D) Number of ways of selection from 10 different rings of 1 set = 2^{10}
Since there are 2 sets, total selections are $2^{10} \times 2^{10} = 2^{20}$
Since atleast 1 has to be selected.
So, total number of ways = $2^{20} - 1$

84.(B) If all rings are identical, then number of ways is 11.
Since there are 2 sets, there are 11×11
$= 121$ ways

Since atleast 1 has to selected, number of ways = 121 − 1 = 120 ways.

85.(B) If we have to pick atleast 1 ring from each set, then it will be ($2^{10} − 1$) for each set. Hence, total number of ways are ($2^{10} − 1)^2$.

86.(B) If atleast one has to be selected from either of the sets, total ways are 10 × 10 = 100

87.(A) Required number of ways
$$= \frac{52!}{(13!)^4 \times (4!)}$$

88.(B) As 32 different things has to be equally distributed among 4 people, each person will get 8 things.
Number of ways to do the same
$= {}^{32}C_8 \times {}^{24}C_8 \times {}^{16}C_8 \times {}^8C_8$
$$= \frac{32!}{8!\,24!} \times \frac{24!}{16!\,8!} \times \frac{16!}{8!\,8!} \times 1$$
$$= \frac{32!}{(8!)^4}$$

89.(D) First ring can be worn in any of the 3 fingers. Similarly, second, third and fourth rings can be worn in any of the three fingers.
4 rings can be worn in
3 × 3 × 3 × 3 = 81 ways

90.(A) First prize can be given away to 4 boys in 4 ways. Similarly, second, third, fourth and fifth

prizes can also be given away to 4 boys in 4 ways.
Hence, the required number of ways in which all the 5 prizes can be given away to 4 boys.
= 4 × 4 × 4 × 4 × 4 = 1024 ways

91.(B) Number of ways in which 20 mangoes can be distributed among 4 people is ${}^{20+4-1}C_{4-1}$
$= {}^{23}C_3$

92.(C) Total number of non-negative integral solutions of the given equation is same as the number of ways of distributing 44 items among 4 people such that each person can receive any number of items.
Hence, total number of solutions
${}^{44+4-1}C_{4-1} = {}^{47}C_3$

93.(A) As, $1 \le x, y, z \le 15$
Let X = x − 1
Y = y − 1
Z = z − 1
Putting x, y and z in equation, we get
X + Y + Z = 15
X + Y + Z = 12 where, $0 \le X, Y, Z \le 12$
Then, number of solutions are
${}^{12+3-1}C_{3-1} = {}^{14}C_2 = 91$

94.(A) $5^3 = 5 \times 5 \times 5 = 125$

95.(B) If empty box is not allowed, number of ways are ${}^{10-1}C_{3-1} = {}^9C_2 = 36$

Practice Exercise Level 2

1.(B) Let the first place be filled with either of the digits 1, 2 and 3.
i.e. 3 ways × 6 ways × 6 ways × 6 ways = 648 numbers
Also, there will be one number starting with 4 that can be formed, which is 4000.
Total numbers are 649.

2.(C) Each of the digits 1, 2, 3 or 4 appear 64 times at all the four places.
Sum of digits = (1 + 2 + 3 + 4) × 64 = 640
Hence, sum of all the numbers = 640 × 1111
= 711040

3.(A) First of all the 6 students can be arranged in 6! ways and 4 teachers can be arranged at 7 places in ${}^7P_4$ ways.
Hence, the required number of arrangements
= 6! × ${}^7P_4$

= 720 × 840 = 604800 ways

4.(A) We have to select two parts; one containing three letters and other containing three numbers and both these parts can be arranged in 2! ways.
For the part containing 3 letters, as repetition is allowed,
Number of ways = 26 × 26 × 26 = 26^3
For the part containing 3 numbers, as repetition is allowed,
Number of ways = 10 × 10 × 10 = 10^3
Hence, total number of ways
= 2 × 26^3 × 10^3

5.(D) Firstly, fix 'a' at the rightmost place, then the remaining letters can take any position. Hence, number of ways = 5!

Now, fix 'a' at the second rightmost place, then the next right letter can assume only 4 letters (excluding 'u'). Hence, number of ways = 4 × 4! Continuing in this manner, we can find total number of ways i.e. Total possible arrangements

= 5! + 4.4! + 4 × 3 × 3! + 4 × 3 × 2 × 2! + 4 × 3 × 2 × 1 × 1

= 120 + 96 + 72 + 48 + 24

= 360

6.(B) Number of paths $= \dfrac{8!}{3!\,5!} = 56$

7.(C) Eight speakers can address the meeting in 8! ways. Out of which, A, B and C will be arranged among themselves in 3! = 6 ways. This means that in each of the given set of speakers' arrangement, there will be some order among A, B and C. This order will be equally divided among these six possible arrangements.

Thus, the required numbers in which the said protocol will be observed is $\dfrac{8!}{6}$.

8.(B) As per the problem:

There are 20 men and 20 women in all at the party.

When a man meets a woman, there are two HELLOs.

When two people of the same gender meet, there is only one handshake.

Number of handshakes = $^{20}C_2$ (for MAN – MAN) + $^{20}C_2$ (for WOMAN – WOMAN) = 2 × 190 = 380

For the number of HELLOs, every man does 19 HELLOs to other woman and they respond in the same way.

Thus, total number of HELLOs

= 20 × 19 × 2 = 380 × 2 = 760

Total number of greetings

= 760 + 380 = 1140

9.(A) We need to first allot the fourth task. This can be done in three ways.

Having done this, the first task can be allocated in three ways.

The remaining five tasks can be allocated in 5! ways.

Total number of ways

= 9 × 5! ways

10.(D) Possible cases:

3 men, 0 women; 2 men, 1 woman ; 1 man, 2 women ; 0 man, 3 women

Required number of ways

= $^5C_3 + {}^5C_2 \times {}^3C_1 + {}^5C_1 \times {}^4C_2 + {}^5C_3$

= 10 + 10 × 3 + 5 × 6 + 10

= 80

11.(C) First of all 4 girls can be arranged in 3! ways then 3 boys can be seated at 4 places in $^4P_3$ ways.

Required number of arrangements = 3! × $^4P_3$

= 6 × 24 = 144

12.(B) For calculating the number of squares, we need to count with the side having least number of smallest squares, that is, 6. As each square will have equal number of squares on each of its sides, thus the total number of squares will be

= 6 × 8 + 5 × 7 + 4 × 6 + 3 × 5 + 2 × 4 + 1 × 3

= 48 + 35 + 24 + 15 + 8 + 3 = 133

13.(D) Total number of possible triangles = $^{10}C_3 = 120$

Now, triangles having one side common with decagon side

= $10 \times {}^6C_1 = 60$

Triangles having two sides common with decagon sides = 10

Number of triangles having no side common with that of the decagon = 120 − 60 − 10 = 50

14.(C) $^8C_3 + ({}^8C_2 \times {}^4C_1) + ({}^8C_1 \times {}^4C_2)$

= 56 + 112 + 48 = 216

15.(D) The data is insufficient because we do not know if any of the 6 points between the lines are collinear with the points on the two lines, i.e. a point not on any of the two lines may be collinear with a point each on the other two lines.

Ans.(16-17) Let L1 has two points P and Q and L2 has 8 points.

P   Q
L1 •————•————
L2 •—•—•—•—•—•—•—•

16.(C) Now for a triangle, we can choose 1 point from L1 and 2 points from L2 or 2 points from L1 and 1 point from L1.

= $^2C_1 \times {}^8C_2 + {}^2C_2 \times {}^8C_1$

= (2 × 28) + 8 = 64 triangles

17.(C) If the triangle include the point P and exclude the point Q then other two points are to be taken from the 8 points on L2 in: $^1C_1 \times {}^8C_2 = 28$ triangles

18.(A) 3 experts including atleast one engineer and one manager can be selected by taking.

(i) 2 managers out of 3 and 1 engineer out of 3.

(ii) 1 manager out of 3 and 2 engineer out of 3.

(iii) 2 persons out of 6 (3 managers and 3 engineers) and 1 person out of one who is both engineer and manager.

In case I, the number of ways $= {}^3C_2 \times {}^3C_1 = 9$

In case II, the number of ways $= {}^3C_1 \times {}^3C_2 = 9$

In case III, the number of ways

$= {}^6C_2 \times {}^1C_1 = 15$

Hence, the possible number of ways

$= 9 + 9 + 15 = 33$

19.(A) Let x, y, z be the number of balls received by the three persons, then

$x \geq 5, y \geq 5, z \geq 5$ and $x + y + z = 21$

Let $u \geq 0, v \geq 0, w \geq 0$, then

$x + y + z = 21$

$u + 5 + v + 5 + w + 5 = 21$

$u + v + w = 6$

Total number of solutions

$= {}^{6+3-1}C_{3-1} = {}^8C_2 = 28$

20.(B) We have, $x \geq 0, y \geq 0, z \geq 0, u \geq 0$ and $t \geq 0$

and $x + y + z = 5$

$x + y + z + u + t = 20$

or $u + t = 15$

Number of solutions of $x + y + z$

$= 5$ is ${}^{5+3-1}C_{3-1} = {}^7C_2 = 21$

Number of solutions of $u + t$

$= 15$ is ${}^{15+2-1}C_{2-1} = {}^{16}C_1 = 16$

Total number of solutions for the given equation $= 21 \times 16 = 336$

21.(C) Lets denote the stopping stations by P, Q, R and S between A and B.

```
 •——+——+——+——+——•
 A   P   Q   R   S   B
```
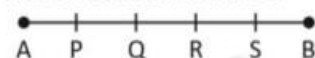
Now, we have to insert remaining 8 non stopping stations between these stopping stations and A and B.

Let's say we have D, E, F, G and H stations between AP, PQ, QR, RS and SB respectively. For P, Q, R, S to be non consecutive, $D \geq 0, E \geq 1, F \geq 1, G \geq 1$ and $H \geq 0$.

Also, $D + E + F + G + H = 8$

$D + e + f + g + H = 5$, where $e = E - 1$, $f = F - 1$ and $g = G - 1$ and $D \geq 0, e \geq 0, f \geq 0, g \geq 0$, and $H \geq 0$.

Then, number of solutions of $D + e + f + g + H$

$= 5$ is ${}^{5+5-1}C_{5-1} = {}^9C_4$

22.(D) Any integer between 1 and 100000 can be taken as abcde, where $0 \leq a, b, c, d, e \leq 9$

As the sum of digits should be equal to 18.

Then, $a + b + c + d + e = 18$ ..... (1)

Number of solutions of this equation is ${}^{18+5-1}C_{5-1} = {}^{22}C_4 = 7315$

But, note that there are solutions which contain a digit greater than 10, so we have to remove those cases as well.

Let $a \geq 10$, then let $a' = a - 10$

(only one of the digits can be greater than 10)

Putting $a = a' + 10$ in equation (1),

$a' + b + c + d + e = 8$

Number of solutions of this equation are ${}^{8+5-1}C_{5-1} = {}^{12}C_4 = 495$

The digit greater than 10 can have any of the digits.

Total cases to be removed

$= {}^6C_1 \times 495 = 2970$

Hence, total possible solutions

$= 7315 - 2970 = 4345$

23.(B) Let the number of mangoes, apples and bananas purchased be A, B and C, respectively.

Thus, $20A + 5B + C = 1000$ and $A + B + C = 100$

Solving the above two equations by eliminating C, we get

$19A + 4B = 900$

or, $B = \dfrac{900 - 19A}{4}$

or, $B = 225 - \left(\dfrac{19}{4}\right)A$

Now, as B is the number of apples and $0 < B < 99$. So, putting these limiting values of B in the above equation will provide the value of A as $27 < A < 47$. As A has to be the multiple of 4, so possible values of A is 28, 32, 36, 40 and 44.

Now, for A = 28 and 32; A + B > 100, so these values of A can be rejected.

For all other values of A, we get the desired solution:

A = 36, B = 54, C = 10

A = 40, B = 35, C = 25

A = 44, B = 16, C = 40

Thus, there are three possible solutions.

24.(A) Each coin can go in any pot $= 3 \times 3 \times 3 \times 3 = 3^4$

25.(A) We can distribute as (0, 0, 4), (0, 1, 3), (0, 2, 2), (1, 1, 2) = 4 ways.
Number of coins in whichever box is irrelevant.

26.(A) $^{4+3-1}C_{3-1} = {^6}C_2 = 15$ ways

27.(A) (0, 0, 4) 1 way

$(0, 1, 3) \Rightarrow \dfrac{4!}{3! \, 1!} = 4$ ways

$(0, 2, 2) \Rightarrow \dfrac{4!}{2! \, 2!} \times \dfrac{1}{2!} = 3$ ways

$(1, 1, 2) \Rightarrow \dfrac{4!}{1! \, 1! \, 2!} \times \dfrac{1}{2!} = 6$ ways

Total = 1 + 4 + 3 + 6 = 14 ways.

Probability

The literal meaning of probability is the chance of occurrence of an event. The problems based on probability can be of the form.

I.   Coins
II. Dice
III. Cards
IV. Picking items from bag/box

Let us first see some basic points of probability before we move on to various types of questions.

RANDOM EXPERIMENT

An experiment whose all possible outcomes are known and which can be repeated under identical conditions, but it is not possible to predict the outcome of any particular experiment in advance, then that experiment is known as a random experiment e.g.

I.   When we toss a coin, we know it very well that either Head or Tail will occur as an outcome, but exactly Head will occur or exactly Tail will occur is difficult to predict.

II. When we throw a die, we may get the outcome as any integer from 1 to 6. But we will exactly get 6 or 4 in any particular chance is difficult to predict.

SAMPLE SPACE

The set of all possible and distinct outcomes of an experiment is called the Sample space of that experiment and is denoted by S. Each element of the sample space is called a sample point. The number of elements of S is denoted by n(S). e.g.

I.   Consider the experiment of tossing a single coin:

$S = \{H, T\}$

$n(S) = 2 = 2^1$ a

Two coins:

$S = \{(H, H), (H, T), (T, H), (T, T)\}$

$n(S) = 4 = 2^2$

Three coins:

$S = \{(H, H, H), (H, H, T), (H, T, H), (T, H, H), (T, T, T), (T, T, H), (T, H, T), (H, T, T)\}$

$n(S) = 8 = 2^3$

So, we can conclude that for any number of coins n(S) is given by

$n(S) = 2^{\text{number of coins}}$

II. Consider the experiment of throwing the dice.

Single die $n(S) = 6^1 = 6$

Two dice $n(S) = 6^2 = 36$

Three dice $n(S) = 6^3 = 216$ and so on

III. A person is selected randomly and is asked the day of the week on which he was born. The outcome may be {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday}. Here, the total number of days is 7. So, $n(S) = 7$.

EVENT

The possible/desired outcomes of a random experiment are called events. In other words, any subset of a sample space is called an event. The sample space 'S' of an experiment serves as the universal set for all questions related to the experiment and an event 'E' of the experiment is a set of possible/desired outcomes favourable to the event E. Note that each event may have one or more occurrences. For example, if we throw a die we can define the following 6 events.

getting a 1	getting a 2	getting a 3
getting a 4	getting a 5	getting a 6

Here, each of the event has one occurrence. Instead we can define the following three events when a die is thrown as:

I.   Getting a prime number {2, 3, 5}
II. Getting an even number {2, 4, 6}
III. Getting an odd number {1, 3, 5}

CALCULATING PROBABILITY

There are several methods to define the probability. But here we use a very simple method. In other words, purely mathematical definition of probability.

If n(S) is the number of sample space i.e. total number of possible outcomes and n(E) is the number of events i.e. total number of favourable outcomes, then probability of any event E is denoted by P(E) and is given by:

$$P(E) = \frac{n(E)}{n(S)}$$

The probability of any event always lies between its uncertainty to certainity, occurrence to non occurence i.e. 0 to 1.

Hence, $0 \leq P(E) \leq 1$

Probability of an Event not happening

If P(E) denotes the probability of an event happening, then $P(\bar{E})$ will denote the probability of the same event not happening. Either the event will occur or it will not occur and hence the sum of these probabilities will be 1.

P(E) + P($\bar{E}$) = 1

Also, P($\bar{E}$) = 1 – P(E)

MUTUALLY EXCLUSIVE EVENTS

Two events are said to be mutually exclusive if the occurrence of one excludes the occurrence of the other i.e. if one occurs then the other cannot occur at the same time. In other words two events are said to be mutually exclusive if they have no common sample points, e.g.

I.   In tossing a coin, the occurrence of 'Head' and the occurrence of 'Tail' are mutually exclusive because if Head occurs, then Tail will never occur and if Tail occurs, then Head will never occur simultaneously.

II. In the throw of a single die, the occurrence of 3 and 4 are mutually exclusive because if 3 occurs then 4 will never occur simultaneously and vice-versa.

EXHAUSTIVE EVENTS

Events are said to be exhaustive if atleast one of them will necessarily occur. And a set of events that includes all the possibilities of the sample space is said to be an exhaustive set of events e.g.

I.   In tossing a coin, there are two exhaustive events 'Head' and 'Tail' and in other words there are two elements in exhaustive set of events.

II. In the throw of a single die, there are six exhaustive events - 1, 2, 3, 4, 5 or 6 and in other words there are six elements in exhaustive set of events.

Example 1: In a simultaneous toss of two coins, what is the probability of

I.   getting 2 heads?
II. exactly 1 head?
III. atleast 1 head?

Solution:

Total number of outcomes = 2^2 = 4

I.   Favourable outcomes (2 heads) = HH = 1

$$P(\text{getting 2 heads}) = \frac{1}{4}$$

II. Favourable outcomes (exactly 1 head) = TH, HT = 2

$$P(\text{exactly 1 head}) = \frac{2}{4} = \frac{1}{2}$$

III. Favourable outcomes (atleast 1 head) = HT, TH, HH = 3

$$P(\text{exactly 1 head}) = \frac{3}{4}$$

Example 2: What is the probability of getting sum 9, in a throw of two dice simultaneously?

Solution:

Total number of outcomes = 6^2 = 36

Favourable cases (Sum 9) = 36, 63, 45, 54 = 4

$$P(\text{sum 9}) = \frac{4}{36} = \frac{1}{9}$$

Example 3: A card is drawn from a well shuffled deck of cards. What is the probability that the card drawn is:

I. An ace

II. A club

III. A black numbered card

IV. A red queen

Solution:

Total number of outcomes = 52

I. Favourable outcomes = 4 (as there are 4 Aces in a pack of cards)

$$P(\text{getting an ace}) = \frac{4}{52} = \frac{1}{13}$$

II. Favourable outcomes = 13 (as there are 13 clubs in a deck)

$$P(\text{getting a Club}) = \frac{13}{52} = \frac{1}{4}$$

III. Total number of black cards = 26

Non numbered black cards = 8 (2 each of A, J, Q, K)

Favourable outcomes = 26 − 8 = 18

$$P(\text{black numbered card}) = \frac{18}{52} = \frac{9}{26}$$

IV. Favourable cases (red queen) = 2 (one each of hearts and diamonds)

$$P(\text{getting a red queen}) = \frac{2}{52} = \frac{1}{26}$$

Example 4: What is the probability of getting 53 Sundays in a randomly chosen leap year?

Solution:

In a leap year, there are 2 extra days apart from 52 weeks. Those 2 consecutive days can be:

Monday-Tuesday, Tuesday-Wednesday, Wednesday-Thursday, Thursday-Friday, Friday-Saturday, Saturday-Sunday, Sunday-Monday.

So, total outcomes = 7

Favourable outcomes = Saturday-Sunday and Sunday-Monday = 2

$$P(\text{getting 53 Sundays}) = \frac{2}{7}$$

Example 5: From a bag containing 8 red, 6 green and 12 white balls, a ball is drawn at random, what is the probability of getting

I. a green ball?

II. a white ball?

III. not a red ball?

Solution:

Total number of outcomes = 8 + 6 + 12 = 26

I. Favourable cases (green ball) = 6

$$P(\text{getting a green ball}) = \frac{6}{26} = \frac{3}{13}$$

II. Favourable cases (white ball) = 12

$$P(\text{getting a white ball}) = \frac{12}{26} = \frac{6}{13}$$

III. Favourable cases (not a red ball) = 6 + 12

i.e. (considering white and green) = 18

$$P(\text{getting not a red ball}) = \frac{18}{26} = \frac{9}{13}$$

CONCEPTS OF ODDS IN FAVOUR AND ODDS AGAINST

Sometimes, probability is also expressed in terms of odds. These odds are generally in favour of and against an event. Consider odds in favour of an event to be x : y and odds against that event to be a : b, then the expression of probability in terms of odd can easily be shown by the following table.

Odds	Occurrence (Chances)	Non-occurrence (Chances)
Favour	$\dfrac{x}{x+y}$	$\dfrac{y}{x+y}$
Against	$\dfrac{b}{a+b}$	$\dfrac{a}{a+b}$

Example 6: The odds in favour of an event A is 4 : 7 and the odds against another event B is 5 : 9. What is the probability

I. exactly one of the event occurs?

II. none of the event occurs?

Solution:

$$P(A) = P(\text{occurrence of A}) = \frac{4}{4+7} = \frac{4}{11}$$

$$P(\bar{A}) = P(\text{non-occurrence of A}) = \frac{7}{4+7} = \frac{7}{11}$$

$P(B) = P(\text{occurrence of B}) = \dfrac{9}{5+9} = \dfrac{9}{14}$

$P(\bar{B}) = P(\text{non-occurrence of B}) = \dfrac{5}{5+9} = \dfrac{5}{14}$

I. P(exactly one event occurs) =

$P(A) \times P(\bar{B}) + P(\bar{A}) \times P(B) = \dfrac{4}{11} \times \dfrac{5}{14} + \dfrac{7}{11} \times \dfrac{9}{14}$

$= \dfrac{20+63}{154} = \dfrac{83}{154}$

II. P(none occurs) $= P(\bar{A}) \times P(\bar{B}) = \dfrac{7}{11} \times \dfrac{5}{14} = \dfrac{5}{22}$

Example 7: There are three events A, B, and C one of which must occur and only one can happen. The odds are 8 : 3 against A, 5 : 2 against B. What are the odds against C?

Solution:

The odds against event A are 8 : 3.

$\Rightarrow$Probability of A $= P(A) = \dfrac{3}{8+3} = \dfrac{3}{11}$

The odds against event B are 5 : 2.

$\Rightarrow$Probability of B $= P(B) = \dfrac{2}{5+2} = \dfrac{2}{7}$

Since only one event can happen i.e. events are mutually exclusive, so we can write

P(A) + P(B) + P(C) = 1

$\Rightarrow \dfrac{3}{11} + \dfrac{2}{7} + P(C) = 1$

$\Rightarrow P(C) = 1 - \left(\dfrac{3}{11} + \dfrac{2}{7}\right)$

$\Rightarrow P(C) = 1 - \dfrac{43}{77} = \dfrac{34}{77}$

P(C), in terms of odds $= \dfrac{34}{43+34}$

Hence, required odds against are 43 : 34.

INDEPENDENT AND DEPENDENT EVENTS

Independent Events

Two events A and B are independent if the probability of one of that events occurring is not affected by whether the other event occurs or not. If A and B are independent, then the probability that event A and B occur is:

P(A and B) = P(A) × P(B) or P(A B) = P(A) × P(B)

For example, in rolling a die three times, the outcomes of one roll is independent to the other rolls. Therefore, the probability of rolling three 6's is P(three 6's)

= P(6 on 1st roll) × P(6 on 2nd roll) × P(6 on 3rd roll)

$= \dfrac{1}{6} \times \dfrac{1}{6} \times \dfrac{1}{6} = \dfrac{1}{216}$

Example 8: The odds in favour that A speaks the truth are 2 : 3 and the odds in favour that B speaks a lie are 3 : 5. What is the probability that both of them are speaking truth together?

Solution:

$P(A) = P(\text{A speaks truth}) = \dfrac{2}{2+3} = \dfrac{2}{5}$

$P(\bar{A}) = P(\text{A speaks lie}) = \dfrac{3}{2+3} = \dfrac{3}{5}$

$P(B) = P(\text{B speaks truth}) = \dfrac{5}{3+5} = \dfrac{5}{8}$

$P(\bar{B}) = P(\text{B speaks lie}) = \dfrac{3}{3+5} = \dfrac{3}{8}$

Both speaking truth are independent events, hence:

$P(\text{both speaking truth}) = P(A) \times P(B) = \dfrac{2}{5} \times \dfrac{5}{8} = \dfrac{1}{4}$

Dependent Events

If the occurrence of one event depends on the occurrence of the other, then they are called dependent events. In other words, if the occurrence of one event is affected by occurrence of the other event, then they are called dependent events.

If we are drawing cards successively from a well shuffled deck of cards without replacement, then the events would be dependent.

Example 9: Two balls are drawn at random from a bag containing 4 green and 5 white balls (without replacement), then what is the probability that the first ball is white and the second ball is green?

Solution:

The two events are dependent as balls are removed one by one.

Total outcomes = 9

$$P(\text{first white ball}) = \frac{5}{9}$$

After removal of one white ball, the total outcomes are 8.

$$\therefore P(\text{second green ball}) = \frac{4}{8}$$

$$\therefore P(\text{first white and second green}) = \frac{5}{9} \times \frac{4}{8} = \frac{5}{18}$$

USE OF BINOMIAL THEOREM IN PROBABILITY

If the probability of an event happening in a single trial is 'p', then the probability that event will happen exactly 'r' trials out of 'n' trials is:

Probability = $^nC_r \, p^r \, (1 - p)^{n - r}$

Example 10: If a coin is tossed 100 times, what is the probability of getting exactly 55 heads?

Solution:

$$P(\text{one head}) = \frac{1}{2}$$

$$1 - p = 1 - \frac{1}{2} = \frac{1}{2}$$

n = 100 (total number of tosses)

r = 55 (exactly 55 heads)

$$p(r = 55) = {}^{100}C_{55} \left(\frac{1}{2}\right)^{55} \times \left(1 - \frac{1}{2}\right)^{45} = {}^{100}C_{55} \left(\frac{1}{2}\right)^{100}$$

EXPECTED VALUE

The case of expected value arises when we have values associated with each outcome.

If there are a number of events E_1, E_2, E_3, etc. with probability P_1, P_2, P_3, ... etc. and there are values of V_1, V_2, V_3, ... etc. associated with each event, then the expected value = $P_1V_1 + P_2V_2 + P_3V_3 \ldots$

GEOMETRIC PROBABILITY

Some probability problems can be solved through the concepts of geometry.

Example 11: A circular coin of unit radius is flipped and it falls on a square of side 10 units. What is the probability that the coin lies completely inside the square?

Solution:
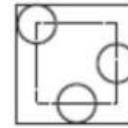
As long as the center of the coin lies within the dotted square it would lie completely inside the square. Therefore, the probability that it lies inside the square:

$$= \frac{8^2}{10^2} = \frac{16}{25}$$

Example 12: Two persons A and B agree to meet at a place between 11 to 12 noon. The first one to arrive waits for 20 minutes and then leave. If the time of their arrival is independent and random, what is the probability that A and B meet?

Solution:
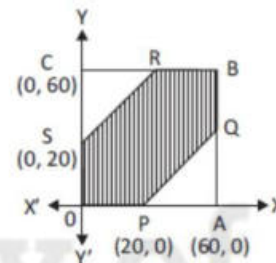
Let A and B arrive at the place of their meeting x minutes and y minutes after 11 noon.

Their meeting is possible only if

$|x - y| \le 20$ ..... (1)

OABC is a square, where A $\equiv$ (60, 0) and C $\equiv$ (0, 60)

Considering the equality part of (1),

i.e., $|x - y| = 20$

The area representing the favourable cases = Area OPQBRSO = Area of square OABC – Area of PAQ – Area of SRC

$$= (60)(60) - \frac{1}{2}(40)(40) - \frac{1}{2}(40)(40)$$

= 3600 – 1600 = 2000 sq. units

Total ways = Area of square OABC

= (60) × (60) = 3600 sq. units

$$\therefore \text{Required probability} = \frac{2000}{3600} = \frac{5}{9}$$

Exercise
Practice Exercise Level - 1

1. What is the probability that the first day of a month is a Monday, Thursday or Saturday?

   (A) $\frac{1}{2}$ (B) $\frac{3}{7}$

   (C) $\frac{4}{7}$ (D) $\frac{2}{3}$

2. A number is selected from the first 20 natural numbers. What is the probability that it is a multiple of both 4 and 5?

   (A) $\frac{9}{20}$ (B) $\frac{3}{5}$

   (C) $\frac{1}{2}$ (D) $\frac{1}{20}$

3. Ten horses are running in a race, the chances that A will win are 30%, that B will win are 20% and C will win are 10%. What is the probability that one of them will win?

   (A) 0.6   (B) 0.5

   (C) 0.4   (D) 0.3

Directions (4-8) If A and B are two mutually exclusive events in a sample space such that,

$$P(A) = \frac{2}{5} \text{ and } P(B) = \frac{1}{2}, \text{ then}$$

4. What is the value of $P(\bar{A})$?

   (A) $\frac{2}{5}$ (B) $\frac{3}{5}$

   (C) $\frac{4}{5}$ (D) $\frac{6}{7}$

5. What is the value of $P(\bar{B})$?

   (A) $\frac{1}{4}$ (B) $\frac{3}{4}$

   (C) $\frac{1}{2}$ (D) $\frac{4}{5}$

6. What is the value of P(A B)?

   (A) $\frac{7}{16}$ (B) $\frac{9}{16}$

   (C) $\frac{9}{10}$ (D) $\frac{1}{2}$

7. What is the value of $P(\bar{A} \ \bar{B})$?

   (A) $\frac{4}{5}$ (B) $\frac{1}{10}$

   (C) $\frac{8}{9}$ (D) $\frac{13}{20}$

8. What is the value of $P(\bar{A}$ B)?

   (A) $\frac{1}{2}$ (B) $\frac{3}{5}$

   (C) $\frac{4}{7}$ (D) $\frac{7}{15}$

9. All possible four-digit numbers are formed using the digits 0, 1, 2, 3 and 4 without repetition. What is the probability that the number formed is greater than 2000?

   (A) $\frac{1}{2}$ (B) $\frac{3}{4}$

   (C) $\frac{1}{3}$ (D) $\frac{2}{3}$

10. Two alphabets are chosen out of the alphabets of the English language. What is the probability that both the alphabets are vowels?

    (A) $\frac{2}{65}$ (B) $\frac{1}{65}$

    (C) $\frac{3}{65}$ (D) $\frac{4}{65}$

11. If out of the first 20 natural numbers, Mr. X selects a number at random, then what is the probability that this number will be a multiple of 4?

    (A) $\frac{1}{4}$ (B) $\frac{2}{4}$

    (C) $\frac{3}{4}$ (D) $\frac{1}{5}$

12. In a box, there are 500 bulbs out of which 40 bulbs are defective. One bulb is taken out at random. What is the probability that it is not defective?

(A) $\frac{23}{25}$

(B) $\frac{24}{25}$

(C) $\frac{2}{25}$

(D) None of these

Directions (13-14) One alphabet is taken at random from each of the words "GEOMETRY" and "ALGEBRA". What is the probability that.

13. There is no vowel?

(A) $\frac{5}{12}$

(B) $\frac{5}{14}$

(C) $\frac{7}{15}$

(D) $\frac{6}{19}$

14. There is exactly one vowel?

(A) $\frac{29}{56}$

(B) $\frac{3}{14}$

(C) $\frac{27}{56}$

(D) $\frac{4}{7}$

15. What is the probability of getting exactly three heads in five tosses of a fair coin?

(A) $\frac{1}{32}$

(B) $\frac{9}{32}$

(C) $\frac{5}{16}$

(D) $\frac{1}{8}$

16. What is the probability of getting a multiple of 2 in a throw of a die?

(A) $\frac{1}{2}$

(B) 1

(C) $\frac{1}{3}$

(D) $\frac{1}{4}$

Directions (17-19) Two dice are rolled simultaneously. What is the probability of-

17. Getting a total of 9?

(A) $\frac{1}{3}$

(B) $\frac{1}{9}$

(C) $\frac{8}{9}$

(D) $\frac{9}{10}$

18. Getting a sum greater than 9?

(A) $\frac{10}{11}$

(B) $\frac{5}{6}$

(C) $\frac{1}{6}$

(D) $\frac{8}{9}$

19. Getting a total of 9 or 11?

(A) $\frac{2}{99}$

(B) $\frac{20}{99}$

(C) $\frac{1}{6}$

(D) $\frac{1}{10}$

20. A fair die is tossed two times, then what is the probability of getting a number greater than four in both the throws?

(A) $\frac{1}{3}$

(B) $\frac{2}{3}$

(C) $\frac{1}{9}$

(D) $\frac{1}{12}$

21. Three dice are thrown simultaneously. What is the probability that the sum of the three numbers obtained is 15?

(A) $\frac{7}{108}$

(B) $\frac{1}{12}$

(C) $\frac{5}{108}$

(D) None of these

22. In a single throw of two dice, what is the probability that neither a doublet nor a total of 8 will appear?

(A) $\frac{7}{15}$

(B) $\frac{5}{18}$

(C) $\frac{13}{18}$

(D) $\frac{3}{16}$

23. Mayank and Amit are throwing unbiased dice. If Mayank throws 1, what is the Amit's chance of throwing a higher number?

(A) $\frac{1}{5}$

(B) $\frac{5}{6}$

(C) $\frac{2}{12}$

(D) None of these

24. Two fair dice are thrown. What is the probability that the number of dots on the first die exceeds 3 and that on the second exceeds 4?

(A) $\frac{2}{6}$

(B) $\frac{3}{6}$

(C) $\frac{1}{6}$

(D) $\frac{5}{6}$

25. Two cards are drawn from a deck of 52 cards. What is the probability of getting one queen and one king?

(A) $\frac{8}{663}$

(B) $\frac{7}{663}$

(C) $\frac{3}{221}$

(D) None of these

26. From a deck of 52 cards, two cards are drawn together at random. What is the probability of both the cards being non-face cards?

(A) $\frac{^{12}C_2}{^{52}C_2}$

(B) $\frac{^{36}C_2}{^{52}C_2}$

(C) $\frac{^{38}C_2}{^{52}C_2}$

(D) $\frac{^{40}C_2}{^{52}C_2}$

Directions (27-32) One card is drawn from a pack of 52 cards, each of the 52 cards being equally likely to be drawn. What is the probability that-

27. The card drawn is black and a queen?

(A) $\frac{1}{13}$

(B) $\frac{1}{52}$

(C) $\frac{1}{26}$

(D) $\frac{5}{6}$

28. The card drawn is either black or a queen?

(A) $\frac{15}{26}$

(B) $\frac{13}{17}$

(C) $\frac{7}{13}$

(D) $\frac{15}{17}$

29. The card drawn is either a king or a queen?

(A) $\frac{5}{6}$

(B) $\frac{1}{13}$

(C) $\frac{2}{13}$

(D) $\frac{12}{13}$

30. The card drawn is either a heart, a queen or a king?

(A) $\frac{17}{52}$

(B) $\frac{21}{52}$

(C) $\frac{19}{52}$

(D) $\frac{9}{26}$

31. The card drawn is neither a spade nor a king?

(A) 0

(B) $\frac{9}{13}$

(C) $\frac{1}{2}$

(D) $\frac{4}{13}$

32. The card drawn is neither an ace nor a king?

(A) $\frac{11}{13}$

(B) $\frac{1}{2}$

(C) $\frac{2}{13}$

(D) $\frac{11}{26}$

33. A speaks the truth in 60% of the cases while B speaks the truth in 40% of the cases. What is the probability that they contradict each other in a case?

(A) $\frac{16}{25}$

(B) $\frac{13}{25}$

(C) 1

(D) $\frac{12}{25}$

34. A bag has five red, four black and three blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is not red?

(A) $\frac{5}{12}$

(B) $\frac{1}{12}$

(C) $\frac{1}{4}$

(D) $\frac{7}{12}$

Directions (35-37) A bag contains 8 red and 4 green balls. What is the probability that-

35. The ball drawn is red when one ball is selected at random?

(A) $\frac{2}{3}$

(B) $\frac{1}{3}$

(C) $\frac{1}{6}$

(D) $\frac{5}{6}$

36. All the 4 balls drawn are red when four balls are drawn at random?

(A) $\frac{17}{32}$

(B) $\frac{14}{99}$

(C) $\frac{7}{12}$

(D) None of these

37. All the 4 balls drawn are green when four balls are drawn at random?

(A) $\frac{1}{495}$

(B) $\frac{7}{99}$

(C) $\frac{5}{12}$

(D) $\frac{2}{3}$

38. The probability of A and B clearing an exam is $\frac{2}{3}$ and $\frac{3}{4}$ respectively. What is the probability that atleast one of them clears the exam?

(A) $\frac{1}{12}$

(B) $\frac{1}{4}$

(C) $\frac{11}{12}$

(D) $\frac{1}{2}$

39. In a class, there are 15 boys and 10 girls. Three students are selected at random. What is the probability that only girls or only boys get selected?

(A) $\frac{1}{3}$

(B) $\frac{1}{4}$

(C) $\frac{1}{5}$

(D) $\frac{1}{6}$

40. Four people are to be arranged in a straight line. What is the probability that two particular people are never together?

(A) $\frac{1}{24}$

(B) $\frac{1}{2}$

(C) $\frac{1}{8}$

(D) $\frac{1}{6}$

41. Five teachers A, B, C, D and E have to take a class each in a particular section. What is the probability that A is the first teacher to take a class while D is the last one to take a class?

(A) $\frac{1}{10}$

(B) $\frac{3}{20}$

(C) $\frac{1}{15}$

(D) $\frac{1}{20}$

42. Anil tossed a coin and rolled a die. What is the probability of getting a tail with the coin and a four on the dice?

(A) $\frac{1}{2}$

(B) $\frac{1}{6}$

(C) $\frac{1}{8}$

(D) $\frac{1}{12}$

43. Among 15 players, 8 are batsmen and 7 are bowlers. What is the probability that a team is chosen of 6 batsmen and 5 bowlers?

(A) $\frac{^8C_6 \times ^7C_5}{^{15}C_{11}}$

(B) $\frac{28}{15}$

(C) $\frac{15}{28}$

(D) None of these

44. The odds against P for solving a problem are 8 : 6 and odds in favour of Q solving the same problem are 14 : 10. What is the probability of the problem being solved, if both of them try it?

(A) $\frac{5}{21}$

(B) $\frac{16}{21}$

(C) $\frac{5}{12}$

(D) $\frac{5}{7}$

45. Four gentlemen and 4 ladies take seats at random around a table. What is the probability that they are sitting alternately?

(A) $\frac{4}{35}$

(B) $\frac{1}{70}$

(C) $\frac{2}{35}$

(D) $\frac{1}{35}$

46. There are 500 students in an examination. 150 students cleared the first paper, 350 students cleared the second paper and 50 students cleared both the papers. What is the probability that a student selected at random has failed in both the papers?

(A) $\frac{1}{5}$

(B) $\frac{1}{10}$

(C) $\frac{3}{10}$

(D) $\frac{3}{5}$

47. A bag contains 5 green apples and 7 red apples. If two apples are drawn from the bag, what is the probability that one is red and the other is green?

(A) $\frac{12}{66}$ (B) $\frac{35}{66}$

(C) $\frac{2}{12}$ (D) $\frac{2}{35}$

48. In a multiple – choice test, a student is given five possible answers for each question. The student receives 4 marks for a correct answer and loses 1 mark for an incorrect answer. If the student is guessing the answer randomly, what is his expected marks in a single question?

(A) 0 (B) 4

(C) 3 (D) 1

49. The odds in favour of an event are 2 : 7. What is the probability of occurrence of this event?

(A) $\frac{2}{9}$ (B) $\frac{5}{12}$

(C) $\frac{7}{12}$ (D) $\frac{2}{5}$

50. The odds against an event are 5 : 7, what is the probability of occurrence of this event?

(A) $\frac{7}{12}$ (B) $\frac{3}{5}$

(C) $\frac{2}{7}$ (D) $\frac{5}{12}$

51. A speaks truth in 60% cases and B speaks truth in 80% cases. Then what is the probability that they will say the same thing while describing a single event?

(A) 0.52 (B) 0.56

(C) 0.42 (D) 0.84

52. The odds against certain event are 5 : 2 and the odds in favour of another independent event are 6 : 5. What is the probability that atleast one of the event will happen?

(A) $\frac{12}{77}$ (B) $\frac{25}{77}$

(C) $\frac{52}{77}$ (D) $\frac{65}{77}$

53. The odds in favour of A winning a game against B is 4 : 3. If three games are to be played to decide the overall winner, then what are the odds in favour of A winning atleast once?

(A) 343 : 27 (B) 316 : 27

(C) 343 : 316 (D) None of these

54. The odds in favour of A winning a game of badminton against B are 5 : 2 If three games are to be played, what are the odds in favour of A's winning atleast one game?

(A) 425 : 5 (B) 365 : 1

(C) 335 : 8 (D) None of these

55. P can hit a target 3 times in 6 shots, Q can hit the target 2 times in 6 shots and R can hit the target 4 times in 4 shots. What is the probability that all 3 shots hit the target?

(A) 1/2 (B) 1/6

(C) 1/3 (D) 5/6

Practice Exercise Level - 2

1. 3 integers are chosen at random from the set of first 20 natural numbers. What is the chance that their product is a multiple of 3?

(A) $\dfrac{194}{285}$

(B) $\dfrac{1}{57}$

(C) $\dfrac{13}{19}$

(D) $\dfrac{3}{4}$

2. What is the probability that a leap year will have 53 Fridays or 53 Saturdays?

(A) $\dfrac{2}{7}$

(B) $\dfrac{3}{7}$

(C) $\dfrac{4}{7}$

(D) $\dfrac{1}{7}$

3. Prakash and Utsav throw one die for a stake of Rs. 11 which is to be won by the player who first throws 6. If Prakash has the first throw, what are their respective expectations?

(A) Rs. 5, Rs. 6

(B) Rs. 6, Rs. 5

(C) Rs. 11, Rs. 0

(D) Rs. 0, Rs. 11

4. A bag contains 15 white, 20 red and 12 black balls. Two balls are drawn in succession without replacement. What is the probability that the first is not red and the second is white?

(A) $\dfrac{783}{2162}$

(B) $\dfrac{1}{4}$

(C) $\dfrac{34}{47}$

(D) None of these

5. Two numbers a and b are chosen at random from a set of first 30 natural numbers. What is the probability that $a^2 - b^2$ is divisible by 3?

(A) $\dfrac{37}{87}$

(B) $\dfrac{47}{87}$

(C) $\dfrac{17}{29}$

(D) None of these

6. Triangles are formed by joining vertices of an octagon. Any one of those triangle is selected at random. What is the probability that the selected triangle has no side common with the octagon?

(A) $\dfrac{3}{7}$

(B) $\dfrac{2}{7}$

(C) $\dfrac{5}{6}$

(D) $\dfrac{1}{14}$

7. Three people participated in an event which was won by one of them. If their respective odds in favour of winning the event is 2 : 3, 3 : 4 and x : y, then what is the difference y − x?

(A) 29

(B) 6

(C) 17

(D) 23

8. There are four hotels in a town. If three men check into the hotels in a day then what is the probability that all of them do not check into the same hotel?

(A) $\dfrac{61}{64}$

(B) $\dfrac{3}{64}$

(C) $\dfrac{63}{64}$

(D) $\dfrac{1}{16}$

9. In a match between two players Arun and Bharat, the chances of Arun winning are 3/5. If Arun and Bharat play 5 matches in succession, what is the probability that Bharat wins atleast 3 matches (assuming no draws)?

(A) $\dfrac{512}{3125}$

(B) $\dfrac{124}{625}$

(C) $\dfrac{372}{625}$

(D) $\dfrac{992}{3125}$

10. Jethalal is running a small cab service in Mumbai. Every day, he travels from Mumbai to a nearby suburb and back. The suburbs are all less than 100 km from Mumbai. Every morning he fills the fuel in his car up to the brim and he can drive a maximum of 250 km without refueling. Today, he forgot to fill the fuel in his car. What is the probability that he will run out of fuel during his trip?

(A) $\dfrac{1}{2}$

(B) $\dfrac{3}{7}$

(C) $\dfrac{11}{37}$

(D) $\dfrac{9}{32}$

11. A dart is thrown to a square target ABCD shown in the figure. What is the probability that it lies within the circle?

(A) $\frac{7}{22}$

(B) $\frac{1}{4}$
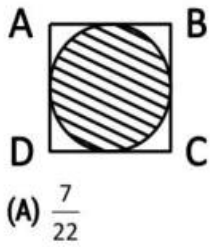
(C) $\frac{1}{2}$

(D) $\frac{11}{14}$

12. A target consists of two concentric circles with radii 10 cm and 40 cm respectively. If an arrow has hit the target, then what is the chance that the arrow is in the smaller circle?

(A) $\frac{1}{8}$

(B) $\frac{1}{2}$

(C) $\frac{1}{16}$

(D) $\frac{1}{4}$

Practice Exercise Level - 3

1. A bag contains 4 white, 3 yellow and 5 pink balls. If three balls are picked at random then what is the probability that at least one is pink?
   (1) 3/4   (2) 183/220
   (3) 37/44   (4) None of these
   (5) 7/44

2. A dice is thrown twice. What is the probability of getting a sum 7 from both the throws?
   (1) 7/36   (2) 2/9
   (3) 1/3   (4) 1/9
   (5) None of these

3. One card is drawn from a pack of 52 cards. What is the probability that the card drawn is either a red card or a king?
   (1) 15/26   (2) 7/52
   (3) 9/26   (4) 1/2
   (5) None of these

4. In how many different ways can the letters to the word 'TESMUS' be arranged in such a way that the vowels never come together ?
   (1) 420   (2) 240
   (3) 360   (4) 720
   (5) None of these

5. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?
   (1) 5/6   (2) 2/3
   (3) 13/18   (4) 7/9
   (5) None of these

6. A speaks truth in 60% cases and B in 75% of the cases. In what percentage of cases are they likely to contradict each - other, in narrating the same incident ?
   (1) 45%   (2) 35%
   (3) 30%   (4) 55%
   (5) None of these

7. There is meeting of 10 men is to be held in a hotel. In how many ways these men can be seated along a round table, If three, particular men always seat together.
   (1) 241920   (2) 36540
   (3) 24720   (4) 30240
   (5) None of these

8. A coin and a dice are thrown at random. what is the probability that a composite number turns up on the dice andthen tail turns up on the coin?

9. A bag contains 7 red, 5 pink and 8 black balls. If three balls are drawn at random, find the probability, that two are red and one is black?
   (1) 7/57   (2) 167/1140
   (3) 14/95   (4) None of these
   (5) 21/114

   (1) 1/3   (2) 1/4
   (3) 2/3   (4) 5/12
   (5) None of these

10. In how many different ways can the letters of the word 'OPERATE' be arranged?
    (1) 720   (2) 2740
    (3) 2560   (4) None of these (5) 5040

11. A box contains 24 electric bulbs, out of which six are defective. Two bulbs are chosen at rondom from this box. The probability that at least one of them is defective?
    (1) 151/276   (2) 119/276
    (3) 43/92   (4) 85/138
    (5) None of these

12. Out of 5 men and 3 women, a committee of three members is to be formed in such a way that at least one member is a men. In how many ways can it be done?
    (1) 65   (2) 80
    (3) 55   (4) 45
    (5) 70

13. When 4 fair coins are tossed together what is the probability of getting at least 3 heads?
    (1) 1/8   (2) 3/8
    (3) 3/16   (4) 5/16
    (5) 1/4

14. In a bike race where 15 bikes are running, the chance that bike A will win is 1/3, that B will win is 1/5 and that C will win is 1/4. Assuming that a dead heat is impossible. Find the chance that one of them will win.
    (1) 47/60   (2) 37/60
    (3) 53/60   (4) 49/60
    (5) None of these

Directions (15-16): Read the following passage and answer the questions that follow:

A boy has 4 library tickets i.e. he can issue a maximum of four books from the library. There exist 12 books of his interest in the library.

15. In how many ways can he choose the three books if he does not want to issue English part 2 unless English part 1 is issued?
(1) 105 (2) 125
(3) 145 (4) 175
(5) 195

16. What is the total number of possible combinations of books that he can issue from the library if he issues at least 1 book from the library?
(1) 726 (2) 759
(3) 799 (4) 817
(5) 793

17. A box contains 7 blue balls, 3 yellow balls and 6 red balls. In how many ways 5 balls are taken out from the box, if at least one blue ball is to be included in the drawn?
(1) 4/9 (2) 5/8
(3) 5/9 (4) 3/8
(5) None of these

18. A bag contains 6 blue hats, 5 green hats and 6 orange hats. Find the probability choosing 4 hats out of which there should be at least one blue hat?
(1) 33/238 (2) 205/238
(3) 212/238 (4) 37/238
(5) None of these

19. Deekshitha has 5 Patiala in her wardrobe. One of them is white the second is blue, the third green, the fourth is yellow and the last is pink. In her wardrobe, she also has 6 tops. One of them is white and the other 5 are black. She opens her wardrobe in the dark and picks out one top and one Patiala pair without examining the colour. What is the likelihood that neither the top nor the Patiala is white?
(1) 5/9 (2) 4/9
(3) 2/3 (4) 1/3
(5) None of these

20. A special coupon is to be held to select students who will live in the only ac room in a hostel. There are 80 Year-3, 160Year-2 and 120 Year-1 students who applied. Each Year-3's name is placed in the lottery 3 times; each Year-2's name, 2 times and Year-1's name, 1 time. What is the probability that a Year-2's name will be chosen?
(1) 8/17 (2) 6/17

(3) 7/17 (4) 5/17
(5) None of these

21. A container contains 4 boxes of variety1 sweet, 5 boxes of variety2 sweet and 3 boxes of variety3 sweet. Three boxes of them are drawn at random, what is the probability that the three are not of the same variety?
(1) 41/44 (2) 3/44
(3) 15/44 (4) 13/44
(5) None of these

Directions (22-23): There are 3 bags containing 3 colored balls – Red, Green and Yellow.

Bag A contains:
15 red balls. Y yellow balls and G green balls. Probability of drawing one yellow ball is 2/9. The ratio of number of green and yellow balls is 9: 4
Bag B contains:
Number of green balls is 2/3rd of G. Total number of balls in bag is 5/6th of balls in Bag A. Number of yellow balls is 3 greater than number of red balls
Bag C contains:
Number of red balls is 1/3rd of total number of red balls in bags A and B. Number of yellow balls is 20% more than number of yellow balls in bag B. Probability of drawing one green ball is 7/16. (2 questions asked as below)

22. One ball from each bag is drawn. Find the probability that these are yellow balls?
(1) 5/16 (2) 3/16
(3) 7/36 (4) 1/36
(5) 9/16

23. 5/6th of red balls, 4/9th of green balls from bag B are placed in bag D. What is the probability that 2 out of 3 balls from bag D are red?
(1) 15/37 (2) 15/34
(3) 17/33 (4) 11/34
(5) 19/34

24. 4 boys and 5 girls plan to go to a movie. But 4 girls are stubborn that they will sit together. How many ways can the 9 sit in the movie?
(1) 86,400 (2) 17,280
(3) 3,62,880 (4) 3,45,600
(5) None of the above

25. A three-digit combination lock can be set possible combinations are such that the second letter is a vowel and no letter is repeated?

(1) 1750   (2) 3000

(3) 1500   (4) 3240

(5) None of these

26. A bag contains 6 white and 4 black balls .2 balls are drawn at random. Find the probability that they are of same colour.

(1) 5/12   (2) 7/15

(3) 8/15   (4) 11/19

(5) None of these

27. Find the probability of forming a committee with 4 persons from 5 men and 3 women and the committee should contains at least one woman.

(1) 2/7   (2) 13/14

(3) 1/14   (4) 5/7

(5) None of these

28. If two dice are thrown then what is the probability that the sum of the faces of dice is not square number?

(1) 5/36   (2) 13/36

(3) 1/3   (4) 7/36

(5) None of these

29. A group contains 10 boys and 8 girls. Out of the boys, 40% are graduate and rest post graduate. Out of the girls, half are boys and half are girls. A committee of six member is to be formed such that the committee contains half graduates and half post graduates. Find the number of ways in which this can be done

(1) 6720   (2) 5620

(3) 4580   (4) 3880

(5) None of these

30. An apartment has 8 floors. An elevator starts with 4 passengers and stops at 8th floor of the apartment. What is the probability that all passengers travels to different floors?

(1) 109/256   (2) 135/256

(3) 105/256   (4) 95/256

(5) None of these

31. Bag P contains some red balls and 4 green balls. Bag Q contains 6 white balls and some blue balls. Probability of drawing one green ball from bag P is 2/3 and probability of drawing one blue ball from bag Q is 2/5. Find the sum of the probability of drawing 2 red balls from bag P and 2 white ball from bag Q.

(1) 4/5   (2) 1/5

(3) 3/5   (4) 2/5

(5) None of these

32. A national team of 6 players is to be selected from a group of 5, 4, 6 and 5 players from east, west, north and south zones respectively. In how many ways a team having exactly 2 players from east zone and at least one player from each zone can be selected?

(1) 4800   (2) 5600

(3) 6400   (4) 7200

(5) None of these

33. Two cards are randomly drawn from well shuffled deck of 52 cards. What is the probability that both the cards drawn are either face cards or red in colour?

(1) 23/78   (2) 188/663

(3) 25/102   (4) 60/221

(5) None of these

34. A group contains 6 boys and 8 girls. Out of the boys, two are under graduate and rest are post graduate. Out of the girls, 3 are under graduate and rest are post graduate. A committee of 7 members is to be formed such that the committee contains 3 under graduate and rest post graduate. Find the number of ways in which this can be done.

(1) 1260   (2) 1380

(3) 1420   (4) 1540

(5) None of these

35. There are 280 ways of forming a group of (x + 2) men and 3 women out of a total of 8 men and 5 women. Find the value of x.

(1) 2   (2) 3

(3) 4   (4) 5

(5) 6

36. A bag contains 'x' red and 12 green balls. If the probability of drawing a red ball from the bag is __, then total number of balls in the bag is __.

The values given in which of the following options will fill the blanks in the same order in which is it given to make the statement true:

I. 0.2, 15   II. 0.4, 20

III. 0.6, 25   IV. 0.8, 30

(1) Only (I)   (2) Only (I) and (II)

(3) Only (I), (II) and (III)   (4) Only (I), (II) and (IV)

(5) Only (II), (III) and (IV)

Directions (37-38): Answer the question based on the information given below.

A bag contains 'x' green, 'y' yellow, '3x – 6' blue and '2y + 4' red balls. Probability of drawing a red

ball from the bag is 2/5 while the probability of drawing a yellow ball is 4/25.

37. Two balls are randomly drawn from the bag. What is the probability that a green ball and a red ball are drawn from the bag?
(1) 2/35
(2) 7/50
(3) 3/25
(4) 4/35
(5) None of these

38. 1 ball is randomly drawn from the bag and put in a box containing 9 red and 6 green balls. Now a ball is randomly drawn from the box. What is the probability that a red ball is drawn from the box?
(1) 1/4
(2) 47/80
(3) 27/40
(4) 27/80
(5) None of these

39. A bag contains 8 red, 5 white and 7 blue balls. A person picks three balls at random. Find the difference between the probability that out of three, 2 balls are of red, and out of three, at least two balls are blue.
(1) 2/95
(2) 7/285
(3) 11/285
(4) 1/19
(5) None of the above

40. How many four letter words having at least one vowel can be formed by using the letters of the word "JAILORS"? (No letter appears twice in the word formed)
(1) 34
(2) 136
(3) 408
(4) 816
(5) None of these

41. A committee of 10 persons is to be formed from a group of 8 men and 7 women. In how many ways, the committee having at most four women can be formed?
(1) 980
(2) 1001
(3) 1160
(4) 1281
(5) None of these

42. In a group there are 5 dancers, 6 engineers, 8 professors and 4 players, out of which 3 dancers, 2 engineers, 4 professors and 2 players are females and rest, are males. A committee of six members is to be selected from the group such that the committee contains one male from each profession and 2 females from any profession. Find the number of ways in which this can be done
(1) 5410
(2) 3520
(3) 4210
(4) 3460
(5) None of these

43. There are two groups i.e. A and B. Group A has 'x' men and 5 women while group B has 7 men and 'y' women. The number of ways of selecting 2 men and a woman from group A and group B is 30 and 105 respectively. What is the value of xy?
(1) 20
(2) 12
(3) 24
(4) 25
(5) None of these

44. A bag contains 3 pink, 4 yellow, 4 white and 5 green balls. If three balls are picked at random, what is the probability that at least one is green?
(1) $\frac{58}{91}$
(2) $\frac{161}{560}$
(3) $\frac{83}{280}$
(4) $\frac{79}{112}$
(5) $\frac{5}{7}$

Directions (45-49): Study the following and answer the following questions.

A Coach has a bag which contains 9 balls of different colors as 2 yellow balls, 3 green balls and 4 blue balls. He has to choose the balls randomly for his players to start the coaching according to the number of players.

45. If three balls are drawn randomly, then what is the probability of getting all are green balls?
(1) 3/84
(2) 1/84
(3) 7/81
(4) 4/83
(5) 9/84

46. If three balls are chosen randomly, then what is the probability of getting all are of the same color?
(1) 1/84
(2) 5/81
(3) 5/84
(4) 2/89
(5) 5/87

47. If two balls are drawn randomly, then what is the probability of getting either all are yellow or all are blue?
(1) 2/35
(2) 3/34
(3) 8/31
(4) 7/36
(5) 1/33

48. If three balls are chosen randomly, then what is the probability of getting at least one is blue?
(1) 31/41
(2) 37/42
(3) 33/43
(4) 35/42
(5) 31/49

49. If two balls are drawn at random, then what is the probability that they will be of different colors?

(1) 13/18   (2) 17/18
(3) 13/17   (4) 14/19
(5) 11/15

50. A bag contains 6 green, 7 yellow, some red and some blue balls. Probability of drawing one red ball from the bag is 5/22 and probability of drawing one blue ball from the bag is 2/11. Find the probability of drawing four balls from the bag such that all the balls are of same colour.
(1) 9/1145   (2) 7/1021
(3) 8/1045   (4) 5/1024
(5) None of these

51. There are 6 men and 6 women in a class, from these 4 members are to be selected to form a committee. Find the number of ways that at least two women were in the committee.
(1) 120   (2) 240
(3) 180   (4) 360
(5) 320

52. A bag contains 4 red, 5 pink and x blue colour balls. One ball is taken out randomly and the probability of getting blue ball is 2/5. Find the total number of balls in the bag.
(1) 15   (2) 10
(3) 5   (4) 20
(5) 25

53. There are 4 green & 5 red balls in first bag and 3 green & 6 red balls in second bag. One ball is drawn from each bag. What is the probability that one ball will be green and other red?
(1) 33/72   (2) 1/2
(3) 13/27   (4) 35/72
(5) None of these

54. The probability of selection of 3 students in a school is 2/5, 5/6 and 4/7 respectively. Find the probability that at least one of them get selected.
(1) 17/70   (2) 24/55
(3) 23/55   (4) 67/70
(5) 11/24

55. If three coins are tossed together, then find the probability that all coins have the same face.
(1) 2/5   (2) 1/3
(3) 3/4   (4) 1/5
(5) 1/4

56. How many ways the word 'MANAGEMENT' can be arranged without repetition?
(1) 226800   (2) 114400
(3) 156200   (4) 172000
(5) 220400

57. A bag contains a total of 48 balls of three colours viz. Red, Blue and Yellow such that the ratio of number of Red and Blue colours balls is 3:2, respectively and the probability of drawing a blue ball is (1/4). Find the number of Yellow balls in the bag.
(1) 18   (2) 15
(3) 8   (4) 24
(5) Cannot be determined

58. Find the total number of distinct vehicle numbers that can be formed using two letters followed by two numbers. Letters need to be different.
(1) 4500 ways   (2) 54000 ways
(3) 65000 ways   (4) 12000 ways
(5) 26000 ways

59. There are 4 bowlers, 6 batsmen and three all-rounders in a match. The cricket board have to select 2 bowlers, 2 batsmen and one all-rounder. What is the probability of selecting team?
(1) 28/143   (2) 42/143
(3) 132/143   (4) 45/143
(5) None of these

60. A box contains 4 red balls, 6 green balls and x pink balls. If one ball is drawn from the box and the probability of that ball pink is 1/6, find the total number of balls present in the box
(1) 24 balls   (2) 10 balls
(3) 12 balls   (4) 15 balls
(5) 20 balls

61. Bag P contains 4 white balls and bag Q contains 6 green balls. Some balls are transferred from bag Q to bag P. Probability of drawing 2 green balls from bag P is 3/14. Find the number of balls transferred to bag P.
(1) 2   (2) 4
(3) 6   (4) 3
(5) None of these

62. A bag contains 5 brown, 4 blue and 3 red balls. A man draws three balls randomly. What would be the probability that all balls are of different colours?
(1) 4/45   (2) 12/19
(3) 3/47   (4) 3/11
(5) 9/22

63. A bag contains 108 balls of three different colors black, white, and grey. The probability of drawing a white ball is (1/3), and the number of grey balls is twice the number of black balls in the bag. Find

the probability of drawing a black ball from the bag.
(1) 2/9 (2) 1/3
(3) 4/9 (4) 5/9
(5) Cannot be determined

64. A fruit seller has three types of mangoes in his bucket viz. Dasheri, Langra and Chaunsa. The probability of selling one Dasheri mango is 3/8, while the probability of selling one Langra mango is 2/7. If he has total 38 Chaunsa mangoes, then what is the total number of mangoes in his bucket?
(1) 56 (2) 72
(3) 96 (4) 112
(5) 124

65. A bag contains (x + 3) pink balls, (x + 5) orange balls, and (x + 7) yellow balls in the bag. The probability of drawing a yellow ball from the bag is (8/21). Find the number of orange balls in the bag.
(1) 9 (2) 12
(3) 14 (4) 16
(5) Cannot be determined

66. A bag contains red, blue and green balls in the ratio of 2:4:5 respectively. Two balls are randomly drawn from the bag and the probability that both the balls drawn are blue in color is 1/8. Find the total number of balls in the bag.
(1) 22 (2) 33
(3) 44 (4) 55
(5) None of these

67. In how many different ways can 6 male and 6 female form a circle such that the male and the female alternate?
(1) 87678 (2) 86400
(3) 78767 (4) 78688
(5) None

68. There are three events A, B and C, one of which must and only can happen. If the odds are 7:4 against A, 5:3 against B, the odds against C must be:
(1) 65/23 (2) 44/57
(3) 23/55 (4) 57/89
(5) None of these

69. In a cartoon contains 6 black pen, 7 violet pen and 5 blue pen. Three pen are drawn at random from the cartoon. The probability that all of them are blue is.
(1) 9/786 (2) 5/408
(3) 11/874 (4) 3/876
(5) None of these

70. In a pack of 52 cards, three cards are taken out randomly. What is the probability that all three are Ace cards?
(1) 34/93 (2) 1/5525
(3) 5/134 (4) 27/973
(5) None of these

71. In how many different ways can the letters of the word 'GRINDER' be arranged?
(1) 2520 (2) 1280
(3) 3600 (4) 1800
(5) 1900

72. The letters H, I, I, N and D are written on a slip of paper. The five slips of paper are placed in a hat. The slips are then selected one at a time from the hat, what is the probability that the order in which they are chosen spells HINDI?
(1) 1/60 (2) 1/120
(3) 1/15 (4) 1/90
(5) 1/30

73. In how many different ways can the letters of the word 'VINTAGE' be arranged such that the vowels always come together?
(1) 720 (2) 1440
(3) 632 (4) 364
(5) 546

74. In a class, there are 12 girls and 13 boys. If three students are selected at random, what is the probability that only girls or only boys get selected?
(1) 22 (2) 24
(3) 18 (4) 21
(5) 27

75. one rupee coin is tossed twice. What is the probability of getting two consecutive heads?
(1) 1/2 (2) ¼
(3) 3/4 (4) 1/3
(5) None of these

76. In how many ways can 8 different bangles be distributed in 6 different boxes if box 3 and box 5 can contain only one and two number of bangles respectively and rest of the boxes can contain any number of bangles?
(1) 173142 ways (2) 172032 ways
(3) 174036 ways (4) 175024 ways
(5) None of these

77. A number is selected at random from first 40 natural numbers. What is the chance that it is a multiple of either 4 or 14?
(1) 1/5 (2) 12/40

(3) 11/40   (4) 10/40
(5) None of these

78. 2 boys and 2girls boarded in a van in which 5 seats are vacant, one of the 5 seats is reserved for ladies. A girl may or may not sit on the seat reserved for ladies, in how many different ways can the five seats be occupied by these persons?
(1) 32   (2) 36
(3) 34   (4) 30
(5) None of these

79. Six male and five female stand in queue for buy a cinema ticket. The probability that they stand in alternate positions is:
(1) 1/258   (2) 1/462
(3) 1/365   (4) 1/512
(5) None

80. Find the probability that in a random arrangement of the letters of the word "EVERYTHING" the two E's come together.
(1) 1/7   (2) 1/9
(3) 1/5   (4) 1/3
(5) None

81. From a pack of 52 cards one card is drawn at random. What is the probability that the card drawn is a six or a diamond?
(1) 17 / 52   (2) 4/13
(3) 9/52   (4) 3/13
(5) None

82. The first 10 alphabets are written down at random. What is the probability that the letters d, e, f and g always come together?
(1) 1/26   (2) 1/30
(3) 1/24   (4) 1/10
(5) None of these

83. The last 7 alphabets are written at random then the probability that the letters x and y are written down side by side is :
(1) 2/7   (2) 2/9
(3) 2/3   (4) 2/5
(5) None of these

84. There are 3 articles, 4 magazines and 2 story books. They have to be arranged so that the articles are together, magazines are together and story books are together, but we no longer require that they should be in a specific order. In how many ways can this be done?
(1) 1728   (2) 288
(3) 864   (4) 1764
(5) None of these

85. How many words can be formed by arranging the letters of the word BLASTED such that B and E are never come together?
(1) 3600   (2) 3565
(3) 3750   (4) 3850
(5) 7320

86. In how many ways a committee of 4 members can be formed from 5 men and 6 women in which at least 2 men should come?
(1) 215   (2) 359
(3) 429   (4) 542
(5) 325

87. The probability of selection of three candidates X, Y and Z in an organization is 2/5, 5/6 and 4/7 respectively. Find the probability that exactly one of them got selected?
(1) 3/65   (2) 2/53
(3) 33/70   (4) 33/47
(5) 21/70

88. 48 uniform chairs must be arranged in rows with the same number of chairs in each row. Each row must contain at least 4 chairs and there must be at least 4 rows. A row is parallel to the front of the room. How many different arrangements are possible?
(1) 3   (2) 4
(3) 5   (4) 6
(5) None of these

89. Srinaya forgot the last digit of a 11 digit land line number. If she randomly dials the final 2 digits after correctly dialling the first nine, then what is the chance of dialling the correct number?
(1) 1/10   (2) 1/100
(3) 1/1000   (4) 1/11
(5) None of these

90. From a pack of 52 cards, 2 cards are drawn. What is the probability that it has no digit card?
(1) $\frac{8}{663}$ (2) $\frac{20}{221}$
(3) $\frac{32}{221}$ (4) $\frac{105}{442}$
(5) None of these

91. How many numbers of five digit can be formed with the digits 0, 2, 4, 6 and 8? When repetition is not allowed.
(1) 120   (2) 72
(3) 24   (4) 240
(5) None of these

92. A box contains 5 green, 2 yellow, 4 pink and 3 white balls, what is the probability that both are yellow or at least one is yellow.
    (1) $\frac{2}{7}$
    (2) $\frac{24}{91}$
    (3) $\frac{27}{91}$
    (4) None of these
    (5) $\frac{51}{182}$

93. Find the number of ways in which 4 identical balls can be distributed among 7 identical boxes, if not more than one ball goes in to a box?
    (1) 15
    (2) 35
    (3) 40
    (4) 64
    (5) None of these

94. A team of 6 children is to be selected out of 6 girls and 4 boys such that it contains at least 4 girls. In how many Different ways can the selection.
    (1) 108
    (2) 146
    (3) 115
    (4) 126
    (5) None of these

95. From a pack of 52 cards, 3 cards are drawn at random what is the probability that it has one Ace, one Queen and One king?
    (1) $\frac{16}{5525}$
    (2) $\frac{25}{5649}$
    (3) $\frac{36}{5398}$
    (4) $\frac{18}{5795}$
    (5) None of these

96. How many ways the latter of the word DIRECTOR, be arranged in such a way that all the vowels come together.
    (1) 4320
    (2) 2180
    (3) 2880
    (4) 1440
    (5) None of these

97. A three digit number is formed with the digits 3,5,6,8 and 7 at random. What is the probability that the number formed is not divisible by 2 ?
    (1) $\frac{2}{5}$
    (2) $\frac{3}{2}$
    (3) $\frac{4}{5}$
    (4) $\frac{11}{25}$
    (5) None of these

98. In how many ways can the latter of word 'ARRANGED' be arranged so that the both R's are always together?
    (1) 1260
    (2) 5040
    (3) 2540
    (4) None of these
    (5) 10080

99. From a pack of 52 cards, 2 cards are drawn at random. What is the probability that it has exactly one queen?
    (1) $\frac{64}{221}$
    (2) $\frac{36}{221}$
    (3) $\frac{42}{221}$
    (4) $\frac{54}{221}$
    (5) None of these

Solution
Practice Exercise Level - 1

1.(B)   Number of favourable cases = 3
Total cases = 7

Required probability $= \dfrac{3}{7}$

2.(D)   If the number is both a multiple of 4 and 5, the number has to be a multiple of 20.
Favourable cases = 1
Total cases = 20

Required probability $= \dfrac{1}{20}$

3.(A)   Probability of winning of either 1, 2 or 3 is
= 0.3 + 0.2 + 0.1
= 0.6

4.(B) $P(\bar{A}) = 1 - P(A) = 1 - \dfrac{2}{5} = \dfrac{3}{5}$

5.(C) $P(\bar{B}) = 1 - P(B) = 1 - \dfrac{1}{2} = \dfrac{1}{2}$

6.(C) $P(A\ B) = P(A) + P(B) - P(A\ B)$
$= \dfrac{2}{5} + \dfrac{1}{2} - 0 = \dfrac{9}{10}$ $(\because P(A \cap B) = 0)$

7.(B) $P(\bar{A} \cap \bar{B}) = P(\overline{A \cup B})$
$= 1 - P(A\ B)$
$= 1 - \dfrac{9}{10} = \dfrac{1}{10}$

8.(A) $P(\ B) = P(B) - P(A\ B)$
$P(\bar{A} \cap B) = P(B) = \dfrac{1}{2}$
$[\ P(A\ B) = 0]$

9.(B)   Total four-digit numbers that can be formed are $4 \times 4 \times 3 \times 2$
= 96 numbers
Favourable cases $= 3 \times 4 \times 3 \times 2$
= 72 numbers

Probability $= \dfrac{72}{96} = \dfrac{3}{4}$

10.(A)   For both alphabets to be vowels:
Favourable cases $= {}^5C_2 = 10$ ways

Total cases $= {}^{26}C_2 = 26 \times \dfrac{25}{2}$

$= 13 \times 25 = 325$ ways

Required probability $= \dfrac{10}{325} = \dfrac{2}{65}$

Total outcomes = 26
Favourble outcomes = 5

$\therefore P(\text{first vowel}) = \dfrac{5}{26}$

Now, with one vowel removed,
Total outcomes = 25
Favourble outcomes = 4

$\therefore P(\text{second vowel}) = \dfrac{4}{25}$

P(first and second vowel)

$= \dfrac{5}{26} \times \dfrac{4}{25}$

$= \dfrac{4}{26 \times 5} = \dfrac{2}{65}$

11.(A)   n(S) = 20
n(E) = {4, 8, 12, 16, 20}

$P(E) = \dfrac{5}{20} = \dfrac{1}{4}$

12.(A)   Here, good bulbs are
= 500 - 40 = 460

Required probability $= \dfrac{460}{500} = \dfrac{23}{25}$

13.(B)   Let A = event of taking a consonant from "GEOMETRY". Let B = event of taking a consonant from "ALGEBRA". Then

$P(A) = \dfrac{5}{8}, P(B) = \dfrac{4}{7}$.

P(A and B) = P(A) × P(B)

$= \dfrac{5}{8} \times \dfrac{4}{7} = \dfrac{5}{14}$

14.(C)   P(E) = P(taking a vowel from "GEOMETRY" and a consonant from "ALGEBRA")

$= \dfrac{3}{8} \times \dfrac{4}{7} = \dfrac{12}{56}$

P(F) = P(taking a consonant from "GEOMETRY" and a vowel from "ALGEBRA")

$= \dfrac{5}{8} \times \dfrac{3}{7} = \dfrac{15}{56}$

P (exactly one vowel) = P(E or F)
= P(E) + P(F)

$= \dfrac{12}{56} + \dfrac{15}{56} = \dfrac{27}{56}$

15.(C)   Required probability

$P = {}^5C_3 \left(\dfrac{1}{2}\right)^3 \times \left(\dfrac{1}{2}\right)^2$

$= \dfrac{10}{32} = \dfrac{5}{16}$

16.(A)   As per the problem,

Number of favourable cases = 3 (2, 4 or 6)
Total number of cases = 6

Required probability $=\frac{3}{6}=\frac{1}{2}$

17.(B) E = {(6, 3), (5, 4), (4, 5), (3, 6)} n(E) =4

$\therefore P(E)=\frac{4}{36}=\frac{1}{9}$

18.(C) E = {(6, 4), (5, 5), (4, 6), (6, 5), (5, 6), (6, 6)}
n(E) = 6

$\therefore P(E)=\frac{6}{36}=\frac{1}{6}$

19.(C) E = {(6, 3), (5, 4), (4, 5), (3, 6), (6, 5), (5, 6)}
n(E) = 6

$\therefore P(E)=\frac{6}{36}=\frac{1}{6}$

20.(C) E = {(5, 5), (5, 6), (6, 5), (6, 6)}
Required probability

$=P(E)=\frac{4}{36}=\frac{1}{9}$

21.(C) We need a sum of 15 on the three dice together.
Favourable cases will be (6, 6, 3) : 3 cases, (6, 5, 4) : 6 cases, (5, 5, 5) : 1 case
Favourable number of cases = 10
Total number of cases = 216

Required probability $=\frac{10}{216}=\frac{5}{108}$

22.(B) n(S) = 36
A = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}
B = {(2, 6), (3, 5), (4, 4), (5, 3), (6, 2)}
(A Ç B) = {(4, 4)}
n(A) = 6, n(B) = 5, n(A Ç B) = 1
Required Probability = P(A) + P(B) − P(A Ç B)

$=\frac{6}{36}+\frac{5}{36}-\frac{1}{36}=\frac{10}{36}=\frac{5}{18}$

23.(B) Total outcomes = [1, 2, 3, 4, 5, 6] = 6
Favourable outcomes = [2, 3, 4, 5, 6] = 5

Required Probability = $\frac{5}{6}$

24.(C) Probability of getting more than 3 dots on die 1 $=\frac{3}{6}=\frac{1}{2}$

Probability of getting more than 4 dots on die 2 $=\frac{2}{6}=\frac{1}{3}$

Required Probability

$=\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$

25.(A) Total number of ways = $^{52}C_2$
Favourable number of ways

$= {}^4C_1 \times {}^4C_1$
Required probability

$=\frac{4\times4\times2}{52\times51}=\frac{8}{13\times51}=\frac{8}{663}$

26.(D) Face cards are King, Queen and Jack and so there are 12 face cards in a normal deck of cards.
Number of non-face cards
= 52 − 12 = 40
Therefore, probability of drawing two cards

that are non-face cards $=\frac{^{40}C_2}{^{52}C_2}$

Ans.(27-32) S = (52 Cards)
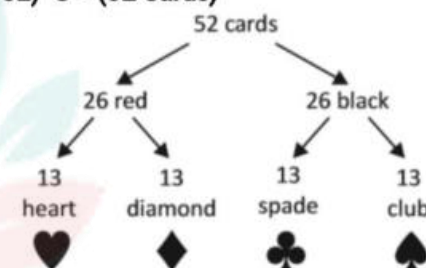
In each of the four suits there is one ace, one king, one queen and one jack (or knave) and rest 9 cards are numbered.
n(S) = 52

27.(C) Since drawn card must be black so there are only two queens. Hence,
n(E) = 2

$\therefore P(E)=\frac{2}{52}=\frac{1}{26}$

28.(C) There are 26 black cards (including two queens). Besides these, there are two more queens (in red colours).
Thus, n(E) = 26 + 2 = 28

$\therefore P(E)=\frac{28}{52}=\frac{7}{13}$

29.(C) There are 4 kings and 4 queens.
E = K Q
n(E) = 4 + 4 = 8

$\therefore P(E)=\frac{8}{52}=\frac{2}{13}$

30.(C) There are 13 hearts (including one queen and one king). Besides these, there are 3 queens and 3 kings in remaining 3 suits each.
Thus, n(E) = 13 + 3 + 3 = 19

$\therefore P(E)=\frac{19}{52}$

31.(B) There are 13 spades (including one king). Besides these, there are 3 more kings in remaining 3 suits.

Thus, n(E) = 13 + 3 = 16

Hence, n($\bar{E}$) = 52 − 16 = 36

$\therefore P(E) = \dfrac{36}{52} = \dfrac{9}{13}$

32.(A) There are 4 aces and 4 kings.

n(E) = 4 + 4 = 8

$\therefore n(\bar{E}) = 52 - 8 = 44$

$\therefore P(E) = \dfrac{44}{52} = \dfrac{11}{13}$

33.(B) As per the problem,

Probability of A speaking the truth = 60%

i.e. $P(A) = \dfrac{3}{5}$

and $P(\bar{A}) = \dfrac{2}{5} = \dfrac{60}{100} = \dfrac{3}{5}$

Probability of B speaking a truth = 40%

i.e. $P(B) = \dfrac{2}{5}$

and $P(\bar{B}) = \dfrac{3}{5} = \dfrac{40}{100} = \dfrac{2}{5}$

They will contradict each other when A speaks the truth and B lies or B speaks the truth and A lies.

P(contradict each other)

= P(C) = P(A) × P($\bar{B}$) + P($\bar{A}$) × P(B)

$= \dfrac{3}{5} \times \dfrac{3}{5} + \dfrac{2}{5} \times \dfrac{2}{5}$

$= \dfrac{9}{25} + \dfrac{4}{25} = \dfrac{13}{25}$

34.(D) Number of favourable cases = 7

Total cases = 12

Required probability $= \dfrac{7}{12}$

35.(A) n(S) = 8 + 4 = 12

n(E) = 8

$\therefore P(E) = \dfrac{8}{12} = \dfrac{2}{3}$

36.(B) n(S) = $^{12}C_4$ = 495

n(E) = $^8C_4$ = 70

$\therefore P(E) = \dfrac{70}{495} = \dfrac{14}{99}$

37.(A) n(S) = $^{12}C_4$ = 495

n(E) = $^4C_4$ = 1

$\therefore P(E) = \dfrac{1}{495}$

38.(C) Probability that both of them do not clear the exam

$= \dfrac{1}{3} \times \dfrac{1}{4} = \dfrac{1}{12}$

Probability that atleast one of them will clear the exam $= 1 - \dfrac{1}{12} = \dfrac{11}{12}$

39.(B) There are 15 boys and 10 girls.

If only boys get selected, number of ways

= $^{15}C_3$

$= \dfrac{15 \times 14 \times 13}{1 \times 2 \times 3}$

= 5 × 7 × 13 = 455 ways

If only girls get selected, number of ways

= $^{10}C_3$

$= \dfrac{10 \times 9 \times 8}{1 \times 2 \times 3}$

= 10 × 3 × 4 = 120 ways

Favourable outcomes

= 455 + 120 = 575 ways

Total outcomes $^{25}C_3$ = 2300

Required probability

$= \dfrac{575}{2300} = \dfrac{1}{4}$

40.(B) Total number of ways = 4!

= 24 ways

If two particular persons are always together, number of ways = 3! × 2! = 12 ways

Number of ways in which two persons are never together = 24 − 12 = 12

Required probability $= \dfrac{12}{24} = \dfrac{1}{2}$

41.(D) Total number of cases = 5! = 120 ways

If A is the first teacher to take a class while D is the last one to take a class, then after fixing the two, number of favourable cases = 3! = 6

Required probability $= \dfrac{6}{120} = \dfrac{1}{20}$

42.(D) Required probability

$= \dfrac{1}{2} \times \dfrac{1}{6} = \dfrac{1}{12}$

43.(A) Total number of players = 15

Total number of batsmen = 8

Total number of bowlers = 7

Total number of players in the team = 11

Total number of ways to choose a team

= $^{15}C_{11}$

Number of ways to choose 6 batsmen and 5 bowlers

= $^8C_6 \times {}^7C_5$

$\therefore$ Required probability $= \dfrac{^8C_6 \times {}^7C_5}{^{15}C_{11}}$

44.(B) The odds against P for solving a problem
$= 8 : 6$
Probability of P for not solving the problem
$= \dfrac{8}{14} = \dfrac{4}{7}$
The odds in favour of Q solving problem
$= 14 : 10$
Probability of Q not solving the problem
$= \dfrac{10}{24} = \dfrac{5}{12}$
Hence, the probability of P and Q not solving the problem
$= \dfrac{4}{7} \times \dfrac{5}{12} = \dfrac{5}{21}$
Probability of the problem being solved
$= 1 -$ probability of the problem not being solved
$= 1 - \dfrac{5}{21} = \dfrac{16}{21}$.

45.(D) Total number of ways 4 gentlemen and 4 ladies can seat around a circular table
$= (8 - 1)!$
$= 7!$
Favourable outcomes $= 3! \times 4!$
Required probability
$= \dfrac{3! \times 4!}{7!} = \dfrac{1}{35}$

46.(B)

Paper 1 — 100 (50) 300 — Paper 2
50
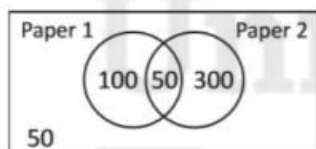
From the above venn diagram,
the number of students who failed in both the papers $= 50$
Required probability
$= \dfrac{50}{500} = \dfrac{1}{10}$

47.(B) Total ways of selecting 2 apples $= {}^{12}C_2$
Total ways of selecting 1 green apple and 1 red apple $= {}^{5}C_1 \times {}^{7}C_1$
Required Probability
$= \dfrac{{}^{5}C_1 \times {}^{7}C_1}{{}^{12}C_2} = \dfrac{5 \times 7 \times 2}{12 \times 11} = \dfrac{35}{66}$

48.(A) The student will get his answer either correct with a probability of 1/5 or incorrect with a probability of 4/5
The expected marks of the student

$= \dfrac{1}{5} \times 4 + \dfrac{4}{5} \times (-1) = 0$

49.(A) Total number of outcomes $= 2 + 7$
Favourable number of cases $= 2$
$\therefore P(E) = \dfrac{2}{9}$

50.(A) Total number of outcomes $= 5 + 7 = 12$
Number of cases against the occurrence of event $= 5$
Number of cases in favour of the event $= 7$
$P(E) = \dfrac{7}{12}$

51.(B) Consider the following events.
A A speaks truth, $\bar{A}$ lies
B B speaks truth, $\bar{B}$ lies
Then, $P(A) = \dfrac{60}{100} = \dfrac{3}{5}$, $P(\bar{A}) = \dfrac{2}{5}$
$P(B) = \dfrac{80}{100} = \dfrac{4}{5}$, $P(\bar{B}) = \dfrac{1}{5}$
Thus, the required probability
$P(A)(B) + P(\bar{A})(\bar{B})$
$= \dfrac{3}{5} \times \dfrac{4}{5} + \left(1 - \dfrac{3}{5}\right)\left(1 - \dfrac{4}{5}\right)$
$= \dfrac{12}{25} + \left(\dfrac{2}{5}\right)\left(\dfrac{1}{5}\right) = \dfrac{14}{25} = 0.56$

52.(C) Probability of at least one event will happen
$= 1 -$ probability of none of event will happen
$= 1 - \dfrac{5}{7} \times \dfrac{5}{11} = 1 - \dfrac{25}{77} = \dfrac{52}{77}$

53.(B) Here, $P(A) = \dfrac{4}{7}$
and $P(\bar{A}) = 1 - \dfrac{4}{7} = \dfrac{3}{7}$
Probability of winning atleast one game
$= 1 -$ Probability of winning no game
$= 1 - \left(\dfrac{3}{7}\right)^3$
$= 1 - \dfrac{27}{343} = \dfrac{316}{343}$
Required odds in favour of A
$= 316 : 27$

54.(C) Given, $P(A) = \dfrac{5}{7}$
and $P(\bar{A}) = 1 - \dfrac{5}{7} = \dfrac{2}{7}$
Probability of winning atleast one game
$= 1 - P(\text{no game winning})$
$= 1 - \left(\dfrac{2}{7}\right)^3$

$$=1-\frac{8}{343}=\frac{335}{343}$$

The odds in favour of A's winning atleast one game = 335 : 8

55.(B) Given, $P(A)=\frac{3}{6}=\frac{1}{2}$,

$$P(B)=\frac{2}{6}=\frac{1}{3}, P(C)=\frac{4}{4}=1$$

Required probability = P(A) × P(B) × P(C)

$$=\frac{1}{2}\times\frac{1}{3}\times1=\frac{1}{6}$$

Practice Exercise Level - 2

1.(A) Total number of ways of selecting 3 integers from 20 natural numbers = $^{20}C_3$ = 1140

Their product is a multiple of 3 means, atleast one number is divisible by 3.

The numbers which are divisible by 3 are 3, 6, 9, 12, 15, 18 and the number of ways of selecting atleast one of them is $^{6}C_1 \times {}^{14}C_2 + {}^{6}C_2 \times {}^{14}C_1 + {}^{6}C_3 = 776$

Required probability $=\dfrac{776}{1140}=\dfrac{194}{285}$

2.(B) In a leap year there are 366 days in which 52 weeks and two days. The combination of 2 days may be:

Sun-Mon, Mon-Tue, Tue-Wed, Wed-Thu, Thu-Fri, Fri-Sat, Sat-Sun.

$P(53 \text{ Fri})=\dfrac{2}{7}$; $P(53 \text{ Sat})=\dfrac{2}{7}$ and $P(53 \text{ Fri and } 53 \text{ Sat})=\dfrac{1}{7}$

P(53 Fri or Sat) = P(53 Fri) + P(53 Sat) – P(53 Fri and Sat)

$$=\frac{2}{7}+\frac{2}{7}-\frac{1}{7}=\frac{3}{7}$$

3.(B) Since Prakash can win the game at the 1st, 3rd, 5th, ..., trials.

If p be the probability of success and q be the probability of fail, then $p=\dfrac{1}{6}$ and $q=\dfrac{5}{6}$

P(Prakash wins at the first trial) $=\dfrac{1}{6}$

P(Prakash wins at the 3 trial) $=\dfrac{5}{6}\times\dfrac{5}{6}\times\dfrac{1}{6}$

P (Prakash wins at the 5 trial)

i.e. $P(A)=\dfrac{5}{6}\times\dfrac{5}{6}\times\dfrac{5}{6}\times\dfrac{5}{6}\times\dfrac{1}{6}$ and so on .

Therefore, P (Prakash wins)

$$=\frac{1}{6}+\left(\frac{5}{6}\right)^2\times\frac{1}{6}+\left(\frac{5}{6}\right)^4\times\frac{1}{6}+\dots\dots\infty$$

$$=\frac{\frac{1}{6}}{1-\left(\frac{5}{6}\right)^2}=\frac{6}{11}$$

Similarly, P(Utsav wins)

$$P(B)=\frac{5}{6}\times\frac{1}{6}+\left(\frac{5}{6}\right)^3\times\frac{1}{6}+\left(\frac{5}{6}\right)^5\times\frac{1}{6}+\dots\dots$$

$$=\frac{\frac{5}{6}\times\frac{1}{6}}{1-\left(\frac{5}{6}\right)^2}=\frac{5}{11}$$

Hence, expectations of Prakash and Utsav are

Rs. $\dfrac{6}{11}\times11$ = Rs. 6 and Rs. $\dfrac{5}{11}\times11$ = Rs. 5 respectively.

4.(A) The bag has 15 white, 20 red and 12 black balls.

Probability that the first ball is not red:

Favourable cases = 15 + 12 = 27

Total cases = 47

Required probabilty $=\dfrac{27}{47}$

Now, remaining balls will be either:

Case 1: 14 white, 20 red and 12 black balls.

Probability that the second ball drawn is white $=\dfrac{14}{46}=\dfrac{7}{23}$

Case 2: 15 white, 20 red and 11 black balls.

Probability that the second ball drawn is white $=\dfrac{15}{46}$

Therefore, required probability

$$=\frac{27}{47}\times\frac{7}{23}+\frac{27}{47}\times\frac{15}{46}=\frac{27}{47}\left(\frac{14}{46}+\frac{15}{46}\right)=\frac{27\times29}{46\times47}$$

$$=\frac{783}{2162}$$

5.(B) Out of 30 numbers 2 numbers can be chosen in $^{30}C_2$ ways. So, total number of cases

= $^{30}C_2$ = 435

Since $a^2 - b^2$ is divisible by 3 if either a and b are both divisible by 3 or a and b both are

not divisible by 3. Hence, total numbers of cases = $^{10}C_2 + {^{20}C_2}$

= 235

Hence, required probability

$$= \frac{235}{435} = \frac{47}{87}$$

6.(B) Total number of triangles formed = $^8C_3 = 56$

Triangles having two sides common = 8

Triangles having one side common = $^8C_1 \times {^4C_1} = 32$

Triangles having three sides common = 0

Triangles having no side common = 56 − 40 = 16

So, probability $= \frac{16}{56} = \frac{2}{7}$

7.(D) Probability of the first person winning $= \frac{2}{5}$

Probability of the second person winning $= \frac{3}{7}$

Probability of the third person winning $= \frac{x}{x+y}$

As per the problem,

$$\frac{2}{5} + \frac{3}{7} + \frac{x}{x+y} = 1$$

$$\frac{14+15}{35} + \frac{x}{x+y} = 1$$

$$\frac{29}{35} + \frac{x}{x+y} = 1$$

$$\frac{x}{x+y} = 1 - \frac{29}{35}$$

$$\frac{x}{x+y} = \frac{6}{35}$$

$$\frac{x}{x+y} = \frac{6}{6+29}$$

$$\therefore \frac{x}{y} = \frac{6}{29}$$

The value of y − x = 29 − 6 = 23

8.(A) The total number of ways in which they can check in = 4 × 4 × 4 = 64 ways.

Out of these, there will be 3 ways in which all of them will check into the same hotel.

Number of ways such that they do not check into the same hotel = 64 − 3 = 61 ways.

Required probability $= \frac{61}{64}$

9.(D) The probability of Bharat winning atleast 3 matches = probability of Bharat winning 3 matches + probability of Bharat winning 4 matches + probability of Bharat winning 5 matches

$$= {^5C_3} \times \left(\frac{2}{5}\right)^3 \times \left(\frac{3}{5}\right)^2 + {^5C_4} \times \left(\frac{2}{5}\right)^4 \times \left(\frac{3}{5}\right) + {^5C_5} \times \left(\frac{2}{5}\right)^5 = \frac{992}{3125}$$

10.(D) An elegant solution to this problem can be found through co-ordinate geometry −

The distances travelled today and yesterday are represented on x-axis and y-axis respectively. Since the maximum distance that can be travelled (to a suburb and back) is 200, the kilometres travelled on either day would be represented within a square of side 200 km as shown. Now if the sum of distances travelled today and tomorrow is greater than 250, Jethalal will run out of fuel. The line x + y = 250 is shown in the figure, hence in the shaded region anywhere, he will run out of fuel. Therefore, probability.

$$= \frac{\frac{1}{2} \times 150 \times 150}{200^2} = \frac{9}{32}$$

11.(D) Let 2X be the length of one side of the square, then radius of the circle = X

The required probability

$$= \frac{\pi X^2}{(2X)^2} = \frac{\pi}{4} = \frac{22}{28} = \frac{11}{14}$$

12.(C) Area of bigger circle is 1600 p sq. cm. While area of smaller circle is 100 p sq. cm.

P(hitting the arrow in smaller circle)

$$= \frac{100 \pi \text{ sq. cm.}}{1600 \pi \text{ sq. cm.}} = \frac{1}{16}$$

Practice Exercise Level - 3

Ans.1(3) Required probability= $1 - {}^7C_3/{}^{12}C_3$
= $1 - 35/220$
= $1 - 4/44 = 37/44$

Ans.2(5) $(1,6),(6,1),(2,5),(5,2),(3,4),(4,3)$ = Possible outcomes
Required probability = $6/36 = 1/6$

Ans.3(5) Required Probability = $28/52 = 7/13$

Ans.4(2) Required Number of ways $6!/2! - 5!/2! \times 2!$
= $720/2 - 120 = 360 - 120$
= 240

Ans.5(5) Required Probability = $n(E)/n(S) = 27/36 = 3/4$

Ans.6(1) $P(E_1) = 60/100 = 3/5$,
$P(E_2) = 75/100 = 3/4$,
$P() = 1 - 3/5 = 2/5$,
$P() = 1 - 3/4 = 1/4$
$= P().P() + P(E_1).P(E_2)$
Required Probability $= (3/5 \times 1/4) + (2/3 \times 3/4)$
= $3/20 - 6/20 = 9/20$
Required cases = $9/5 \times 100 = 45\%$

Ans.7(4) Total number of ways = $[(7+1)-1]! \times 3!$
= $7! \times 3!$
= $5040 \times 6 = 30240$

Ans.8(5) The probability of getting a composite number and a tail = $(2/6) \times 1/2 = 1/6$

Ans.9(3) Required Probability = ${}^7C_2 \times {}^8C_1 / {}^{20}C_3$
= $21 \times 8 / 3 \times 20 \times 19 = 14/95$

Ans.10(4) Required ways = $7!/2! = 2520$

Ans.11(5) Method I:
Required probability
= ${}^6C_2 + {}^{18}C_1 \times {}^6C_1 / {}^{24}C_2$
= $15 - 108 / 276 = 123/276$
= $41/92$
Method II:
Required Probability = $1 = {}^{18}C_2 / {}^{24}C_2$
= $1 - 153/276 = 123/276 = 41/92$

Ans.12(3) Required number ways = $({}^5C_1 \times {}^3C_2) + ({}^5C_1 \times {}^3C_2) + ({}^5C_2 \times {}^3C_1) + ({}^5C_3) = 5 \times 3 + (10 \times 3) + 10$
= $15 + 30 + 10 = 55$

Ans.13(4) When 4 fair coins are tossed simultaneously, the total number of outcomes is $2^4 = 16$

At least 3 heads implies that one can get either 3 heads or 4 heads.
(One can get 3 heads in $4C3 = 4$ ways)
and (can get 4 heads in $4C4 = 1$ ways.)
∴ Total number of favorable outcomes
= $4 + 1 = 5$
required probability = $(4 + 1) / 16$
= $5 / 16$

Ans.14(1) Required probability $= P(X) + P(Y) + P(Z)$
(all the events are mutually exclusive)
= $1/3 + 1/4 + 1/5$
= $20 + 15 + 12/60$
= $47/60$
The chance that one of them will win is
= $47/60$

Ans.15(4) The total number of ways to select = ${}^{12}C_3$
= 220
The number of ways in which English part 2 is selected and not English part 1
= ${}^{10}C_2 = 45$
∴ Necessary ways = $220 - 45 = 175$

Ans.16(5) Number of ways to get 1 book released
= ${}^{12}C_1 = 12$
Number of ways to get 2 books released
= ${}^{12}C_2 = 66$
Number of ways to get 3 books released
= ${}^{12}C_3 = 220$
Number of ways to get 4 books released
= ${}^{12}C_4 = 495$
∴ Total number of ways = $12 + 66 + 220 + 495 = 793$

Ans.17(2) Probability of choosing a blue ball = $1 - 9C_5/16C_5$
= $1 - 3/8 = 5/8$

Ans.18(2) Probability = $1 - 11C_4/ (17C_4$
Probability = $1 - 33/238 = 205/238$

Ans.19(3) Probability that Patiala is not white = $4/5$
Probability that top is not white = $5/6$
Required probability = Probability that Patiala is not white × Probability that top is not white
= $4/5 \times 5/6$

Ans.20(1) = 4/6
= 2/3
Total names in the coupon,
= 80×3+160×2+120×1
= 240+320+120
= 680
Number of Year-2's names,
= 160×2
= 320
Required probability,
= 320/680=32/68
= 8/17

Ans.21(1)

Ans.22(4) First find balls in each bag. Start with bag A:
R = 15, Y = 4x, G = 9x. Prob of Y = 2/9
So 4x/(15+9x+4x) = 2/9
Solve, x = 3
So in bag A: R = 15, Y = 12, G = 27.
Total = 54
Bag B:
G = 2/3 × 27 = 18
Total = 5/6 × 54 = 45
Now 18 + Y + Y − 3 = 45
So, yellow balls = 15, and then red = 12
So in bag B: R = 12, Y = 15, G = 18. Total = 45
Bag C:
R = 1/3 (15+12) = 9
Yellow = 120/100 × 15 = 18
Probability of green ball = 7/16
So z/(9+18+z) = 7/16 [Let z green balls]
Solve, z = 21
So in bag C: R = 9, Y = 18, G = 21. Total = 48
Now probability of yellow ball from each bag = 12/54 × 15/45 × 18/48
= 1/36

Ans.23(2) In bag D:
Red balls = 5/6 × 12 = 10
Green balls = 4/9 × 18 = 8
So required probability = $^{10}C_2 \times {}^8C_1/{}^{18}C_3$
= 15/34

Ans.24(2) _ 0 _ 0 _ 0 _ 0 _ 0 _ 0 _
= seats occupied by the remaining 5 (4 boys + 1 girl)
= Gaps where the 4 girls can sit together
Assuming 4 girls to be 1, total people to be seated = (5+1) = 6
Combinations amongst these 6 people
= 6!
Combinations amongst the girls = 4!
Therefore, total combinations = 6! × 4!
= 17,280

Ans.25(2) A three digit combination lock has to be setup.
Formula:
Consider we have 'n' objects. The number of ways of selecting 'k' objects from these 'n' objects where $k \le n$ is given by the
Formula:
$$c_k^n = \frac{n!}{(n-k)! \times k!}$$
Now, the middle letter of the combination is a vowel.
There are 5 vowels in total in the alphabet.
Therefore, the number of ways of selecting 1 vowel out of 5 is:
$$c_1^5 = \frac{5!}{(5-1)! \times 1!}$$
= 5
The first and the last letter of the combination can be two distinct letters out of the remaining 25 letters of the alphabet.
Therefore, the number of ways of selecting 2 letters out of 25 is:
$$c_2^{25} = \frac{25!}{(25-2)! \times 2!}$$
= 300
Now, these two letters can be arranged in two possible ways on either side of the middle letter.
For example, if the vowel is 'a' and the letters are 't' and 's'
The two possible arrangements are:
'tas' & 'sat'
Note:
In permutations and combinations, you multiply the selections when you take a sequence of options to reach the desired outcome
In this case, the sequence of operations is as follows:
i. Select a vowel
ii. Select the remaining two alphabets

iii. Create permutations of the letters.
Let the number of total possible combinations be 'T'
$T = 5 \times 300 \times 2 = 3000$
Thus, the total number of combinations is 3000.

Ans.26(2) Let us be the sample space
Then, no. of ways of drawing 2 balls out of $(6+4) = 10C_2 = (10 \times 9)/(2 \times 1)$
$= 45$
Let E = event of getting both balls of same colour
Then, no. of ways (2 balls out of six) or (2 balls out of 4)
$= 6C_2 + 4C_2$
$= 15 + 6 = 21$
Therefore, Required Probability $= 21/45$
$= 7/15$

Ans.27(2) $= 3C_1 \times 5C_3 + 3C_2 \times 5C_2 + 3C_3 \times 5C_1 = 65$
Total Probability $= 8C_4 = 70$.
Possible Probability $= 65/70 = 13/14$

Ans.28(4) Possibility of square:
The sum may be 4, 9.
4 can be obtained in 3 ways = (1, 3), (2, 2), (3, 1).
9 can be obtained in 4 ways = (3, 6), (4, 5), (5, 4), (6,3)
So total favorable ways = 3+4 = 7 ways
Total outcomes = $6 \times 6 = 36$
$P(E) = 7/36$.

Ans.29(1) Boys (10):
Graduate = $40/100 \times 10 = 4$
Post graduate = $10 - 4 = 6$
Girls (8):
Graduate = $8/2 = 4$
Post graduate = $8 - 4 = 4$
Total graduate = $4 + 4 = 8$
Total post graduate = $6 + 4 = 10$
Required number of ways = $8C_3 \times 10C_3$
$= 56 \times 120$
$= 6720$

Ans.30(3) Total outcomes = $8 \times 8 \times 8 \times 8$
Favorable outcomes = $8 \times 7 \times 6 \times 5$ (first person having 8 choices, after that second person have 7 choices and so on)
So, Required probability = $105/256$

Ans.31(4) In bag P:
Green = 4
Let, Red = x

$4/(4 + x) = 2/3$
$\Rightarrow 12 = 8 + 2x$
$\Rightarrow 2x = 12 - 8$
$\Rightarrow 2x = 4$
$\Rightarrow x = 2$
In bag Q:
White = 6
Let, Blue = y
$y/(6 + y) = 2/5$
$\Rightarrow 5y = 12 + 2y$
$\Rightarrow 5y - 2y = 12$
$\Rightarrow 3y = 12$
$\Rightarrow y = 12/3$
$\Rightarrow y = 4$
Required probability $= 2c_2/6c_2 + 6c_2/10c_2$
$= 1/15 + 1/3$
$= (1 + 5)/15$
$= 6/15$
$= 2/5$

Ans.32(4) Case I: 2 players from east, 2 players from west, 1 player from north and 1 player from south
Number of ways = $5C_2 \times 4C_2 \times 6C_1 \times 5C_1$
$= 10 \times 6 \times 6 \times 5 = 1800$
Case II: 2 players from east, 1 player from west, 2 players from north and 1 player from south
Number of ways = $5C_2 \times 4C_1 \times 6C_2 \times 5C_1$
$= 10 \times 4 \times 15 \times 5 = 3000$
Case III: 2 players from east, 1 player from west, 1 player from north and 2 players from south
Number of ways = $5C_2 \times 4C_1 \times 6C_1 \times 5C_2$
$= 10 \times 4 \times 6 \times 10 = 2400$
So the total number of ways in which team can be selected = 1800 + 3000 + 2400
$= 7200$

Ans.33(2) Let A be the event when cards are red in colour
So $P(A) = {}^{26}C_2/{}^{52}C_2 = 325/1326 = 25/102$
Let B be the event when cards are face cards
So $P(B) = {}^{12}C_2/{}^{52}C_2 = 66/1326 = 11/221$
If both the cards are face cards and are red in colour
So $P(A) = {}^6C_2/{}^{52}C_2 = 15/1326 = 5/442$
So the desired probability = $P(A) + P(B) - P(A \cap B) = 25/102 + 11/221 - 5/442$
$= 188/663$

Ans.34(1) Boys = 6
Under graduate = 2
Post graduate = 6 − 2 = 4
Girls = 8
Under graduate = 3
Post graduate = 8 − 3 = 5
Total under graduate = 2 + 3 = 5
Total post graduate = 4 + 5 = 9
Required number of ways = $^5C_3 \times {}^9C_4$
= 10 x 126
= 1260

Ans.35(3) According to question,
$^8C_{(x+2)} \times {}^5C_3 = 280$
$^8C_{(x+2)} = 280/10 = 28$
$^8C_{(x+2)} = {}^8C_2 = {}^8C_6$
Therefore, (x + 2) = 2 or 6
So, x = 0 or 4

Ans.36(2) Total number of balls in the bag = (x + 12) balls
I. 0.2, 15
According to question,
$x/(x + 12) = 0.2$
x = 0.2x + 2.4
0.8x = 2.4
x = 3
Therefore, total number of balls in the bag
= 3 + 12 = 15
II. 0.4, 20
According to question,
$x/(x + 12) = 0.4$
x = 0.4x + 4.8
0.6x = 4.8
x = 8
Therefore, total number of balls in the bag
= 8 + 12 = 20
III. 0.6. 25
According to question,
$x/(x + 12) = 0.6$
x = 0.6x + 7.2
0.4x = 7.2
x = 18
Therefore, total number of balls in the bag
= 18 + 12 = 30
IV. 0.8, 30
According to question,
$x/(x + 12) = 0.8$
x = 0.8x + 9.6
0.2x = 9.6
x = 48

Therefore, total number of balls in the bag
= 48 + 12 = 60

Ans.37(4) Total number of balls in the bag = x + y + 3x − 6 + 2y + 4 = 4x + 3y − 2
Probability that a red ball is drawn
= $^{2y+4}C_1/{}^{4x+3y-2}C_1 = 2/5$
(2y + 4)/(4x + 3y − 2) = 2/5
10y + 20 = 8x + 6y − 4
8x − 4y = 24
2x − y = 6 .... (i)
Probability that a yellow ball is drawn
= $^yC_1/{}^{4x+3y-2}C_1 = 4/25$
y/(4x + 3y − 2) = 4/25
25y = 16x + 12y − 8
16x − 13y = 8 .... (ii)
Solving (i) and (ii) we get x = 7 and y = 8
So the total number of balls in the bag = 4 × 7 + 3 × 8 − 2 = 50
The bag contains 7 green, 8 yellow, 15 blue and 20 red balls.
So the probability that a green ball and a red ball are drawn = $^7C_1 \times {}^{20}C_1/{}^{50}C_2 = 7 \times 20/1225$
= 4/35

Ans.38(2) So the probability that a red ball is drawn from the box = $^{20}C_1/{}^{50}C_1 \times {}^{10}C_1/{}^{16}C_1$
= 2/5 × 5/8 = 1/4
Case II: A ball other than red ball is drawn from the bag
So the probability that a red ball is drawn from the box = $^{30}C_1/{}^{50}C_1 \times {}^9C_1/{}^{16}C_1$
= 3/5 × 9/16 = 27/80
So the probability that a red ball is drawn from the box = 1/4 + 27/80
= 47/80

Ans.39(2) Total number of balls in the bag = 8 + 5 + 7 = 20
Probability that out of three, 2 balls are red
= $(^8C_2 \times {}^{12}C_1)/{}^{20}C_3 = (28 \times 12)/1140$
= 336/1140
Probability that out of three, at least two balls are blue = $\{(^7C_2 \times {}^{13}C_1) + {}^7C_3\}/{}^{20}C_3$
= {(21 × 13) + 35}/1140 = 308/1140
Required difference = 336/1140 − 308/1140
= 28/1140 = 7/285

Ans.40(4) Word JAILORS contains 3 vowels and 4 consonants

Case I: 1 vowel and 3 consonants are there in the word

So the number of ways in which 4 letters can be chosen = $^3C_1 \times {}^4C_3 = 3 \times 4 = 12$

Case II: 2 vowels and 2 consonants are there in the word

So the number of ways in which 4 letters can be chosen = $^3C_2 \times {}^4C_2 = 3 \times 6 = 18$

Case III: 3 vowels and 1 consonant are there in the word

So the number of ways in which 4 letters can be chosen = $^3C_3 \times {}^4C_1 = 1 \times 4 = 4$

So the total number of ways in which 4 letters of the word can be chosen = 12 + 18 + 16 = 34

So the number of ways in which these 4 letter words can be arranged with in the word

= 4! = 24

So the total number of words formed = 34 × 24 = 816

Ans.41(4) Case I: 4 women and 6 men are there in the committee

So the number of ways

= $^7C_4 \times {}^8C_6 = 35 \times 28 = 980$

Case II: 3 women and 7 men are there in the committee

So the number of ways

= $^7C_3 \times {}^8C_7 = 35 \times 8 = 280$

Case III: 2 women and 8 men are there in the committee

So the number of ways = $^7C_2 \times {}^8C_8 = 21 \times 1 = 21$

So the total number of ways in which the committee can be formed

= 980 + 280 + 21 = 1281

Ans.42(2) Total number of females = 3 + 2 + 4 + 2 = 11

Required number of ways

= $^2C_1 \times {}^4C_1 \times {}^4C_1 \times {}^2C_1 \times {}^{11}C_2$

= 2 × 4 × 4 × 2 × 55

= 3520

Ans.43(1) No. of ways of selecting 2 men and a woman from group A = $^xC_2 \times {}^5C_1 = 30$

No. of ways of selecting 2 men and a woman from group B = $^7C_2 \times {}^yC_1 = 105$

According to question,

$^xC_2 \times {}^5C_1 = 30$

$5x(x - 1) = 60$

$5x^2 - 5x - 60 = 0$

$x^2 - x - 12 = 0$

$x^2 - 4x + 3x - 12 = 0$

$x(x - 4) + 3(x - 4) = 0$

$(x - 4)(x + 3) = 0$

So, x = 4

And,

$^7C_2 \times {}^yC_1 = 105$

$21y = 105$

y = 5

So, xy = 4 × 5 = 20

Ans.44(4) Required Probability = $1 - \frac{^{11}c_3}{^{16}c_3}$

= $1 - \frac{165}{560} = 1 - \frac{33}{112} = \frac{79}{112}$

Ans.45(2) $n(E) = {}^3C_3$

Since three balls are chosen, $n(S) = {}^9C_3$

We know that, P(E) = n(E)/n(S)

= (3×2×1)/ (9×8×7)

= 1/84

Ans.46(3) $n(S) = {}^9C_3$

$n(E) = {}^3C_3 + {}^4C_3 = 1 + 4 = 5$

Then P(E) = $5/{}^9C_3$

= 5/84

Ans.47(4) $n(E) = {}^2C_2 + {}^4C_2$

= 1 + 6 = 7

Since two balls are chosen randomly, $n(S) = {}^9C_2 = 36$

We know that, P(E) = n(E)/n(S)

= 7/36

Ans.48(2) $n(S) = {}^9C_3$

$n(E) = {}^5C_3$

Then P(E) = $^5C_3 / {}^9C_3$

= 5/42

Thus the probability that no ball is blue = 1 - (5/42)

= 37/42

Ans.49(1) Since the coach chosen two balls, $n(S) = {}^9C_2$

Then $n(E) = {}^2C_1 \times {}^3C_1 + {}^3C_1 \times {}^4C_1 + {}^4C_1 \times {}^2C_1$

= 6 + 12 + 8 = 26

Hence, P(E) = 26/36 = 13/18

Ans.50(3) Green balls = 6

Yellow balls = 7

Let, red balls = x

Blue balls = y

Total number of balls

= (6 + 7 + x + y) = (13 + x + y)

According to the question

x/(13 + x + y) = 5/22

=> 22x = 65 + 5x + 5y
=> 17x − 5y = 65 ----- (i)
And
y/(13 + x + y) = 2/11
=> 11y = 26 + 2x + 2y
=> 2x − 9y = -26 ---- (ii)
Equation (i) x 9 − equation (ii) x 5
=> 153x − 45y − 10x + 45y = 585 + 130
=> 143x = 715
=> x = 5
Putting the value ox in equation (i)
85 − 5y = 65
=> 5y = 20
=> y = 4
Total number of balls = 6 + 7 + 5 + 4 = 22
Required probability = $(^6c_4 + {}^7c_4 + {}^5c_4 + {}^4c_4)/^{22}c_4$
= (15 + 35 + 5 + 1)/7315
= 56/7315
= 8/1045

Ans.51(4) Number of ways = $(6c_2 \times 6c_2) + (6c_3 \times 6c_1) + (6c_4)$
= [(6×5/1×2) × (6×5/1(1×2)] + [(6×5×4/1×2×3)×6] + (6×5/1×2)
= (15×15) + (20×6) + 15
= 225 + 120 +15
= 360

Ans.52(1) Total number of balls in a bag = 4 + 5 + x
= 9+x
Probability of a blue ball = $xc_1/ (9+x)c_1$
=2/5
x/(9+x) =2/5
5x = 18 +2x
3x =18
x=6
Total number of balls in the bag = 9 +6 =15

Ans.53(3) Case 1: first green, second red
Prob. = 4/9 × 6/9 = 24/81
Case 2: first red, second green
Prob. = 5/9 × 3/9 = 15/81
Required answer = (24+15)/81
= 39/81 = 13/27

Ans.54(4) Probability that no one is selected
= (3/5)×(1/6)×(3/7)
= 3/70
Hence required probability=1-(3/70)
= 67/70

Ans.55(5) Total outcomes=8
Then favorable outcome={TTT, HHH}

= 2
Hence required probability =2/8 = 1/4

Ans.56(1) Required number of ways
= (10!)/(2!×2!×2!×2!)
= 226800

Ans.57(1) Number of blue balls in the bag = (1/4) × 48
= 12
So, number of red balls in the bag
= (12/2) × 3 = 18
Therefore, number of yellow balls in the bag
= 48 − (12 + 18) = 18

Ans.58(3) No. of ways to select 2 distinct alphabets from 26= $26P_2$
Also there are total 10 digits so to select one number we have 10 ways and two select another number we have 10 ways
So there are total 10×10 = 100 ways to select numbers
Then combinations of letters and numbers
= $26P_2$ ×100 = 65000 ways

Ans.59(5) Required probability
=$(4c_2 \times 6c_2 \times 3c_1)/13c_5$=30/143

Ans.60(3) Given,
Total number of balls in the box = 6+4+x
=10+x
Probability of one pink ball = $xc_1/(10+x)c_1$
=1/6
=> x/(10+x) =1/6
6x =10+x
=>5x =10
=>x=2
Required Total = 10+2 =12 balls

Ans.61(2) Let the number of balls transferred = x
Now,
$^xc_2/^{(4 + x)}c_2$ = 3/14
=>x (x − 1)/(4 + x)(3 + x) = 3/14
=> $14x^2 − 14x = 3 x (12 + 4x + 3x + x^2)$
=> $14x^2 − 14x = 36 + 21x + 3x^2$
=> $11x^2 − 35x − 36 = 0$
=> (x − 4) (11x + 9) = 0
=> x = 4, -9/11(rejected)
=> x = 4

Ans.62(4) Total number of ways of drawing 3 balls
= $^{12}C_3$ = 220
Total number of ways drawing balls of different colour = $^5C_1 \times {}^4C_1 \times {}^3C_1$ = 60
Therefore, probability of drawing different colour = 60/220 = 3/11

Ans.63(1) Number of white balls in the bag = 108 × (1/3)
= 36
So, remaining balls = 108 − 36 = 72
Let, number of grey balls and black balls be 2x and x respectively,
Therefore, 2x + x = 72
3x = 72, x = 72/3 = 24
So, number of black balls = 24
Therefore, required probability = (24/108) = 2/9

Ans.64(4) Probability of selling a Chaunsa mango = 1 − (3/8 + 2/7) = 1 − (21 + 16)/56 = (56 − 37)/56 = 19/56
Therefore, total number of mangoes in his bucket = 38 × (56/19) = 112

Ans.65(3) According to question,
(x + 7)/[(x + 3) + (x + 5) + (x + 7)] = 8/21
21x + 147 = 8(3x + 15)
24x − 21x = 147 − 120
3x = 27
x = 27/3
x = 9
Therefore, number of orange balls in the bag
= 9 + 5 = 14

Ans.66(2) Let the number of red, blue and green balls in the bag are 2x, 4x and 5x respectively.
Total number of balls in the bag = 2x + 4x + 5x
= 11x
So according to question: $^{4x}C_2/^{11x}C_2 = 1/8$
4x (4x − 1)/ 11x (11x − 1) = 1/8
(16x − 4)/ (121x − 11) = 1/8
128x − 32 = 121x − 11
7x = 21, x = 3
So the total number of balls in the bag
= 33

Ans.67(2) 6 male can be arranged in (6-1)! Ways
Now there are 6 positions in which 6 female can be placed.
This can be done in 6! Ways.
Required number of ways = (6-1)! × 6!
= 5! × 6!
= 120 × 720
= 86400

Ans.68(1) According to the question,
P(A')/P(A)=7/4
P(A')=7/11

P(A)=4/11
P(B')/P(B)=5/3
P(B')=5/8,
P(B)=3/8
Now, out of A, B and C, one and only one can happen.
P(A)+P(B)+P(C)=1
4/11+3/8+P(Z)=1
P(C)=1-4/11-3/8
= 88-32-33/88
= 23/88
P(C')=1-P(C)
=1-23/88
= 65/88
So odd against c
p(c')/p(c)=65/23

Ans.69(2) Let s be the sample space
Then n(s)=no. of ways of drawing 3 pen out of 18
= 18c₃
= 18×17×16 / 3×2×1
= 816
Let e = event of getting all the 3 blue pen
N(e) = 5c₃
= 5c₂ =5×4 / 2×1
=10
P(e) = n(e) / n(s)
= 10/816
= 5/408

Ans.70(2) n(S) = 52C₃
n(E) = 4C₃
P(E) = n(E)/n(S) = 4C₃/ 52C₃
= > (4×3×2)/(52×51×50)
= > 1/5525

Ans.71(1) In these 7 letters, 'R' occurs 2 times, and rest of the letters are different.
Hence, number of ways to arrange these letters
= {7!} /{(2!) }
= {7×6×5×4×3×2×1} / {2×1} = 2520

Ans.72(1) There are 5! Arrangement of the 5 letters:, total sample = 5!
Probability = 1/5! = 1/120
But there are two identical alphabet, so probability = 2/120 = 1/60.

Ans.73(1) It has 3 vowels (IAE) and these 3 vowels should always come together. Hence these 3 vowels can be grouped and considered as a single letter.

That is, VNTG(IAE).
Hence we can assume total letters as 5.
Number of ways to arrange these letters
$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
In the 3 vowels (IAE), all the vowels are different. Number of ways to arrange these vowels among themselves
$3! = 3 \times 2 \times 1 = 6$
Total number of ways $120 \times 6 = 720$

Ans.74(1) Required Probability $= \frac{12c_3}{25c_3} + \frac{13c_3}{25c_3}$

$= \frac{12 \times 11 \times 10}{25 \times 24 \times 23} + \frac{13 \times 12 \times 11}{25 \times 24 \times 23}$

$= \frac{110}{1150} + \frac{143}{1150}$

$= \frac{253}{1150} = \frac{11}{50} = .22$

Ans.75(2) Probability of getting a head in one toss
$= 1/2$
The coin is tossed twice. So $1/2 \times 1/2$
$= 1/4$ is the answer.
Here's the verification of the above answer with the help of sample space.
When a coin is tossed twice, the sample space is {(H,H), (H,T), (T,H), (T,T)}.
Our desired event is (H,H) whose occurrence is only once out of four possible outcomes and hence, our answer is 1/4.

Ans.76(2) One bangle for box 3 can be selected in $^8C_1$ ways.
Two bangles for box 5 can be selected in $^7C^2$ ways.
Remaining bangles = 5
Remaining boxes = 4
In these 5 bangles, 1st bangle can be put in any of these 4 boxes
Similarly 2nd bangles can be put in any of these 4 boxes.
3rd bangles can be put in any of these 4 boxes.
4th bangles can be put in any of these 4 boxes.
5th bangles can be put in any of these 4 boxes.
i.e., these 5 bangles can be arranged in $4 \times 4 \times 4 \times 4 \times 4 = 4^5$
Required number of ways = $^8C_1 \times ^7C_2 \times 4^5$
$= 8 \times 21 \times 1024$
$= 172032$ ways

Ans.77(3) We know that,

Probability = Favorable Cases/Total Cases
The probability that the number is a multiple of 4 is 10/40
Since favorable cases here
{4,8,12,16,20,24,28,32,36,40}
=10 cases
Total cases= 40 cases
Similarly the probability that the number is a multiple of 14 is 2/40.
Since favorable cases here {14,28}
=2 cases
Total cases= 40cases
4 and 14 has common multiple of 28 from 1 to 40.
Therefore chance that the selected number is a multiple of 4 or 14 is:
$=(10+1)/40$
$=11/40$

Ans.78(4) Case I:
If girl sits on the reserved seat, then 2 boys can occupy seats from 3 vacant seats in = $3P_2$ = 6 ways
Case II:
If lady does not sit on reversed seat, then I Girls can occupy a seat from four seats in 4 ways.
Boys can occupy a seat from 3 seats in 3 ways, also 1. Boy left can occupy a seat from remaining two seats in 2 ways.
Therefore, Total ways = $4 \times 3 \times 2$ = 24 ways
From case I and case II
Total number of ways = 6+24 = 30

Ans.79(2) Total number of possible arrangements for Six male and five female stand in queue
= 11!
When they occupy alternate position the arrangement would be like:
MFMFMFMFMFM
Thus, total number of possible arrangements for males,
$= 6 \times 5 \times 4 \times 3 \times 2$
Total number of possible arrangements for females = $5 \times 4 \times 3 \times 2$
Required probability
$= 6 \times 5 \times 4 \times 3 \times 2 \times 5 \times 4 \times 3 \times 2 / 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2$
$= 1/462$

Ans.80(3) The total number of words which can be formed by permuting the letters of the

word 'EVERYTHING' is 10!2! as there is two E's.

Hence n(S) =10!2!

Taking two E's as one letter, number of ways of arrangement in which both E's are together =9!

So n(X)=9!

Hence required probability

= n(X)/n(S)

= (9!/10!)×2!

= 1/5

Ans.81(2) Here n(s) = 52

There are 13 diamond cards (including one six) and there are 3 more sixes

Let E = event of getting a six or a diamond

Then nE = 13 +3

nE = 16

Therefore pE = nE / n (s)

=16 / 52

PE = 4/13

Ans.82(2) The 10 letters can be written in 10! ways

n(S) = 10!

Let E be the event that the letters d, e, f and g always come together when the first 10 alphabets are written down.

Now the letters (defg), a, b, c, h, i and j can be arranged in 7! ways

The letters d, e, f and g can be arranged themselves in 4! ways

n(E) = 7! x 4!

Now, the required P(E) = n(E)/n(S)

= 7! x 4!/10!

= 1/30

Hence the answer is 1/30

Ans.83(1) The 7 letters can be written in 7! ways.

Then n(S) = 7!

Let E be the event that the letters x and y are written down side by side.

(i.e., x and y are always come together).

Now the alphabets t,u,v, w, (x y) and z can be written in 6! ways.

And x,y written in 2 different ways.

Then, n(E) = 6! x 2!

Therefore p(E) = 6! x 2!/7!

=2/7

Hence the answer is 2/7

Ans.84(1) First, we consider the books on articles, magazines and story books as single objects.

These three objects can be arranged in 3!=6 ways.

Let us fix one of these 6 arrangements.

This may give us a specific order, say, magazines ->articles->story books

Given this order, the books on the same subject can be arranged as follows.

The 3articlescan be arranged among themselves in 3!=6Ways

The 4magazines can be arranged in 4!=24 ways.

The 2story books can be arranged in 2! =2ways.

For a given order, the books can be arranged in 6 × 24 × 2=288ways.

Therefore, for all the 6 possible orders the books can be arranged in 6 × 288=1728ways.

Ans.85(1) Total number of possible words =7!= 5040

If B and E comes together, they can be considered as a single unit.

Total number of possible words if B and E always comes together= 6! ×2!

= 1440

Total number of possible words if B and E never comes together = 5040-1440

= 3600

Ans.86(1) Possible selection= 2 women, 2 men + 1 woman, 3 men + 4 men

= $5C_2 \times 6C_2 + 5C_3 \times 6C_1 + 5C_4$

= 10 × 15 + 10 × 6 + 5

= 215

Ans.87(5) Required probability

=2/5×1/6×3/7+3/5×5/6×3/7+3/5×1/6×4/7

= (6+45+12)/210

= 63/210

= 21/70

Ans.88(2) Three conditions have to be satisfied.

1. The number of students per row has to be at least 4.

2. Number of row has to be at least 4.

3. Equal number of students has to be seated in a row.

The following arrangements satisfy all 3 conditions.

Arrangement 1: 4 students to a row; 12 rows

Arrangement 2: 6 students to a row; 8 rows

Arrangement 3: 8 students to a row; 6 rows

Arrangement 4: 12 students to a row; 4 rows

You will observe that the number of students in a row is a factor of 48.

So, an alternative and faster approach is to list down factors of 48: 1, 2, 3, 4, 6, 8, 12, 16,24, and 48.

And then start from 4 and quickly find out if the number of rows is at least 4.

Both the conditions are satisfied for the following factors: 4, 6, 8 and 12. i.e., 4 arrangements

Ans.89(2) It is given that last two digits are randomly dialled.

Then each of the digits can be selected out of 10 digits in 10 ways.

Hence required probability

$= (1/10)^2$

$= 1/100$

Ans.90(2) Required Probability $= \frac{16_{c_2}}{52_{c_2}} = \frac{15 \times 8}{26 \times 51} = \frac{20}{221}$

Ans.91(5) Required number of ways = 4x4x3x2x1

= 96

Ans.92(4) Required Probability

$= (2c_2 + 2c_1 \times 12c_1)/14c_2$

$= \frac{(1+2\times12)}{\left(\frac{14\times13}{2}\right)} = \frac{25}{91}$

Ans.93(2) Required number of ways $= 7C_4$

$= \frac{7!}{4!3!} = 35$

Ans.94(3) Total number of ways $= {}^6C_4 \times {}^4C_2 + {}^6C_5 \times {}^4C_1 + {}^6C_6$

$= 15 \times 6 + 6 \times 4 + 1 = 115$

Ans.95(1) Required Probability $= \frac{4C_1 \times 4C_1 \times 4C_1}{52C_1}$

$= \frac{16}{52 \times 17 \times 25}$

$= \frac{16}{13 \times 17 \times 25} = \frac{16}{5525}$

Ans.96(5) Required number of ways $= \frac{6!}{2!} \times 3! = 2160$

Ans.97(5) Required Probability

P(*not divisible by 2*)

= 1 - P (*divisible by 2*)

$= 1 - \frac{2}{5} = \frac{3}{5}$

Ans.98(4) ARRANGED

Required number of ways $= \frac{7!}{2!} = \frac{5040}{2}$

= 2520

Ans.99(5) Required Probability $= \frac{4_{c_1} \times 48_{c_1}}{52_{c_2}} = \frac{4 \times 48}{26 \times 51}$

$= \frac{32}{221}$

Algebra

1. **Important formula**

(1) $(a + b)^2 = a^2 + 2ab + b^2 = (a - b)^2 + 4ab$

(2) $(a - b)^2 = a^2 - 2ab + b^2 = (a + b)^2 - 4ab$

(3) $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$

(4) $(a + b)^2 - (a - b)^2 = 4ab$

(5) $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 = a^3 + b^3 + 3ab(a + b)$

(6) $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3 = a^3 - b^3 - 3ab(a - b)$

(7) $(a + b)^3 + (a - b)^3 = 2(a^3 + 3ab^2) = 2a(a^2 + 3b^2)$

(8) $(a + b)^3 - (a - b)^3 = 6a^2b + 2b^3 = 2b(3a^2 + b^2)$

(9) $(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

(10) $(a - b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$

(11) $(a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$

(12) $(a - b)^5 = a^5 - 5a^4b + 10a^3b^3 - 10a^2b^3 + 5ab^4 - b^5$

(13) $a^2 - b^2 = (a - b)(a + b)$

(14) $a^3 + b^3 = (a + b)(a^2 - ab + b^2) = (a + b)^3 - 3ab(a + b)$

(15) $a^3 - b^3 = (a - b)(a^2 + ab + b^2) = (a - b)^3 + 3ab(a - b)$

(16) $a^4 - b^4 = (a^2 - b^2)(a^2 + b^2) = (a - b)(a + b)(a^2 + b^2) = (a - b)(a^3 + a^2b + ab^2 + b^3)$

(17) $x^2 + (a + b)x + ab = (x + a)(x + b)$

(18) $x^2 - (a + b)x + ab = (x - a)(x - b)$

Explanation: $x^2 + \frac{1}{x^2} = 1$

$\Rightarrow x^4 - x^2 + 1 = 0]$

Multiplying both sides by $(x^2 + 1)$, $(x^2 + 1)(x^4 - x^2 + 1) = 0$ Or, $(x^2)^3 + 1 = 0 \Rightarrow x^6 = -1$ etc.

2. **General Formula**

(A) If $x + \frac{1}{x} = a$ then $x^2 + \frac{1}{x^2} = a^2 - 2$

(B) If $\dot{x} + \frac{1}{x} = a$ then $x^3 + \frac{1}{x^3} = a^3 - 3a$

(C) If $x + \frac{1}{x} = a$ then $x^4 + \frac{1}{x^4} = a^4 - 4a^2 + 2$

(D) If $x + \frac{1}{x} = a$ then $x^5 + \frac{1}{x^5} = a^5 - 5a^3 + 5a$

(E) If $x + \frac{1}{x} = a$ then $x^6 + \frac{1}{6} = a^6 - 6a^4 + 9a^2 - 2$

3. (A) If $x - \frac{1}{x} = a$ then $x^2 + \frac{1}{x^2} = a^2 + 2$

(B) If $x - \frac{1}{x} = a$ then $x^3 - \frac{1}{x^3} = a^3 + 3a$

(C) If $x - \frac{1}{x} = a$ then $x^4 + \frac{1}{x^4} = a^4 + 4a^2 + 2$

(D) If $x - \frac{1}{x} = a$ then $x^5 - \frac{1}{x^5} = a^5 + 5a^3 + 5a$

(E) If $x - \frac{1}{x} = a$ then $x^6 + \frac{1}{x^6} = a^6 + 6a^4 + 9a^2 + 2$

4. (A) If $x^2 + \frac{1}{x^2} = 1$ then $x^6 = -1$

(B) If $x^2 + \frac{1}{x^2} = -1$ then $x^6 = 1$

5. Factor for $a^n - b^n$.

(a) $a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \cdots + ab^{n-2} + b^{n-1})$

(b) If $n = 2$ then, $a^2 - b^2 = (a - b)(a + b)$

If n = 3 then, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

If n = 4 then, $a^4 - b^4 = (a - b)(a^3 + a^2b + ab^2 + b^3)$

If n = 5 then, $a^5 - b^5 = (a - b)(a^4 + a^3b + a^2b^2 + ab^3 + b^4)$ etc.

(c) If $a = 1, b = x$ then $(1 - x^n) = (1 - x) = (1 + x + x^2 + x^3 + \cdots\cdots + x^{n-1})$

If $n = 2$, then $(1 - x^2) = (1 - x)(1 + x)$

If $n = 3$, then $(1 - x^3) = (1 - x)(1 + x + x^2)$

If $n = 4$, then $(1 - x^4) = (1 - x)(1 + x + x^2 + x^3)$

If $n = 5$, then $(1 - x^5) = (1 - x)(1 + x + x^2 + x^4)$ etc.

6. **Important factors:**

(A) $a^4 + a^2b^2 + b^4 = (a^2 + b^2)^2 - a^2b^2 = (a^2 - ab + b^2)(a^2 + ab + b^2)$

(B) $(a + b + c)(bc + ca + ab) - abc = (b + c)(c + a)(a + b)$

(C) $(a + b + c)^3 - a^3 - b^3 - c^3 = 3(b + c)(c + a)(a + b)$

7. (A) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

(B) If $a + b + c = 0$, then, $a^3 + b^3 + c^3 = 3abc$ $a + b + c = 0$ $a^3 + b^3 + c^3 = 3abc$

(C) $\because a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2}\{(a - b)^3 + (b - c)^2 + (c - a)^2\}$

$\therefore a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)\{(a - b)^2 + (b - c)^2 + (c - a)^2\}$

But, if $\{(a - b)^2 + (b - c)^2 + (c - a)^2\} = 0$

then, $a - b = 0, b - c = 0$, and $c - a = 0$

or, $a = b, b = c, c = a$ or, $a = b = c$

Hence, $a^3 + b^3 + c^3 - 3abc = 0$

or, $a = b = c$

(D) $(a - b)^2 + (b - c)^2 + (c - a)^2 \geq 0$
$\Rightarrow 2(a^2 + b^2 + c^2 - ab - bc - ca) \geq 0 \Rightarrow a^2 + b^2 + c^2 \geq ab + bc + ca$

(E) $(a + b + c)^2 \geq 0 \Rightarrow a^2 + b^2 + c^2 + 2(ab + bc + ca) \geq 0$
$\Rightarrow ab + bc + ca \geq \frac{-1}{2}(a^2 + b^2 + c^2)$

8. **Cyclic factor**

(A) $a^2(b - c) + b^2(c - a) + c^2(a - b) = -(a - b)(b - c)(c - a)$

(B) $bc(b - c) + ca(c - a) + ab(a - b) = -(a - b)(b - c)(c - a)$

(C) $a(b^2 - c^2) + b(c^2 - a^2) + c(a^2 - b^2) = (a - b)(b - c)(c - a)$

9. **Formulae for two index three and four terms.**

(A) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

(B) $(a + b + c + d)^2 = a^2 + b^2 + c^2 + d^2 + 2(ab + ac + ad + bc + bd + cd)$

Note: $(a - b - c)^2 = a^2 + b^2 + c^2 + 2a(-b) + 2a(-c) + 2(-b)(-c)$
$= a^2 + b^2 + c^2 - 2ab - 2ac + 2bc$ etc

(C) $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(b + c)(c + a)(a + b)$

10. (A) **Componendo-dividendot**

If $\frac{a}{b} = \frac{c}{d}$ then, $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ or, $\frac{a-b}{a+b} = \frac{c-d}{c+d}$

(B) If $\frac{a}{b} = \frac{c}{d}$ then, $\frac{a+b}{b} = \frac{c+d}{d}$ (by componendo)

(C) If $\frac{a}{b} = \frac{c}{d}$ then, $\frac{a-b}{b} = \frac{c-d}{d}$ (by dividendo)

11. **Ratio-proportion**

(A) $\frac{a}{b} = \frac{c}{d} = \frac{a+c}{b+d} = \frac{a-c}{b-d} = \frac{\sqrt{ac}}{\sqrt{bd}} = \frac{\sqrt{a^2+c^2}}{\sqrt{b^2+d^2}}$

(B) $\frac{a}{b} = \frac{c}{d} = \frac{ka+mb}{kb+md} = \frac{ka-mb}{kb-md}$

(C) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{a+c+e}{b+d+f} = \frac{a+c-e}{b+d-f} = \frac{\sqrt[3]{ace}}{\sqrt[3]{bdf}}$
$= \frac{\sqrt{a^2+c^2+e^2}}{\sqrt{b^2+d^2+f^2}}$ etc.

12. **Remainder Theorem and Factor Theorem.**

(A) Remainder theorem When a polynomial $p(x)$ of one or more than ane degree divided by $x - a$, the remaindcr is $p(a)$. e.g., suppose $p(x) = 2x^3 + 3x^2 - x - 1$ is a polynomial. When it is divided by $x - 3$ Remainder $p(3) = 2 \times 3^3 + 3 \times 3^2 - 3 - 1 = 54 + 27 - 4 = 77$

(B) Factor theorem When a polynomial $p(x)$ of one or more than one de- gree is divided by $(x - a)$ and remainder is zero. Then $x^6 - a$ ' is a factor of $p(x)$. e.g., In, $p(x) = x^3 - x^2 + x - 1, p(1) = 1 - 1 + 1 - 1 = 0$

Hence, $(x - 1)$ is a factor of $x^3 - x^2 + x - 1$

13. **Important cases for Remainder and Factors theorem.**

(A) When a polynomial $p(x)$ of one or more than one degree is divided by $(ax + b)$, the remainder is $p\left(\frac{-b}{a}\right)$

(B) When a polynomial $p(x)$ of one or more than one degree is divided by (ar+b) and the remainder is zero then $ax + b$ is a factor of $p(x)$

(C) Suppose a polynomial $p(x)$ is divided by $x - a$ and $x - b$ and remainder are respectively m and n. When the polynomial is divided by $(x - a)(x - b)$, the remain- der will be of the form $Ax + B$, where $p(a) = Aa + B = m$ and $p(b) = Ab + B = n$. Solve these two equations to get values of A and B.

Exercise

TYPE – I

1. The two equations $x - 4y = 0$ and $4x + 3y = 19$ have a solution (a, b). Find the value of $\dfrac{ab}{a+4b}$
   - (A) 1/4
   - (B) 1/2
   - (C) 1
   - (D) 23

2. How many solutions does a pair of linear equations will have, if the equations are $4x + 5y - 6 = 0$ and $16x + 20y + 20 = 0$?
   - (A) 0
   - (B) 1
   - (C) 2
   - (D) 3

3. The two lines $3x - 8y = 16$ and $2x + 4y = 6$ intersect at (a, b). Find the value of $a^2 - 4b^2$.
   - (A) 5
   - (B) 10
   - (C) 15
   - (D) 20

4. If $x \cdot y \cdot \sqrt{18} = -1$ and $x + y \cdot 3\sqrt{2} = 1$, then what is the value of $12xy(x^2 \cdot y^2)$?
   - (A) 0
   - (B) 1
   - (C) $512\sqrt{2}$
   - (D) $612\sqrt{2}$

5. If $\left(\dfrac{x}{y} + 1\right) = 4$, then what is the value of $\left(\dfrac{x^2+y^2}{y^2}\right)$?
   - (A) 14
   - (B) 22
   - (C) 10
   - (D) 12

6. If x, y, z are three integers such that $x + y = 8$, $y + z = 13$ and $z + x = 17$, then the value of x^2/yz is:
   - (A) 0
   - (B) 18/11
   - (C) 1
   - (D) 7/5

7. If x, y, z are three numbers such that $x + y = 13$, $y + z = 15$ and $z + x = 16$, then the value of $\dfrac{xy+xz}{xyz}$ is:
   - (A) 36/5
   - (B) 5/18
   - (C) 18/5
   - (D) 5/36

TYPE – II

1. If $x = 1 + \sqrt{2}$, then find the value of $\sqrt{x} + \dfrac{1}{\sqrt{x}}$
   - (A) 2.1014
   - (B) 2.1973
   - (C) 1.9996
   - (D) 1.9876

2. If $x + \dfrac{1}{x} = 8$, then find the value of $\dfrac{5x}{x^2+1-6x}$
   - (A) 6
   - (B) 6.5
   - (C) 5
   - (D) 2.5

3. If $x + 1/x = 4$, then the value of $x^4 + (1/x)^4$ is-
   - (A) 14
   - (B) 16
   - (C) 194
   - (D) 196

4. If $x \cdot (1/x) = 8$, find the value of $x^4 + (1/x)^4$.
   - (A) 4355
   - (B) 4356
   - (C) 4352
   - (D) 4354

5. If $a^2 + \dfrac{2}{a^2} = 16$, then find the value of $\dfrac{72a^2}{a^4+2+8a^2}$
   - (A) 3
   - (B) 4
   - (C) 2
   - (D) 1

6. If $x + \dfrac{1}{x} = 4$ then find the value of $x^4 + \dfrac{1}{x^4}$
   - (A) 128
   - (B) 194
   - (C) 162
   - (D) 136

7. If $p + \dfrac{1}{p} = 112$, find $(p - 112)^{15} + \dfrac{1}{p^{15}}$
   - (A) 1
   - (B) 15
   - (C) 10
   - (D) 0

8. If $x + \dfrac{4}{x} - 4 = 0$, then the value of $x^2 - 4$ is equal to:
   - (A) 4
   - (B) 1
   - (C) 2
   - (D) 0

9. If $x = 3 + 2\sqrt{2}$, then the value of $x^2 + \dfrac{1}{x^2}$ is:
   - (A) 34
   - (B) 30
   - (C) 36
   - (D) 32

10. If $x + \dfrac{1}{x} = 5, x \neq 0$ then the value of $\dfrac{x^4+\frac{1}{x^2}}{x^2-3x+1}$ is equal to:
    - (A) 60
    - (B) 65
    - (C) 55
    - (D) 50

11. If $x + \dfrac{1}{x} = 5$, then the value of $x^2 + \dfrac{1}{x^2}$ is:
    - (A) 23
    - (B) 25
    - (C) 29
    - (D) 27

12. If $x^2 \cdot 6\sqrt{3} x + 1 = 0$, then the value of $x^3 + \dfrac{1}{x^3}$
    - (A) $666\sqrt{3}$
    - (B) $630\sqrt{3}$
    - (C) $216\sqrt{3}$
    - (D) $234\sqrt{3}$

13. If $x^2 \cdot 3x + 1 = 0$, then the value of $2\left(x^8 + \dfrac{1}{x^8}\right) - 5\left(x^2 + \dfrac{1}{x^2}\right)$ is:
    - (A) 4379
    - (B) 3479
    - (C) 4370
    - (D) 4279

14. If $x + \dfrac{1}{x} = 7$, then $x^3 + \dfrac{1}{x^3}$ is equal to:
    - (A) 340
    - (B) 161
    - (C) 343
    - (D) 322

15. If $x + \dfrac{1}{x} = \sqrt{7}$, then what is the value of $(x^2 + 1) \div \left[x^4 + \left(\dfrac{1}{x^2}\right)\right]$?
    - (A) 1/4
    - (B) $2\sqrt{7}$
    - (C) 1/2
    - (D) $3\sqrt{7}$

16. If $a + b = p$, $ab = q$, then $(a^4 + b^4)$ is equal to

(A) $p^4 - 4p^2q + 2q^2$ (B) $p^4 - 4p^2q^2 + 2q^2$

(C) $p^4 - 2p^2q^2 + q^2$ (D) $p^4 - 4p^2q + q^2$

17. If $\left(x + \frac{1}{x}\right)^3 = 27$, then what is the value of $\left(x^2 + \frac{1}{x^2}\right)$ Given that x is real.

(A) 7   (B) 25

(C) 11   (D) 9

18. If $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$ then the value of $x^6 + \frac{1}{x^6}$ will be

(A) 2270   (B) 2502

(C) 2712   (D) 2702

19. If $x - \frac{2}{x} = 4$ then what will be the value of $x^2 + \frac{4}{x^2}$?

(A) 18   (B) 20

(C) 12   (D) 8

20. If $x^2 - 5x + 1 = 0$, then the value of $\left(\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)\right)$ is:

(A) 25   (B) 21

(C) 22   (D) 24

21. If $x^2 - 3x + 1 = 0$, then the value of $\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$ is:

(A) 9   (B) 5

(C) 6   (D) 7

22. If $x^2 + 3x + 1 = 0$, then what is the value of $x^6 + \frac{1}{x^6}$?

(A) 318   (B) 322

(C) 327   (D) 324

23. If $x^2 - 2\sqrt{5}x + 1 = 0$, then what is the value of $x^5 + \frac{1}{x^5}$

(A) $406\sqrt{5}$ (B) $610\sqrt{5}$

(C) $408\sqrt{5}$ (D) $612\sqrt{5}$

24. If $a + 1/a = 5$ then $a^3 + 1/a^3$ is

(A) 10   (B) 140

(C) 110   (D) 80

25. If $x + \frac{1}{x} = 4$, then the value of $x^5 + \frac{1}{x^5}$ is:

(A) 776   (B) 736

(C) 724   (D) 684

26. If $x^2 - \sqrt{11}x + 1 = 0$, then $(x^3 + x^{-3}) =$

(A) $10\sqrt{11}$ (B) $4\sqrt{11}$

(C) $8\sqrt{11}$ (D) $7\sqrt{11}$

27. If $x^8 - 433x^4 + 16 = 0$, x > 0, then what is the value of $(x+2x)(x+2x)$?

(A) 4   (B) 5

(C) 7   (D) 9

28. If $x^2 - 5\sqrt{2}x + 1 = 0$, then what is the value of $\frac{\left(x^3 + \frac{1}{x}\right)}{x^2 + 1}$?

(A) $\frac{12\sqrt{2}}{5}$ (B) $\frac{24\sqrt{2}}{5}$

(C) $\frac{26\sqrt{2}}{5}$ (D) $\frac{18\sqrt{2}}{5}$

29. If $x + \frac{1}{x} = 2\sqrt{5}$, then what is the value of $\frac{\left(x^4 + \frac{1}{x^2}\right)}{x^2 + 1}$?

(A) 23   (B) 17

(C) 20   (D) 14

30. If $x + \frac{1}{x} = 7$, then $x^2 + \frac{1}{x^2}$ is equal to:

(A) 61   (B) 49

(C) 47   (D) 51

31. If $x = 4 + \sqrt{15}$, what is the value of $\left(x^2 + \frac{1}{x^2}\right)$?

(A) 54   (B) 48

(C) 72   (D) 62

32. If $8k^6 + 15k^3 - 2 = 0$, then the positive value of $\left(k + \frac{1}{k}\right)$ is :

(A) $2\frac{1}{2}$ (B) $2\frac{1}{8}$

(C) $8\frac{1}{2}$ (D) $8\frac{1}{8}$

33. If $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$, then what is the value of $x^4 + \frac{1}{x^4}$?

(A) 531   (B) 7

(C) 623   (D) 527

34. If $\sqrt{x} + \frac{1}{\sqrt{x}} = 3$, then the value of $x^3 + \frac{1}{x^3}$ is:

(A) 322   (B) 326

(C) 324   (D) 422

35. If $x^2 - \sqrt{7}x + 1 = 0$, then what is the value of $x^5 + \frac{1}{x^5}$?

(A) $27\sqrt{7}$ (B) $21\sqrt{7}$

(C) $25\sqrt{7}$ (D) $19\sqrt{7}$

36. If $x^2 - 3x + 1 = 0$, then the value of $\frac{\left(x^4 + \frac{1}{x^2}\right)}{(x^2 + 5x + 1)}$ is:

(A) $\frac{9}{4}$ (B) $\frac{27}{8}$

(C) $\frac{5}{2}$ (D) 2

37. If $x + \frac{1}{x} = 3$, $x \ne 0$, then the value of $x^7 + \frac{1}{x^7}$ is:

(A) 749   (B) 843

(C) 746   (D) 849

TYPE – III

1. If $x - \frac{1}{x} = 13$, then the value of $x^2 + \frac{1}{x^2}$ is:

(A) 165   (B) 171

(C) 167   (D) 169

2. $A = \frac{x-1}{x+1}$, then the value of A - 1/A is:

(A) $\frac{-4(2x-1)}{x^2-1}$ (B) $\frac{x^2-1}{-4(2x-1)}$

(C) $\frac{x^2-1}{-4(2x+1)}$ **(D)** $\frac{-4x}{x^2-1}$

3. If $x\left(5-\frac{2}{x}\right)=\frac{5}{x}$, then the value of $x^2+\frac{1}{x^2}$ is equal to:

   (A) $2\frac{4}{25}$ **(B)** $2\frac{1}{25}$
   (C) $\frac{4}{25}$ **(D)** $2\frac{3}{25}$

4. If $x=3+2\sqrt{2}$, then the value of $\sqrt{x}-\frac{1}{\sqrt{x}}$ is:

   (A) 2   **(B)** 1
   (C) 0   **(D)** 3

5. If $x^2 \cdot 5\sqrt{2}x \cdot 1 = 0$, then what will be the value of $x^3-\frac{1}{x^3}$?

   (A) $250\sqrt{2}$ **(B)** $255\sqrt{2}$
   (C) $485\sqrt{2}$ **(D)** $265\sqrt{2}$

6. If $x \cdot 1/x = 11$, then $x^3 \cdot 1/x^3$ is:

   (A) 1188   **(B)** 1474
   (C) 1364   **(D)** 1298

7. If $x-\frac{1}{x}=5, x \neq 0$, then what is the value of $\frac{x^6-5x^3-1}{x^6+7x^3-1}$?

   (A) $\frac{49}{45}$ **(B)** $\frac{45}{41}$
   (C) $\frac{45}{49}$ **(D)** $\frac{41}{45}$

8. If $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{7}$, then the value of $x^2+\frac{1}{x^2}$ is:

   (A) 60   **(B)** 75
   (C) 81   **(D)** 79

9. Given that $x^8 \cdot 34x^4 + 1 = 0$, $x > 0$. What is the value of $(x^3 \cdot x^{-3})$?

   (A) 12   **(B)** 14
   (C) 18   **(D)** 16

10. If $x^2 \cdot 5x \cdot 1 = 0$, what is the value of $\frac{x^6-x^4+x^2-1}{x^3}$?

    (A) 145   **(B)** 140
    (C) 130   **(D)** 135

11. If $x\left(3-\frac{2}{x}\right)=\frac{3}{x}$, then the value of $x^3-\frac{1}{x^3}$ is equal to:

    (A) $\frac{62}{27}$ **(B)** $\frac{52}{27}$
    (C) $\frac{61}{27}$ **(D)** $\frac{8}{27}$

TYPE – IV

1. If $x^4+\frac{1}{x^4}=14159$, then the value of $x+\frac{1}{x}$ is:

   (A) 11   **(B)** 12
   (C) 9   **(D)** 10

2. If $x^2+\frac{1}{x^2}=38$, then what is the value of $\left|x-\frac{1}{x}\right|$?

   (A) 9   **(B)** 6
   (C) 5   **(D)** 4

3. If $x^4+\frac{1}{x^4}=\frac{257}{16}$ then find $\frac{8}{13}\left(x^3+\frac{1}{x^3}\right)$, where $x>0$.

   (A) 5   **(B)** 8
   (C) 4   **(D)** 6

4. If $a^2+\frac{1}{a^2}=98, a>0$, then the value of $a^3+\frac{1}{a^3}$ will be:

   (A) 960   **(B)** 950
   (C) 970   **(D)** 870

5. If $x^4+\frac{1}{x^4}=6887$ then the positive value of $x-\frac{1}{x}$ is:

   (A) 15   **(B)** 8
   (C) 9   **(D)** 12

6. If $x^4 \cdot 142x^2 + 1 = 0$, then the value of x^3+1/x^3 is

   (A) 1962   **(B)** 1952
   (C) 1692   **(D)** 1592

7. If $x^4+\frac{1}{x^4}=3842$ then the positive value of $x+\frac{1}{x}$ will be:

   (A) 10   **(B)** 8
   (C) 6   **(D)** 12

8. If $x^4+x^{-4}=194, x>0$, then the value of $x+\frac{1}{x}$ is:

   (A) 4   **(B)** 6
   (C) 8   **(D)** 14

9. $X^4+X^{-4}=194, X>0$, then what is the value of $+\frac{1}{x}+2$?

   (A) 14   **(B)** 4
   (C) 8   **(D)** 6

10. If $a^3+1/a^3=52$, then the value of $2(a+1/a)$ is:

    (A) 4   **(B)** 6
    (C) 8   **(D)** 2

11. If $a^4+1/a^4=50, a>0$, then find the value of a^3+1/a^3.

    (A) $\sqrt{2(1+\sqrt{13})}+(-1+2\sqrt{13})$
    (B) $\sqrt{2(1+\sqrt{13})}-(-1-2\sqrt{13})$
    (C) $\sqrt{2(1+\sqrt{13})(-1+2\sqrt{13})}$
    (D) $\sqrt{2(1-\sqrt{13})(-1+2\sqrt{13})}$

12. If $x^4+\frac{1}{x^4}=727, x>1$, then what is the value of $\left(x-\frac{1}{x}\right)$?

    (A) -6   **(B)** 5
    (C) -5   **(D)** 6

13. Given that $x^8 \cdot 34x^4 + 1 = 0$, $x > 0$. What is the value of (x^3+x^{-3})?

(A) $6\sqrt{2}$ (B) $5\sqrt{4}$

(C) $10\sqrt{2}$ (D) $5\sqrt{6}$

14. If $x^2 + \frac{1}{x^2} = 7$, then the value of $x^3 + \frac{1}{x^3}$ where x > 0 is equal to:

(A) 16   (B) 18

(C) 12   (D) 15

TYPE – V

1. If $x^2 - 2\sqrt{10}x + 1 =$ then what is the value of $x - \frac{1}{x}$?

(A) 4   (B) 6

(C) 3   (D) 5

2. If $x = a + 1/a$ and $y = a - 1/a$ then $\sqrt{(x^4 + y^4 - 2x^2y^2)}$ is equal to:

(A) 8   (B) $8/a^2$

(C) $16a^2$ (D) 4

3. If $x^4 - 6x^2 - 1 = 0$, then the value of $x^6 - 5x^2 + 5/x^2 - 1/x^6 + 5$ is:

(A) 239   (B) 204

(C) 219   (D) 209

4. If $a - \frac{1}{a} = 3$. then $a^6 + \frac{1}{a^6}$ is equal to:

(A) 1298   (B) 996

(C) 729   (D) 1331

5. When $[x + (1/x)] = 5$, then what is the value of $[x - (1/x)]$?

(A) 11   (B) $\pm\sqrt{22}$

(C) 21   (D) $\pm\sqrt{21}$

6. If $x + (1/x) = \sqrt{13}$, then what is the value of $x^5 - (1/x^5)$?

(A) 169   (B) $169\sqrt{3}$

(C) 393   (D) 507

7. If $\frac{4}{3}\left(x^2 + \frac{1}{x^2}\right) = 110\frac{2}{3}$ find $\frac{1}{9}\left(x^3 - \frac{1}{x^3}\right)$ where x > 0.

(A) 74   (B) 76

(C) 84   (D) 85

8. If $x - \frac{1}{x} = \sqrt{77}$, then one of the values of $x^3 + \frac{1}{x^3}$ is:

(A) $80\sqrt{77}$ (B) $77\sqrt{77}$

(C) $3\sqrt{77}$ (D) 702

9. If $x + \frac{1}{x} = \frac{17}{4}, x > 1$ then what is the value of $x - \frac{1}{x}$?

(A) $\frac{8}{3}$ (B) $\frac{15}{4}$

(C) $\frac{3}{2}$ (D) $\frac{9}{4}$

TYPE – VI

1. If $2a + \frac{1}{a} = 4$, then find the value of $a^2 + \frac{1}{4a^2}$ is:

(A) 5   (B) 3

(C) 12   (D) 4

2. If $2x^2 \cdot 6x = 1$, then $x^2 + \frac{1}{4x^2} =$?

(A) 8   (B) 9

(C) 10   (D) 12

3. If $k - \frac{3}{k} = 5$, then what is the value of $k^2 + \frac{9}{k^2}$?

(A) 31   (B) 11

(C) 25   (D) 19

4. If $x - \frac{1}{2x} = 4$, the the value of $8x^3 - \frac{1}{x^3}$ will be:

(A) 560   (B) 480

(C) 540   (D) 520

5. If $x^4 + \frac{16}{x^4} = 27217$, x > 0, then the value of $x + \frac{2}{x}$ is:

(A) 13   (B) 17

(C) 15   (D) 11

6. If $\left(x + \frac{2}{x}\right) = 7$, then what is the value of $\left(2x^2 + \frac{8}{x^2}\right)$?

(A) 44   (B) 90

(C) 94   (D) 50

7. If $x - 3 = \frac{1}{2x}$, then what is the value of $\left(x^4 + \frac{1}{16x^4}\right)$?

(A) $99\frac{1}{2}$ (B) 10

(C) 11   (D) 98

8. If $5x + 1/3x = 4$, then what is the value of $9x^2 + \frac{1}{25x^2}$?

(A) 144/125   (B) 119/25

(C) 174/125   (D) 114/25

9. If $30x^2 - 15x + 1 = 0$, then what is the value of $25x^2 + (36x^2) - 1$?

(A) 65/12   (B) 25/4

(C) 9/2   (D) 55/12

10. If $12x^2 - 21x + 1 = 0$, then what is the value of $9x^2 + (16x^2) - 1$?

(A) 429/8   (B) 417/16

(C) 453/8   (D) 465/16

11. If $20x^2 - 30x + 1 = 0$, then what is the value of $25x^2 + \frac{1}{16x^2}$?

(A) $58\frac{3}{4}$ (B) $58\frac{1}{2}$

(C) $53\frac{3}{4}$ (D) $53\frac{1}{2}$

12. If $2x^2 \cdot 8x \cdot 1 = 0$, then what is the value of $8x^3 - \frac{1}{x^3}$?

(A) 540   (B) 560

(C) 524   (D) 464

13. If $\left(2x - \frac{3}{x}\right) = 2$, then what is the value of $\left(16x^4 + \frac{81}{x^4}\right)$?

(A) 220   (B) 180
(C) 184   (D) 328

14. If $4x^4 - 37x^2 + 9 = 0, x > \sqrt{\frac{3}{2}}$, then what is the value of $8x^3 - \frac{27}{x^3}$

(A) -215   (B) 35
(C) -35   (D) 215

15. If $4x^4 = 5x^2 - 1, x > \frac{1}{\sqrt{2}}$, then what is the value of $(2x^2 \cdot x - 1)$?

(A) 1   (B) -2
(C) 2   (D) 0

16. If $\left(2a + \frac{3}{a} - 1\right) = 11$, what is the value of $\left(4a^2 + \frac{9}{a^2}\right)$?

(A) 121   (B) 148
(C) 110   (D) 132

17. If $2x^2 - 7x + 5 = 0$, then what is the value of $x^3 + \frac{125}{8x^3}$?

(A) $12\frac{5}{8}$ (B) $16\frac{5}{8}$
(C) $18\frac{5}{8}$ (D) $10\frac{5}{8}$

18. If $x - \frac{2}{x} = 15$, then what is the value of $\left(x^2 + \frac{4}{x^2}\right)$?

(A) 223   (B) 227
(C) 229   (D) 221

19. If $3x^2 - 5x + 1 = 0$, then the value of $\left(x^2 + \frac{1}{9x^2}\right)$ is:

(A) $(5/3)$ (B) $(4/3)$
(C) $(19/9)$ (D) $(7/2)$

20. If $2x^2 - 7x + 5 = 0$, then what is the value of $x^2 + \frac{25}{4x^2}$?

(A) $5\frac{1}{2}$ (B) $7\frac{1}{4}$
(C) $9\frac{3}{4}$ (D) $9\frac{1}{2}$

21. If $x + \frac{16}{x} = 8$, then the value of $x^2 + \frac{32}{x^2}$ is:

(A) 24   (B) 18
(C) 20   (D) 16

22. If $x - \frac{3}{x} = 6, x \neq 0, \frac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3}$ is:

(A) 54   (B) 270
(C) 80   (D) 90

23. If $2x^2 + 5x + 1 = 0$, then one of the values of $x - \frac{1}{2x}$ is:

(A) $\frac{\sqrt{17}}{2}$ (B) $\frac{\sqrt{13}}{2}$
(C) $\frac{5}{2}$ (D) $\frac{3}{2}$

TYPE – VII

1. If $p + \left(\frac{1}{p}\right) = 2$ find the value of $p \times p \times p$

(A) 1   (B) 2
(C) 4   (D) 8

2. If $x - \frac{1}{x} = 1$, then what is the value of $x^8 + \frac{1}{x^8}$?

(A) 3   (B) 47
(C) 119   (D) -1

3. If $x^2 + \frac{1}{x^2} = 2$ then what is the value of x^6?

(A) 6   (B) 0
(C) 1   (D) 3

4. If $x + 1/x = -2$, then what is the value of $1 + x^3 + x^5$?

(A) 0   (B) 1
(C) 2   (D) -1

5. If $x^2 + 16 = -4x$, then what is the value of $x^3 - 64$?

(A) 128   (B) 0
(C) 64   (D) 256

6. If $x + (1/x) = 2$, then what is the value of $x^{64} + x^{121}$?

(A) 0   (B) 1
(C) 2   (D) -2

7. If $x + (1/x) = 2$, then what is the value of $x^{21} + (1/x^{1331})$?

(A) 0   (B) 1
(C) 2   (D) 4

8. If $x^{1/4} + x^{-1/4} = 2$ then what is the value of $x^{81} + (1/x^{81})$?

(A) -2 (B) 0
(C) 1   (D) 2

9. If $(x/y) + (y/x) = 1$, then what is the value of $x^3 + y^3$?

(A) -1 (B) 0
(C) 1   (D) 3

10. If $x^2 + (1/x^2) = 1$, then what is the value of $x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$?

(A) -9 (B) 0
(C) 1   (D) 9

11. If $(x/5) + (5/x) = -2$, then what is the value of x^3?

(A) -125 (B) 5
(C) $1/125$ (D) 625

TYPE – VIII

1. If $a^3 + a - 1 = 0$ then find the value of $a^5 + a^4 + a - 2$.

(A) $-3a^3$ (B) 0
(C) a^3 (D) $-2a^3$

2. If $(p^2 + q^2)/(r^2 + s^2) = (pq)/(rs)$, then what is the value of $(p - q)/(p + q)$ in terms of r and s?
   (A) $(r + s)/(r - s)$
   (B) $(r - s)/(r + s)$
   (C) $(r + s)/(rs)$
   (D) $(rs)/(r - s)$

3. What is the simplified value of
   $\left(x^{32} + \frac{1}{x^{32}}\right)\left(x^8 + \frac{1}{x^8}\right)\left(x - \frac{1}{x}\right)\left(x^{16} + \frac{1}{x^{16}}\right)\left(x + \frac{1}{x}\right)\left(x^4 + \frac{1}{x^4}\right)$?
   (A) $\left(x^{64} + \frac{1}{x^{64}}\right)$
   (B) $\frac{\left(x^{64} + \frac{1}{x^{64}}\right)}{\left(x^2 + \frac{1}{z^2}\right)}$
   (C) $\frac{\left(x^{64} - \frac{1}{x^{64}}\right)}{\left(x^2 + \frac{1}{x^2}\right)}$
   (D) $\frac{\left(x^{32} + \frac{1}{x^{32}}\right)}{x + \frac{1}{z}}$

4. If $\sqrt{(7x + 12)} + \sqrt{(7x - 12)} = 3 + \sqrt{33}$, then what is the value of x?
   (A) 0
   (B) 1
   (C) 3
   (D) 9

5. What is the simplified value of $(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1)$?
   (A) $x^{256} - 1$
   (B) $(x^{128} - 1)/(x - 1)$
   (C) $(x^{64} - 1)/(x - 1)$
   (D) $(x^{256} - 1)/(x - 1)$

6. If $\left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4}\right)\left(x^8 + \frac{1}{x^8}\right)\left(x^{16} + \frac{1}{x^{16}}\right)$?
   (A) $\frac{\left(x^{22} - \frac{1}{x^{22}}\right)}{x - \frac{1}{x}}$
   (B) $\frac{\left(x^8 - \frac{1}{x^8}\right)}{x - \frac{1}{x}}$
   (C) $\frac{\left(x^{64} - \frac{1}{x^{64}}\right)}{x - \frac{1}{z}}$
   (D) $\frac{\left(x^{16} - \frac{1}{x^{16}}\right)}{x - \frac{1}{z}}$

7. If $(c - d) = (c + d)/5 = (cd)/3$ and c, d $\neq$ 0, then what is the value of cd?
   (A) 1/2
   (B) 3/2
   (C) 5/2
   (D) 5/4

8. If $a/4 = 1 + 3/a$, then what is the value of a^3?
   (A) -81
   (B) 148
   (C) -243
   (D) 216

9. If $\left(x - \frac{1}{3}\right)^2 + (y - 4)^2 = 0$, then what is the value of $\frac{y+x}{y-x}$?
   (A) 11/13
   (B) 13/11
   (C) 16/9
   (D) 9/16

10. If $\frac{\sqrt{5+x} + \sqrt{5-x}}{\sqrt{5+x} - \sqrt{5-x}} = 3$, then what is the value of x?
    (A) 5/2
    (B) 25/3
    (C) 4
    (D) 3

11. If $x/y = 4/9$, then what is the value of $(7x^2 - 19xy + 11y^2)/y^2$?
    (A) 59/81
    (B) 100/27
    (C) 319/81
    (D) 913/81

12. If $(5x - y)/(5x + y) = 3/7$, then what is the value of $(4x^2 + y^2 - 4xy)/(9x^2 + 16y^2 + 24xy)$?
    (A) 0
    (B) 3/7
    (C) 18/49
    (D) 1/6

13. What is the value of x in the equation $\sqrt{\frac{1+x}{x}} - \sqrt{\frac{x}{1+x}} = \frac{1}{\sqrt{6}}$?
    (A) -2
    (B) 3
    (C) 2
    (D) None of these

14. If $\sqrt{5x - 6} + \sqrt{5x + 6} = 6$, then what is the value of x?
    (A) -4
    (B) 0
    (C) 2
    (D) 4

15. If $p/q = r/s = t/u = \sqrt{5}$, then what is the value of $[(3p^2 + 4r^2 + 5t^2)/(3q^2 + 4s^2 + 5u^2)]$?
    (A) 1/5
    (B) 5
    (C) 25
    (D) 60

TYPE – IX

1. If $a^2 + b^2 + 2b + 4a + 5 = 0$, then the value of $\frac{2a-3b}{2a+3b}$ is equal to:
   (A) 3/7
   (B) 2/7
   (C) 1/7
   (D) 2/5

2. If $a^2 + b^2 + c^2 + 170 = 2(8a + 5b - 9c)$, then the value of $\sqrt{4a + 8b - c}$ will be:
   (A) 8
   (B) 12
   (C) 9
   (D) 15

3. If $49a^2 + 25b^2 = 30$ and ab = 1, a, b > 0, then the value of $(7a + 5b)$ is:
   (A) 10
   (B) 12
   (C) 14
   (D) 8

4. If $a^2 + 4b^2 + 25c^2 + 18 = 2(a - 2b + 20c)$, then what is the value of $(a + 2b + 5c)$?
   (A) 6
   (B) 5
   (C) 3
   (D) 4

5. If $a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$, then $\sqrt{ab - bc + ca}$ is:
   (A) 6
   (B) 4
   (C) 8
   (D) 3

6. If $x^2 + 8y^2 - 12y - 4xy + 9 = 0$, then the value of $(7x - 8y)$ is:
   (A) 12
   (B) 9
   (C) 21
   (D) 5

7. If $x^2 + 8y^2 + 12y - 4xy + 9 = 0$, then the value of $(7x + 8y)$ is:
   (A) 9
   (B) -33
   (C) -9
   (D) 33

8. If $a^2 + b^2 + c^2 + 84 = 4(a - 2b + 4c)$, then $\sqrt{ab - bc + ca}$ is equal to:
   (A) $4\sqrt{10}$
   (B) $5\sqrt{10}$
   (C) $2\sqrt{10}$
   (D) $\sqrt{10}$

9. If $16a^4 + 36a^2b^2 + 81b^4 = 91$ and $4a^2 + 9b^2 - 6ab = 13$, then what is the value of $3ab$?
   (A) 5　　　　　　　　(B) −3
   (C) 3/2　　　　　　　(D) −3/2

10. If the value of $(a + b - 2)^2 + (b + c - 5)^2 + (c + a - 5)^2 = 0$, then the value of $\sqrt{(b + c)^a + (c + a)^b - 1}$ is:
    (A) 1　　　　　　　　(B) 0
    (C) 3　　　　　　　　(D) 2

11. If $x^2 - 4x + 4 = 0$, then the value of $16(x^4 - 1/x^4)$ is:
    (A) 127　　　　　　　(B) 255/16
    (C) 255　　　　　　　(D) 127/16

12. If $a^2 + c^2 + 17 = 2(a - 8b - 2b^2)$ then what is the value of $(a^3 + b^3 + c^3)$?
    (A) -7　　　　　　　(B) -4
    (C) 10　　　　　　　(D) 9

13. If $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$, then the value of $(x - 3y + z)$ is:
    (A) 13　　　　　　　(B) 5
    (C) 11　　　　　　　(D) 10

14. If $a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$, then $\sqrt{ab - bc - ca}$ is:
    (A) $8\sqrt5$　　　　　(B) $6\sqrt5$
    (C) $3\sqrt5$　　　　　(D) $4\sqrt5$

15. If $9(a^2 + b^2) + c^2 + 20 = 12(a + 2b)$, then the value of $\sqrt{6a + 9b + 2c}$ is:
    (A) 6　　　　　　　　(B) 3
    (C) 4　　　　　　　　(D) 2

16. If $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$ then the value of $(a + b - 7c)$ is:
    (A) 4　　　　　　　　(B) 3
    (C) 2　　　　　　　　(D) 1

17. If $a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$, then the value of $(a - b - 7c)$ is:
    (A) 4　　　　　　　　(B) 3
    (C) 2　　　　　　　　(D) 1

18. If $a^2 + b^2 + 49c^2 + 18 = 2(b + 28c - a)$, then the value of $(2a - b + 7c)$ is:
    (A) 5　　　　　　　　(B) -3
    (C) -4　　　　　　　(D) 1

TYPE – X

1. If $b + c = ax$, $c + a = by$, $a + b = cz$, then the value of $\left[\dfrac{1}{x+1} + \dfrac{1}{y+1} + \dfrac{1}{z+1}\right]$ is:
   (A) 1　　　　　　　　(B) 1/3
   (C) 0　　　　　　　　(D) 1/9

2. If $a + b + c = 0$, then what is the value of $\dfrac{(b+c)^2}{bc} + \dfrac{(c+a)^2}{ca} + \dfrac{(a+b)^2}{ab}$?
   (A) -3　　　　　　　(B) 3
   (C) -1　　　　　　　(D) 1

3. If $\dfrac{6x-1}{x} + \dfrac{7y-1}{y} + \dfrac{8z-1}{z} = 0$ then what is the value of $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$?
   (A) 1　　　　　　　　(B) 3
   (C) 0　　　　　　　　(D) 21

4. If $\dfrac{1}{X+2} = \dfrac{3}{Y+3} = \dfrac{1331}{Z+1331} = \dfrac{1}{3}$ then $\dfrac{X}{X+1} + \dfrac{4}{Y+2} + \dfrac{z}{Z+2662}$?
   (A) 0　　　　　　　　(B) 1
   (C) 3/2　　　　　　　(D) 3

5. If $\dfrac{3x-1}{x} + \dfrac{5y-1}{y} + \dfrac{7z-1}{z} = 0$, then what is the value of $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$
   (A) -3　　　　　　　(B) 0
   (C) 15　　　　　　　(D) 21

6. If $\dfrac{11-13x}{x} + \dfrac{11-13y}{y} + \dfrac{11-13z}{z} = 5$, then what is the value of $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$?
   (A) 1　　　　　　　　(B) 13/11
   (C) 13/5　　　　　　(D) 4

TYPE – XI
Nature – I

1. If $2(a^2 + b^2) = (a + b)^2$ then,
   (A) $a = b$　　　　　(B) $b = 2a$
   (C) $a = 2b$　　　　　(D) $a = -b$

2. If $a + b = 11$ and $ab = 15$, then $a^2 + b^2$ is equal to:
   (A) 90　　　　　　　(B) 91
   (C) 93　　　　　　　(D) 92

3. If $x - 2y = 3$ and $xy = 5$, find the value of $x^2 - 4y^2$
   (A) 21　　　　　　　(B) 20
   (C) 23　　　　　　　(D) 22

4. If $xy = 16$ and $x^2 + y^2 = 32$, then the value of $(x + y)$ is:
   (A) ±10　　　　　　(B) ±4
   (C) ±8　　　　　　　(D) ±6

5. If $2a + 3b = 8$ and $ab = 5$, then find the value of $4a^2 + 9b^2$.
   (A) 6　　　　　　　　(B) 8
   (C) 2　　　　　　　　(D) 4

6. If a and b are two positive real numbers such that $4a^2 + b^2 = 20$ and $ab = 4$, then the value of $2a + b$ is:
   (A) 80　　　　　　　(B) 8
   (C) 6　　　　　　　　(D) 5

7. If $4x^2 + y^2 = 40$ and $xy = 6$, ($x > 0$, $y > 0$) then the value of $2x + y$ is
   (A) 4　　　　　　　　(B) 24
   (C) 8　　　　　　　　(D) 16

8. If $x + y = 3$ and $\frac{1}{x} + \frac{1}{y} = -\frac{3}{10}$, then the value of $(x^2 + y^2)$ is:
(A) 28   (B) 34
(C) 29   (D) 26

Nature – II

1. $(a + 2b)^2 - (a - 2b)^2$ is equal to:
(A) 6ab   (B) 10ab
(C) 8ab   (D) 4ab

2. $(a + b - c + d)^2 - (a - b + c - d)^2 = ?$
(A) 2a (a + b − c)   (B) 4a (b + d − c)
(C) 2a (b + c − d)   (D) 4a (b − d + c)

3. $(a + b + c - d)^2 - (a - b - c + d)^2 = ?$
(A) 4a (b + c - d)   (B) 2a(b + c + d)
(C) 2a (b - c + d)   (D) 2a (b + c - d)

4. Simplify $(x - y + z)^2 - (x - y - z)^2$.
(A) 2xz + 2yz   (B) 4xz + 4yz
(C) 4yz - 4xz   (D) 4xz - 4yz

5. If $1 + 9r^2 + 81r^4 = 256$ and $1 + 3r + 9r^2 = 32$, then find the value of $1 - 3r + 9r^2$.
(A) 4   (B) 12
(C) 16   (D) 8

6. If $x^4 + y^4 + x^2y^2 = 117$ and $x^2 + y^2 - xy = 3(4 + \sqrt{3})$, then the value of $(x^2 + y^2)$ will be:
(A) 9   (B) $6\sqrt{3}$
(C) 12   (D) $13\sqrt{3}$

7. If $a^4 + b^4 + a^2b^2 = 133$ and $a^2 + b^2 - ab = 19$, then the value of ab will be:
(A) -9   (B) -6
(C) 12   (D) 15

8. If $x^4 + x^2y^2 + y^4 = 21$ and $x^2 + xy + y^2 = 7$, then the value of $\left(\frac{1}{x^2} + \frac{1}{y^2}\right)$ is:
(A) 5/2   (B) 7/4
(C) 7/3   (D) 5/4

9. If $x^4 + x^2y^2 + y^4 = 273$ and $x^2 - xy + y^2 = 13$, then the value of xy is:
(A) 6   (B) 8
(C) 10   (D) 4

10. If $x^4 + y^4 + x^2y^2 = 21$ and $x^2 + y^2 - xy = 7$, then what is the value of $\frac{x}{y} + \frac{y}{x}$?
(A) $\frac{3}{4}$ (B) $-\frac{3}{2}$
(C) $-\frac{5}{2}$ (D) $\frac{5}{4}$

11. If $x^4 + x^2y^2 + y^4 = 21$ and $x^2 + xy + y^2 = 3$, then what is the value of $(-xy)$?
(A) -2   (B) -1
(C) 2   (D) 1

12. If $a^4 + b^4 + a^2b^2 = 273$ and $a^2 + b^2 - ab = 21$, then one of the value of (1/a+1/b) is:
(A) 3/2   (B) 9/8
(C) −3/4   (D) 1/2

13. If $x^4 + y^4 + x^2y^2 = 17\frac{1}{16}$ and $x^2 - xy + y^2 = 5\frac{1}{4}$, then one of the values of $(x - y)$ is:
(A) $\frac{5}{2}$ (B) $\frac{3}{4}$
(C) $\frac{5}{4}$ (D) $\frac{3}{2}$

Nature – III

1. If the value of $\frac{3x\sqrt{y}+2y\sqrt{x}}{3x\sqrt{y}-2y\sqrt{x}} - \frac{3x\sqrt{y}-2y\sqrt{x}}{3x\sqrt{y}+2y\sqrt{x}}$, is the same as that of $\sqrt{x}\sqrt{y}$ then which of the following relations between x and y is correct?
(A) 9x - 4y = 24   (B) 9x + 4y = 24
(C) 9x + 4y = 36   (D) 9x - 4y = 36

2. If $x + y = 15$ and $xy = 14$, then the value of $x - y$ is:
(A) 12   (B) 14
(C) 13   (D) 11

3. If $x - y = 13$ and $xy = 25$, then the value of $x^2 - y^2 = ?$
(A) $13\sqrt{229}$ (B) $13\sqrt{210}$
(C) $13\sqrt{269}$ (D) $13\sqrt{240}$

4. If $a + 3b = 12$ and $ab = 9$, then the value of $(a - 3b)$ is:
(A) 9   (B) 4
(C) 6   (D) 8

5. If $a + 2b = 10$ and $2ab = 9$, then $|a - 2b|$ is equal to:
(A) 4   (B) 8
(C) 2   (D) 6

6. If $3u + 2v = 7$ and $uv = 2$, then the value of $(3u - 2v)$ is:
(A) 1   (B) 2
(C) 0   (D) 5

7. If $x + y = 5$ and $x^2 + y^2 = 17$ then the value of $(x-y)^2$ is equal to:
(D) 9   (B) 16
(C) 4   (D) 25

8. If $(3p - 5m) = 5$ and $pm = 6$, then what is the value of $(9p^2 - 25 m^2)$?
(D) $30\sqrt{10}$ (B) $5\sqrt{385}$
(C) $\pm30\sqrt{10}$ (D) $\pm5\sqrt{385}$

Nature – IV

1. If $a^3 + b^3 = 20$ and $a + b = 5$, then find the value of $a^4 + b^4$ $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
(A) 26   (B) 23
(C) 25   (D) 24

2. If $x^3 + y^3 = 16$ and $x + y = 4$, then find the value of $x^4 + y^4$
(A) 26   (B) 28
(C) 36   (D) 32

3. If $2x + y = 6$ and $xy = 4$, then find the value of $8x^3 + y^3$ is:
   (A) 16   (B) 72
   (C) 48   (D) 64

4. If $a + b = 8$ and $a + a^2 b + b + ab^2 = 128$ then the positive value of $a^3 + b^3$ is:
   (A) 152   (B) 224
   (C) 96   (D) 344

5. If $a + b = 10$ and $3/7$ of $ab = 9$, then the value of $a^3 + b^3$ is:
   (A) 350   (B) 370
   (C) 270   (D) 360

6. If $x + y = 14$; $x^3 + y^3 = 1064$, and $xy = 30$, then the value of $(x - y)^2$ is:
   (A) 46   (B) 64
   (C) 81   (D) 100

7. If $a + b = 8$ and $ab = 12$, then the value of $a^3 + b^3$ is:
   (A) 288   (B) 96
   (C) 512   (D) 224

8. If $x + y = 4$ and $x^3 + y^3 = 12$, then the value of $x^4 + y^4 = ?$
   (A) 146/9   (B) 146/3
   (C) 146/5   (D) 146/7

9. If $x^3 + y^3 = 16$ and $x + y = 4$, then the value of $x^4 + y^4$ is:
   (A) 48   (B) 32
   (C) 64   (D) 30

10. If $a^3 + b^3 = 62$ and $a + b = 2$, then the value of ab is:
    (A) -6   (B) 9
    (C) 6   (D) -9

11. If $x^3 + y^3 = 468$ and $x + y = 12$, then the value of $x^4 + y^4$ will be:
    (A) 2036   (B) 3025
    (C) 3620   (D) 3026

12. If $x + y = 5$ and $\frac{1}{x} + \frac{1}{y} = \frac{20}{9}$, then the value of $(x^3 + y^3)$ will be:
    (A) $\frac{365}{4}$ (B) $\frac{635}{8}$
    (C) $\frac{635}{4}$ (D) $\frac{205}{4}$

13. If $8a^3 + b^3 = 16$ and $2a + b = 4$, then find the value of $16a^4 + b^4$,
    (A) 28   (B) 36
    (C) 38   (D) 32

14. If $a^2 + b^2 = 8^2$ and $ab = 9$, then a possible value of $a^3 + b^3$ is:
    (A) 750   (B) 730
    (C) 830   (D) 720

15. If $a^3 + b^3 = 217$ and $a + b = 7$, then the value of ab is:
    (A) -1   (B) 6
    (C) -6   (D) 7

16. The coefficient of x^2 in $(2x + y)^3$ is:
    (A) $12y^2$ (B) 12
    (C) $12y$ (D) 8

17. Expand $\left(\frac{x}{3} + \frac{y}{5}\right)^3$
    (A) $\frac{x^3}{25} + \frac{x^2 y}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$
    (B) $\frac{x^3}{27} + \frac{x^2 y}{25} + \frac{xy^2}{25} + \frac{y^3}{125}$
    (C) $\frac{x^3}{27} + \frac{x^2 y}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$
    (D) $\frac{x^3}{27} + \frac{xy}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$

18. If $A + B = 12$ and $AB = 17$, what is the value of $A^3 + B^3$?
    (A) 1116   (B) 1166
    (C) 1106   (D) 1213

19. If $p + q = 7$, $pq = 5$, then the value of $p^3 + q^3$ is:
    (A) 448   (B) 64
    (C) 238   (D) 34

20. If $x + y = 4$ and $\frac{1}{x} + \frac{1}{y} = \frac{16}{15}$ then what is the value of $(x^3 + y^3)$?
    (A) 18   (B) 19
    (C) 21   (D) 16

21. If $16x^2 + y^2 = 48$ and $xy = 2$, $x, y > 0$, then the value of $(64x^3 + y^3)$ is
    (A) 340   (B) 240
    (C) 320   (D) 300

22. If $a^3 + b^3 = 405$ and $a + b = 9$, then the value of ab is
    (A) 10   (B) 15
    (C) 12   (D) 8

23. If $(16\sqrt{2}x^3 + 81\sqrt{3}y^3) \div (2\sqrt{2}x + 3\sqrt{3}y) = Ax^2 + By^2 + Cxy$, then find the value of $2A - 3B - 2\sqrt{6}C$.
    (A) 7   (B) 137
    (C) 25   (D) 79

24. If $x + y = 2$ and $\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$, then the value of $(x^3 + y^3)$ is:
    (A) $3\frac{1}{3}$ (B) $4\frac{3}{5}$
    (C) $3\frac{1}{5}$ (D) $4\frac{2}{3}$

25. If $(54\sqrt{2}\, x^3 + 24\sqrt{3}\, y^3) \div (\sqrt{18}\, x + \sqrt{12}\, y) = Ax^2 + By^2 + Cxy$, then what is the value of $A^2 - (B^2 + C^2)$?
    (A) 12   (B) 24
    (C) -36   (D) -24

26. If $(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$, then the value of $A \cdot B \cdot C$ is:
    (A) 15   (B) 13
    (C) 20   (D) 27

27. If $(x + 6y) = 8$, and $xy = 2$, where $x > 0$, what is the value of $(x^3 16y^3)$?

(A) 288   (B) 224

(C) 368   (D) 476

28. If $(4x + 2y)^3 + (4x - 2y)^3 = 16(Ax^3 + Bxy^2)$, then what is the value of $\frac{1}{2}(\sqrt{A^2 + B^2})$?

(A) 3   (B) 5

(C) 8   (D) 7

29. If $a^3 + b^3 = 218$ and $a + b = 2$, then the value of $\sqrt{1 - ab}$ is:

(A) 4   (B) 3

(C) 5   (D) 6

30. If $9x^2 + y^2 = 37$ and $xy = 2$, x, y > 0, then the value of $(27x^3 + y^3)$ is:

(A) 256   (B) 301

(C) 207   (D) 217

31. If $x^2 + 4y^2 = 17$ and $xy = 2$, where x > 0, y > 0, then what is the value of $x^3 + 8y^3$?

(A) 85   (B) 65

(C) 76   (D) 95

32. If $(x + y)^3 + 8(x - y)^3 = (3x + Ay)(3x^2 + Bxy + Cy^2)$, then the value of A + B + C is:

(A) 3   (B) 2

(C) 4   (D) 0

33. If $a + b = 8, ab = 10$, then the value of $a^3 + b^3$ is:

(A) 111   (B) 272

(C) 215   (D) 312

Nature – V

1. If a - b = 18 and $a^3 - b^3 = 324$, then find ab.

(A) 105   (B) -102

(C) -104   (D) 103

2. If a - b = 4 and $a^3 - b^3 = 88$, then find the value of $a^2 - b^2$.

(A) 8√6   (B) 6√6

(C) 7√2   (D) 9√6

3. If $x = \sqrt[3]{5} + 2$, then the value of $x^3 - 6x^2 + 12x - 12$ is equal to:

(A) 0   (B) 2

(C) 1   (D) -1

4. Simplify the following expression.

$(2x - 3y)^3 - 18xy (2x - 3y)$

(A) $8x^3 - 72x^2y + 108xy^2 - 27y^3$

(B) $8x^3 - 27y^3$

(C) $8x^3 + 108xy^2 - 72x^2y$

(D) $8x^3 - 27y^3 - 36x^2y - 54xy^2$

5. Given that $(2x + y)^3 - (x + 2y)^3 = (x - y) [A(x^2 + y^2) + Bxy]$, the value of (2A - B) is:

(A) 1   (B) 7

(C) 0   (D) 6

6. If $x^2 + y^2 = 45$ and x - y = 5 then what is the value of $x^3 - y^3$?

(A) -25   (B) 250

(C) 150   (D) 275

7. If $x - y = \frac{7}{4}$ and $\frac{1}{x} - \frac{1}{y} = \frac{14}{3}$, then $x^3 - y^3$ is equal to:

(A) 433/32   (B) 433/64

(C) 217/64   (D) 217/32

8. If $(5\sqrt{5}x^3 - 3\sqrt{3}y^3) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$, then the value of $(3A + B - \sqrt{15}C)$ is:

(A) 8   (B) 5

(C) 3   (D) 12

9. If $(5\sqrt{5}x^3 - 3\sqrt{3}y^3) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$, then what is the value of $3A - B - \sqrt{15}C$?

(A) -5   (B) 12

(C) 8   (D) -3

10. If x - y = 4 and xy = 45, then the value of $x^3 - y^3$ is:

(A) 82   (B) 604

(C) 822   (D) 151

11. $(3a - 4b)^3$ is equal to:

(A) $9a^2 - 16b^2$

(B) $27a^3 - 64b^3$

(C) $27a^3 - 64b^3 - 108a^2b + 144ab^2$

(D) $9a^2 - 24ab + 16b^2$

12. The value of $27a^3 - 2\sqrt{2}b^3$ is equal to:

(A) $(3a - \sqrt{2}b)(9a^2 + 2b^2 + 3\sqrt{2}\,ab)$

(B) $(3a - \sqrt{2}b)(9a^2 + 2b^2 + 6\sqrt{2}\,ab)$

(C) $(3a - \sqrt{2}b)(9a^2 - 2b^2 + 6\sqrt{2}\,ab)$

(D) $(3a - \sqrt{2}b)(9a^2 - 2b^2 - 3\sqrt{2}\,ab)$

13. The coefficient of x in $(x - 3y)^3$ is:

(A) $3y^2$ (B) $27y^2$

(C) $-3y^2$ (D) $-27y^2$

14. If $1 - 64x^3 - 12x + px^2 = (1 - 4x)^3$ then the value of p is:

(A) -48   (B) 16

(C) 48   (D) -12

15. The coefficient of y in the expansion of $(2y - 5)^3$, is:

(A) -150   (B) 50

(C) 150   (D) -30

16. If $8(x + y)^3 - 27(x - y)^3 = (5y - x)(Ax^2 + By^2 + Cxy)$, then what is the value of (A + B - C) ?

(A) 16   (B) -26

(C) 36   (D) -16

17. If x - y = 11 and $\frac{1}{x} - \frac{1}{y} = \frac{11}{24}$ then the value of $x^3 - y^3 + x^2y^2$?

(A) 1115   (B) 1331

(C) 1105   (D) 1307

18. If $x^2 + 4y^2 = 53$ and x - 2y = 5, then what is the value of $x^3 - 8y^3$?

(A) -85   (B) 85

(C) 155   (D) 335

19. If $p - 2q = 3$ and $pq = 5$, then what is the value of $(p^3 - 8q^3)$?
    (A) 27
    (B) -63
    (C) 72
    (D) 117

20. What is the constant term in the expansion of $\left(5x^2 - \frac{1}{x}\right)^3$?
    (A) 5
    (B) 15
    (C) 75
    (D) -15

21. If $a^3 - b^3 = 2349$ and $(a - b) = 9$, then $(a + b)^2 - ab$ is equal to:
    (A) 280
    (B) 244
    (C) 261
    (D) 229

22. If $(56\sqrt{7}x^3 - 2\sqrt{2}y^3) \div (2\sqrt{7}x - \sqrt{2}y) = Ax^2 + By^2 - Cxy$, then find the value of $A + B - \sqrt{14}C$.
    (A) 19
    (B) 10
    (C) 58
    (D) 38

23. If $x - y = 4$ and $x^3 - y^3 = 316$, $y > 0$ then the value of $x^4 - y^4$ is:
    (A) 2320
    (B) 2500
    (C) 2482
    (D) 2401

24. What is the coefficient of x in the expansion of $(3x - 4)^3$?
    (A) -144
    (B) 144
    (C) -108
    (D) 108

25. If $8 + 2px^2 - 36x - 27x^3 = (2 - 3x)^3$, then what is the value of p?
    (A) 27
    (B) 9
    (C) -27
    (D) 54

26. If $(2x + y)^3 - (x - 2y)^3 = (x + 3y)[Ax^2 + By^2 + Cxy]$, then what is the value of $(A + 2B + C)$?
    (A) 7
    (B) 13
    (C) 14
    (D) 10

27. If $y = 2x + 1$, then what is the value of $(8x^3 - y^3 + 6xy)$?
    (A) 1
    (B) -1
    (C) -15
    (D) 15

28. What is the coefficient of x^2 in the expansion of $\left(5 - \frac{x^2}{3}\right)^3$
    (A) $-\frac{25}{3}$
    (B) -25
    (C) $-\frac{5}{3}$
    (D) 25

29. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$, then the value of $(A^2 + B^2 + C^2)$ is:
    (A) 11
    (B) 19
    (C) 16
    (D) 18

30. If $2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$, then the value of $\sqrt{(A^2 + B^2 + C^2)}$ is:
    (A) $\sqrt{19}$
    (B) $\sqrt{11}$
    (C) $\sqrt{17}$
    (D) $\sqrt{21}$

31. If $27(x + y)^3 - 8(x - y)^3 = (x + 5y)(Ax^2 + By^2 + Cxy)$, then what is the value of $(A + B - C)$?
    (A) 13
    (B) 16
    (C) 18
    (D) 11

32. If $2x - y = 2$ and $xy = \frac{3}{2}$, then what is the value of $x^3 - \frac{y^3}{8}$?
    (A) $\frac{9}{2}$
    (B) $-\frac{5}{4}$
    (C) $\frac{5}{2}$
    (D) $\frac{13}{4}$

33. If $27x^3 - 64y^3 = (Ax + By)(Cx^2 - Dy^2 + 12xy)$, then the value of $4A + B + 3C + 2D$ is:
    (A) 5
    (B) 3
    (C) -3
    (D) -4

Nature – VI

1. If $x + y + z = 19$, $x^2 + y^2 + z^2 = 133$ and $xz = y^2$, $x > z > 0$, what is the value of $(x - z)$?
    (A) -2
    (B) -5
    (C) 5
    (D) 0

2. If $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$, then the value of $(A^2 + B^2 - AB)$ is:
    (A) 18
    (B) 16
    (C) 6
    (D) 14

3. If $a^2 + b^2 + c^2 = 300$ and $ab + bc + ca = 50$ then what is the value of $a + b + c$? (Given that a, b and c are all positive)
    (A) 15
    (B) 22
    (C) 20
    (D) 25

4. Expand:
    $(4a + 3b + 2c)^2$
    (A) $16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca$
    (B) $16a^2 + 9b^2 + 4c^2 - 24ab - 12bc - 16ca$
    (C) $4a^2 + 3b + 2c^2 + 24ab + 12bc + 16ca$
    (D) $16a^2 - 9b^2 + 4c^2 - 24ab + 12bc - 16ca$

5. If $a^2 + b^2 + c^2 = 6.25$ and $(ab + bc + ca) = 0.52$, what is the value of $(a + b + c)$, if $(a + b + c) < 0$?
    (A) ±2.8
    (B) ±2.7
    (C) -2.7
    (D) -2.8

Nature – VII

1. The value of $[(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3] \div [(a - b)^3 + (b - c)^3 + (c - a)^3]$ is equal to:
    (A) $(a + b)(b + c)(c + a)$
    (B) $(a^2 + b^2)(b^2 + c^2)(c^2 + a^2)$
    (C) $(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$
    (D) $(a - b)(b - c)(c - a)$

2. If $a + b + c = 2$, $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$, $ac = \frac{4}{b}$ and $a^3 + b^3 + c^3 = 28$, find the value of $a^2 + b^2 + c^2$

(A) 8   (B) 6

(C) 10   (D) 12

3. If $x + y + z = 10$, $x^3 + y^3 + z^3 = 75$ and $xyz = 15xyz = 15$, then find the value of $x^2 + y^2 + z^2 - xy - yz - zx$

(A) 3   (B) 5

(C) 6   (D) 4

4. If $x = 255$, $y = 256$, $z = 257$, then find the value of $x^3 + y^3 + z^3 - 3xyz$

(A) 1378   (B) 2304

(C) 1876   (D) 1984

5. If $a = 355$, $b = 356$, $c = 357$, then find the value of $a^3 + b^3 + c^3 - 3abc$.

(A) 3206   (B) 3202

(C) 3204   (D) 3208

6. If $x^3 + 27 y^3 + 64 z^3 = 36xyz$, then the relationship between x, y and z is

(A) $x + 3y = 4z$ (B) $x + y + z = 0$

(C) $x - 3y + 4z = 0$ (D) $x + 3y + 4z = 0$

7. What is the value of $a^3 + b^3 + c^3 - 3abc$, when $a = 225$, $b = 226$, and $c = 227$?

(A) 2430   (B) 2304

(C) 2340   (D) 2034

8. If $x + y = 4$, $xy = 2$, $y + z = 5$, $yz = 3$, $z + x = 6$ and $zx = 4$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

(A) 151.75   (B) 152.75

(C) 153.75   (D) 150.75

9. If $(a + b + c) = 0$ and $(abc) = 12$, then what is the value of $(a^3 + b^3 + c^3)$?

(A) 6   (B) 12

(C) 72   (D) 36

10. If $a + b + c = 5$ and $a^3 + b^3 + c^3 - 3abc = 185$, then the value of $ab + bc + ac$ lies between:

(A) 5 and 9   (B) -3 and 1

(C) 1 and 5   (D) -7 and -3

11. If $x + y + z = 5$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$, $xyz = 12$, and $x^3 + y^3 + z^3 = 151$ then the value of $(x^2 + y^2 + z^2)$ is:

(A) 23   (B) 21

(C) 24   (D) 22

12. If $(7x + 3)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(7x + 3) \times (x - 2) \times (2x - 5)$ then the value of $5x + 3$ is:

(D) 2   (B) 10

(C) 6   (D) 8

13. If $x + y + z = 4$, $xy + yz + zx = 1$ and $x^3 + y^3 + z^3 = 34$, then what is the value of $2xyz$?

(A) 8   (B) -12

(C) -6   (D) 18

14. If $a^3 + b^3 + c^3 - 3abc = 250$ and $a + b + c = 10$, then what will be the value of $\frac{1}{5}(ab + bc + ca)$?

(A) 5   (B) 25

(C) 15   (D) 10

15. If $x + y + z = 3$, $x^2 + y^2 + z^2 = 45$ and $x^3 + y^3 + z^3 = 69$, then what is the value of xyz?

(A) 30   (B) 40

(C) -30   (D) -40

16. If $x + y + z = 19$, $xyz = 216$ and $xy + yz + zx = 114$, then the value of $x^3 + y^3 + z^3 + xyz$ is:

(A) 1225   (B) 1441

(C) 577   (D) 361

17. If $x + y + z = 17$, $xyz = 171$ and $xy + yz + zx = 111$, then the value of $\sqrt[3]{(x^3 + y^3 + z^3 + xyz)}$ is:

(A) 0   (B) -4

(C) 4   (D) -64

18. If $x + y + z = 13$, $x^2 + y^2 + z^2 = 133$ and $x^3 + y^3 + z^3 = 847$, then the value of $\sqrt[3]{xyz}$ is:

(A) -9   (B) -6

(C) 7   (D) 8

19. If $x + y + z = 19$, $xyz = 216$ and $xy + yz + zx = 114$, then the value of $\sqrt{x^3 + y^3 + z^3 + xyz}$ is:

(A) 32   (B) 28

(C) 30   (D) 35

20. If $a + b + c = 0$, then the value of $\frac{a^3 + b^3 + c^3}{abc}$ is:

(A) 1   (B) 0

(C) -1   (D) 3

21. If $a + b + c = 11$, $ab + bc + ca = 3$ and $abc = -135$, then what is the value of $a^3 + b^3 + c^3$?

(A) 929   (B) 925

(C) 827   (D) 823

22. If $a + b + c = 7$ and $ab + bc + ca = -6$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

(A) 469   (B) 472

(C) 463   (D) 479

23. If $x + y + z = 3$, and $x^2 + y^2 + z^2 = 101$, then what is the value of $\sqrt{x^3 + y^3 + z^3 - 3xyz}$?

(A) 24   (B) 21

(C) 19   (D) 28

24. If $a + b + c = 9$ and $ab + bc + ca = -22$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

(A) 783   (B) 487

(C) 1323   (D) 1571

25. If $x + y + z = 10$ and $xy + yz + zx = 15$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

(A) 550   (B) 525

(C) 575   (D) 660

26. Find the product of $(a + b + 2c)$ $(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$.

(A) $a^3 + b^3 + 8c^3 - abc$

(B) $a^3 + b^3 + 8c^3 - 6abc$

(C) $a^3 + b^3 + 8c^3 - 2abc$

(D) $a^3 + b^3 + 6c^3 - 6abc$

27. If $x + 3y + 2 = 0$ then value of $x^3 + 27y^3 + 8 - 18xy$ is:
(A) 1   (B) -2
(C) 0   (D) 2

28. $x + y + z = 2$ and $xy + yz + zx = -11$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is:
(A) 71   (B) 74
(C) 69   (D) 78

29. If $x + y + z = 7$, $x^2 + y^2 + z^2 = 85$ and $x^3 + y^3 + z^3 = 913$, then the value of $\sqrt[3]{xyz}$ is
(A) 1   (B) 2
(C) 4   (D) 8

30. If $x + y + z = 1$, $xy + yz + zx = xyz = -4$, then what is the value of $(x^3 + y^3 + z^3)$?
(A) 8   (B) 1
(C) -1   (D) -8

31. If $x + y + z = 3$, $xy + yz + zx = -12$ and $xyz = -16$, then the value of $\sqrt{x^3 + y^3 + z^3 + 13}$ is:
(A) 10   (B) 11
(C) 8   (D) 9

32. If $(x + 6)^3 + (2x + 3)^3 + (3x + 5)^3 = (3x + 18)(2x + 3)(3x + 5)$, then what is the value of x ?
(A) $\frac{5}{3}$ (B) $-\frac{5}{3}$
(C) $-\frac{7}{3}$ (D) $\frac{7}{3}$

33. If $x + y + z = 2$, $x^3 + y^3 + z^3 - 3xyz = 74$, then $(x^2 + y^2 + z^2)$ is equal to:
(A) 22   (B) 29
(C) 24   (D) 26

34. If $2x + 3y + 1 = 0$, then what is the value of $(8x^3 + 8 + 27y^3 - 18xy)$?
(A) -7   (B) -9
(C) 7   (D) 9

35. If $x + y + z = 11$, $xy + yz + zx = -6$, and $x^3 + y^3 + z^3 = 1604$, then the value of xyz is:
(A) 5   (B) 4
(C) 1   (D) 25

36. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 32$, and $a^3 + b^3 + c^3 = 189$, then the value of $abc - 3$ is:
(A) 2   (B) 3
(C) 1   (D) 0

37. If $x + y + z = 18$, $xyz = 81$ and $xy + yz + zx = 90$, then the value of $x^3 + y^3 + z^3 + xyz$ is :
(A) 1321   (B) 1250
(C) 1225   (D) 1296

38. If $x + y + z = 18$, $xyz = 81$ and $xy + yz + zx = 90$, then find the value of $\sqrt[4]{x^3 + y^3 + z^3 + xyz}$.
(A) 6   (B) 9
(C) 10   (D) 12

39. If $x + y + z = 2$, $xy + yz + zx = -11$, and $xyz = -12$, then what is the value of $x^3 + y^3 + z^3$?
(A) 38   (B) 36
(C) 42   (D) 40

40. If $x + y + z = 7$, $xy + yz + zx = 8$, then what is the value of $x^3 + y^3 + z^3 - 3xyz$?
(A) 175   (B) 150
(C) 125   (D) 200

41. If $a + b + c = 6$, $a^3 + b^3 + c^3 - 3abc = 342$, and $a^2 + b^2 + c^2 = 50$, then what is the value of $ab + bc + ca$?
(A) 5   (B) - 5
(C) - 7   (D) 8

42. If $a + b + c = 7$ and $a^3 + b^3 + c^3 - 3abc = 175$, then what is the value of $(ab + bc + ca)$?
(A) 8   (B) 7
(C) 6   (D) 9

43. If $a + b + c = 1$, $ab + bc + ca = -22$ and $abc = -40$, then what is the value of $a^3 + b^3 + c^3$?
(A) 27   (B) 67
(C) −51   (D) −53

44. If $x = 32.5$, $y = 34.6$ and $z = 30.9$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is 0.98k, where k is equal to:
(A) 1033   (B) 933
(C) 1026   (D) 921

TYPE – XII

1. The value of :
$\left(a^{\frac{2}{3}} + 2a^{\frac{1}{2}} + 3a^{\frac{1}{3}} + 2a^{\frac{1}{6}} + 1\right)\left(a^{\frac{1}{3}} - 2a^{\frac{1}{6}} + 1\right) - a^{\frac{1}{2}}\left(a^{\frac{1}{2}} - 2\right)$
(A) 0   (B) $\sqrt{7}$
(C) 7   (D) 1

2. If $a + b + c = 0$, then $\left(\frac{2a^2}{3bc} + \frac{2b^2}{3ca} + \frac{2c^2}{3ab}\right)$ is equal to:
(A) 3   (B) 4
(C) 1   (D) 2

3. If $x - y - z = 0$, then the value of $(x^2 + y^2 + z^2) \div (y^2 + xz)$ is:
(A) 2   (B) 1
(C) -2   (D) -1

4. The expression $(a + b - c)^3 + (a - b + c)^3 - 8a^3$ is equal to:
(A) $3a(a + b - c)(a - b + c)$
(B) $6a(a + b - c)(a - b + c)$
(C) $6a(a - b + c)(c - a - b)$
(D) $3a(a - b + c)(c - a - b)$

5. If $a^2 + b^2 - c^2 = 0$, then the value of $\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$ is:
(A) 1   (B) 0

(C) 3   (D) 2

6. If $\frac{x}{y} + \frac{y}{x} = 2(x, y \neq 0)$, then the value of $(x - y)$ is:
(A) -2   (B) 1
(C) 2   (D) 0

7. If $x + y + 3 = 0$, then find the value of $x^3 + y^3 - 9x + 9$
(A) −18   (B) −36
(C) 18   (D) 36

8. If $x - y + z = 0$, then find the value of $\frac{y^2}{2xz} - \frac{x^2}{2yz} - \frac{z^2}{2xy}$.
(A) $\frac{3}{2}$ (B) $\frac{1}{2}$
(C) -6   (D) $-\frac{3}{2}$

TYPE – XIII

1. If $kx^3 + 4x^2 + 3x - 4$ and $x^3 - 4x + k$ leave the same remainder when divided by $(x - 3)$, then the value of k is:
(A) 0   (B) -1
(C) 1   (D) 2

2. If $x^3 - 6x^2 + ax + b$ is divisible by $(x^2 - 3x + 2)$, then the values of a and b are:
(A) a = -6 and b = -11   (B) a = -11 and b = 6
(C) a= 11 and b = -6   (D) a = 6 and b = 11

3. Find the factors of the expression $3x^2 - 5x - 8$.
(A) $(x + 1)$ and $(3x + 8)$
(B) $(x + 1)$ and $(3x - 8)$
(C) $(x - 1)$ and $(3x + 8)$
(D) $(x - 1)$ and $(3x - 8)$

4. If $2x^3 + ax^2 + bx - 2$ leaves the remainders 7 and 0 when divided by $(2x - 3)$ and $(x + 2)$, respectively, then the values of a and b are respectively.
(A) 3 ; -3   (B) -2 ; 2
(C) -3 ; 3   (D) 2 ; -2

5. Find the values of x for the given equation $3x^2 + 5x - 2 = 0$
(A) −3 and −2   (B) 2 and −3
(C) 3 and −1/2   (D) −2 and 1/3

6. The factors of the expression $2x^2 - 5x - 12$ are:
(A) $(x - 4)$ and $(2x - 3)$
(B) $(x + 4)$ and $(2x - 3)$
(C) $(x + 4)$ and $(2x + 3)$
(D) $(x - 4)$ and $(2x + 3)$

7. If $x = 2 + \sqrt{3}$, then find the value of $x^4 - 8x^3 + 16x^2$
(A) 1   (B) -1
(C) 2   (D) 0

8. $2x - 3y$ is a factor of:
(A) $4x^2 + 9y^2 - 12xy$ (B) $4x^2 + 9y^2 + 12xy$
(C) $8x^3 + 27y^3$ (D) $4x^2 + 36y^2 + 12xy$

9. $(ax + by)$ is a factor of:
(A) $a^2x^2 + 2ab + b^2y^2$ (B) $a^2x^2 + 2ab + b^2y^2x$
(C) $a^2x^2 + 2abxy + b^2y^2$ (D) $a^2x^2 + 2ab - b^2y^2$

10. If α and β are two roots of the quadratic equation $ax^2 - bx + c = 0$ where a, b, c are constants and $a \neq 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is
(A) c/b   (B) c/a
(C) −b/c   (D) b/c

11. If $x^3 + 2x^2 - ax - b$ is exactly divisible by $(x^2 - 1)$, then the values of a and b are:
(A) a = -1 and b = 2   (B) a = 1 and b = -2
(C) a = 1 and b = 2   (D) a = 2 and b = 2

12. Using algebraic identities, simplify the following expression. $\frac{(x^4+x^2+1)}{(x^2+x+1)}$
(A) $(x^2 - x + 1)$ (B) $(x^2 + x + 1)$
(C) $(x^2 - 2x + 1)$ (D) $(x^2 + 2x + 1)$

13. If $a - \frac{12}{a} = 1$, where a > 0, then the value of $a^2 + \frac{16}{a^2}$ is:
(A) 15   (B) 19
(C) 17   (D) 11

TYPE – XIV

1. If $a + b + c + d = 2$, then the maximum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is _____.
(A) $\frac{91}{9}$ (B) $\frac{81}{16}$
(C) $\frac{63}{22}$ (D) $\frac{54}{13}$

2. If $2x + (9/x) = 9$, then what is the minimum value of $x^2 + (1/x^2)$?
(A) 95/36   (B) 97/36
(C) 86/25   (D) 623/27

TYPE – XV

1. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is:
(A) 4   (B) 0
(C) 2   (D) -2

2. If $A = \frac{1+2x}{1-2x}$ and $B = \frac{1-2x}{1+2x}$, then the value of $\frac{A+B}{A-B}$ is:
(A) $x + \frac{1}{4x}$ (B) $x - \frac{1}{4x}$
(C) $\frac{1}{4x} - x$ (D) $x^2 + \frac{1}{4x^2}$

3. If $a = \frac{2+\sqrt{3}}{2-\sqrt{3}}$ and $b = \frac{2-\sqrt{3}}{2+\sqrt{3}}$, then the value of $a^2 + b^2 + ab$ is:
   (A) 195
   (B) 185
   (C) 196
   (D) 186

4. If $a^2 + b^2 = 25$, $x^2 + y^2 = 17$ and $ax + by = 8$, then what is the value of $(ay - bx)$?
   (A) 25
   (B) 33
   (C) 19
   (D) 21

5. If $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = (Ax + 2)(Bx + C)$. then what is the value of $(A + B + C)?(A>0)$
   (A) 4
   (B) $4 + \sqrt{3}$
   (C) $4 - \sqrt{3}$
   (D) $2\sqrt{3}$

6. If $x^{2a} = y^{2b} = z^{2c} \neq 0$ and $x^2 = yz$, then the value of $\frac{ab+bc+ca}{bc}$ is:
   (A) 3ac
   (B) 3ab
   (C) 3bc
   (D) 3

TYPE – XVI

1. The difference between two numbers is 43 and their product is 50. Find the sum of their squares.
   (A) 1947
   (B) 1949
   (C) 1946
   (D) 1948

2. The sum of two numbers is 59 and their product is 840. Find the sum of their squares.
   (A) 2961
   (B) 1801
   (C) 1875
   (D) 1754

3. If the sum of two numbers is 11 and the sum of their squares is 65, then the sum of their cubes will be:
   (A) 407
   (B) 576
   (C) 615
   (D) 355

4. The area of a rectangle is $a^2 - b^2$ and its length is $a + b$, what will be its breadth?

(A) 2ab
(B) a + b
(C) ab
(D) a – b

5. If a and b are two positive real numbers such that $a + b = 20$ and $ab = 4$, then the value of $a^3 + b^3$ is:
   (A) 7760
   (B) 240
   (C) 8000
   (D) 8240

6. If $a + b = 27$ and $a^3 + b^3 = 5427$, then find ab
   (A) 149
   (B) 135
   (C) 176
   (D) 143

7. The sum of two numbers is 47 and their product is 550. Find the sum of their squares.
   (A) 986
   (B) 876
   (C) 1109
   (D) 1209

8. The difference between two number is 3 and the difference between their cubes is 999. Find the difference between their squares.
   (A) 63
   (B) 36
   (C) 81
   (D) 18

9. The area of a square park is $16x^2 + 8x + 1$. What is the length of the park?
   (A) $(4x + 1)$ units
   (B) $(4x - 1)$ units
   (C) $(4x + 1)^2$ units
   (D) 4x units

10. If the difference between two numbers is 5 and the difference between their cubes is 1850, then the difference between their squares is:
    (A) $5\sqrt{484}$
    (B) $5\sqrt{482}$
    (C) $5\sqrt{485}$
    (D) $5\sqrt{483}$

11. The sum of two numbers is 59 and their product is 1150. Find the sum of their squares.
    (A) 1183
    (B) 1178
    (C) 1176
    (D) 1181

Solution

TYPE – I

1. **Answer: (B)**
   Given
   $x - 4y = 0$ ---- (i)
   $4x + 3y = 19$ ---- (ii)
   Multiplying equation 1 by 4, we get
   $4x - 16y = 0$
   $4x + 3y = 19$
   on subtraction,
   $-19y = -19$
   $\Rightarrow y = 1$
   Putting $y = 1$ in equation 1,
   $\Rightarrow 4x - 16 = 0$
   $\Rightarrow x = 4$
   Hence $x = a = 4$, $y = b = 1$ i.e. (4, 1)
   $\therefore ab/(a + 4b) = (4 \times 1)/(4 + 4 \times 1) = 4/8 = \frac{1}{2}$

2. **Answer: (A)**
   $4x + 5y - 6 = 0$ & $16x + 20y + 20 = 0$
   If so many solutions are possible $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
   If then no solution is possible $a_1/a_2 = b_1/b_2 \neq c_1/c_2$
   $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$
   when compared to

$\Rightarrow a_1 = 4$, $b_1 = 5$, $c_1 = -6$ and $a_2 = 16$, $b_2 = 20$, $c_2 = 20$

$\Rightarrow 4/16 = 5/20 \neq (-6)/20$

Hence no solution is possible.

3. Answer: (C)

Given

$\Rightarrow 3x - 8y = 16$ ----(1)

$\Rightarrow 2x + 4y = 6$

$\Rightarrow 4x + 8y = 12$ ----(2)

Adding equation (1) and (2), we get

$\Rightarrow 7x = 28$

$\Rightarrow x = 4$

Now,

$\Rightarrow 3(4) - 8y = 16$

$\Rightarrow 12 - 16 = 8y$

$\Rightarrow y = -1/2$

$\Rightarrow (a, b) = (4, -1/2)$

Therefore,

$\therefore a^2 - 4b^2 = (4)^2 - 4(-1/2)^2 = 16 - 1 = 15$

4. Answer: (D)

$x - y - \sqrt{18} = -1$

$x + y - 3\sqrt{2} = 1$

$x - y = \sqrt{18} - 1$ ....(i)

$x + y = 1 + 3\sqrt{2}$ ... (ii)

Therefore,

$(x^2 - y^2) = 17$

From equation I and II,

$x = \sqrt{18}$

$y = 1$

Therefore,

$12xy(x^2 - y^2) = 12 \times \sqrt{18} \times 1(17)$

$= 612\sqrt{2}$

5. Answer: (C)

$\Rightarrow (x/y + 1)^2 = (x^2/y^2) + 1 + 2x/y$

$\Rightarrow 16 = (x/y)^2 + 1 + 2 \times 3$

$\Rightarrow (x/y)^2 + 1 = 10$

$\therefore (x^2 + y^2)/y^2 = 10$

6. Answer: (B)

$x + y = 8$ ---(1)

$y + z = 13$ ---(2)

$z + x = 17$ ---(3)

From equation (1) $y = 8 - x$

Substitute $y = 8 - x$ in equation (2)

$8 - x + z = 13$

$z - x = 13 - 8$

$z - x = 5$ ---(4)

From equation (3) and equation (4)

$z = 11$ and $x = 6$

put $x = 6$ in equation (2) $y + 11 = 13$

$y = 2$

Now,

x^2/yz

$\Rightarrow (6 \times 6)/(2 \times 11)$

$\Rightarrow 18/11$

7. Answer: (B)

Given, $x + y = 13$, $y + z = 15$ and $z + x = 16$

On adding all the given equations,

$2(x + y + z) = 44$

$\Rightarrow x + y + z = 22$

so,

$x = 22 - 15 = 7$

$y = 22 - 16 = 6$

And,

$z = 22 - 13 = 9$

Now,

$(xy + yz)/xyz$

$\Rightarrow (y + z)/yz$

$\Rightarrow 15/(6 \times 9)$

$\Rightarrow 5/18$

TYPE – II

1. Answer: (B)

$x = 1 + \sqrt{2}$

$\Rightarrow 1/x = 1/(1 + \sqrt{2})$

$\Rightarrow 1/x = (\sqrt{2} - 1)/(\sqrt{2} + 1) \times (\sqrt{2} - 1)$

$\Rightarrow 1/x = (\sqrt{2} - 1)$

Now,

$x + 1/x = \sqrt{2} + 1 + \sqrt{2} - 1$

$\Rightarrow (\sqrt{x} + 1/\sqrt{x})^2 - 2 = 2\sqrt{2}$

$\Rightarrow (\sqrt{x} + 1/\sqrt{x})^2 = 2 + 2\sqrt{2}$

$\Rightarrow (\sqrt{x} + 1/\sqrt{x}) = \sqrt{4.8284}$ $[\sqrt{2} = 1.414]$

$\Rightarrow (\sqrt{x} + 1/\sqrt{x}) = 2.1973$

$\therefore (\sqrt{x} + 1/\sqrt{x}) = 2.1973$

2. Answer: (D)

$5x/(x^2 + 1 - 6x)$

$= 5/(x + 1/x - 6)$

$= 5/(8 - 6)$

$= 5/2$

$= 2.5$

3. Answer: (C)

$x + (1/x) = 4$

On squaring both sides,

$\Rightarrow [x + (1/x)]^2 = 4^2$

$\Rightarrow x^2 + (1/x)^2 + 2 = 16$

$\Rightarrow x^2 + (1/x)^2 = 14$

On squaring both sides,

$\Rightarrow [x^2 + (1/x)^2]^2 = 14^2$

$\Rightarrow x^4 + (1/x^4) + 2 = 196$

$\Rightarrow x^4 + (1/x^4) = 194$

4. Answer: (D)

$x - (1/x) = 8$

On squaring both the sides,

$x^2 + (1/x)^2 - 2 = 64$

$\Rightarrow x^2 + (1/x)^2 = 66$

Now on squaring both the sides again,

$\Rightarrow x^4 + (1/x)^4 + 2 = 66^2$

$\Rightarrow x^4 + (1/x)^4 = 4356 - 2 = 4354$

5. **Answer: (A)**

$\because a^2 + (2/a^2) = 16$

$\Rightarrow (a^4 + 2)/a^2 = 16$

$\Rightarrow a^4 + 2 = 16a^2 \quad \text{------(1)}$

Now, on substituting the value of equation (1) in the given question, we get

$= 72a^2/(16a^2 + 8a^2)$

$= 72a^2/(24a^2)$

$= 3$

6. **Answer: (B)**

$\left(x + \dfrac{1}{x}\right)^2 = x^2 + \dfrac{1}{x^2} + 2 \times x \times \dfrac{1}{x}$

$\Rightarrow 16 = x^2 + \dfrac{1}{x^2} + 2$

$\Rightarrow x^2 + \dfrac{1}{x^2} = 14 \ldots\ldots\ldots (1)$

On squaring both sides of equation 1

$\Rightarrow \left(x^2 + \dfrac{1}{x^2}\right)^2 = x^4 + \dfrac{1}{x^4} + 2 \times x^2 \times \dfrac{1}{x^2}$

$\Rightarrow 16 = x^2 + \dfrac{1}{x^2} + 2$

$\Rightarrow x^4 + \dfrac{1}{x^4} = 194$

7. **Answer: (D)**

$p + 1/p = 112$

So, $(p - 112) + 1/p = 0$

We know that, $(p - 112) = 0$ and $1/p = 0$

$\Rightarrow$ so, $(p - 112)^{15} + 1/p^{15} = 0$

8. **Answer: (D)**

to know, $x^2 - 4$

$x + \dfrac{4}{x} - 4 = 0$

Multiplying both sides by x

$\Rightarrow x^2 + 4 - 4x = 0$

$\Rightarrow x^2 - 2x - 2x + 4 = 0$

$\Rightarrow x(x - 2) - 2(x - 2) = 0$

$\Rightarrow (x - 2)(x - 2) = 0$

$\therefore x = 2$

Now,

$\Rightarrow x^2 - 4 = 2^2 - 4 = 0$

9. **Answer: (A)**

$X = 3 + 2\sqrt{2}$

on squaring both sides

$X^2 = (3 + 2\sqrt{2})^2$

$X^2 = 3^2 + 2 \times 3 \times 2\sqrt{2} + (2\sqrt{2})^2$

$X^2 = 9 + 12\sqrt{2} + 8$

$X^2 = 17 + 12\sqrt{2} \quad \text{----1}$

Now,

$x^2 + \dfrac{1}{x^2} = 17 + 12\sqrt{2} + \dfrac{1}{17 + 12\sqrt{2}}$

by rationalization method

$\Rightarrow 17 + 12\sqrt{2} + \dfrac{1}{17 + 12\sqrt{2}} \times \dfrac{17 - 12\sqrt{2}}{17 - 12\sqrt{2}}$

$(a^2 - b^2)$ use the $= (a - b)(a + b)$

$\Rightarrow 17 + 12\sqrt{2} + \dfrac{17 - 12\sqrt{2}}{17^2 - (12\sqrt{2})^2}$

$\Rightarrow 17 + 12\sqrt{2} + \dfrac{17 - 12\sqrt{2}}{289 - 288}$

$\Rightarrow 17 + 12\sqrt{2} + 17 - 12\sqrt{2}$

$\Rightarrow 34 \therefore x^2 + \dfrac{1}{x^2} = 34$

10. **Answer: (C)**

$x + \dfrac{1}{x} = 5 \text{ ----------- (i)}$

$\dfrac{x^4 + \dfrac{1}{x^2}}{x^2 - 3x + 1}$

$\Rightarrow \dfrac{x\left(x^3 + \dfrac{1}{x^3}\right)}{x\left(x + \dfrac{1}{x} - 3\right)} \text{ ----- (ii)}$

but,

$\Rightarrow x^3 + \dfrac{1}{x^3} = 125 - 3 \times 5$

$\Rightarrow x^3 + \dfrac{1}{x^3} = 110 \text{ ----- (iii)}$

Substituting values from 1 and 3 in equation 2, we get

$\Rightarrow 110/(5 - 3)$

$\Rightarrow 55$

Therefore,

$\dfrac{x^4 + \dfrac{1}{x^2}}{x^2 - 3x + 1}$ The value of is 55.

11. **Answer: (A)**

$x + 1/x = 5$

$\Rightarrow$ So, $x^2 + 1/x^2 = 5^2 - 2 = 23$

$\therefore$ The value of $x^2 + 1/x^2$ is 23

12. **Answer: (B)**

$x^3 + 1/x^3 = (6\sqrt{3})^3 - 3 \times 6\sqrt{3}$

$\Rightarrow 648\sqrt{3} - 18\sqrt{3} = 630\sqrt{3}$

$\therefore$ Required $= 630\sqrt{3}$

13. **Answer: (A)**

$x^2 + 1/x^2 = 3^2 - 2 = 7$

$x^4 + 1/x^4 = 7^2 - 2 = 47$

$x^8 + 1/x^8 = (47)^2 - 2 = 2207$

$2\left(x^8 + \dfrac{1}{x^8}\right) - 5\left(x^2 + \dfrac{1}{x^2}\right) = 2 \times 2207 - 5 \times 7$

$\therefore$ Desired Value $= 4379$

14. **Answer: (D)**

$(x + 1/x)^2 = (x^2 + 1/x^2 + 2)$

$\Rightarrow x^2 + 1/x^2 = 49 - 2 = 47$

So, $(x^3 + 1/x^3) = (x + 1/x)(x^2 - 1 + 1/x^2)$

$= 7 \times (47 - 1) = 322$

$\therefore (x^3 + 1/x^3) = 322$

15. **Answer: (A)**

$(x^2 + 1) \div \left[x^4 + \left(\frac{1}{x^2}\right)\right]$

Dividing by x we get,

$\Rightarrow (x^2 + 1)/x \div [x^4 + (1/x^2)/x]$

$\Rightarrow (x + 1/x)/(x^3 + 1/x^3)$......(1)

If $(x + 1/x) = \sqrt{7}$

Then,

$(x^3 + 1/x^3) = [(\sqrt{7})^3 - 3\sqrt{7}]$

Substituting the value of x + 1/x in equation (1), we get,

$\Rightarrow (\sqrt{7})/(7\sqrt{7} - 3\sqrt{7})$

$\Rightarrow \sqrt{7}/4\sqrt{7}$

$\Rightarrow 1/4$

∴ The required value is 1/4.

16. **Answer: (A)**

$(a + b)^2 = a^2 + b^2 + 2ab$

$p^2 = (a^2 + b^2) + 2q$

$(a^2 + b^2) = p^2 - 2q$

So,

$(a^4 + b^4) = (a^2 + b^2)^2 - 2a^2b^2$

$= (p^2 - 2q)^2 - 2q^2$

$= p^4 - 4p^2q + 2q^2$

∴ $(a^4 + b^4) = p^4 - 4p^2q + 2q^2$

17. **Answer: (A)**

$(x + 1/x)^2 = x^2 + 1/x^2 + 2$

∴ $(x^2 + 1/x^2) = 9 - 2 = 7$

18. **Answer: (D)**

$\sqrt{x} + \dfrac{1}{\sqrt{x}} = \sqrt{6}$

$\Rightarrow (\sqrt{x} + 1/\sqrt{x})^2 = 6$

$\Rightarrow x + 1/x + 2 = 6$

$\Rightarrow (x + 1/x) = 4$

$\Rightarrow x^2 + 1/x^2 = 4^2 - 2 = 14$

$\Rightarrow (x^2 + 1/x^2)^3 = x^6 + 1/x^6 + 3(x^2 + 1/x^2)$

∴ $(x^6 + 1/x^6) = 2702$

19. **Answer: (B)**

$(x^2 + 4/x^2) = (x - 2/x)^2 + 4 = 4^2 + 4 = 20$

20. **Answer: (C)**

$x^2 - 5x + 1 = 0$

$\Rightarrow x(x - 5 + 1/x) = 0$

$\Rightarrow (x - 5 + 1/x) = 0$

$\Rightarrow (x + 1/x) = 5$

Cube both sides,

$\Rightarrow (x + 1/x)^3 = (5)^3$

$\Rightarrow x^3 + 1/x^3 + 3(x)(1/x)(x + 1/x) = 125$

$\Rightarrow x^3 + 1/x^3 + 3(5) = 125$

$\Rightarrow x^3 + 1/x^3 + 15 = 125$

$\Rightarrow x^3 + 1/x^3 = 125 - 15$

$\Rightarrow x^3 + 1/x^3 = 110$

$(x^4 + 1/x^2)/(x^2 + 1)$

Dividing numerator and denominator by x,

$(1/x)(x^4 + 1/x^2)/(x^2 + 1)(1/x)$

$\Rightarrow (x^3 + 1/x^3)/(x + 1/x)$

$\Rightarrow 110/5$

$\Rightarrow 22$

∴ The value of $\left(x^4 + \frac{1}{x^2}\right) \div (x^2 + 1)$ is 22.

21. **Answer: (C)**

$x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow x + 1/x = 3$

$\Rightarrow x^3 + 1/x^3 = (x + 1/x)^3 - 3(x + 1/x)$

$\Rightarrow x^3 + 1/x^3 = 27 - 9$

$\Rightarrow x^3 + 1/x^3 = 18$

Required value = $(x^4 + 1/x^2) \div (x^2 + 1)$

$\Rightarrow x(x^3 + 1/x^3) \div x(x + 1/x)$

$\Rightarrow (x^3 + 1/x^3) \div (x + 1/x)$

$\Rightarrow 18 \div 3 = 6$

∴ the correct answer is 6

22. **Answer: (B)**

$x^2 + 3x + 1 = 0,$

divided by x

$x + 3 + 1/x = 0$

$\Rightarrow x + 1/x = (-3)$

as we know,

$(x + 1/x)^2 = (-3)^2$

$\Rightarrow x^2 + 1/x^2 + 2 = 9$

$\Rightarrow x^2 + 1/x^2 = 9 - 2$

$\Rightarrow x^2 + 1/x^2 = 7$

Then as we know,

$(x^2 + 1/x^2)^3 = 7^3$

$\Rightarrow x^6 + 1/x^6 + 3(x^2 + 1/x^2) = 343$

$\Rightarrow x^6 + 1/x^6 + 3 \times 7 = 343$

$\Rightarrow x^6 + 1/x^6 = 343 - 21$

$\Rightarrow x^6 + 1/x^6 = 322$

23. **Answer: (B)**

as we know,

If x + 1/x = a, then

$\Rightarrow x^5 + 1/x^5 = (a^2 - 2)(a^3 - 3a) - a$

If x + 1/x = 2√5,

$\Rightarrow x^5 + a/x^5 = [(2\sqrt{5})^2 - 2][(2\sqrt{5})^3 - 3 \times 2\sqrt{5}] - 2\sqrt{5}$

$\Rightarrow x^5 + a/x^5 = (20 - 2)(40\sqrt{5} - 6\sqrt{5}) - 2\sqrt{5} = 18 \times 34\sqrt{5} - 2\sqrt{5} = 610\sqrt{5}$

24. **Answer: (C)**

a + 1/a = 5

As we all know,

$a^3 + 1/a^3 = (a + b)^3 - 3(a + b)$

$\Rightarrow a^3 + 1/a^3 = 5^3 - 3 \times 5 = 125 - 15 = 110$

25. **Answer: (C)**

$\left[x + \dfrac{1}{x} = 4\right]$

x + 1/x = 4

On squaring and cubing both sides,

$\Rightarrow x^2 + 1/x^2 = 16 - 2 \times 1 = 14$ (1)

$\Rightarrow x^3 + 1/x^3 = 64 - 3 \times 4 = 52$ (2)

(1) × (2)

$(x^2 + 1/x^2) \times (x^3 + 1/x^3) = 14 \times 52 = 728$

$\Rightarrow x^5 + 1/x + x + 1/x^5 = 728$

$\Rightarrow x^5 + 1/x^5 = 728 - 4$

$\because \left[x + \frac{1}{x} = 4 \right]$

$\therefore x^5 + 1/x^5 = 724$

26. **Answer: (C)**

$x^2 - \sqrt{11}x + 1 = 0 \, x^2 - \sqrt{11}x + 1 = 0$

$\Rightarrow x^2 + 1 = \sqrt{11}x$

$\Rightarrow x + 1/x = \sqrt{11}$

$(x + 1/x)^3 = x^3 + 1/x^3 + 3(x + 1/x)$

$\Rightarrow (\sqrt{11})^3 = x^3 + 1/x^3 + 3(\sqrt{11})$

$\Rightarrow (x^3 + x^{-3}) = 11\sqrt{11} - 3\sqrt{11}$

$\Rightarrow (x^3 + x^{-3}) = 8\sqrt{11}$

$\therefore$ Required value is $8\sqrt{11}$

27. **Answer: (B)**

dividing by x^4

$\Rightarrow x^8 - 433x^4 + 16 = 0$

$\Rightarrow (x^8 - 433x^4 + 16)/x^4 = 0$

Now, adding 8 to both sides

$\Rightarrow x^4 + 16/x^4 + 8 = 433 + 8$

$\Rightarrow (x^2 + 4/x^2)^2 = (441)$

$\Rightarrow (x^2 + 4/x^2) = \sqrt{441}$

$\Rightarrow (x^2 + 4/x^2) = 21$

Now, adding 4 to both sides

$\Rightarrow (x^2 + 4/x^2) + 4 = 21 + 4$

$\Rightarrow (x + 2/x)^2 = 25$

$\Rightarrow (x + 2/x) = \sqrt{25}$

$\Rightarrow (x + 2/x) = 5$

$\therefore$ Required value is 5.

28. **Answer: (B)**

Let the value be k.

$x^2 - 5\sqrt{2}x + 1 = 0$

$\Rightarrow x^2 + 1 = 5\sqrt{2}x$

Dividing the number by x, we get

$\Rightarrow (x^2 + 1)/x = (5\sqrt{2}x)/x$

$\Rightarrow x + 1/x = 5\sqrt{2}$

Now,

On squaring both the sides, we get

$\Rightarrow (x + 1/x)^2 = 50$

We know $(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow (x)^2 + (1/x)^2 + (2 \times x \times 1/x) = 50$

$\Rightarrow x^2 + 1/x^2 + 2 = 50$

$\Rightarrow x^2 + 1/x^2 = 50 - 2$

$\Rightarrow x^2 + 1/x^2 = 48$

Now,

$(x^3 + 1x)x^2 + 1(x^3 + 1x)x^2 + 1$

Further dividing the given equation by x, we get

$\Rightarrow (x^2 + 1/x^2)/(x + 1/x)$

$\Rightarrow (48/5\sqrt{2})$

Multiplying the conjugate of $\sqrt{2}$ by numerator and denominator, we get

$\Rightarrow (48/5\sqrt{2} \times \sqrt{2}/\sqrt{2})$

$\Rightarrow (48\sqrt{2}/5 \times 2)$

$\Rightarrow 24\sqrt{2}/5$

$\therefore$ Required value is $(24\sqrt{2})/5$.

29. **Answer: (B)**

$x + \frac{1}{x} = 2\sqrt{5}$

Cubing both sides, we get

$\Rightarrow (x + 1/x)^3 = (2\sqrt{5})^3$

$\Rightarrow x^3 + 1/x^3 + 3 \times x \times 1/x (2\sqrt{5}) = 40\sqrt{5}$

$\Rightarrow x^3 + 1/x^3 + 6\sqrt{5} = 40\sqrt{5}$

$\Rightarrow x^3 + 1/x^3 = (40\sqrt{5} - 6\sqrt{5})$

$\Rightarrow x^3 + 1/x^3 = 34\sqrt{5}$

Now,

$\frac{(x^4 + \frac{1}{x^2})}{x^2 + 1}$

Dividing the equation by x, we get

$\Rightarrow (x^3 + 1/x^3)/(x + 1/x) = (34\sqrt{5}/2\sqrt{5})$

$= 17$

30. **Answer: (C)**

According to Question,

$x + \frac{1}{x} = 7$

On squaring both sides we get,

$\Rightarrow (x)^2 + (1/x)^2 + 2 \times x \times 1/x = (7)^2$

$\Rightarrow x^2 + 1/x^2 + 2 = 49$

$\Rightarrow x^2 + 1/x^2 = (49 - 2)$

$\Rightarrow x^2 + 1/x^2 = 47$

31. **Answer: (D)**

$x = 4 + \sqrt{15}$

Therefore, $1/x = 1/(4 + \sqrt{15})$

$= (4 - \sqrt{15})/[(4 + \sqrt{15})(4 - \sqrt{15})]$

$= (4 - \sqrt{15})/(16 - 15)$

$= 4 - \sqrt{15}$

So, $x + (1/x) = (4 + \sqrt{15}) + (4 - \sqrt{15})$

$\Rightarrow x + (1/x) = 8$

$\Rightarrow [x + (1/x)]^2 = 8^2$ [Square both sides]

$\Rightarrow x^2 + (1/x^2) + [2 \times x \times (1/x)] = 64$

$\Rightarrow x^2 + (1/x^2) + 2 = 64$

$\Rightarrow x^2 + (1/x^2) = 64 - 2 = 62$

32. **Answer: (A)**

Let $k^3 = x$

So, $8x^2 + 15x - 2 = 0$

$\Rightarrow 8x^2 + 16x - x - 2 = 0$

$\Rightarrow 8x (x + 2) - 1 (x + 2) = 0$

$\Rightarrow (8x - 1)(x + 2) = 0$

$\Rightarrow 8x - 1 = 0 \Rightarrow x = 1/8$

$\Rightarrow x + 2 = 0 \Rightarrow x = -2$

[Not possible due to negative value]

Now, $k^3 = 1/8$

$\Rightarrow k = 1/2 \Rightarrow 1/k = 2$

So, $(k + 1/k) = (1/2 + 2) = 5/2 = 2\frac{1}{2}$

33. **Answer: (D)**

$\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$

On squaring both the sides, we get-

$\Rightarrow (\sqrt{x})^2 + \left(\frac{1}{\sqrt{x}}\right)^2 - 2 \times \sqrt{x} \times \frac{1}{\sqrt{x}} = (\sqrt{3})^2$

$\Rightarrow x + \frac{1}{x} - 2 = 3$

$\Rightarrow x + \frac{1}{x} = 5$

On squaring both the sides,

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 25$

$\Rightarrow x^2 + \frac{1}{x^2} = 23$

on squaring both sides,

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 529$

$\Rightarrow x^4 + \frac{1}{x^4} = 527$

The answer to the expression is 527.

34. **Answer: (A)**

$\sqrt{x} + 1/\sqrt{x} = 3$

$\Rightarrow x + 1/x = (3^2 - 2)$

($\because$ If $a + 1/a = p$, then $a^2 + 1/a^2 = (p^2 - 2)$)

$\Rightarrow 7$

$x^3 + 1/x^3 = (7^3 - 3 \times 7)$

($\because$ If $a + 1/a = p$, then $a^3 + 1/a^3 = (p^3 - 3p)$)

$= 322$

35. **Answer: (D)**

$x^2 - \sqrt{7}x + 1 = 0$

$\Rightarrow x^2 + 1 = \sqrt{7}x$

$\Rightarrow (x + 1/x) = \sqrt{7}$

On squaring both the sides,

$\left(x + \frac{1}{x}\right)^2 = (\sqrt{7})^2$

$\Rightarrow x^2 + \frac{1}{x^2} + \frac{2 \cdot x}{x} = 7$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 7$

$\Rightarrow x^2 + \frac{1}{x^2} = (7 - 2)$

$\Rightarrow x^2 + \frac{1}{x^2} = 5$

Cube both sides,

$\left(x + \frac{1}{x}\right)^3 = (\sqrt{7})^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{7} = 7\sqrt{7}$

$\Rightarrow x^3 + \frac{1}{x^3} = 4\sqrt{7}$

Now,

$x^5 + 1/x^5 =$

$= \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= (5 \times 4\sqrt{7}) - \sqrt{7}$

$= 20\sqrt{7} - \sqrt{7}$

$= 19\sqrt{7}$

36. **Answer: (A)**

$x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

dividing both sides by x

$\Rightarrow \frac{x^2}{x} + \frac{1}{x} = \frac{3x}{x}$

$\Rightarrow x + \frac{1}{x} = 3 \ ... (1)$

Cube both sides,

$\Rightarrow \left(x + \frac{1}{x}\right)^3 = (3)^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x} \times \left(x + \frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 9 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} = (27 - 9)$

$\Rightarrow x^3 + \frac{1}{x^3} = 18$

Now,

$\frac{\left(x^4 + \frac{1}{x^2}\right)}{(x^2 + 5x + 1)}$

dividing the number by x

$\Rightarrow \left(x^3 + \frac{1}{x^3}\right) / \left(x + 5 + \frac{1}{x}\right)$

$\Rightarrow \frac{18}{3 + 5}$

$\Rightarrow \frac{18}{8}$

$\Rightarrow \frac{9}{4}$

37. **Answer: (B)**

If $x + 1/x = 3$

$x^3 + 1/x^3 = 3^3 - 3.3$

$\Rightarrow 27 - 9 = 18$

$x^4 + 1/x^4 = [3^2 - 2]^2 - 2$

$\Rightarrow [7]^2 - 2$

$\Rightarrow 49 - 2 = 47$

So,

$x^7 + 1/x^7 = 18 \times 47 - 3$

$\Rightarrow 846 - 3$

$\Rightarrow 843$

TYPE – III

1. **Answer: (B)**

$\Rightarrow (x - 1/x)^2 = 13^2$

$\Rightarrow x^2 + 1/x^2 = 169 + 2$

$\Rightarrow x^2 + 1/x^2 = 171$

$\therefore$ the value of $x^2 + 1/x^2$ is 171

2. **Answer: (D)**

$A - 1/A$

Putting $A = \frac{x-1}{x+1}$ in question,

$\Rightarrow (x - 1)/(x + 1) - (x + 1)/(x - 1)$

$\Rightarrow \frac{(x-1)\times(x-1) - (x+1)\times(x+1)}{x^2 - 1}$

$\Rightarrow \frac{(x^2 - x - x + 1) - (x^2 + x + x + 1)}{x^2 - 1}$

$\Rightarrow \frac{-4x}{x^2 - 1}$

3. **Answer: (A)**

$5x - 2 = 5/x$

$\Rightarrow x - 1/x = 2/5$

4. $\Rightarrow$ Then, $x^2 + 1/x^2 = (2/5)^2 + 2$

$\Rightarrow (4/25) + 2 = 54/25 = 2\frac{4}{25}$

4. **Answer: (A)**

$x = 3 + 2\sqrt2$

$\Rightarrow x = 1 + 2 + 2(\sqrt2)(1)$

$\Rightarrow x = (\sqrt2 + 1)^2$

$\Rightarrow \sqrt x = \sqrt2 + 1$

Again, $1/\sqrt x = 1/(\sqrt2 + 1)$

$\Rightarrow 1/\sqrt x = (\sqrt2 - 1)/(\sqrt2 + 1)(\sqrt2 - 1)$

$\Rightarrow 1/\sqrt x = \sqrt2 - 1$

According to Question:

$\Rightarrow \sqrt x - 1/\sqrt x = (\sqrt2 + 1) - (\sqrt2 - 1)$

$\Rightarrow \sqrt x \cdot 1/\sqrt x = 1 + 1$

$\Rightarrow \sqrt x - 1/\sqrt x = 2$

$\therefore (\sqrt x - 1/\sqrt x) = 2$

5. **Answer: (D)**

$x^2 - 5\sqrt2 x - 1 = 0$

divide both sides by x

$\Rightarrow x - 1/x = 5\sqrt2$

$\Rightarrow x^3 - 1/x^3 = (5\sqrt2)^3 + 3 \times 5\sqrt2$

$\Rightarrow x^3 - 1/x^3 = 250\sqrt2 + 15\sqrt2$

$\Rightarrow x^3 - 1/x^3 = 265\sqrt2$

$\therefore$ Required value is $265\sqrt2$.

6. **Answer: (C)**

$x - 1/x = 11$

as we know,

$\Rightarrow (x - 1/x)^3 = x^3 - 1/x^3 - 3 (x - 1/x)$

$\Rightarrow 11^3 = x^3 - 1/x^3 - 3 \times 11$

$\Rightarrow 1331 = x^3 - 1/x^3 - 33$

$\Rightarrow x^3 - 1/x^3 = 1331 + 33$

$\Rightarrow x^3 - 1/x^3 = 1364$

7. **Answer: (C)**

$x - 1/x = 5$

$\Rightarrow x^3 - (1/x)^3 - 3 \times x \times 1/x(x - 1/x) = 125$

$\Rightarrow x^3 - 1/x^3 - 15 = 125$

$\Rightarrow x^3 - 1/x^3 = 140$

Now, according to the question,

$\dfrac{x^6 - 5x^3 - 1}{x^6 + 7x^3 - 1}$

$\Rightarrow (x^3 - 1/x^3 - 5)/(x^3 - 1/x^3 + 7)$

$\Rightarrow (140 - 5)/(140 + 7)$

$\Rightarrow 135/147$

$\Rightarrow 45/49$

8. **Answer: (D)**

$\sqrt x - \dfrac{1}{\sqrt x} = \sqrt7$

$\Rightarrow (\sqrt x - 1/\sqrt x)^2 = (\sqrt7)^2$ (Squaring both sides)

$\Rightarrow (\sqrt x)^2 - (2 \times \sqrt x \times 1/\sqrt x) + (1/\sqrt x)^2 = 7$

$\Rightarrow (\sqrt x)^2 - (2 \times 1) + (1/\sqrt x)^2 = 7$

$\Rightarrow (x + 1/x) = 7 + 2$

$\Rightarrow (x + 1/x) = 9$

$\Rightarrow (x + 1/x)^2 = 9^2$ (Squaring both sides)

$\Rightarrow (x)^2 + (2 \times x \times 1/x) + (1/x)^2 = 9^2$

$\Rightarrow (x)^2 + (1/x)^2 = 81 - 2$

$\Rightarrow (x)^2 + (1/x)^2 = 79$

9. **Answer: (B)**

$x^8 - 34x^4 + 1 = 0$

$\Rightarrow x^4 - 34 + x^{-4} = 0$

(Multiplying both sides by x^{-4})

$\Rightarrow x^4 + x^{-4} = 34$

$\Rightarrow x^4 + x^{-4} + 2 = 34 + 2$

$\Rightarrow (x^2 + x^{-2})^2 = 36$

$\Rightarrow (x^2 + x^{-2}) = 6$

$\Rightarrow x^2 + x^{-2} - 2 = 6 - 2$

$\Rightarrow (x + x^{-1})^2 = 4$

$\Rightarrow (x + x^{-1}) = 2$

$\Rightarrow (x + x^{-1})^3 = 2^3$

$\Rightarrow (x^3 - 3 \times (x - x^{-1}) - x^{-3}) = 8$

$\Rightarrow (x^3 - (3 \times 2) - x^{-3}) = 8$

$\Rightarrow (x^3 - x^{-3}) = 8 + 6$

$\Rightarrow (x^3 - x^{-3}) = 14$

10. **Answer: (D)**

Dividing both sides of the equation $(x^2 - 5x - 1)$ by x, we get

$\Rightarrow X - 5 - \dfrac{1}{x} = 0 \Rightarrow X - \dfrac{1}{x} = 5x^3 - \dfrac{1}{x^3}$

$= \left(X - \dfrac{1}{x}\right)^3 + 3 \times X \times \dfrac{1}{x} \times \left(X - \dfrac{1}{x}\right)$

$\Rightarrow 5^3 + 3 \times 5 = 140$

On dividing fractions-

$\Rightarrow \dfrac{x^6}{x^3} - \dfrac{x^4}{x^3} + \dfrac{x^2}{x^3} - \dfrac{1}{x^3}$

$\Rightarrow x^3 - x + \dfrac{1}{x} - \dfrac{1}{x^3}$

Rearranging the equation, we get-

$\Rightarrow \left(x^3 - \dfrac{1}{x^3}\right) - \left(x - \dfrac{1}{x}\right)$

On substituting the values, we get-

$\Rightarrow 140 - 5 = 135$

11. **Answer: (A)**

$x\left(3 - \dfrac{2}{x}\right) = \dfrac{3}{x}$,

$\Rightarrow 3x - 2 = 3/x$

$\Rightarrow 3x - 3/x = 2$

$\Rightarrow x - 1/x = 2/3$

$\Rightarrow x^3 - 1/x^3 = (2/3)^3 + 3 \times (2/3)$

$\Rightarrow 8/27 + 2$

$\Rightarrow (8 + 54)/27$

$\Rightarrow 62/27$

TYPE – IV

1. **Answer: (A)**

$x^4 + 1/x^4 = 14159$

Adding 2 to both sides,

$\Rightarrow x^4 + 1/x^4 + 2 = 14159 + 2$

$\Rightarrow (x^2 + 1/x^2)^2 = 14161$

taking the square root of both sides

$\Rightarrow (x^2 + 1/x^2) = \sqrt{(14161)}$

$\Rightarrow (x^2 + 1/x^2) = 119$

Adding 2 to both sides,
$\Rightarrow x^2 + 1/x^2 + 2 = 119 + 2$
$\Rightarrow (x + 1/x)^2 = 121$
taking the square root of both sides
$\Rightarrow x + 1/x = \sqrt{121}$
$\Rightarrow x + 1/x = 11$

2. **Answer: (B)**
$(x - 1/x)^2 = x^2 + 1/x^2 - 2$
$\Rightarrow (x - 1/x)^2 = 38 - 2$
$\Rightarrow (x - 1/x) = \sqrt{36}$
$\Rightarrow (x - 1/x) = 6$
Now,
$\left| x - \frac{1}{x} \right| = |6| = 6$

3. **Answer: (A)**
$(x^2 + 1/x^2)^2 = x^4 + 1/x^4 + 2$
$\Rightarrow (x^2 + 1/x^2)^2 = (257/16) + 2$
$\Rightarrow (x^2 + 1/x^2)^2 = (257 + 32)/16$
$\Rightarrow (x^2 + 1/x^2) = \sqrt{(289/16)}$
$\Rightarrow (x^2 + 1/x^2) = 17/4$
Again,
$(x + 1/x)^2 = x^2 + 1/x^2 + 2$
$\Rightarrow (x + 1/x)^2 = (17/4) + 2$
$\Rightarrow (x + 1/x)^2 = (17 + 8)/4$
$\Rightarrow (x + 1/x) = \sqrt{(25/4)}$
$\Rightarrow (x + 1/x) = 5/2$
$(x^3 + 1/x^3) = (x + 1/x)^3 - 3(x + 1/x)$
$\Rightarrow (x^3 + 1/x^3) = (5/2)^3 - 3 \times (5/2)$
$\Rightarrow (x^3 + 1/x^3) = (125/8) - (15/2)$
$\Rightarrow (x^3 + 1/x^3) = (125 - 60)/8$
$\Rightarrow (x^3 + 1/x^3) = 65/8$
$\Rightarrow (8/13) \times (x^3 + 1/x^3) = (65/8) \times (8/13)$
$\Rightarrow (8/13) \times (x^3 + 1/x^3) = 5$

4. **Answer: (C)**
$\Rightarrow a^2 + \dfrac{1}{a^2} = 98$
$\Rightarrow$ Then, $a + 1/a = \sqrt{(98 + 2)} = \sqrt{100} = 10$
$\Rightarrow a + 1/a = x$, then $a^3 + 1/a^3 = x^3 - 3x$
$\Rightarrow$ So, $a^3 + 1/a^3 = 10^3 - 3 \times 10 = 970$

5. **Answer: (C)**
$x^4 + \dfrac{1}{x^4} = 6887$
Adding 2 to both sides,
$\Rightarrow x^4 + 1/x^4 + 2 = 6887 + 2$
$\Rightarrow (x^2 + 1/x^2)^2 = 6889$
$\Rightarrow (x^2 + 1/x^2) = \sqrt{6889} = 83 = a$
Now, $x - 1/x = \sqrt{83 - 2} = 9$
$\therefore$ Required value = 9

6. **Answer: (C)**
$x^4 - 142x^2 + 1 = 0$
Dividing the equation by x^2,
$\Rightarrow x^2 - 142 + 1/x^2 = 0$
$\Rightarrow x^2 + 1/x^2 = 142$
Adding 2 to the right side and the left side,

$\Rightarrow x^2 + 1/x^2 + 2 = 142 + 2$
$\Rightarrow (x + 1/x)^2 = 144$
$\Rightarrow (x + 1/x) = \sqrt{144} = 12$
Cubing both sides,
$\Rightarrow (x + 1/x)^3 = 12^3$
$\Rightarrow x^3 + 1/x^3 + 3 \times x \times 1/x (x + 1/x) = 1728$
$\Rightarrow x^3 + 1/x^3 = 1728 - 3 \times (x + 1/x) = 1728 - 3 \times 12$
$\Rightarrow 1728 - 36 = 1692$
$\therefore x^3 + 1/x^3 = 1692$

7. **Answer: (B)**
$(x^4 + 1/x^4) = (x^2 + 1/x^2)^2 - 2$
$\Rightarrow (x^2 + 1/x^2)^2 = 3842 + 2 = 3844$
$\Rightarrow (x^2 + 1/x^2) = 62$
Then,
$(x + 1/x)^2 = x^2 + 1/x^2 + 2$
$= 62 + 2$
$= 64$
$\therefore (x + 1/x) = \sqrt{64} = 8$

8. **Answer: (A)**
$x^4 + x^{-4} = 194$
Adding 2 to both sides
$x^4 + x^{-4} + 2 = 194 + 2$
$\Rightarrow (x^2 + 1/x^2)^2 = 196 = 14^2$
$\Rightarrow x^2 + 1/x^2 = 14$
Again adding 2 to both sides
$x^2 + 1/x^2 + 2 = 14 + 2$
$\Rightarrow (x + 1/x)^2 = 16 = 4^2$
$\therefore x + 1/x, 4$ है

9. **Answer: (D)**
$X^4 + 1/X^4 = 194$
$\Rightarrow (X^2)^2 + 1/(X^2)^2 = 194$
$\Rightarrow (X^2)^2 + 1/(X^2)^2 + 2 = 194 + 2$
[Adding 2 to both sides]
$\Rightarrow (X^2)^2 + 1/(X^2)^2 + 2 \times X^2 \times 1/X^2 = 196$
$\Rightarrow (X^2 + 1/X^2)^2 = 196$
$\Rightarrow X^2 + 1/X^2 = \sqrt{196}$
$\Rightarrow X^2 + 1/X^2 = 14$
$\Rightarrow X^2 + 1/X^2 + 2 = 14 + 2$
[Adding 2 to both sides]
$\Rightarrow X^2 + 1/X^2 + 2 \times X \times 1/X = 16$
$\Rightarrow (X + 1/X)^2 = 16$
$\Rightarrow X + 1/X = \sqrt{16}$
$\Rightarrow X + 1/X = 4$
$X + 1/X + 2 = 4 + 2$
$\Rightarrow X + 1/X + 2 = 6$
$\therefore$ The value of $X + 1/X + 2$ is 6.

10. **Answer: (C)**
$a^3 + 1/a^3 = 52$
as we know,
$(a + 1/a)^3 = a^3 + 1/a^3 + 3(a + 1/a)$ --- (1)
by option
$2(a + 1/a) = 8$

(a + 1/a) = 4

from equation (1)

$4^3 = a^3 + 1/a^3 + 3 \times 4$

$\Rightarrow a^3 + 1/a^3 = 64 - 12 = 52$(Satisfied)

11.   **Answer: (C)**

$a^4 + 1/a^4 = 50$

$\Rightarrow (a^2 + 1/a^2)^2 = a^4 + 1/a^4 + 2 = 50 + 2 = 52$

$\Rightarrow a^2 + 1/a^2 = \sqrt{52} = 2\sqrt{13}$

$\Rightarrow (a + 1/a)^2 = a^2 + 1/a^2 + 2$

$\Rightarrow (a + 1/a)^2 = 2\sqrt{13} + 2$

$\Rightarrow \left(a + \frac{1}{a}\right) = \sqrt{2\left(1 + \sqrt{13}\right)}$

$\Rightarrow a^3 + \frac{1}{a^3} = \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right)$

$\Rightarrow a^3 + \frac{1}{a^3} = \left(a + \frac{1}{a}\right)\left[\left(a + \frac{1}{a}\right)^2 - 3\right]$

$\Rightarrow a^3 + \frac{1}{a^3} = \sqrt{2\left(1 + \sqrt{13}\right)}\left[2 + 2\sqrt{13} - 3\right]$

$\Rightarrow a^3 + \frac{1}{a^3} = \sqrt{2\left(1 + \sqrt{13}\right)\left[-1 + 2\sqrt{13}\right]}$

12.   **Answer: (B)**

$x^4 + \frac{1}{x^4} = 727$

Adding 2 to both sides,

$x^4 + 1/x^4 + 2 = 727 + 2$

$\Rightarrow (x^2 + 1/x^2)^2 = 729$

$\Rightarrow (x^2 + 1/x^2) = \sqrt{729}$

$\Rightarrow (x^2 + 1/x^2) = 27$

Subtracting 2 from both sides,

$\Rightarrow (x^2 + 1/x^2) - 2 = 27 - 2$

$\Rightarrow (x - 1/x)^2 = 25$

$\Rightarrow (x - 1/x) = \sqrt{25}$

$\therefore (x - 1/x) = 5$

13.   **Answer: (C)**

$x^8 - 34x^4 + 1 = 0$

Dividing both sides of the equation by x^4, the equation becomes

$x^4 - 34 + x^{-4} = 0$

$\Rightarrow x^4 + x^{-4} = 34$

Adding 2 to both sides of the equation

$x^4 + x^{-4} + 2 = 36$

$\Rightarrow (x^2 + x^{-2})^2 = 36$

$\Rightarrow x^2 + x^{-2} = 6$

Adding 2 to both sides of the equation

$x^2 + x^{-2} + 2 = 8$

$\Rightarrow (x^1 + x^{-1})^2 = 8$

$\Rightarrow x + x^{-1} = 2\sqrt{2}$

Now on cubing both sides of the equation

$(x + x^{-1})^3 = (2\sqrt{2})^3$

$\Rightarrow x^3 + x^{-3} = 10\sqrt{2}$

$\therefore$ Value of $x^3 + x^{-3} = 10\sqrt{2}$

14.   **Answer: (B)**

$(x + 1/x)^2 = x^2 + 1/x^2 + 2$

$\Rightarrow (x + 1/x)^2 = 7 + 2$

$\Rightarrow x + 1/x = \sqrt{9}$

$\Rightarrow x + 1/x = 3$

Now,

$\Rightarrow (x + 1/x)^3 = x^3 + 1/x^3 + 3(x + 1/x)$

$\Rightarrow 3^3 = x^3 + 1/x^3 + 3 \times 3$

$\Rightarrow x^3 + 1/x^3 = 27 - 9$

$\Rightarrow x^3 + 1/x^3 = 18$

$\therefore$ Required value is 18.

TYPE – V

1.   **Answer: (B)**

$X^2 - 2\sqrt{10}X + 1 = 0$

Dividing the above equation by X, we get,

$X - 2\sqrt{10} + 1/X = 0$

$X + 1/X = 2\sqrt{10}$

$(X - 1/X)^2 = (X + 1/X)^2 - 4 = 40 - 4 = 36$

$\Rightarrow (X - 1/X) = 6$

2.   **Answer: (D)**

$\sqrt{(x^4 + y^4 - 2x^2y^2)}$

We know that,

$\Rightarrow x^2 + y^2 - 2xy = (x - y)^2$

$\Rightarrow \sqrt{(x^2 - y^2)^2} = x^2 - y^2 = (x - y)(x + y)$

$\Rightarrow \left(a + \frac{1}{a} - a + \frac{1}{a}\right)\left(a + \frac{1}{a} + a - \frac{1}{a}\right)$

$\Rightarrow [2/a] \times 2a$

$\Rightarrow 4$

3.   **Answer: (D)**

$x^4 - 6x^2 - 1 = 0$

$\Rightarrow x^2 - 6 - 1/x^2 = 0$

$\Rightarrow x^2 - 1/x^2 = 6$

$\Rightarrow (x^6 - 1/x^6) = (x^2 - 1/x^2)^3 + 3(x^2 - 1/x^2)$

$\Rightarrow x^6 - 1/x^6 = 6^3 + 3 \times 6 = 216 + 18 = 234$

$\Rightarrow x^6 - 5x^2 + 5/x^2 - 1/x^6 + 5$

$\Rightarrow x^6 - 1/x^6 - 5(x^2 - 1/x^2) + 5$

$\Rightarrow 234 - 5 \times 6 + 5$

$\Rightarrow 239 - 30$

$\Rightarrow 209$

4.   **Answer: (A)**

$a - 1/a = 3$

On cubing both sides,

$(a - 1/a)^3 = 3^3$

$a^3 - 1/a^3 - 3(a - 1/a) = 27\{(a^3 - b^3) = a^3 - b^3 - 3ab(a - b)\}$

$a^3 - 1/a^3 - 3(3) = 27$

$a^3 - 1/a^3 = 27 + 9$

$a^3 - 1/a^3 = 36$

On squaring both the sides,

$(a^3 - 1/a^3)^2 = (36)^2$

$a^6 - 2 \times a^3 \times (1/a^3) + 1/a^6 = 36^2$

$\therefore a^6 + 1/a^6 - 2 \times 1 = 1296$

$\therefore a^6 + 1/a^6 = 1298$

5.   **Answer: (D)**

$x + \dfrac{1}{x} = 5$

$\rightarrow x^2 + \dfrac{1}{x^2} = 23$

$\rightarrow (x - \dfrac{1}{x})^2 = x^2 + \dfrac{1}{x^2} - 2 = 23 - 2$

$x - \dfrac{1}{x} = \pm\sqrt{21}$

6. **Answer: (C)**

$x + (1 / x) = \sqrt{13}$ ·· ·· ·· ··· ·· (I)

On squaring both the sides,

$x^2 + \dfrac{1}{x^2} = 13 - 2 = 11$ ·· ·· ·· ·· (II)

On cubing both sides,

$x^3 + \dfrac{1}{x^3} = 3^3 + 9 = 36$ ·· ·· ·· ·· ·· (III)

Subtracting 4 from both sides,

$x^2 + \dfrac{1}{x^2} - 4 = 9$

Therefore, $x - \dfrac{1}{x} = 3$

Now, $x^5 - \dfrac{1}{x^5}$

$= \left(x^2 + \dfrac{1}{x^2}\right)\left(x^3 + \dfrac{1}{x^3}\right) - \left(x - \dfrac{1}{x}\right)$

$= 11 \times 36 - 3 = 393$

7. **Answer: (C)**

$(4/3)(x^2 + 1/x^2) = (332/3)$

$\Rightarrow (x^2 + 1/x^2) = (332/3) \times (3/4)$

$\Rightarrow x^2 + 1/x^2 = 83$

$\Rightarrow x - 1/x = \sqrt{(83 - 2)} = \sqrt{81} = 9$

$\Rightarrow x^3 - 1/x^3 = 9^3 + 3(9) = 729 + 27 = 756$

$\Rightarrow 1/9(x^3 - 1/x^3) = 84$

8. **Answer: (D)**

$x - \dfrac{1}{x} = \sqrt{77}$

On squaring both the sides,

$(x - 1/x)^2 = (\sqrt{77})^2$

$\Rightarrow (x)^2 + (1/x)^2 - 2 \times x \times 1/x = 77$

$\Rightarrow x^2 + 1/x^2 - 2 = 77$

$\Rightarrow x^2 + 1/x^2 = (77 + 2)$

$\Rightarrow x^2 + 1/x^2 = 79$

Now,

$(x + 1/x)^2 = x^2 + 1/x^2 + 2 \times x \times 1/x$

$\Rightarrow x^2 + 1/x^2 + 2 = 79 + 2 = 81$

$\Rightarrow (x + 1/x) = 9$

Now,

$(x^3 + 1/x^3) = (x + 1/x)^3 - 3 \times x \times 1/x \times (x + 1/x)$

$\Rightarrow (9)^3 - 3 \times 3 = 729 - 27 = 702$

We know that when we find the square root of a number, there are two values i.e. positive value or negative value.

∴ Required value is 702.

9. **Answer: (B)**

According to the question

On squaring both the sides, we get

$(x + 1/x)^2 = (17/4)^2$

$\Rightarrow x^2 + 1/x^2 + 2 \times x \times 1/x = 289/16$

$\Rightarrow x^2 + 1/x^2 + 2 = 289/16$

$\Rightarrow x^2 + 1/x^2 = (289/16 - 2)$

$\Rightarrow x^2 + 1/x^2 = (289 - 32)/16$

$\Rightarrow x^2 + 1/x^2 = 257/16$

Now,

$(x - 1/x)^2 = x^2 + (1/x)^2 - 2 \times x \times 1/x = 257/16$

$\Rightarrow (x - 1/x)^2 - 2 = 257/16$

$\Rightarrow (x - 1/x)^2 = (257/16 - 2)$

$\Rightarrow (x - 1/x)^2 = (257 - 32)/16$

$\Rightarrow (x - 1/x)^2 = 225/16$

$\Rightarrow x - 1/x = 15/4$

∴ Required value is 15/4

TYPE – VI

1. **Answer: (B)**

$2a + \dfrac{1}{a} = 4 - - - -(1)$

Divide by 2 in equation (1)

$\Rightarrow \dfrac{1}{2} \times \left(2a + \dfrac{1}{a}\right) = \dfrac{1}{2} \times 4$

$\Rightarrow a + \dfrac{1}{2a} = 2$

On squaring both sides

$\Rightarrow \left(a + \dfrac{1}{2a}\right)^2 = 4$

$\Rightarrow a^2 + \dfrac{1}{4a^2} + 2 \times a \times \dfrac{1}{2a} = 4$

$\Rightarrow a^2 + \dfrac{1}{4a^2} + 1 = 4$

$\Rightarrow a^2 + \dfrac{1}{4a^2} = 3$

Correct answer is C.

2. **Answer: (C)**

$2x^2 - 6x = 1$

$\Rightarrow x - 3 = 1/2x$ [Dividing both sides by 2x]

$\Rightarrow x - 1/2x = 3$

$\Rightarrow (x - 1/2x)^2 = 9$ [Squaring both sides]

$\Rightarrow x^2 + 1/4x^2 - 1 = 9$

$\Rightarrow x^2 + 1/4x^2 = 10$

∴ The expected value of $x^2 + 1/4x^2$ is 10.

3. **Answer: (A)**

$[k - (3/k)]^2 = 25$

$\Rightarrow k^2 + (9/k^2) - 6 = 25$ $[(a - b)^2 = a^2 + b^2 - 2ab]$

$\Rightarrow k^2 + (9/k^2) = 31$

∴ Option A is the correct answer.

4. **Answer: (A)**

$(2x - 1/x)^2 = 4x^2 - 4 + 1/x^2$

$\Rightarrow 4x^2 + 1/x^2 = 64 + 4 = 68$

$\Rightarrow [(2x)^3 - (1/x)^3] = (2x - 1/x)(4x^2 + 2 + 1/x^2)$

$\Rightarrow 8x^3 - 1/x^3 = 8 \times (68 + 2) = 560$

∴ $8x^3 - 1/x^3 = 560$

5. **Answer: (A)**

$x^4 + 16/x^4 = (x^2 + 4/x^2)^2 - 8$

$\Rightarrow 27217 + 8 = (x^2 + 4/x^2)^2$

$\Rightarrow (x^2 + 4/x^2) = 165$

$\Rightarrow (x^2 + 4/x^2) = (x + 2/x)^2 - 4$

$\Rightarrow (x + 2/x)^2 = 169$

$\therefore (x + 2/x) = 13$

6. **Answer: (B)**

$(x + 2/x)^2 = 49$

$\Rightarrow x^2 + 4/x^2 + 4 = 49$

$\Rightarrow x^2 + 4/x^2 = 49 - 4$

$\Rightarrow x^2 + 4/x^2 = 45$

$\Rightarrow 2x^2 + 8/x^2 = 45 \times 2$

$\therefore (2x^2 + 8/x^2) = 90$

7. **Answer: (A)**

$\Rightarrow (x - 1/2x)^2 = x^2 + 1/4x^2 - 1$

$\Rightarrow x^2 + 1/4x^2 = 10$

$\Rightarrow (x^2 + 1/4x^2)^2 = x^4 + 1/16x^4 + 1/2$

$\Rightarrow x^4 + 1/16x^4 = 100 - 1/2 = 199/2$

$\therefore x^4 + 1/16x^4 = 199/2 = 99\frac{1}{2}$

8. **Answer: (D)**

$5x + 1/3x = 4$

Multiplying by 3/5

$3x + 1/5x = 12/5$

On squaring both sides,

$(3x + 1/5x)^2 = (12/5)^2$

$\Rightarrow 9x^2 + 1/25x^2 + 2 \times 3x \times (1/5x) = 144/25$

$\Rightarrow 9x^2 + 1/25x^2 = 144/25 - 6/5$

$\Rightarrow 9x^2 + 1/25x^2 = (144 - 30)/25 = 114/25$

9. **Answer: (D)**

$30x^2 - 15x + 1 = 0$

dividing by 6x

$5x - 15/6 + 1/6x = 0$

$\Rightarrow 5x + 1/6x = 5/2$

on squaring both sides

$(5x + 1/6x)^2 = (5/2)^2$

$\Rightarrow 25x^2 + 1/36x^2 + 2 \times 5x \times 1/6x = 25/4$

$\Rightarrow 25x^2 + 1/36x^2 + 5/3 = 25/4$

$\Rightarrow 25x^2 + 1/36x^2 = 25/4 - 5/3$

$\Rightarrow 25x^2 + 1/36x^2 = 55/12$

10. **Answer: (B)**

$12x^2 - 21x + 1 = 0$

dividing by 4x

$\Rightarrow 3x - 21/4 + 1/4x = 0$

$\Rightarrow 3x + 1/4x = 21/4$

on squaring both sides

$9x^2 + 1/16x^2 + 2 \times 3x \times (1/4x) = 441/16$

$\Rightarrow 9x^2 + 1/16x^2 = 441/16 - 3/2$

$\Rightarrow 9x^2 + 1/16x^2 = (441 - 24)/16$

$\Rightarrow 9x^2 + 1/16x^2 = 417/16$

11. **Answer: (C)**

$20x^2 - 30x + 1 = 0$

dividing by 4x

$5x - 15/2 + 1/4x$

$5x + 1/4x = 15/2$

as we know

$(5x + 1/4x)^2 = 25x^2 + 1/16x^2 + 2 \times 5x \times (1/4x)$

$(15/2)^2 = 25x^2 + 1/16x^2 + 10/4$

$25x^2 + 1/16x^2 = 225/4 - 10/4 = 215/4 = 53\frac{3}{4}$

12. **Answer: (B)**

$2x^2 - 8x - 1 = 0$

Dividing the above equation by x;

$\Rightarrow 2x - 8 - 1/x = 0$

$\Rightarrow 2x - 1/x = 8$

On squaring both the sides;

$\Rightarrow (2x)^3 - 1/x^3 - 3 \times 2x \times 1/x(2x - 1/x) = 512$

$\Rightarrow 8x^3 - 1/x^3 - 6 \times 8 = 512$

$\therefore 8x^3 - 1/x^3 = 560$

13. **Answer: (C)**

$\left(2x - \frac{3}{x}\right) = 2$

On squaring both the sides, we get

$\Rightarrow (2x - 3/x)^2 = (2)^2$

$\Rightarrow 4x^2 + 9/x^2 = 4 + 2 \times 2 \times 3$

$\Rightarrow 4x^2 + 9/x^2 = 16$

Now,

$\left(16x^4 + \frac{81}{x^4}\right) = (16)^2 - 2 \times 4 \times 9$

$\Rightarrow 256 - 72$

$\Rightarrow 184$

$\therefore$ The value of $\left(16x^4 + \frac{81}{x^4}\right)$ is 184.

14. **Answer: (D)**

$4x^4 - 37x^2 + 9 = 0$

Let us assume that $x^2 = a$,

$\Rightarrow 4a^2 - 37a + 9 = 0$

$\Rightarrow 4a^2 - 36a - a + 9 = 0$

$\Rightarrow 4a(a - 9) - 1(a - 9) = 0$

$\Rightarrow (4a - 1)(a - 9) = 0$

$a = 1/4$ or $a = 9$

Then,

$x^2 = 1/4$ is not acceptable because $x > \sqrt{3}/2$

means $x^2 > 3/2$.

$x^2 = 9$ then $x = 3$ or $x = -3$ (not valid, $x > \sqrt{3}/2$)

Then, put $x = 3$

$? = 8x^3 - 27/x^3$

$? = 8 \times 3^3 - 27/3^3$

$? = 215$

$\therefore 8x^3 - 27/x^3 = 215$

15. **Answer: (D)**

$4x^4 - 5x^2 + 1 = 0$

$\Rightarrow 4x^4 - 4x^2 - x^2 + 1 = 0$

$\Rightarrow 4x^2(x^2 - 1) - 1(x^2 - 1) = 0$

$\Rightarrow (x^2 - 1)(4x^2 - 1) = 0$

$\Rightarrow (x^2 - 1) = 0 \ (4x^2 - 1) = 0$

$x - 1 = 0$

$2x - 1 = 0$

$\Rightarrow x = 1$ or $1/2$

$(2x^2 - x - 1)$

putting $x = 1$

$2 \times 1 - 1 - 1$

$\Rightarrow 2 \cdot 2 = 0$

$\therefore$ The intended answer is 0.

16.   **Answer: (D)**

$\left(2a + \frac{3}{a} - 1\right) = 11$

$\Rightarrow 2a + 3/a = 12$

$\Rightarrow (2a + 3/a)^2 = 12^2$

$\Rightarrow 4a^2 + 9/a^2 + 2 \times 2a \times 3/a = 144$

$\Rightarrow 4a^2 + 9/a^2 + 12 = 144$

$\Rightarrow 4a^2 + 9/a^2 = 132$

$\therefore$ The value of $\left(4a^2 + \frac{9}{a^2}\right)$ is 132

17.   **Answer: (B)**

$2x^2 \cdot 7x + 5 = 0$

$\Rightarrow 2x^2 + 5 = 7x$

$\Rightarrow x^2 + 5/2 = 7/2$

$\Rightarrow x + 5/2x = 7/2$

Cubing both sides of the equation

$\Rightarrow (x + 5/2x)^3 = (7/2)^3$

$\Rightarrow (x)^3 + (5/2x)^3 + 3 \times x \times 5/2x(x + 5/2x) = 343/8$

$\Rightarrow x^3 + 125/8x^3 + 15/2 (7/2) = 343/8$

$\Rightarrow x^3 + 125/8x^3 + 105/4 = 343/8$

$\Rightarrow x^3 + 125/8x^3 = (343/8 - 105/4)$

$\Rightarrow x^3 + 125/8x^3 = (343 - 210)/8$

$\Rightarrow x^3 + 125/8x^3 = 133/8$

$\Rightarrow x^3 + 125/8x^3 = 16\frac{5}{8}$

$\therefore$ Required value is $16\frac{5}{8}$

18.   **Answer: (C)**

Given:

$x - \frac{2}{x} = 15$

$\Rightarrow x^2 \cdot 4 + 4/x^2 = 225$ (Squaring both sides)

$\Rightarrow x^2 + 4/x^2 = 229$

$\therefore$ The required value of $\left(x^2 + \frac{4}{x^2}\right)$ is 229.

19.   **Answer: (C)**

$3x^2 \cdot 5x + 1 = 0$

First dividing both sides by x.

$\Rightarrow (3x^2 \cdot 5x + 1)/x = 0/x$

$\Rightarrow (3x^2/x) \cdot (5x/x) + (1/x) = 0$

$\Rightarrow 3x \cdot 5 + (1/x) = 0$

$\Rightarrow 3x + (1/x) = 5$

Now, again dividing both sides by 3.

$\Rightarrow (3x/3) + ((1/x)/3) = (5/3)$

$\Rightarrow x + (1/3x) = (5/3)$

Now, on squaring both the sides.

$\Rightarrow (x + (1/3x))^2 = (5/3)^2$

$\Rightarrow x^2 + (1/3x)^2 + (2 \times x \times (1/3x)) = (25/9)$

$\Rightarrow x^2 + (1/9x^2) + (2/3) = (25/9)$

$\Rightarrow x^2 + (1/9x^2) = (25/9) \cdot (2/3)$

$\Rightarrow x^2 + (1/9x^2) = (25 \cdot 6)/9$

$\Rightarrow x^2 + (1/9x^2) = (19/9)$

20.   **Answer: (B)**

$2x^2 - 7x + 5 = 0$

$\Rightarrow 2x^2 + 5 = 7x$

$\Rightarrow x^2 + 5/2 = 7x/2$

$\Rightarrow x + 5/2x = 7/2$

Squaring both sides of the equation.

$\Rightarrow (x + 5/2x)^2 = (7/2)^2$

$\Rightarrow x^2 + (5/2x)^2 + 2 \times x \times 5/2x = 49/4$

$\Rightarrow x^2 + 25/4x^2 + 5 = 49/4$

$\Rightarrow x^2 + 25/4x^2 = 49/4 - 5$

$\Rightarrow x^2 + 25/4x^2 = 29/4$

$\Rightarrow x^2 + 25/4x^2 = 7\frac{1}{4}$

$\therefore$ The correct answer is $7\frac{1}{4}$

21.   **Answer: (B)**

Let the value of x be 4, then

$4 + 16/4 = 8$ (Satisfied)

So, $4^2 + 32/4^2 = 16 + 2 = 18$

$\therefore$ The value of the given identity is 18.

22.   **Answer: (D)**

$(a \cdot b)^2 = (a^2 + b^2 \cdot 2ab)$

$\Rightarrow x - \frac{3}{x} = 6, x \neq 0,$

On squaring both sides,

$\Rightarrow (x \cdot 3/x)^2 = (6)^2$

$\Rightarrow x^2 + 9/x^2 \cdot 6 = 36$

$\Rightarrow x^2 + 9/x^2 = 42$

$\dfrac{x^4 - \frac{27}{x^2}}{x^2 - 3x - 3}$

Divide numerator and denominator by x

$\Rightarrow \dfrac{x^3 - \frac{27}{x^3}}{x - 3 - \frac{3}{x}}$

$\Rightarrow \dfrac{\left(x - \frac{3}{x}\right)\left(x^2 + \frac{9}{x^2} + 3\right)}{\left(x - \frac{3}{x}\right) - 3}$

$\Rightarrow \dfrac{6 \times (42 + 3)}{6 - 3} = \dfrac{6 \times 45}{3} = 90$

$\therefore \dfrac{x^3 - \frac{27}{x^3}}{x - 3 - \frac{3}{x}} = 90$

23.   **Answer: (A)**

$2x^2 + 5x + 1 = 0$

Dividing both sides by 2x,

$\Rightarrow x + \frac{5x}{2x} + \frac{1}{2x} = 0$

$\Rightarrow x + \frac{1}{2x} = -\frac{5}{2}$

$\left(x - \frac{1}{2x}\right)^2 = \left(x + \frac{1}{2x}\right)^2 - 4 \cdot x \cdot \frac{1}{2x}$

$\Rightarrow \left(x - \frac{1}{2x}\right)^2 = \left(\frac{-5}{2}\right)^2 - 2$

$\Rightarrow \left(x - \frac{1}{2x}\right) = \pm\sqrt{\frac{17}{4}}$

TYPE – VII

1.   **Answer: (A)**

$p + \left(\frac{1}{p}\right) = 2$

in p = 1

Then,

$p \times p \times p = (p)^3$
$\Rightarrow (p)^3 = (1)^3$
∴ the value of $p \times p \times p$ is 1.

2. **Answer: (B)**
$(x - 1/x) = 1$
On squaring both the sides,
$\Rightarrow x^2 + 1/x^2 - 2 \times x \times 1/x = 1$
$\Rightarrow x^2 + 1/x^2 = 1 + 2$
$\Rightarrow x^2 + 1/x^2 = 3$
On squaring both the sides again;
$\Rightarrow x^4 + 1/x^4 + 2 = 9$
$\Rightarrow x^4 + 1/x^4 = 9 - 2 = 7$
Squaring both sides one more time;
$\Rightarrow x^8 + 1/x^8 + 2 = 49$
$\Rightarrow x^8 + 1/x^8 = 49 - 2 = 47$
∴ $x^8 + 1/x^8 = 47$

3. **Answer: (C)**
$x^2 + 1/x^2 = 2$
$\Rightarrow x^2 + 1/x^2 - 2 = 0$
$\Rightarrow (x - 1/x)^2 = 0$
$\Rightarrow x - 1/x = 0$
$\Rightarrow x = 1/x$
$\Rightarrow x^2 = 1$
∴ $x = 1, -1$
Therefore, $x^6 = 1$

4. **Answer: (D)**
$\Rightarrow x + 1/x = -2$
$\Rightarrow x^2 + 1 = -2x$
$\Rightarrow x^2 + 2x + 1 = 0$
$\Rightarrow (x + 1)^2 = 0$
$\Rightarrow x + 1 = 0$
$\Rightarrow x = -1$
∴ $1 + x^3 + x^5$
$= 1 + (-1)^3 + (-1)^5$
$= 1 - 1 - 1$
$= -1$

5. **Answer: (B)**
$x^2 + 16 = -4x$
$x^2 + 16 + 4x = 0$
$x^3 + 16x + 4x^2 = 0$
Adding 64 to both sides,
$x^3 + 16x + 4x^2 + 64 = 64$
$x^3 - 64 = -(16x + 4x^2 + 64)$ ----(1)
Now,
$x^2 + 16 = -4x$
$16x + 4x^2 + 64 = 0$ ----(2)
From equation (1) and (2),
$x^3 - 64 = 0$

6. **Answer: (C)**
$x + (1/x) = 2$
$X^2 + 1 = 2x$
$X^2 + 1 - 2x = 0$
$(x - 1)^2 = 0$

$X = 1$
$x^{64} + x^{121} = 1 + 1 = 2$

7. **Answer: (C)**
$x + \frac{1}{x} = 2$
This is possible only when $x = 1$
∴ $x^{21} + \frac{1}{x^{1331}} = 2$

8. **Answer: (D)**
As per the question,
$x^{1/4} + \frac{1}{x^{1/4}} = 2$
∴ $x = 1$
Therefore,
$x^{81} + \frac{1}{x^{81}} = 1 + 1 = 2$

9. **Answer: (B)**
$(x/y) + (y/x) = 1$
$\frac{x^2 + y^2}{xy} = 1$
$x^2 + y^2 = xy$
$x^2 + y^2 - xy = 0$
$x^3 + y^3 = (x + y)(x^2 + y^2 - xy)$
But, $x^2 + y^2 - xy = 0$
Therefore, $x^3 + y^3 = 0$

10. **Answer: (C)**
$x^2 + \frac{1}{x^2} = 1$
$\Rightarrow x + \frac{1}{x} = \sqrt{3}$
on cube,
$x^3 + \frac{1}{x^3} = (\sqrt{3})^3 - 3\sqrt{3} = 0$
$\Rightarrow x^6 = -1 \Rightarrow x^6 + 1 = 0$
Then,
$x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$
$= x^{42}(x^6 + 1) + x^{30}(x^6 + 1) + x^{18}(x^6 + 1) + x^6 (x^6 + 1) + 1$
$= 1$

11. **Answer: (A)**
$\left(\frac{x}{5} + \frac{5}{x}\right) = -2$
$\Rightarrow \frac{x^2 + 25}{5x} = -2$
$\Rightarrow x^2 + 25 = -10x$
$\Rightarrow x^2 + 10x + 25 = 0$
$\Rightarrow x^2 + 5x + 5x + 25 = 0$
$\Rightarrow x(x + 5) + 5(x + 5) = 0$
$\Rightarrow x = -5, -5$
∴ $x^3 = -125$

TYPE – VIII

1. **Answer: (A)**
Given,
$a^3 + a - 1 = 0$
$\Rightarrow a^3 = 1 - a$

Now, $a^5 + a^4 + a - 2$

$\Rightarrow a^3 \times a^2 + a^3 \times a + a - 2$

$\Rightarrow (1 - a)a^2 + (1 - a)a + a - 2$

$\Rightarrow a^2 - a^3 + a - a^2 + a - 2$

$\Rightarrow -a^3 - 2(1 - a)$

$\Rightarrow -a^3 - 2a^3$

$\Rightarrow -3a^3$

2. **Answer: (B)**

$\dfrac{p^2+q^2}{r^2+s^2} = \dfrac{pq}{rs}$

$\dfrac{p^2 + q^2}{pq} = \dfrac{r^2 + s^2}{rs}$

$\dfrac{(p + q)^2 - 2pq}{pq} = \dfrac{r^2 + s^2}{rs}$

$[(a^2 + b^2) = (a + b)^2 - 2ab]$

Adding 2 to both sides, we get

$\dfrac{(p + q)^2}{pq} = \dfrac{r^2 + s^2 + 2rs}{rs} = \dfrac{(r + s)^2}{rs}$

$[(a^2 + b^2 + 2ab = (a + b)^2]$ ----(I)

$\dfrac{p^2 + q^2}{r^2 + s^2} = \dfrac{pq}{rs}$

$\dfrac{p^2 + q^2}{pq} = \dfrac{r^2 + s^2}{rs}$

$\dfrac{(p - q)^2 + 2pq}{pq} = \dfrac{r^2 + s^2}{rs}$

$[(a^2 + b^2) = (a - b)^2 + 2ab]$

Subtracting 2 from both sides, we get

$\dfrac{(p - q)^2}{pq} = \dfrac{r^2 + s^2 - 2rs}{rs} = \dfrac{(r - s)^2}{rs}$

$[(a^2 + b^2 + 2ab = (a + b)^2]$ ----(ii)

Dividing (ii) by (i), we get

$\dfrac{\frac{(p - q)^2}{pq}}{\frac{(p + q)^2}{pq}} = \dfrac{\frac{(r - s)^2}{rs}}{\frac{(r + s)^2}{rs}} = \dfrac{(p - q)^2}{(p + q)^2}$

$= \dfrac{(r - s)^2}{(r + s)^2}$

Taking square root of both sides, we get

$\dfrac{p - q}{p + q} = \dfrac{r - s}{r + s}$

3. **Answer: (C)**

$(x^{32} + 1/x^{32}) (x^8 + 1/x^8) (x^2 - 1/x^2) (x^{16} + 1/x^{16}) (x^4 + 1/x^4)$

Now we multiply and divide by $(x^2 + 1/x^2)$,

$= [(x^2 + 1/x^2) (x^{32} + 1/x^{32}) (x^8 + 1/x^8) (x^2 - 1/x^2) (x^{16} + 1/x^{16}) (x^4 + 1/x^4)]/(x^2 + 1/x^2)$

$= (x^4 - 1/x^4) (x^{32} + 1/x^{32}) (x^8 + 1/x^8) (x^{16} + 1/x^{16}) (x^4 + 1/x^4)]/(x^2 + 1/x^2)$

$= (x^8 - 1/x^8) (x^{32} + 1/x^{32}) (x^8 + 1/x^8) (x^{16} + 1/x^{16})]/(x^2 + 1/x^2)$

$= (x^{16} - 1/x^{16})^8) (x^{32} + 1/x^{32}) (x^{16} + 1/x^{16})]/(x^2 + 1/x^2)$

$= (x^{32} - 1/x^{32}) (x^{32} + 1/x^{32})/(x^2 + 1/x^2)$

$= (x^{64} - 1/x^{64})/(x^2 + 1/x^2)$

4. **Answer: (C)**

$7x + 12 + 7x - 12 + 2\sqrt{(7x + 12)}\sqrt{(7x - 12)} = 9 + 33 + 6\sqrt{33}$

$14x + 2((7x)^2 - 12^2)^{1/2} = 42 + 6\sqrt{33}$

$7x + ((7x)^2 - 12^2)^{1/2} = 21 + 3\sqrt{33}$

on comparison,

$7x = 21, x = 3$

And $((7x)^2 - 12^2)^{1/2} = 3\sqrt{33}$

$(7x)^2 - 144 = 9 \times 33$

$x^2 = 441/49$

$x = 21/7 = 3$

5. **Answer: (D)**

$(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1)$

$\Rightarrow [(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1)(x - 1)]/(x - 1)$

$\Rightarrow [(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x^2 - 1)]/(x - 1)$

$\Rightarrow [(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^4 - 1)]/(x + 1)$

$\Rightarrow [(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^8 - 1)]/(x + 1)$

$\Rightarrow [(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^{16} - 1)]/(x - 1)$

$\Rightarrow (x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{32} - 1)]/(x - 1)$

$\Rightarrow (x^{128} + 1)(x^{64} + 1)(x^{64} - 1)]/(x - 1)$

$\Rightarrow (x^{128} + 1)(x^{128} - 1)]/(x - 1)$

$\Rightarrow (x^{256} - 1)/(x - 1)$

6. **Answer: (A)**

$\Rightarrow \left(x\frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4}\right)\left(x^8 + \frac{1}{x^8}\right)\left(x^{16} + \frac{1}{x^{16}}\right)$

$\Rightarrow \dfrac{\left[\left(x-\frac{1}{x}\right)\left(x+\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}\right)\left(x^4+\frac{1}{x^4}\right)\left(x^8+\frac{1}{x^8}\right)\left(x^{16}+\frac{1}{x^{16}}\right)\right]}{x^{\frac{1}{z}}}$

$\Rightarrow \dfrac{\left[\left(x^2-\frac{1}{z^2}\right)\left(x^2+\frac{1}{x^2}\right)\left(x^4+\frac{1}{x^4}\right)\left(x^8+\frac{1}{x^8}\right)\left(x^{16}+\frac{1}{x^{16}}\right)\right]}{x^{\frac{1}{x}}}$

$\Rightarrow \dfrac{\left[\left(x^4-\frac{1}{z^4}\right)\left(x^4+\frac{1}{x^4}\right)\left(x^8+\frac{1}{x^8}\right)\left(x^{16}+\frac{1}{x^{16}}\right)\right]}{x^{\frac{1}{x}}}$

$\Rightarrow \dfrac{\left[\left(x^8-\frac{1}{z^8}\right)\left(x^8+\frac{1}{x^8}\right)\left(x^4+\frac{1}{x^4}\right)\left(x^{16}+\frac{1}{x^{16}}\right)\right]}{x^{\frac{1}{z}}}$

$\Rightarrow \dfrac{\left[\left(x^{16}-\frac{1}{z^{16}}\right)\left(x^{16}+\frac{1}{z^{16}}\right)\right]}{x^{\frac{1}{z}}}$

$\Rightarrow \dfrac{x^{32}-1/x^{32}}{x^{\frac{1}{x}}}$

7. **Answer: (B)**

Agreed, $(c-d) = \dfrac{c+d}{5} = \dfrac{cd}{3} = k$

$\Rightarrow (c - d) = k$

$\Rightarrow (c + d) = 5k$

$\Rightarrow cd = 3k$

$(c + d)^2 = (c - d)^2 + 4cd$

$\Rightarrow 25k^2 = k^2 + 3k \times 4 = k^2 + 12k$

$\Rightarrow 24k^2 - 12k = 0$

$\Rightarrow 12k(2k - 1) = 0$

k cannot be 0.

$\Rightarrow k = 1/2$

$\therefore cd = 3k = 3/2$

8. **Answer: (D)**

$a/4 = 1 + 3/a$

$a^2 = 4a + 12$

$a^2 - 4a - 12 = 0$

$a = 6, -2$

$a^3 = 216$ or -8

9. **Answer: (B)**

$(x - \frac{1}{3})^2 + (y - 4)^2 = 0$

i.e $x = 1/3$ and $y = 4$

So, $\frac{y+x}{y-x} = \frac{4+1/3}{4-1/3} = \frac{13/3}{11/3} = \frac{13}{11}$

10. **Answer: (D)**

$\frac{\sqrt{5+x} + \sqrt{5-x}}{\sqrt{5+x} - \sqrt{5-x}} = 3$

By summation,

$\frac{2\sqrt{5+x}}{2\sqrt{5-x}} = 2$

$\frac{5+x}{5-x} = 4$

$5 + x = 20 - 4x$

$5x = 15$

$x = 3$

11. **Answer: (C)**

$\frac{7x^2 - 19xy + 11y^2}{y^2}$

$= 7\left(\frac{x}{y}\right)^2 - 19\left(\frac{x}{y}\right) + 11$

$= 7 \times \left(\frac{4}{9}\right)^2 - 19\left(\frac{4}{9}\right) + 11$

$= \frac{7 \times 16}{81} - \frac{76}{9} + 11$

$= \frac{112 - 684 + 891}{81}$

$= \frac{319}{81}$

12. **Answer: (A)**

$(5x - y)/(5x + y) = 3/7$,

$35x - 7y = 15x + 3y$

$y = 2x$

Let $x = k$; Then, $y = 2k$

$\frac{(4x^2 + y^2 - 4xy)}{(9x^2 + 16y^2 + 24xy)}$

$= \frac{(4k^2 + 4k^2 - 8k^2)}{(9k^2 + 64k^2 + 48k^2)} = 0$

13. **Answer: (D)**

$\sqrt{\frac{1+x}{x}} - \sqrt{\frac{x}{1+x}} = \frac{1}{\sqrt{6}}$

$\Rightarrow \frac{(\sqrt{1+x})^2 - (\sqrt{x})^2}{\sqrt{x}(1+x)} = \frac{1}{\sqrt{6}}$

$\Rightarrow \frac{1 + x - x}{\sqrt{x(1+x)}} = \frac{1}{\sqrt{6}}$

$\Rightarrow \frac{1}{x(1+x)} = \frac{1}{6}$

$\Rightarrow x(x + 3) - 2(x + 3) = 0$

$\Rightarrow (x - 2)(x + 3) = 0$

$\Rightarrow x = 2, -3$

14. **Answer: (C)**

$\sqrt{5x - 6} + \sqrt{5x + 6} = 6\sqrt{5x - 6} - 3$

$= 3 - \sqrt{5x + 6}$

On squaring both sides,

$5x - 6 + 9 - 6\sqrt{5x - 6}$

$= 9 + 5x + 6 - 6\sqrt{5x + 6}$

$-2 = -\sqrt{5x + 6} + \sqrt{5x - 6}$... (ii)

From equation (i) and (ii),

$\sqrt{5x - 6} = 2x = 2$

15. **Answer: (B)**

$\frac{p}{q} = \frac{r}{s} = \frac{t}{4} = \sqrt{5}$

Then, $\left(\frac{3p^2 + 4r^2 + 5t^2}{3q^2 + 4r^2 + 5u^2}\right) = (\sqrt{5})^2 = 5$

TYPE – IX

1. **Answer: (C)**

$a^2 + b^2 + 2b + 4a + 5 = 0$,

$\Rightarrow a^2 + 4a + b^2 + 2b + 5 = 0$

$\Rightarrow (a + 2)^2 = a^2 + 4a + 4$

$\Rightarrow (b + 1)^2 = b^2 + 2b + 1$

$\Rightarrow a^2 + 4a + 4 + b^2 + 2b + 1 = 0$

$\Rightarrow (a + 2)^2 + (b + 1)^2 = 0$

So, $a + 2 = 0$

$\Rightarrow a = -2$

And, $b + 1 = 0$

$\Rightarrow b = -1$

So,

$\frac{2a - 3b}{2a + 3b}$

Substituting the values of a and b in this equation

$\Rightarrow \frac{2 \times (-2) - 3 \times (-1)}{2 \times (-2) + 3 \times (-1)} = \frac{4+3}{4-3}$

$= 1/7$

2. **Answer: (C)**

$a^2 + b^2 + c^2 + 170 = 2(8a + 5b - 9c)$

$a^2 + b^2 + c^2 - 16a - 10b + 18c + 170 = 0$

$a^2 - 16a + 64 + b^2 - 10b + 25 + c^2 + 18c + 81 = 0$ ($\because 64 + 25 + 81 = 170$)

$(a - 8)^2 + (b - 5)^2 + (c + 9)^2 = 0$

Now,

$(a - 8)^2 = a - 8 = 0$
$\Rightarrow a = 8,$
Similarly,
$\Rightarrow b = 5$ and $c = -9$
Now,
$\Rightarrow \sqrt{(4a + 8b - c)} = [(32 + 40 - (-9)]$
$\Rightarrow \sqrt{(72 + 9)}$
$\Rightarrow \sqrt{81}$
$\Rightarrow 9$
$\therefore$ Option C is the correct answer.

3. **Answer: (A)**
On squaring the equation $(7a + 5b)$;
$\Rightarrow (7a + 5b)^2 = 49a^2 + 25b^2 + 2 \times 7a \times 5b$
$\Rightarrow (7a + 5b)^2 = 49a^2 + 25b^2 + 2 \times 7a \times 5b$
$\Rightarrow (7a + 5b)^2 = 49a^2 + 25b^2 + 70ab$
$\Rightarrow (7a + 5b)^2 = 30 + 70 \times 1$
$\Rightarrow (7a + 5b)^2 = 100$
$\Rightarrow (7a + 5b) = \sqrt{100}$
$\Rightarrow (7a + 5b) = \pm 10$
$\Rightarrow (7a + 5b) = + 10, \ (7a + 5b) \neq -10$
$\therefore$ The expected result is 10.

4. **Answer: (D)**
$\Rightarrow a^2 + 4b^2 + 25c^2 + 18 = 2(a - 2b + 20c)$
$\Rightarrow a^2 + 4b^2 + 25c^2 - 2a + 4b - 40c + 18 = 0$
$\Rightarrow (a^2 - 2a + 1) + (4b^2 + 4b + 1) + (25c^2 - 40c + 16) = 0$
$\Rightarrow (a - 1)^2 + (2b + 1)^2 + (5c - 4)^2 = 0$
$a - 1 = 0, 2b + 1 = 0, 5c - 4 = 0$
$a = 1, b = -1/2$ and $c = 4/5$
So,
$\Rightarrow ? = a + 2b + 5c$
$\Rightarrow ? = 1 - 1 + 4 = 4$
$\therefore (a + 2b + 5c) = 4$

5. **Answer: (A)**
$a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$
$\Rightarrow a^2 - 12a + b^2 - 12b + c^2 + 24c + 216 = 0$
$\Rightarrow a^2 - 12a + 36 + b^2 - 12b + 36 + c^2 + 24c + 144 = 0$
$\Rightarrow (a - 6)^2 + (b - 6)^2 + (c + 12)^2 = 0$
$\Rightarrow a = 6, b = 6, c = -12$
$\sqrt{ab - bc + ca}$
$\Rightarrow \sqrt{6 \times 6 - (6 \times (-12) + (-12 \times 6)}$
$\Rightarrow \sqrt{36}$
$\Rightarrow 6$

6. **Answer: (B)**
$x^2 + 8y^2 - 12y - 4xy + 9 = 0$
$\Rightarrow x^2 + 4y^2 + 4y^2 - 12y - 4xy + 9 = 0$
$\Rightarrow (x^2 + 4y^2 - 4xy) + (4y^2 - 12y + 9) = 0$
$\Rightarrow (x - 2y)^2 + (2y - 3)^2 = 0$
Either $(2y - 3)^2 = 0$
$\Rightarrow (2y - 3) = 0$
$\Rightarrow 2y = 3$
$\Rightarrow y = 3/2$

Or $(x - 2y)^2 = 0$
$\Rightarrow (x - 2y) = 0$
$\Rightarrow x = 2 \times 3/2$
$\Rightarrow x = 3$
$(7x - 8y) = 7 \times 3 - 8 \times 3/2$
$\Rightarrow (7x - 8y) = 21 - 12$
$\Rightarrow (7x - 8y) = 9$
$\therefore$ The value of $(7x - 8y)$ is 9.

7. **Answer: (B)**
$x^2 + 8y^2 + 12y - 4xy + 9 = 0$
$\Rightarrow x^2 - 4xy + 4y^2 + 4y^2 + 12y + 9 = 0$
$\Rightarrow (x - 2y)^2 + (2y + 3)^2 = 0$
$\Rightarrow x - 2y = 0, 2y + 3 = 0$
$\Rightarrow x = 2y, 2y = -3$
$\Rightarrow x = -3, y = -3/2$
Now,
$7x + 8y = 7 \times (-3) + 8 \times (-3/2)$
$\Rightarrow -21 - 12 = -33$
$\therefore$ Correct answer is -33.

8. **Answer: (C)**
on rearranging the equation
$\Rightarrow a^2 + b^2 + c^2 + 84 - 4a + 8b - 16c = 0$
$\Rightarrow a^2 - 4a + 4 + b^2 + 8b + 16 + c^2 - 16c + 64 = 0$
$\Rightarrow (a - 2)^2 + (b + 4)^2 + (c - 8)^2 = 0$
If $(a - b)^2 + (b - c)^2 + (c - a)^2 = 0$
Then,
$a - b = 0$
$\Rightarrow a = b$
$\Rightarrow b = c$
$\Rightarrow c = a$
$\therefore a = 2, b = -4, c = 8$
Then,
$[\sqrt{ab - bc + ca}] =$
$[\sqrt{(2 \times -4) - (8 \times -4) + (8 \times 2)}]$
$\sqrt{(-8) - (-32) + (16)} = \sqrt{40}$
$\Rightarrow \sqrt{40} = 2\sqrt{10}$
$\therefore \sqrt{ab - bc + ca}$ is equal to $2\sqrt{10}$.

9. **Answer: (D)**
$(x^4 + x^2y^2 + y^4) = (x^2 + xy + y^2)(x^2 - xy + y^2)$
$\Rightarrow 4a^2 + 9b^2 - 6ab = 13$
$\Rightarrow [4a^2 - 6ab + 9b^2] = 13$ ------ (1)
$\Rightarrow 16a^4 + 36a^2b^2 + 81b^4 = 91$
$\Rightarrow [4a^2 + 6ab + 9b^2][4a^2 - 6ab + 9b^2] = 91$
$\Rightarrow [4a^2 + 6ab + 9b^2] = 91/13$
$\Rightarrow [4a^2 + 6ab + 9b^2] = 7$ ------ (2)
Subtracting equation (2) from equation (1) we get,
$12ab = 7 - 13$
$\Rightarrow ab = -6/12$
$\Rightarrow 3ab = -3/2$

10. **Answer: (C)**
Since we know,

If $(a - b)^2 + (x - y)^2 = 0$, then $a - b = 0$ and $x - y = 0$.
$(a + b - 2)^2 + (b + c - 5)^2 + (c + a - 5)^2 = 0$
So,
$(a + b - 2) = 0$
$\Rightarrow a + b = 2$ ---- (1)
$(b + c - 5) = 0$
$\Rightarrow b + c = 5$ ---- (2)
$(c + a - 5) = 0$
$\Rightarrow c + a = 5$ ---- (3)
On solving (1), (2) and (3), we get,
$a = 1$, $b = 1$ and $c = 4$
Now,
$\sqrt{(b + c)^a + (c + a)^b - 1}$
$= \sqrt{(1 + 4)^1 + (4 + 1)^1 - 1} = \sqrt{9} = 3$

11. **Answer: (C)**
$x^2 - 4x + 4 = 0$
$\Rightarrow x^2 - 2 \times x \times 2 + 2^2 = 0$
$\Rightarrow (x - 2)^2 = 0$
$\Rightarrow x = 2$
Now, $16(x^4 - 1/x^4)$
$= 16(16 - 1/16)$
$= 256 - 1$
$= 255$

12. **Answer: (A)**
$a^2 + c^2 + 17 = 2(a - 8b - 2b^2)$
$\Rightarrow a^2 + c^2 + 17 = 2a - 16b - 4b^2$
$\Rightarrow a^2 + 4b^2 + c^2 + 17 = 2(a - 8b)$
$\Rightarrow a^2 - 2a + 1 + 4b^2 + 16b + c^2 = 0$
$\Rightarrow (a - 1)^2 + (2b + 4)^2 + c^2 = 0$
$\Rightarrow a = 1$, $b = -2$ and $c = 0$
Now,
$(a^3 + b^3 + c^3) = (1)^3 + (-2)^3 + (0)^3$
$\Rightarrow 1 - 8 + 0$
$\Rightarrow -7$
$\therefore$ Required value is -7.

13. **Answer: (A)**
$x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$
$\Rightarrow x^2 + 9y^2 + 4z^2 = 12x - 24y + 24z - 88$
$\Rightarrow x^2 + 9y^2 + 4z^2 - 12x + 24y - 24z + 88 = 0$
$\Rightarrow x^2 - 12x + 36 + 9y^2 + 24y + 16 + 4z^2 - 24z + 36 = 0$
$\Rightarrow (x - 6)^2 + (3y + 4)^2 + (2z - 6)^2 = 0$
$(x - 6) = 0$
$\Rightarrow x = 6$
$(3y + 4) = 0$
$\Rightarrow y = -4/3$
$(2z - 6) = 0$
$\Rightarrow z = 3$
$(x - 3y + z)$
$\Rightarrow 6 - 3(-4/3) + 3$
$\Rightarrow 6 + 4 + 3$
$\Rightarrow 13$

$\therefore$ The required answer is 13.

14. **Answer: (B)**
$a^2 + b^2 + c^2 + 216 = 12(a + b - 2c)$
$\Rightarrow a^2 + b^2 + c^2 + 216 = 12a + 12b - 24c$
$\Rightarrow a^2 - 12a + 36 + b^2 - 12b + 36 + c^2 + 24c + 144 = 0$
$\Rightarrow (a - 6)^2 + (b - 6)^2 + (c + 12)^2 = 0$
$(a - 6) = 0$
$(b - 6) = 0$
$(c + 12) = 0$
So, $a = 6$
$b = 6$
$c = -12$
$\sqrt{ab - bc - ca}$
$\Rightarrow \sqrt{6 \times 6 - 6 \times (-12) - (-12) \times 6}$
$\Rightarrow \sqrt{36 + 72 + 72}$
$\Rightarrow \sqrt{180}$
$\Rightarrow 6\sqrt{5}$
$\therefore$ The value of $\sqrt{ab - bc - ca}$ is $6\sqrt{5}$

15. **Answer: (C)**
$9(a^2 + b^2) + c^2 + 20 = 12(a + 2b)$
$\Rightarrow 9a^2 + 9b^2 + c^2 + 20 = 12a + 24b$
$\Rightarrow 9a^2 - 12a + 9b^2 - 24b + c^2 + 20 = 0$
$\Rightarrow 9a^2 - 12a + 4 + 9b^2 - 24b + 16 + c^2 = 0$
$\Rightarrow (3a - 2)^2 + (3b - 4)^2 + c^2 = 0$
$(3a - 2) = 0$
$(3b - 4) = 0$
$c = 0$
$a = 2/3$
$b = 4/3$
$c = 0$
So,
$\sqrt{6a + 9b + 2c} = \sqrt{6 \times 2/3 + 9 \times 4/3}$
$\Rightarrow \sqrt{4 + 12}$
$\Rightarrow 4$

16. **Answer: (A)**
$a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$
$\Rightarrow a^2 + b^2 + 49c^2 + 18 = 2b - 56c - 2a$
$\Rightarrow a^2 + b^2 + 49c^2 + 18 - 2b + 56c + 2a = 0$
$\Rightarrow a^2 + 2a + 1 + b^2 - 2b + 1 + 49c^2 + 56c + 16 = 0$
$\Rightarrow (a + 1)^2 + (b - 1)^2 + (7c + 4)^2 = 0$
Now the above equation is 0, only when
$\Rightarrow a + 1 = 0$, $b - 1 = 0$, $7c + 4 = 0$
$\Rightarrow a = -1$, $b = 1$, $c = -4/7$
So, $(a + b - 7c) = (-1) + 1 - [7 \times (-4/7)]$
$= -1 + 1 + 4$
$= 4$

17. **Answer: (C)**
As per the question,
$a^2 + b^2 + 49c^2 + 18 = 2(b - 28c - a)$
$\Rightarrow a^2 + b^2 + 49c^2 + 18 = 2b - 56c - 2a$

$\Rightarrow a^2 + b^2 + 49c^2 + 18 - 2b + 56c + 2a = 0$
$\Rightarrow (a^2 + 2a + 1) + (b^2 - 2b + 1) + (7c)^2 + 56c + 16 = 0$
$\Rightarrow (a + 1)^2 + (b - 1)^2 + \{(7c)^2 + 56c + 4^2\} = 0$
$\Rightarrow (a + 1)^2 + (b - 1)^2 + (7c + 4)^2 = 0$ ----(1)
(from formulas 1 and 2)
Now in equation 1, all the values have to be 0 for it to be 0.
$\therefore (a + 1)^2 = 0$
$\Rightarrow (a + 1) = 0$
$\Rightarrow a = -1$ ----(2)
Again,
$(b - 1)^2 = 0$
$\Rightarrow (b - 1) = 0$
$\Rightarrow b = 1$ ----(3)
Again,
$(7c + 4)^2 = 0$
$\Rightarrow (7c + 4) = 0$
$\Rightarrow 7c = -4$
$\Rightarrow c = -4/7$ ----(4)
According to the question,
$(a - b - 7c) = -1 - 1 - 7 \times (-4/7)$
$\Rightarrow (a - b - 7c) = -2 + 4$
$\Rightarrow (a - b - 7c) = 2$
$\therefore$ The value of $(a - b - 7c)$ is 2.

18. **Answer: (D)**
According to the question,
$a^2 + b^2 + 49c^2 + 18 = 2(b + 28c - a)$
$\Rightarrow a^2 + b^2 + 49c^2 + 18 = 2b + 56c - 2a$
$\Rightarrow a^2 + b^2 + 49c^2 + 18 - 2b - 56c + 2a = 0$
$\Rightarrow (a^2 + 2a + 1) + (b^2 - 2b + 1) + (7c)^2 - 56c + 16 = 0$
$\Rightarrow (a + 1)^2 + (b - 1)^2 + \{(7c)^2 - 56c + 42\} = 0$
$\Rightarrow (a + 1)^2 + (b - 1)^2 + (7c - 4)^2 = 0$ ----(1)
(from formulas 1 and 2)
Now in equation 1, all the units have to be 0 for it to equal 0.
$\therefore (a + 1)^2 = 0$
$\Rightarrow (a + 1) = 0$
$\Rightarrow a = -1$ ----(2)
Again,
$(b - 1)^2 = 0$
$\Rightarrow (b - 1) = 0$
$\Rightarrow b = 1$ ----(3)
Again,
$(7c - 4)^2 = 0$
$\Rightarrow (7c - 4) = 0$
$\Rightarrow 7c = 4$
$\Rightarrow c = 4747$ ----(4)
According to the question,
$(2a - b + 7c) = (2 \times -1) - 1 + 7 \times 4/7$
$= -2 - 1 + 4 = 1$

TYPE – X

1. **Answer: (D)**
$b + c = ax$, $c + a = by$ and $a + b = cz$
Putting $a = b = c = 1$ and $x = y = z = 2$, then all the conditions are satisfied
Now,
$1/9 [1/(x + 1) + 1/(y + 1) + 1/(z + 1)]$
$= 1/9 [1/3 + 1/3 + 1/3]$
$= 1/9 \times 3/3$
$= 1/9$

2. **Answer: (B)**
$a + b + c = 0$
$a + b = -c$ ..(1)
$b + c = -a$ ...(2)
$c + a = -b$ ...(3)
Now,
$\frac{(b+c)^2}{bc} + \frac{(c+a)^2}{ca} + \frac{(a+b)^2}{ab}$
$\Rightarrow (b^2 + c^2 + 2bc)/bc + (c^2 + a^2 + 2ca)/ca + (a^2 + b^2 + 2ab)/ab$
$\Rightarrow (b^2/bc + c^2/bc + 2bc/bc) + (c^2/ca + a^2/ca + 2ca/ca) + (a^2/ab + b^2/ab + 2ab/ab)$
$\Rightarrow (b/c + c/b + 2) + (c/a + a/c + 2) + (a/b + b/a + 2)$
$\Rightarrow (b + c)/a + (c + a)/b + (a + b)/c + 2 + 2 + 2$
Using equation (1), (2) and (3) we get
$(-b/b) + (-c/c) + (-a/a) + 6$
$= (-1) + (-1) + (-1) + 6$
$= 6 - 3$
$= 3$

3. **Answer: (D)**
$\frac{6x + 1}{x} + \frac{7y - 1}{y} + \frac{8z - 1}{z} = 0$
$\frac{6xyz - yz + 7xyz - xz + 8xyz - xyz}{xyz}$
$= \frac{21xyz - xy - yz - zx}{xyz}$
$= 21 - \frac{1}{z} - \frac{1}{x} - \frac{1}{y} = 0$
$21 = \frac{1}{z} + \frac{1}{x} + \frac{1}{y}$

4. **Answer: (C)**
$1/(x + 2) = 1/3 \Rightarrow x = 1$
$3/(y + 3) = 1/3 \Rightarrow y = 6$
$1331/(z + 1331) = 1/3 \Rightarrow z = 2662$
$\frac{x}{x+1} + \frac{4}{y+2} + \frac{z}{z+2662}$
$= \frac{1}{1+1} + \frac{4}{6+2} + \frac{2662}{2662+2662} = 3/2$

5. **Answer: (C)**
$\frac{3X - 1}{X} + \frac{(5Y - 1)}{Y} + \frac{7Z - 1}{Z} = 0$
$= 3 - \frac{1}{X} + 5 - \frac{1}{Y} + 7 - \frac{1}{Z} = 0$
$= \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 3 + 5 + 7 = 15$

6.
Answer: (D)

$$\frac{11-13X}{X} + \frac{11-13Y}{Y} + \frac{11-13Z}{Z} = 5$$

$$\frac{11}{X} + \frac{11}{Y} + \frac{11}{Z} - 13 - 13 - 13 = 5$$

$$11\left(\frac{1}{X} + \frac{1}{Y} + \frac{1}{Z}\right) = 44$$

$$\frac{1}{X} + \frac{1}{Y} + \frac{1}{Z} = 4$$

TYPE – XI
Nature – I

$(a + b)^2 = a^2 + 2ab + b^2$
$(a - b)^2 = a^2 - 2ab + b^2$

1. **Answer: (A)**

According to Question,
$2(a^2 + b^2) = (a + b)^2$
$\Rightarrow 2(a^2 + b^2) = (a^2 + b^2 + 2ab)$
$\Rightarrow 2a^2 + 2b^2 = (a^2 + b^2 + 2ab)$
$\Rightarrow 2a^2 + 2b^2 - a^2 - b^2 - 2ab = 0$
$\Rightarrow a^2 + b^2 - 2ab = 0$
$\Rightarrow (a - b)^2 = 0$
$\Rightarrow a - b = 0$
$\Rightarrow a = b$
$\therefore$ Answer is a = b.

2. **Answer: (B)**

$(a + b)^2 = a^2 + b^2 + 2ab$
$\Rightarrow 11^2 = a^2 + b^2 + 2 \times 15$
$\Rightarrow a^2 + b^2 = 121 - 30$
$\therefore a^2 + b^2 = 91$

3. **Answer: (A)**

$(x - 2y)^2 = x^2 + 4y^2 - 2 \times x \times 2y$
$\Rightarrow 3^2 = x^2 + 4y^2 - 4 \times 5$
$\Rightarrow x^2 + 4y^2 = 9 + 20$
$\Rightarrow x^2 + 4y^2 = 29$ ---- (1)
$(x^2 + 4y^2)^2 = x^4 + 16y^4 + 2 \times x^2 \times 4y^2$
$\Rightarrow 29^2 = x^4 + 16y^4 + 8 \times 25$
$\Rightarrow x^4 + 16y^4 = 841 - 200$
$\Rightarrow x^4 + 16y^4 = 641$ --- (2)
$(x^2 - 4y^2)^2 = x^4 + 16y^4 - 2 \times x^2 \times 4y^2$
$\Rightarrow (x^2 - 4y^2)^2 = 641 - 8 \times 25$
$\Rightarrow (x^2 - 4y^2)^2 = 441$
$\Rightarrow x^2 - 4y^2 = \sqrt{441}$
$\therefore x^2 - 4y^2 = 21$

4. **Answer: (C)**

$(x + y)^2 = x^2 + y^2 + 2xy$
$\Rightarrow (x + y)^2 = 32 + 2 \times 16$
$\Rightarrow (x + y)^2 = 32 + 32$
$\Rightarrow (x + y)^2 = 64$
$\Rightarrow (x + y) = \pm 8$

5. **Answer: (D)**

On squaring the given equation,
$\Rightarrow (2a + 3b)^2 = 64$
$\Rightarrow 4a^2 + 9b^2 + 12ab = 64$
Substituting the value of ab,
$\Rightarrow 4a^2 + 9b^2 + (12 \times 5) = 64$
$\Rightarrow 4a^2 + 9b^2 = 64 - 60 = 4$

$\therefore$ The value of $4a^2 + 9b^2$ is 4.

6. **Answer: (C)**

$4a^2 + b^2 = 20$
$\Rightarrow (2a)^2 + b^2 = 20$
$\Rightarrow (2a + b)^2 - 2 \times 2a \times b = 20$
$\Rightarrow (2a + b)^2 - 4 \times 4 = 20$
$\Rightarrow (2a + b)^2 - 16 = 20$
$\Rightarrow (2a + b)^2 = 20 + 16$
$\Rightarrow (2a + b)^2 = 36$
$\Rightarrow 2a + b = \sqrt{36}$
$\Rightarrow 2a + b = 6$
$\therefore 2a + b = 6.$

7. **Answer: (C)**

$(2x + y)^2 = 4x^2 + y^2 + 4xy$
Since,
$xy = 6$
So,
$4xy = 4 \times 6 = 24$
Now,
$(2x + y)^2 = 4x^2 + y^2 + 4xy$
Substituting the values of $y^2 + 4x^2$ and $4xy$ as given above
We receive,
$(2x + y)^2 = 40 + 24$
$\Rightarrow (2x + y)^2 = 64$
$\Rightarrow (2x + y) = \pm 8$
$\Rightarrow (2x + y) = 8$
$\therefore$ The value of $2x + y$ is 8.

8. **Answer: (C)**

$1/x + 1/y = -(3/10)$
$\Rightarrow (x + y)/xy = -(3/10)$
$\Rightarrow xy = (-10)$
Now,
$x + y = 3$
$\Rightarrow (x + y)^2 = 9$ (Squaring both sides)
$\Rightarrow x^2 + y^2 + 2xy = 9$
$\Rightarrow x^2 + y^2 = 9 - 2xy$
$\Rightarrow x^2 + y^2 = 9 - 2 \times (-10)$
$\Rightarrow x^2 + y^2 = 29$
$\therefore$ The required value of $x^2 + y^2$ is 29.

Nature – II

1. **Answer: (C)**

$(a + 2b)^2 - (a - 2b)^2$
$= (a + 2b + a - 2b)(a + 2b - a + 2b)$
$= 2a \times 4b = 8ab$

2. **Answer: (B)**

$(a + b - c + d)^2 - (a - b + c - d)^2$
Putting a = 1, b = 2, c = 3 and d = 4, then
$\Rightarrow (1 + 2 - 3 + 4)^2 - (1 - 2 + 3 - 4)^2$
$\Rightarrow 16 - 4$
$\Rightarrow 12$
From option 2
$4a(b + d - c)$

$\Rightarrow 4 \times 1 (2 + 4 - 3)$

$\Rightarrow 4 \times 3$

$\Rightarrow 12$ (Satisfied)

3. **Answer: (A)**

$(a + b + c - d)^2 - (a - b - c + d)^2$

Putting $a = b = c = d = 1$, then

$\Rightarrow (1 + 1 + 1 - 1)^2 - (1 - 1 - 1 + 1)^2$

$\Rightarrow 2^2 - 0$

$\Rightarrow 4$

From option 1

$4a (a + c - d)$

$\Rightarrow 4 \times 1 (1 + 1 - 1)$

$\Rightarrow 4$

4. **Answer: (D)**

$(x - y + z)^2 - (x - y - z)^2$

$\Rightarrow (x - y + z + x - y - z)(x - y + z - x + y + z)$

$\Rightarrow (2x - 2y)(2z)$

$\Rightarrow 4xz - 4yz$

$\therefore$ Required answer is $4xz - 4yz$

5. **Answer: (D)**

Let, $1 - 3r + 9r^2 = x$

So, $(1 + 9r^2 + 3r)(1 + 9r^2 - 3r) = 32x$

$\Rightarrow (1 + 9r^2)^2 - 9r^2 = 32x$

$\Rightarrow 1 + 81r^4 + 18r^2 - 9r^2 = 32x$

$\Rightarrow 1 + 81r^4 + 9r^2 = 32x$

$\Rightarrow 256 = 32x$

$\Rightarrow x = 256/32 = 8$

$\therefore$ Value of $1 - 3r + 9r^2 = 8$

6. **Answer: (C)**

$(x^2 + y^2 + xy) = 117/3(4 + \sqrt{3}) = 39 \times (4 - \sqrt{3})/$

$(4 + \sqrt{3}) \times (4 - \sqrt{3})$

$\Rightarrow 12 - 3\sqrt{3} \dots (2)$

Adding (1) and (2), we get,

$2(x^2 + y^2) = 12 + 3\sqrt{3} + 12 - 3\sqrt{3}$

$\therefore (x^2 + y^2) = 12$

7. **Answer: (B)**

$(a^2 + b^2 + ab)(a^2 + b^2 - ab) = a^4 + b^4 + a^2b^2$

$(a^2 + b^2 + ab) = 133/19$

$a^2 + b^2 + ab = 7$

But, $a^2 + b^2 - ab = 19$

after subtracting,

$2ab = -12$

$ab = -6$

8. **Answer: (D)**

as we know,

$x^4 + x^2y^2 + y^4 = (x^2 - xy + y^2)(x^2 + xy + y^2)$

$x^4 + x^2y^2 + y^4 = 21$ and $x^2 + xy + y^2 = 7$ $\cdots$ (1)

$21 = (x^2 - xy + y^2) \times 7$

$(x^2 - xy + y^2) = 21/7$

$(x^2 - xy + y^2) = 3$ $\cdots$ (2)

Subtracting (1) from equation (2)

$2xy = 4$

$\Rightarrow xy = 2$

$\Rightarrow (xy)^2 = 4$

From equation (1)

$x^2 + y^2 = 7 - 2$

$\Rightarrow x^2 + y^2 = 5$

$\Rightarrow (1/x^2 + 1/y^2)$

$\Rightarrow (x^2 + y^2)/(xy)^2$

$\Rightarrow 5/4$

9. **Answer: (D)**

$x^2 - xy + y^2 = 13$ $\cdots$(1)

$x^4 + x^2y^2 + y^2 = 273$

as we know

$(x^2 - xy + y^2)(x^2 + xy + y^2) = x^4 + x^2y^2 + y^2$

$13 \times (x^2 + xy + y^2) = 273$

$(x^2 + xy + y^2) = 273/13 = 21$ $\cdots$(2)

From equation (1) and equation (2)

$2xy = 8$

$xy = 4$

10. **Answer: (C)**

$x^4 + y^4 + x^2y^2 = (x^2 + y^2 - xy)(x^2 + y^2 + xy)$

$\Rightarrow 21 = 7(x^2 + y^2 + xy)$

$\Rightarrow (x^2 + y^2 + xy) = 3$

Now,

$(x^2 + y^2 + xy) + (x^2 + y^2 - xy) = 3 + 7$

$\Rightarrow x^2 + y^2 = 5$

So, $xy = 3 - 5 = -2$

$\frac{x}{y} + \frac{y}{x} = \frac{x^2 + y^2}{xy}$

$\Rightarrow -5/2$

$\therefore$ Required answer is $-5/2$.

11. **Answer: (C)**

$x^4 + x^2y^2 + y^4 = 21$

and, $x^2 + xy + y^2 = 3$ $\dots$(1)

Now,

$x^4 + x^2y^2 + y^4 = (x^2 - xy + y^2)(x^2 + xy + y^2)$

$\Rightarrow 21 = (x^2 - xy + y^2) \times 3$

$\Rightarrow (x^2 - xy + y^2) = 7$ $\dots$(2)

Subtracting equation (2) from (1), we get,

$(x^2 - xy + y^2 = 7) - (x^2 + xy + y^2 = 3)$

$\Rightarrow 2xy = (-4)$

$\Rightarrow xy = (-4/2)$

$\Rightarrow xy = -2$

Now,

The value of $-xy = 2$

$\therefore$ Required value is 2.

12. **Answer: (C)**

$a^4 + b^4 + a^2b^2 = 273$

$\Rightarrow (a^2 + b^2 + ab)(a^2 + b^2 - ab) = 273$

$\Rightarrow (a^2 + b^2 + ab)(21) = 273$

$\Rightarrow (a^2 + b^2 + ab) = (273/21)$

$\Rightarrow (a^2 + b^2 + ab) = 13$ $\dots$(1)

$a^2 + b^2 - ab = 21$ $\dots$(2)

Adding equation (1) and (2), we get,

$\Rightarrow (a^2 + b^2 + ab) = 13 + a^2 + b^2 - ab = 21$

⇒ 2(a² + b²) = (21 + 13)
⇒ 2(a² + b²) = 34
⇒ a² + b² = 17
Substituting the value 17 in equation (2),
⇒ 17 − ab = 21
⇒ -ab = 4
⇒ ab = -4
Now,
(a + b)² = a² + b² + 2ab
⇒ (a + b)² = 17 + 2 × (-4)
⇒ (a + b)² = 17 − 8
⇒ (a + b)² = 9
⇒ (a + b) = 3
So,
The value of (1/a+1/b),
⇒ [(b + a)/ab] = [3/(-4)]
⇒ -3/4
∴ The required value is -3/4.

13. **Answer: (A)**
According to the formula used
a⁴ + b⁴ + a²b² = (a² − ab + b²) (a² + ab + b²)
⇒ x⁴ + y⁴ + x²y² = (x² − xy + y²) (x² + xy + y²)
⇒ $17\frac{1}{16} = 5\frac{1}{4}$ (x² + xy + y²)
⇒ $\frac{273}{16} = \frac{21}{4}$ (x² + xy + y²)
⇒ (x² + xy + y²) = $\frac{13}{4}$ ----(iii)
Adding (ii) and (iii), we get
(x² + y²) = $\frac{17}{4}$ -----(iv)
Subtracting (ii) from (iii), we get
xy = -1   ----(v)
Now, using the formula (a - b)² = a² + b² - 2ab
(x - y)² = x² + y² - 2xy
From (iv) and (v), we get
⇒ (x - y)² = (17/4) - 2 × (-1)
⇒ (x - y)² = (17/4) + 2 = 25/4
⇒ (x - y) = 5/2
∴ The required value of (x - y) is 5/2.

Nature – III

1. **Answer: (A)**
Let a = 3x√y and b = 2y√x
The given equation will be changed to [(a + b)/(a - b)] - [(a - b)/(a + b)]
⇒ [(a + b)² - (a - b)²]/[(a + b)(a - b)] = √(xy)
⇒ 4ab/(a² - b²) = √(xy)
⇒ (4 × 3x√y × 2y√x)/[(3x√y)² -(2y√x)²] = √(xy)
⇒ (24x√x × y√y)/(9x²y - 4y²x) = √(xy)
⇒ [24 × xy × √(xy)]/[(xy)(9x - 4y) = √(xy)
⇒ 24/(9x - 4y) = 1
⇒ 9x - 4y = 24

2. **Answer: (C)**
⇒ (x − y)² = (15)² − 4 × 14 = 225 − 56 = 169

∴ x − y = 13

3. **Answer: (C)**
x − y = 13
on squaring both sides
⇒ (x − y)² = 13²
 (x + y)² = (x − y)² + 4xy
⇒ (x + y)² = 169 + 4 × 25
⇒ (x + y) = √(269)
x² − y² = (x − y) (x + y)
⇒ x² − y² = 13√269

4. **Answer: (C)**
(a - 3b)² = (a + 3b)² - 4 × 3ab
= 144 − 4 × 27
= 144 − 108 = 36
a − 3b = 6

5. **Answer: (B)**
(a - 2b)² = (a + 2b)² - 4 × 2ab
= 100 − 4 × 9
= 100 − 36 = 64
a − 2b = 8

6. **Answer: (A)**
⇒ (3u + 2v)² = 72
⇒ (3u − 2v)² + 4 × 3u × 2v = 49
⇒ (3u − 2v)² + 24uv = 49
⇒ (3u − 2v) = √ (49 − 24 × 2)
⇒ (3u − 2v) = √ 1
⇒ (3u − 2v) = +1 or -1
∴ The value of (3u - 2v) is 1.

7. **Answer: (A)**
⇒ (x + y)² = x² + y² + 2xy
⇒ 2xy = 25 - 17 = 8
So,
(x - y)² = x² + y² - 2xy
= 17 - 8
= 9
∴ (x - y)² = 9

8. **Answer: (D)**
(3p + 5m)² = (3p - 5m)² +4 × 15pm
(3p + 5m)² = 25 + 4 × 15 × 6
(3p + 5m)² = 25 + 360 = 385
⇒ (3p + 5m) = ±√385
∴ (9p² - 25m²) = (39 - 5m)(3p + 5m) = ±5√385

Nature – IV

a³ + b³ = (a + b)(a² − ab + b²)

1. **Answer: (B)**
(a + b)³ = a³ + b³ + 3ab(a + b)
5³ = a³ + b³ + 3ab(5)
⇒ 3ab(5) = 125 − 20
⇒ ab = 7
Now,
(a + b)² = a² + b² + 2ab
⇒ 5² = a² + b² + 2 × 7
⇒ a² + b² = 25 − 14 = 11

So,
$(a^2 + b^2)^2 = a^4 + b^4 + 2a^2b^2$
$11^2 = a^4 + b^4 + 2 \times 49$
$\Rightarrow a^4 + b^4 = 121 - 98$
$\Rightarrow 23$

2. **Answer: (D)**
$(x + y)[(x + y)^2 - 3xy] = 16$
$\Rightarrow 4[16 - 3xy] = 16$
$\Rightarrow (64 - 12xy) = 16$
$\Rightarrow 64 - 16 = 12xy$
$\Rightarrow 48 = 12xy$
$\Rightarrow xy = 4$
$x^4 + y^4 = (x^2 + y^2)^2 - 2x^2y^2$
$\Rightarrow [(x + y)^2 - 2xy]^2 - 2x^2y^2$
$\Rightarrow [(4)^2 - 8]^2 - 2 \times 16$
$\Rightarrow [16 - 8]^2 - 32$
$\Rightarrow 8^2 - 32$
$\Rightarrow 64 - 32$
$\Rightarrow 32$

3. **Answer: (B)**
$2x + y = 6$
$xy = 4$
$\Rightarrow (2x + y)^2 = 4x^2 + y^2 + 4xy$
$\Rightarrow 6^2 = 4x^2 + y^2 + 4 \times 4$
$\Rightarrow 4x^2 + y^2 = 36 - 16$
$\Rightarrow 4x^2 + y^2 = 20$
Now,
$(2x)^3 + y^3 = (2x + y)(4x^2 + y^2 - 2xy)$
$\Rightarrow 8x^3 + y^3 = 6(20 - 2 \times 4)$
$\Rightarrow 8x^3 + y^3 = 6 \times (20 - 8)$
$\Rightarrow 8x^3 + y^3 = 6 \times 12$
$\therefore 8x^3 + y^3 = 72$

4. **Answer: (A)**
$a + a^2b + b + ab^2 = 128$
$\Rightarrow a + b + a^2b + ab^2 = 128$
$\Rightarrow 8 + a^2b + ab^2 = 128$
$\Rightarrow a^2b + ab^2 = 128 - 8$
$\Rightarrow a^2b + ab^2 = 120$
$\Rightarrow ab(a + b) = 120$
$\Rightarrow ab \times 8 = 120$
$\Rightarrow ab = 120/8$
$\Rightarrow ab = 15$
$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$
$\Rightarrow a^3 + b^3 = 8[8^2 - 3 \times 15]$
$\Rightarrow a^3 + b^3 = 8[64 - 45]$
$\Rightarrow a^3 + b^3 = 8 \times 19$
$\therefore a^3 + b^3 = 152$

5. **Answer: (B)**
Given:
$a + b = 10$
ab का 3/7 = 9
Formula:
3/7 of ab = 9

$\Rightarrow ab = 9 \times (7/3)$
$\Rightarrow ab = 21$
$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$
$\Rightarrow a^3 + b^3 = 10 \times [10^2 - 3 \times 21]$
$\Rightarrow a^3 + b^3 = 10 \times [100 - 63]$
$\Rightarrow a^3 + b^3 = 10 \times 37$
$\therefore a^3 + b^3 = 370$
We have, $a + b = 10$ and $ab = 21$, so we can easily take $a = 7$ and $b = 3$
Now, $a^3 + b^3$
$= 7^3 + 3^3$
$= 343 + 27$
$= 370$

6. **Answer: (A)**
$(x^3 + y^3) = (x + y)(x^2 + y^2 - xy)$
$\Rightarrow 1064 = 14 \times (x^2 + y^2 - 2xy + xy)$
$\Rightarrow 76 = (x - y)^2 + xy$
$\Rightarrow 76 - 30 = (x - y)^2$
$\Rightarrow (x - y)^2 = 46$
$\therefore (x - y)^2 = 46$

7. **Answer: (D)**
$a + b = 8$, $ab = 12$
$\Rightarrow 8^2 = a^2 + b^2 + 2 \times 12$
$\Rightarrow a^2 + b^2 = 40$
$\Rightarrow a^3 + b^3 = 8 \times (40 - 12) = 224$

8. **Answer: (A)**
$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
$\Rightarrow 12 = 4 \times (x^2 - xy + y^2)$
$\Rightarrow x^2 + y^2 = 3 + xy$
$\Rightarrow (x + y)^2 - 2xy = 3 + xy$
$\Rightarrow 4^2 - 3 = 3xy$
$\Rightarrow xy = (16 - 3)/3$
$\Rightarrow xy = 13/3$
$x^4 + x^4 = (x^2 + y^2)^2 - 2x^2y^2$
$\Rightarrow (3 + xy)^2 - 2 \times (13/3)^2$
$\Rightarrow [3 + (13/3)]^2 - 2 \times (169/9)$
$\Rightarrow [(9 + 13)/9]^2 - 338/9$
$\Rightarrow (484/9) - 338/9$
$\Rightarrow (484 - 338)/9$
$\Rightarrow 146/9$

9. **Answer: (B)**
$\Rightarrow x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
$\Rightarrow$ Putting the given values of $x^3 + y^3$ and $(x + y)$
$\Rightarrow 16 = 4 \times ((x+y)^2 - 3xy)$
$\Rightarrow 16 = 4 \times (16 - 3xy)$
$\Rightarrow 16 = 64 - 12xy$
$\Rightarrow 12xy = 48$
$\Rightarrow xy = 4$
$\Rightarrow x^4 + y^4 = (x^2 + y^2)^2 - 2x^2y^2$
$\Rightarrow (x^2 + y^2)^2 - 2 \times 16$
$\Rightarrow ((x + y)^2 - 2xy)^2 - 2 \times 16$
$\Rightarrow (16 - 8)^2 - 2 \times 16$

$\Rightarrow 64 \cdot 32 = 32$

10. Answer: (D)

$a + b = 2$

On squaring the given equation

$(a + b)^3 = 2^3$

$\Rightarrow a^3 + b^3 + 3ab(a + b) = 8$ ----$[(a + b)^3 = a^3 + b^3 + 3ab(a + b)]$

$\Rightarrow 62 + 3ab \times 2 = 8$ ----$(a^3 + b^3 = 62, a + b = 2)$

$\Rightarrow 6ab = 8 - 62$

$\Rightarrow 6ab = \cdot 54$

$\Rightarrow ab = \cdot 54/6 = \cdot 9$

11. Answer: (D)

$x^4 + y^4 = (x^2 + y^2)^2 \cdot 2x^2y^2$ ......(1)

$x^3 + y^3 = (x + y)(x^2 + y^2 \cdot xy)$

$468/12 = (x^2 + y^2 \cdot xy)$

$39 = (x^2 + y^2 \cdot xy)$ ......(2)

$(x+y)^2 = x^2 + y^2 + 2xy$

$144 = x^2 + y^2 + 2xy$

$x^2 + y^2 = 144 \cdot 2xy$ ......(3)

Substituting the values $x^2 + y^2$ in equation (2),

$39 = (144 \cdot 2xy \cdot xy)$

We get, $xy = 35$ & $x^2 + y^2 = 74$

Now,

$x^4 + y^4 = (74)^2 \cdot 2(35)^2$

$\Rightarrow 5476 \cdot 2450$

$\Rightarrow 3026$

12. Answer: (A)

$\frac{1}{x} + \frac{1}{y} = \frac{20}{9}$

$\Rightarrow (y + x)/xy = 20/9$

$\Rightarrow 5/xy = 20/9$

$\Rightarrow xy = 9/4$ (1)

Also, $(x + y)^2 = x^2 + 2xy + y^2$

$\Rightarrow 5^2 \cdot 2xy = x^2 + y^2$

$\Rightarrow 25 \cdot 2 \times 9/4 = x^2 + y^2$ (From equation 1)

$\Rightarrow 25 \cdot 9/2 = x^2 + y^2$

$\Rightarrow (50 \cdot 9)/2 = x^2 + y^2$

$\Rightarrow x^2 + y^2 = 41/2$ (2)

Now, $(x^3 + y^3) = (x + y)(x^2 \cdot xy + y^2)$

$\Rightarrow 5 \times (41/2 \cdot 9/4)$

$\Rightarrow 5 \times 73/4$

$\Rightarrow 365/4$

$\therefore (x^3 + y^3) = 365/4$

13. Answer: (D)

$\Rightarrow (8a^3 + b^3) = (2a + b)(4a^2 \cdot 2ab + b^2)$

$\Rightarrow 16 = 4 \times (4a^2 \cdot 2ab + b^2)$

$\Rightarrow 4a^2 \cdot 2ab + b^2 = 4$

$\Rightarrow (2a + b)^2 = 4a^2 + 4ab + b^2$

$\Rightarrow 16 = 4a^2 + 4ab + b^2$

on solving,

$\Rightarrow 6ab = 12$

$\Rightarrow ab = 2$

Then,

$\Rightarrow 4a^2 + b^2 = 8$

Then,

$\Rightarrow ? = 16a^4 + b^4$

$\Rightarrow ? = (4a^2 + b^2)^2 \cdot 8a^2b^2$

$\Rightarrow ? = 8^2 \cdot 8 \times (2)^2$

$\Rightarrow ? = 32$

$\therefore 16a^4 + b^4 = 32$

14. Answer: (B)

$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

We need to find $(a + b)$

$(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow (a + b)^2 = 8^2 + 2 \times 9$

$\Rightarrow (a + b)^2 = 100$

$\Rightarrow (a + b) = 10$

Now,

$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

$\Rightarrow (10)^3 = a^3 + b^3 + 3 \times 9 \times 10$

$\Rightarrow 1000 = a^3 + b^3 + 270$

$\Rightarrow a^3 + b^3 = 1000 \cdot 270 = 730$

$\therefore$ the value of $a^3 + b^3$ is 730

15. Answer: (B)

Substituting the values in the formula

$(7)^3 = 217 + 3ab(7)$

$343 - 217 = 21ab$

$126/21 = ab$

$\therefore$ The value of $ab = 6$.

16. Answer: (C)

$(2x + y)^3$

$\Rightarrow (2x)^3 + y^3 + 3 \times 2x \times y(2x + y)$

$\Rightarrow 8x^3 + y^3 + 12x^2y + 6xy^2$

$\Rightarrow$ The coefficient of x^2 is $12y$.

17. Answer: (C)

$\left(\frac{x}{3} + \frac{y}{5}\right)^3$

$\Rightarrow \frac{x^3}{27} + 3 \times \frac{x}{3} \times \frac{y}{4}\left(\frac{x}{3} + \frac{y}{5}\right) + \frac{y^3}{125}$

$\Rightarrow \frac{x^3}{27} + \frac{x^2y}{15} + \frac{xy^2}{25} + \frac{y^3}{125}$

18. Answer: (A)

$A + B = 12$ and $AB = 17$

$\Rightarrow A^3 + B^3 = (A + B)[(A + B)^2 \cdot 3AB]$

$\Rightarrow A^3 + B^3 = 12[12^2 \cdot 3 \times 17]$

$\Rightarrow A^3 + B^3 = 12[144 \cdot 51] = 12 \times 93 = 1116$

19. Answer: (C)

$p + q = 7$ and $pq = 5$

as we know,

$(p + q)^3 = p^3 + q^3 + 3pq(p + q)$

$\Rightarrow 7^3 = p^3 + q^3 + 3 \times 5 \times 7$

$\Rightarrow p^3 + q^3 = 343 \cdot 105$

$\Rightarrow p^3 + q^3 = 238$

20. Answer: (B)

$\frac{1}{x} + \frac{1}{y} = \frac{16}{15}$

$\Rightarrow (y + x)/xy = 16/15$

$\Rightarrow 4/xy = 16/15$

$\Rightarrow xy = 15/4$ (1)

$x + y = 4$

On squaring both sides,

$x^2 + y^2 + 2xy = 16$

$\Rightarrow x^2 + y^2 = 16 - 2xy$

$\Rightarrow x^2 + y^2 = 16 - 2 \times 15/4$

$\Rightarrow x^2 + y^2 = 16 - 15/2 = 17/2$ (2)

$\because (x^3 + y^3) = (x + y)(x^2 - xy + y^2)$

$\Rightarrow (x^3 + y^3) = 4 \times (17/2 - 15/4)$

$\therefore (x^3 + y^3) = 19$

21. Answer: (C)

$\Rightarrow 16x^2 + y^2 = 48$

$\Rightarrow (4x)^2 + y^2 = 48$

$\Rightarrow (4x)^2 + y^2 + 8xy = 48 + 8xy \; [\because xy = 2]$

$\Rightarrow (4x+y)^2 = 48 + 16$

$\Rightarrow (4x+y)^2 = 64$

$\Rightarrow (4x+y)^2 = (8)^2$

$\Rightarrow 4x + y = 8$

$(a + b)^3 = a^3 + b^3 + 3(ab)(a + b)$ on applying,

$\Rightarrow (4x+y)^3 = 8^3$

$\Rightarrow 64x^3 + y^3 + 3(4xy)(4x+y) = 512$

$\Rightarrow 64x^3 + y^3 + (3 \times 8 \times 8) = 512$

$\Rightarrow 64x^3 + y^3 + 192 = 512$

$\Rightarrow 64x^3 + y^3 = 512 - 192$

$\Rightarrow 64x^3 + y^3 = 320$

$\therefore$ The value of $(64x^3 + y^3)$ is 320.

22. Answer: (C)

plugging the values into the formula

$\Rightarrow (9)^3 = 405 + 3ab(9)$

$\Rightarrow 729 = 405 + 27ab$

$\Rightarrow 27ab = 324$

$\Rightarrow ab = 12$

$\therefore$ The value of ab is 12.

23. Answer: (A)

$\Rightarrow (16\sqrt{2}x^3 + 81\sqrt{3}y^3) \div (2\sqrt{2}x + 3\sqrt{3}y) = Ax^2 + By^2 + Cxy$

$\Rightarrow Ax^2 + By^2 + Cxy = [(2\sqrt{2}x + 3\sqrt{3}y)(8x^2 + 27y^2 - 2\sqrt{2}x \times 3\sqrt{3}y)]/(2\sqrt{2}x + 3\sqrt{3}y)$

$\Rightarrow Ax^2 + By^2 + Cxy = (8x^2 + 27y^2 - 2\sqrt{2}x \times 3\sqrt{3}y)$

$\Rightarrow Ax^2 + By^2 + Cxy = (8x^2 + 27y^2 - 6\sqrt{6}y)$

$A = 8, B = 27$ and $C = -6\sqrt{6}$

Then,

$\Rightarrow ? = 2A - 3B - 2\sqrt{6}C$

$\Rightarrow ? = 2 \times 8 - 3 \times 27 - 2\sqrt{6} \times (-6\sqrt{6})$

$\Rightarrow ? = 16 - 81 + 72$

$\Rightarrow ? = 7$

$\therefore 2A - 3B - 2\sqrt{6}C = 7$

24. Answer: (D)

$\Rightarrow 1/x + 1/y = 18/5$

$\Rightarrow (x + y)/xy = 18/5$

$\Rightarrow xy = 2 \times 5/18 = 5/9$

but,

$\Rightarrow (x + y)^2 = (x^2 + 2xy + y^2)$

$\Rightarrow 2^2 = (x^2 + y^2 + 2 \times 5/9)$

$\Rightarrow (x^2 + y^2) = 26/9$

Then,

$(x^3 + y^3) = (x + y)(x^2 - xy + y^2)$

$= 2 \times (26/9 - 5/9)$

$= 2 \times 21/9$

$= 14/3$

$\therefore (x^3 + y^3) = 14/3 = 4\frac{2}{3}$

25. Answer: (C)

$(54\sqrt{2}x^3 + 24\sqrt{3}y^3)/(\sqrt{18}x + \sqrt{12}y)$

$\Rightarrow (54\sqrt{2}x^3 + 24\sqrt{3}y^3)/(3\sqrt{2}x + 2\sqrt{3}y)$

$\Rightarrow 18x^2 + 12y^2 - 6\sqrt{6} = Ax^2 + By^2 + Cxy$

Where $A = (18), B = (12)$ and $C = (-6\sqrt{6})$

Now,

Value of $A^2 - (B^2 + C^2) = (18)^2 - (12)^2 + (6\sqrt{6})^2$

$\Rightarrow 324 - (144 + 216)$

$\Rightarrow 324 - 360$

$\Rightarrow -36$

$\therefore$ Required value is -36.

26. Answer: (B)

$(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$

$\Rightarrow (x + y)^3 + (3x - 3y)^3 = (x + y + 3x - 3y) [x^2 + y^2 + 2xy + 9x^2 + 9y^2 - 18xy - 3x^2 + 3xy - 3xy + 3y^2]$

$\Rightarrow (4x - 2y) [x^2 + 9x^2 - 3x^2 + y^2 + 9y^2 + 3y^2 + 2xy - 18xy]$

$\Rightarrow (4x - 2y) [7x^2 + 13y^2 - 16xy]$

Now,

according to the question,

Value of $A = 4, B = 7$ and $C = -16$

$A - B - C = [4 - 7 - (-16)]$

$\Rightarrow (-3 + 16)$

$\Rightarrow 13$

$\therefore$ Required value is 13.

27. Answer: (B)

$(x + 6y) = 8$

On cubing both the sides –

$x^3 + 216y^3 + 3(x)(6y)(x + 6y) = 512$

$x^3 + 216y^3 + 18xy(8) = 512$

$x^3 + 216y^3 + 18(2)(8) = 512$

$x^3 + 216y^3 = 512 - 288 = 224$

28. Answer: (B)

$(4x + 2y)^3 + (4x - 2y)^3 = (4x + 2y + 4x - 2y) [(4x + 2y)^2 + (4x - 2y)^2 - (4x + 2y)(4x - 2y)]$

$(4x + 2y)^3 + (4x - 2y)^3 = 8x [2(16x^2 + 4y^2)] - (16x^2 - 4y^2)$

$(4x + 2y)^3 + (4x - 2y)^3 = 8x(32x^2 + 8y^2 - 16x^2 + 4y^2)$

$(4x + 2y)^3 + (4x - 2y)^3 = 8x(16x^2 + 12y^2)$

$(4x + 2y)^3 + (4x - 2y)^3 = 16 (8x^3 + 6xy^2)$ .....(2)

Satisfying equation (1) and (2), we get,

A = 8 and B = 6

So, $(1/2) \sqrt{(A^2 + B^2)} = (1/2) \sqrt{(8^2 + 6^2)}$

$= 1/2 \times \sqrt{(64 + 36)}$

$= 1/2 \times \sqrt{100}$

$= 1/2 \times 100 = 5$

∴ The value of $(1/2) \sqrt{(A^2 + B^2)}$ is 5.

29. **Answer: (D)**

$a^3 + b^3 = 218$

$\Rightarrow 2(a^2 + b^2 - ab) = 218$

$\Rightarrow a^2 + b^2 - ab = 109$ ----(i)

Again,

$a + b = 2$

$\Rightarrow (a + b)^2 = 2^2$

$\Rightarrow a^2 + b^2 + 2ab = 4$ ----(ii)

Subtracting equation (i) from equation (ii), we get,

$3ab = -105$

$\Rightarrow ab = -(105/3)$

$\Rightarrow ab = -35$

Now,

$\sqrt{1 - ab} = \sqrt{1 - (-35)}$

$\Rightarrow \sqrt{1 + 35}$

$\Rightarrow \sqrt{36}$

$\Rightarrow 6$

∴ The correct answer is 6.

30. **Answer: (D)**

$(3x + y)^2 = 9x^2 + y^2 + 6xy$

$\Rightarrow (3x + y)^2 = 37 + 6 \times 2$

$\Rightarrow (3x + y)^2 = 37 + 12$

$\Rightarrow (3x + y)^2 = 49$

$\Rightarrow (3x + y) = 7$

$(3x + y)^3 = 27x^3 + y^3 + 27x^2y + 9xy^2$

$\Rightarrow 7^3 = 27x^3 + y^3 + 27x^2y + 9xy^2$

$\Rightarrow 343 = 27x^3 + y^3 + 9xy(3x + y)$

$\Rightarrow 343 = 27x^3 + y^3 + 9 \times 2 \times 7$

$\Rightarrow 27x^3 + y^3 = 343 - 126$

$\Rightarrow 27x^3 + y^3 = 217$

∴ The value of $27x^3 + y^3$ is 217

31. **Answer: (B)**

$x^2 + 4y^2 = 17$ and $xy = 2$, Where $x > 0$, $y > 0$

$\Rightarrow xy = 2$ Then, $4xy = 8$

$\Rightarrow (x + 2y)^2 = x^2 + 4y^2 + 4xy = 17 + 8 = 25$

$\Rightarrow (x + 2y) = 5$

$\Rightarrow x^3 + 8y^3 = (x + 2y) (x^2 + 4y^2 - 2xy)$

$\Rightarrow x^3 + 8y^3 = (5) \times (17 - 4) = 65$

∴ $x^3 + 8y^3 = 65$

32. **Answer: (D)**

$(x + y)^3 + 8 (x - y)^3$

$\Rightarrow (x + y)^3 + [2 (x - y)]^3$

$\Rightarrow [x + y + 2 (x - y)] \{(x + y)^2 - (x + y) \times 2 (x - y) + (2x - 2y)^2\}$

$\Rightarrow (x + y + 2x - 2y) [x^2 + 2xy + y^2 - (x + y) (2x - 2y) + (4x^2 - 8xy + 4y^2)]$

$\Rightarrow (3x - y) [x^2 + 2xy + y^2 - (2x^2 - 2xy + 2xy - 2y^2) + 4x^2 - 8xy + 4y^2]$

$\Rightarrow (3x - y) (5x^2 - 6xy + 5y^2 - 2x^2 + 2y^2)$

$\Rightarrow (3x - y) (3x^2 - 6xy + 7y^2)$

Comparing the coefficients of the terms in equation 1,

$\Rightarrow A = -1$

$\Rightarrow B = -6$

$\Rightarrow C = 7$

$\Rightarrow A + B + C = -1 + -6 + 7$

$\Rightarrow A + B + C = 0$

∴ The value of A + B + C is 0.

33. **Answer: (B)**

$a + b = 8$, $ab = 10$

$\Rightarrow (8)^2 = a^2 + b^2 + 2 \times 10$

$\Rightarrow 64 = a^2 + b^2 + 20$

$\Rightarrow a^2 + b^2 = (64 - 20)$

$\Rightarrow a^2 + b^2 = 44$

Now,

$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$

$\Rightarrow (a^3 + b^3) = (8)(44 - 10)$

$\Rightarrow (a^3 + b^3) = (8 \times 34)$

$\Rightarrow (a^3 + b^3) = 272$

∴ The required value is 272.

Nature – V

1. **Answer: (B)**

$a^3 - b^3 = (a - b)[(a - b)^2 + 3ab]$

$\Rightarrow 18[18^2 + 3ab] = 324$

$\Rightarrow 18[324 + 3ab] = 324$

$\Rightarrow 5832 + 54ab = 324$

$\Rightarrow 54ab = 324 - 5832$

$\Rightarrow 54ab = -5508$

$\Rightarrow ab = -102$

∴ The value of ab is −102

2. **Answer: (A)**

According to the formula

$88 = 4 \times (4^2 + 3ab)$

$\Rightarrow 22 = 16 + 3ab$

$\Rightarrow 3ab = 22 - 16$

$\Rightarrow ab = 6/3$

$\Rightarrow ab = 2$

$(a - b)^2 = a^2 + b^2 - 2ab$

$\Rightarrow 4^2 = a^2 + b^2 - 2 \times 2$

$\Rightarrow a^2 + b^2 = 16 + 4$

$\Rightarrow a^2 + b^2 = 20$

$(a^2 + b^2)^2 - (a^2 - b^2)^2 = 4a^2b^2$

$\Rightarrow 20^2 - (a^2 - b^2)^2 = 4 \times 2^2$

$\Rightarrow (a^2 - b^2)^2 = 400 - 16$

$\Rightarrow (a^2 - b^2)^2 = 384$

$\Rightarrow (a^2 - b^2) = \sqrt{384}$

$\therefore (a^2 - b^2) = 8\sqrt{6}$

3. **Answer: (C)**

$\Rightarrow x = \sqrt[3]{5} + 2$

$\Rightarrow x - 2 = \sqrt[3]{5}$

$\Rightarrow (x - 2)^3 = (\sqrt[3]{5})^3$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 5$

$\Rightarrow x^3 - 6x^2 + 12x - 13 = 0$

$\Rightarrow x^3 - 6x^2 + 12x - 13 + 1 = 1$

$\Rightarrow x^3 - 6x^2 + 12x - 12 = 1$

4. **Answer: (A)**

$(2x - 3y)^3 - 18xy (2x - 3y) = 8x^3 - 72x^2y - 3 \times 2x \times 3y (2x - 3y) - 18xy (2x - 3y)$

$\Rightarrow 8x^3 - 27y^3 - 18xy (2x - 3y) - 18xy (2x - 3y)$

$\Rightarrow 8x^3 - 27y^3 - 36x^2y + 54xy^2 - 36x^2y + 54xy^2$

$\therefore$ Desired Result $= 8x^3 - 72x^2y + 108xy^2 - 27y^3$

5. **Answer: (A)**

$(2x + y)^3 - (x + 2y)^3 = (x - y) [A(x^2 + y^2) + Bxy]$

$\Rightarrow (2x)^3 + y^3 + 3 \times 2x \times y(2x + y) - (x)^3 - (2y)^3 - 3 \times x \times 2y (x + 2y) = (x - y) [Ax^2 + Ay^2 + Bxy]$

$\Rightarrow 8x^3 + y^3 + 12x^2y + 6xy^2 - x^3 - 8y^3 - 6x^2y - 12xy^2 = [Ax^3 + Axy^2 + Bx^2y - Ax^2y - Ay^3 - Bxy^2]$

$\Rightarrow 7x^3 - 7y^3 + 6x^2y - 6xy^2 = Ax^3 - Ay^3 + (B - A)x^2y + (A - B)xy^2$

Comparing the right side and the left side,

$\Rightarrow A = 7, (B - A) = 6, (A - B) = -6$

$\Rightarrow (B - 7) = 6$

$\Rightarrow B = 13$

$\therefore (2A - B) = (2 \times 7 - 13)$

$\Rightarrow 1$

6. **Answer: (D)**

$x - y = 5$

$\Rightarrow (x - y)^2 = 25$

$\Rightarrow x^2 + y^2 - 2xy = 25$

$\Rightarrow 45 - 2xy = 25$

$\Rightarrow 2xy = 20$

$\Rightarrow xy = 10$

$x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$

$\Rightarrow 5\{45 + 10\}$

$\Rightarrow 5 \times 55$

$\Rightarrow 275$

$\therefore$ The required answer is 275.

7. **Answer: (C)**

According to Question,

$\dfrac{1}{x} - \dfrac{1}{y} = \dfrac{14}{3}$

$\Rightarrow -(x - y)/xy = 14/3$

Substituting the values of $x - y$ in the given equation,

$\Rightarrow -(7/4)/xy = 14/3$

$\Rightarrow -1/xy = 14/3 \times 4/7$

$\Rightarrow -1/xy = 8/3$

$\Rightarrow xy = -3/8$

Now,

$x^3 - y^3 = (x - y)[(x - y)^2 + 3xy]$

$\Rightarrow x^3 - y^3 = (7/4) \times (49/16) - (9/8)$

$\Rightarrow x^3 - y^3 = 7/4 \times (49 - 18)/16$

$\Rightarrow x^3 - y^3 = (7/4 \times 31/16)$

$\Rightarrow x^3 - y^3 = 217/64$

$\therefore$ The desired value is 217/64.

8. **Answer: (C)**

$(5\sqrt{5}x^3 - 3\sqrt{3}y^3) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$

$\Rightarrow (x\sqrt{5})^3 - (y\sqrt{3})^3 \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$

$\Rightarrow (\sqrt{5}x - \sqrt{3}y)(5x^2 + \sqrt{15}xy + 3y^2) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$

$\Rightarrow 5x^2 + \sqrt{15xy} + 3y^2 = Ax^2 + By^2 + Cxy$

Comparing both the sides, we get,

A = 5, B = 3 and C = $\sqrt{15}$

$3A + B - \sqrt{15}C$

$\Rightarrow 3 \times 5 + 3 - \sqrt{15} \times \sqrt{15}$

$\Rightarrow 15 + 3 - 15$

$\Rightarrow 3$

$\therefore$ The required value is 3.

9. **Answer: (D)**

$(5\sqrt{5}x^3 - 3\sqrt{3}y^3) = (\sqrt{5}x)^3 - (\sqrt{3}y)^3$

$(\sqrt{5}x)^3 - (\sqrt{3}y)^3 = (\sqrt{5}x - \sqrt{3}y) \times (5x^2 + 3y^2 + \sqrt{15}xy)$

As, $(5\sqrt{5}x^3 - 3\sqrt{3}y^3) \div (\sqrt{5}x - \sqrt{3}y) = (Ax^2 + By^2 + Cxy)$

$\Rightarrow [(\sqrt{5}x - \sqrt{3}y) \times (5x^2 + 3y^2 + \sqrt{15}xy)] \div (\sqrt{5}x - \sqrt{3}y) = Ax^2 + By^2 + Cxy$

$\Rightarrow 5x^2 + 3y^2 + \sqrt{15}xy = Ax^2 + By^2 + Cxy$

On comparing both the sides, we get

A = 5, B = 3 and C = $\sqrt{15}$

According to the question we have to get

$3A - B - \sqrt{15}C$

$\Rightarrow 3A - B - \sqrt{15}C = 3 \times 5 - 3 - \sqrt{15} \times \sqrt{15}$

$\therefore$ The value of $3A - B - \sqrt{15}C$ is -3

10. **Answer: (B)**

x − y = 4 and xy = 45

$(x^3 - y^3) = (x - y) [(x - y)^2 + 3xy]$

$x^3 - y^3 = 4 [4^2 + 3 \times 45]$ [Hint: Answer will be divisible by 4, only 1 option, 604, is divisible by 4]

$x^3 - y^3 = 4 [16 + 135]$

$x^3 - y^3 = 4 \times 151 = 604$

11. **Answer: (C)**

$(3a - 4b)^3$

$\Rightarrow (3a)^3 - (4b)^3 - 3 \times 3a \times 4b (3a - 4b)$

$\Rightarrow 27a^3 - 64b^3 - 108a^2b + 144ab^2$

12. **Answer: (A)**

Since we know that,

$a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$

$\Rightarrow 27a^3 \cdot 2\sqrt{2}\, b^3$

$\Rightarrow (3a - \sqrt{2}\, b)(9a^2 + 2b^2 + 3\sqrt{2}\, ab)$

13. **Answer: (B)**

$(x - 3y)^3$

$\Rightarrow x^3 - (3y)^3 - 3 \times x \times 3y\,(x - 3y)$

$\Rightarrow x^3 - 27y^3 - 9x^2y + 27xy^2$

So coefficient of x x = $27y^2$

14. **Answer: (C)**

$1 - 64x^3 - 12x + px^2 = (1 - 4x)^3$

$\Rightarrow 1 - 64x^3 - 12x + px^2 = 1 - 64x^3 - 3 \times x \times 4x\,(1 - 4x)$

$\Rightarrow 1 - 64x^3 - 12x + px^2 = 1 - 64x^3 - 12x + 48x^2$

$\Rightarrow px^2 = 48x^2$

$\Rightarrow p = 48$

15. **Answer: (C)**

$(2y - 5)^3$

$\Rightarrow (2y)^3 - 5^3 - 3 \times 2y \times 5\,(2y - 5)$

$\Rightarrow 8y^3 - 125 - 60y^2 + 150y$

Coefficient of y = 150.

16. **Answer: (C)**

$8(x + y)^3 \cdot 27(x \cdot y)^3 = (5y \cdot x)(Ax^2 + By^2 + Cxy)$

$\Rightarrow 8[x^3 + y^3 + 3xy(x + y)] \cdot 27[x^3 \cdot y^3 - 3xy(x \cdot y)] = 5Ax^2y + 5By^3 + 5Cxy^2 \cdot Ax^3 \cdot Bxy^2 \cdot Cx^2y$

$\Rightarrow \cdot 19x^3 + 35y^3 + 105x^2y \cdot 57xy^2 = \cdot Ax^3 + 5By^3 + 5Ax^2y \cdot Cx^2y + 5Cxy^2 \cdot Bxy^2$

Comparing the values of A, B and C on the left side and the right side, we get,

$\Rightarrow \cdot 19x^3 = \cdot Ax^3$

$\therefore A = 19$

$\Rightarrow + 35y^3 = 5By^3$

$\Rightarrow 35 = 5B$

$\therefore B = 7$

$\Rightarrow 105x^2y = 5Ax^2y \cdot Cx^2y$

$\Rightarrow 105x^2y = x^2y(5A \cdot C)$

$\Rightarrow 105 = 5A \cdot C$

$\Rightarrow 105 = 5 \times 19 \cdot C \quad [A = 19]$

$\therefore C = \cdot 10$

Now, $(A + B \cdot C) = 19 + 7 \cdot (\cdot 10)$

$\Rightarrow 26 + 10 = 36$

$\therefore$ Required Result = 36

17. **Answer: (A)**

$1/x - 1/y = 11/24$

$\Rightarrow (y \cdot x)/xy = 11/24$

$\Rightarrow \cdot(x \cdot y)/xy = 11/24$

$\Rightarrow \cdot 11/xy = 11/24$

$\Rightarrow xy = \cdot 24$

Now,

$x^3 \cdot y^3 + x^2y^2 = (x - y)^3 + 3xy\,(x - y) + (xy)^2$

$\Rightarrow (11)^3 + 3(\cdot 24) \times 11 + 576$

$\Rightarrow 1331 - 792 + 576$

$\Rightarrow 539 + 576$

$\Rightarrow 1115$

18. **Answer: (D)**

$\Rightarrow (x \cdot 2y)^2 = x^2 - 4xy + 4y^2$

$\Rightarrow 25 = 53 \cdot 4xy$

$\Rightarrow xy = 7$

So,

$\Rightarrow x^3 \cdot (2y)^3 = (x \cdot 2y)(x^2 + 2xy + 4y^2)$

$= 5 \times (53 + 2 \times 7)$

$\therefore x^3 \cdot 8y^3 = 335$

19. **Answer: (D)**

$\Rightarrow (p \cdot 2q)^2 = p^2 + 4q^2 \cdot 4pq$

$\Rightarrow 3 = p^2 + 4q^2 \cdot 4 \times 5$

$\Rightarrow p^2 + 4q^2 = 29$

$(p^3 \cdot (2q)^3) = (p \cdot 2q)(p^2 + 2pq + 4q^2)$

$= 3 \times (29 + 2 \times 5)$

$= 117$

$\therefore (p^3 \cdot 8q^3) = 117$

20. **Answer: (B)**

$\Rightarrow \left(\left(5x^2 - \frac{1}{x}\right)^3 = (5x^2)^3 - (1/x)^3 - 3 \times 5x^2 \times 1/x(5x^2 - 1/x)\right.$

$\Rightarrow (125x^6 - 1/x^3 - 3 \times 5x(5x^2 - 1/x)$

$\Rightarrow 125x6 - 1/x^3 - 75x^3 + 15$

According to the question,

$\Rightarrow 15$

$\therefore$ The desired value is 15.

21. **Answer: (C)**

According to the question,

$(a + b)^2 - ab$

$\Rightarrow a^2 + b^2 + 2ab - ab$

$\Rightarrow a^2 + b^2 + ab$

Now,

$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$

$\Rightarrow 2349 = 9(a^2 + ab + b^2)$

$\Rightarrow (a^2 + ab + b^2) = (2349/9)$

$\Rightarrow (a^2 + ab + b^2) = 261$

$\therefore$ The desired value is 261.

22. **Answer: (C)**

$(56\sqrt{7}x^3 \cdot 2\sqrt{2}y^3) \div (2\sqrt{7}x \cdot \sqrt{2}y)$

$\Rightarrow \{(2\sqrt{7}x)^3 \cdot (\sqrt{2}y)^3\} \div (2\sqrt{7}x - \sqrt{2}y)$

$\Rightarrow \{(2\sqrt{7}x \cdot \sqrt{2}y) \times (2\sqrt{7}x)^2 + 2\sqrt{7}x \times \sqrt{2}y + (\sqrt{2}y)^2\} \div (2\sqrt{7}x \cdot \sqrt{2}y)$

$\Rightarrow \{(2\sqrt{7}x \cdot \sqrt{2}y) \times (28x^2 + 2\sqrt{14}xy + 2y^2)\} \div (2\sqrt{7}x \cdot \sqrt{2}y)$

$\Rightarrow (28x^2 + 2\sqrt{14}xy + 2y^2)$

According to the question,

$(56\sqrt{7}x^3 \cdot 2\sqrt{2}y^3) \div (2\sqrt{7}x \cdot \sqrt{2}y) = Ax^2 + By^2 \cdot Cxy$

$\Rightarrow (28x^2 + 2\sqrt{14}xy + 2y^2) = Ax^2 \cdot Cxy + By^2$

Now on comparing both the sides we get,

A = 28

B = 2

C = (- 2√14)

Now,

A + B - √14C

$\Rightarrow 28 + 2 - \{\sqrt{14} \times (- 2\sqrt{14})\}$

$\Rightarrow 28 + 2 + 28$

$\Rightarrow 58$

∴ The required value of (A + B - √14C) is 58.

23. **Answer: (A)**

$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

Putting the values of $(x - y)$ and $(x^3 - y^3)$

$\Rightarrow 316 = (4) \times (x - y)^2 - 3xy$

$\Rightarrow 316 = (4) \times [(4)^2 - 3xy]$

$\Rightarrow 316 = 4 \times (16 - 3xy)$

$\Rightarrow 316 = 64 - 12xy$

$\Rightarrow 12xy = 252$

$\Rightarrow xy = 21$

Now,

The value of x = 7 and y = 3

$x^4 - y^4 = (x^2 - y^2)(x^2 + y^2)$

$\Rightarrow (x - y)(x + y)(x^2 + y^2)$

$\Rightarrow (7 - 3)(7 + 3)(7^2 + 3^3)$

$\Rightarrow [4 \times 10 \times (49 + 9)]$

$\Rightarrow (40 \times 58)$

$\Rightarrow 2320$

∴ Desired value is 2320

24. **Answer: (B)**

According to the question

$(3x - 4)^3 = (3x)^3 - (-4)^3 - 3 \times 3x \times (-4)(3x - 4)$

$\Rightarrow 27x^3 + 64 + 36x(3x - 4)$

$\Rightarrow 27x^3 + 64 + 108x^2 - 144x$

Now,

The coefficient of x in broadcast is 144

∴ Required value of x is 144

25. **Answer: (A)**

$(2 - 3x)^3$

$(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

$(2)^3 - (3x)^3 - 3 \times 2 \times 3x (2 - 3x)$

$\Rightarrow 8 - 27x^3 - 18x (2 - 3x)$

$\Rightarrow 8 - 27x^3 - 36x - 54x^2$

Comparing the coefficients of both the equations, we get

$8 + 2px^2 - 36x - 27x^3 = 8 - 27x^3 - 36x - 54x^2$

$\Rightarrow 2px^2 = 54x^2$

$\Rightarrow 2p = 54$

$\Rightarrow p = (54/2)$

$\Rightarrow p = 27$

∴ Required value of p is 27

26. **Answer: (D)**

$(2x + y)^3 - (x - 2y)^3 = (2x + y - x + 2y)[(2x + y)^2 + (x - 2y)^2 + (2x + y)(x - 2y)]$

$\Rightarrow (x + 3y)[4x^2 + y^2 + 4xy + x^2 + 4y^2 - 4xy + 2x^2 - 4xy + xy - 2y^2]$

$\Rightarrow (x + 3y)[7x^2 + 3y^2 - 3xy]$

So,

A = 7

B = 3

C = - 3

Now, (A + 2B + C) = 7 + 6 - 3 = 10

∴ The required answer is 10.

27. **Answer: (B)**

y = 2x + 1

$\Rightarrow 2x - y = (-1)$

$\Rightarrow (2x - y)^3 = (-1)^3$

$\Rightarrow 8x^3 - 12x^2y + 6xy^2 - y^3 = (-1)$

$\Rightarrow 8x^3 - 6xy(2x - y) - y^3 = (-1)$

$\Rightarrow 8x^3 - 6xy \times (-1) - y^3 = (-1)$

$\Rightarrow 8x^3 + 6xy - y^3 = (-1)$

$\Rightarrow 8x^3 - y^3 + 6xy = (-1)$

∴ The value of $(8x^3 - y^3 + 6xy)$ is (-1).

28. **Answer: (B)**

$\left(5 - \frac{x^2}{3}\right)^3 = 125 - (25x^2) + (5x^4/3) - (x^6/27)$

∴ (-25) is the coefficient of x^2 in the expansion of $\left(5 - \frac{x^2}{3}\right)^3$.

29. **Answer: (B)**

$2\sqrt{2}x^3 - 3\sqrt{3}y^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$

$\Rightarrow (\sqrt{2}x)^3 - (\sqrt{3}y)^3 = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$

$\Rightarrow (\sqrt{2}x - \sqrt{3}y)(2x^2 - \sqrt{6}xy + 3y^2) = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$

Therefore, A = 2; B = -√6; and C = 3

Then, $(A^2 + B^2 + C^2) = 2^2 + (\sqrt{6})^2 + 3^2$

= 4 + 6 + 9

= 19

∴ The value of $(A^2 + B^2 + C^2)$ is 19.

30. **Answer: (A)**

The expression $2\sqrt{2}x^3 - 3\sqrt{3}y^3$ can be rearranged as $(\sqrt{2}x - \sqrt{3}y)(2x^2 + 3y^2 + \sqrt{2}\sqrt{3}xy)$

$\Rightarrow (\sqrt{2}x - \sqrt{3}y)(2x^2 + 3y^2 + \sqrt{2}\sqrt{3}xy) = (\sqrt{2}x - \sqrt{3}y)(Ax^2 - Bxy + Cy^2)$

By canceling the common term $(\sqrt{2}x - \sqrt{3}y)$ on both sides,

$(2x^2 + \sqrt{2}\sqrt{3}xy + 3y^2) = (Ax^2 - Bxy + Cy^2)$

Comparing the coefficients of x^2, y^2, and xy, we get

$\Rightarrow A = 2$

$\Rightarrow B = -\sqrt{2}\sqrt{3}$

$\Rightarrow C = 3$

Substitituting the values of A, B and C in the expression $\sqrt{A^2 + B^2 + C^2}$, we get

$$\Rightarrow \sqrt{2^2 + 3^2 + (-\sqrt{2}\sqrt{3})^2} = \sqrt{19}$$

31. **Answer: (B)**

$27(x + y)^3 - 8(x - y)^3 = [3(x + y)]^3 - [2(x - y)]^3$

Using the above formula

$\Rightarrow [3(x + y) - 2(x - y)] \; [(3x + 3y)^2 + (2x - 2y)^2 + 3(x + y) \times 2(x - y)]$

$\Rightarrow (x + 5y)(19x^2 + 7y^2 + 10xy)$

Comparing $(x + 5y)(19x^2 + 7y^2 + 10xy)$ with $(x + 5y)(Ax^2 + By^2 + Cxy)$

We get A = 19, B = 7 and C = 10

So,

A + B - C = 19 + 7 - 10 = 16

32. **Answer: (D)**

$2x - y = 2$

Dividing the equation by 2, we get

$$\Rightarrow \left(x - \frac{y}{2}\right) = 1$$

On squaring both sides, we get

$$\Rightarrow \left(x - \frac{y}{2}\right)^3 = 1^3$$

$$\Rightarrow x^3 - \frac{y^3}{8} - \frac{3xy}{2} \times \left(x - \frac{y}{2}\right) = 1$$

$$\Rightarrow x^3 - \frac{y^3}{8} = 1 + \frac{3}{2} \times xy$$

$$\Rightarrow x^3 - \frac{y^3}{8} = 1 + \frac{3}{2} \times \frac{3}{2}$$

$$\Rightarrow x^3 - \frac{y^3}{8} = 1 + \frac{9}{4}$$

$$\Rightarrow x^3 - \frac{y^3}{8} = \frac{4+9}{4}$$

$$\Rightarrow x^3 - \frac{y^3}{8} = \frac{13}{4}$$

33. **Answer: (B)**

We have $27x^3 - 64y^3 = (Ax + By)(Cx^2 - Dy^2 + 12xy)$

LHS = $27x^3 - 64y^3 = (3x)^3 - (4y)^3$

according to the formula used

$\Rightarrow (3x)^3 - (4y)^3 = (3x - 4y)(9x^2 + 16y^2 + 12xy)$ ----(i)

Comparing equation (i) and (ii), we get

A = 3, B = -4, C = 9, D -16

Now, we have to find 4A + B + 3C + 2D

$\Rightarrow 4 \times 3 - 4 + 3 \times 9 + 2 \times (-16)$

$= 12 - 4 + 27 - 32$

$= 3$

Nature – VI

1. **Answer: (C)**

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow (19)^2 = 133 + 2(xy + yz + y^2)$

$\Rightarrow 133 + 2[y(x + y + z)] = 361$

$\Rightarrow 2y(19) = 361 - 133$

$\Rightarrow y = 6$

x + y + z = 19

$\Rightarrow x + z = 13$

The possible values of x and z are 9 and 4.

x - z

$\Rightarrow 9 - 4$

$\Rightarrow 5$

$\therefore$ Value is 5.

2. **Answer: (D)**

as we know,

$(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$

$\Rightarrow 2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$

$\Rightarrow (\sqrt{2}x)^2 + y^2 + (2\sqrt{2}z)^2 - 2 \times (\sqrt{2}x) \times y + 2 \times y \times 2\sqrt{2}z - 2 \times 2\sqrt{2}z \times \sqrt{2}x = (Ax + y + Bz)^2$

$\Rightarrow (\sqrt{2}x - y - 2\sqrt{2}z)^2 = (Ax + y + Bz)^2$

Comparing both sides

A = $\sqrt{2}$ and B = $-2\sqrt{2}$

Now,

$(A^2 + B^2 - AB)$

$\Rightarrow [(\sqrt{2})^2 + (-2\sqrt{2})^2 - \sqrt{2} \times (-2\sqrt{2})]$

$\Rightarrow [2 + 8 + 4]$

$\Rightarrow 14$

3. **Answer: (C)**

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow (a + b + c)^2 = 300 + 2 \times 50$

$\Rightarrow (a + b + c)^2 = 300 + 100 = 400$

$\Rightarrow (a + b + c) = \sqrt{400} = 20$

4. **Answer: (A)**

$(4a + 3b + 2c)^2$

$\Rightarrow (4a)^2 + (3b)^2 + (2c)^2 + 2 \times 4a \times 3b + 2 \times 3b \times 2c + 2 \times 2c \times 4a$

$\Rightarrow 16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca$

As we know

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

5. **Answer: (C)**

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow (a + b + c)^2 = 6.25 + (2 \times 0.52)$

$\Rightarrow (a + b + c)^2 = 6.25 + 1.04$

$\Rightarrow (a + b + c)^2 = 7.29$

$\Rightarrow (a + b + c) = \sqrt{7.29}$

$\Rightarrow (a + b + c) = \pm 2.7$

But,

$(a + b + c) < 0$

So,

a + b + c = -2.7

Nature – VII

1. **Answer: (A)**

$(a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2) = 0$, Then

$\Rightarrow (a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3 = 3(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$

$\Rightarrow$ Similarly,

$\Rightarrow (a - b) + (b - c) + (c - a) = 0$

$\Rightarrow$ Then, $(a - b)^3 + (b - c)^3 + (c - a)^3 = 3(a - b)(b - c)(c - a)$

$\Rightarrow \{(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3\} / \{(a - b)^3 + (b - c)^3 + (c - a)^3\}$

$\Rightarrow \{3(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)\} / 3\{(a - b)(b - c)(c - a)\}$

$\Rightarrow \{(a + b)(a - b)(b + c)(b - c)(c + a)(c - a)\} / \{(a - b)(b - c)(c - a)\}$

$\therefore (a + b)(b + c)(c + a)$

2. **Answer: (A)**

$1/a + 1/b + 1/c = 0$

$\Rightarrow (ab + bc + ca)/abc = 0$

$\Rightarrow ab + bc + ca = 0$

And,

$ac = 4/b$

$\Rightarrow abc = 4$

According to the question

$a^3 + b^3 + c^3 - 3abc = (a + b + c) (a^2 + b^2 + c^2 - ab - bc - ca)$

$\Rightarrow 28 - 3 \times 4 = 2 \times (a^2 + b^2 + c^2 - 0)$

$\Rightarrow (28 - 12)/2 = a^2 + b^2 + c^2$

$\Rightarrow a^2 + b^2 + c^2 = 16/2$

$\therefore a^2 + b^2 + c^2 = 8$

3. **Answer: (A)**

According to the given formula

$(x^3 + y^3 + z^3 - 3xyz) = (x + y + z) (x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow 75 - 3 \times 15 = 10 \times (x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow 75 - 45 = 10 \times (x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow (x^2 + y^2 + z^2 - xy - yz - zx) = 30/10$

$\therefore x^2 + y^2 + z^2 - xy - yz - zx = 3$

4. **Answer: (B)**

According to the question

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = 1/2 \times (255 + 256 + 257) \times [(255 - 256)^2 + (256 - 257)^2 + (257 - 255)^2]$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (1/2) \times 768 \times [(-1)^2 + (-1)^2 + (-2)^2]$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (1/2) \times 768 \times [1 + 1 + 4]$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (1/2) \times 768 \times 6$

$\therefore x^3 + y^3 + z^3 - 3xyz = 768 \times 3 = 2304$

5. **Answer: (C)**

$a^3 + b^3 + c^3 - 3abc = (1/2) \times (355 + 356 + 357) \times [(355 - 356)^2 + (356 - 357)^2 + (357 - 355)^2]$

$\Rightarrow (1/2) \times (1068) \times (1 + 1 + 4)$

$\Rightarrow 534 \times 6$

$\Rightarrow 3204$

$\therefore$ The value of $a^3 + b^3 + c^3 - 3abc$ is 3204.

6. **Answer: (D)**

$x^3 + (3y)^3 + (4z)^3 = 3 \times (x) \times (3y) \times (4z)$

$\Rightarrow x + 3y + 4z = 0$

$\therefore$ If $x^3 + 27y^3 + 64z^3 = 36xyz$,

So $x + 3y + 4z = 0$.

7. **Answer: (D)**

$a^3 + b^3 + c^3 - 3abc$, if a = 225, b = 226, and c = 227

$\Rightarrow a^3 + b^3 + c^3 - 3abc$

$= \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$

$\Rightarrow a^3 + b^3 + c^3 - 3abc$

$= \frac{1}{2}(225 + 226 + 227)[(225 - 226)^2 + (226 - 227)^2 + (227 - 225)^2]$

$\Rightarrow a^3 + b^3 + c^3 - 3abc$

$= \frac{1}{2}(678)[1^2 + 1^2 + 2^2]a^3 + b^3 + c^3 - 3abc$

$= (678)(3) = 2034$

8. **Answer: (C)**

If x + y = 4, xy = 2, y + z = 5, yz = 3, z + x = 6 and zx = 4

x + y = 4, y + z = 5, z + x = 6

So,

x + y + z = 15/2 = 7.5

xy + yz + zx = 2 + 3 + 4 = 9

Now,

$(x + y)^2 = x^2 + y^2 + 2xy$

$x^2 + y^2 = 16 - 4$ ....(2xy = 4)

$\Rightarrow 12$

$(y + z)^2 = y^2 + z^2 + 2yz$

$y^2 + z^2 = 25 - 6$ ....(2yz = 6)

$\Rightarrow 19$

$(x + z)^2 = x^2 + z^2 + 2xz$

$x^2 + z^2 = 36 - 8$ ....(2zx = 8)

$\Rightarrow 28$

So,

$2x^2 + 2y^2 + 2z^2 = 12 + 19 + 28 = 59$

$x^2 + y^2 + z^2 = 29.5$

Now,

$x^3 + y^3 + z^3 - 3xyz = (x + y + z) \times (x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow (7.5) \times (29.5 - 9)$

$\Rightarrow 7.5 \times 20.5$

$\Rightarrow 153.75$

9. **Answer: (D)**

$a^3 + b^3 + c^3 = 3abc$ (a + b + c = 0)

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

$\Rightarrow a^3 + b^3 + c^3 = 36$

10. **Answer: (D)**

$a^3 + b^3 + c^3 - 3abc = (a + b + c) [(a + b + c)^2 - 3(ab + bc + ca)]$

$\Rightarrow 185 = 5 [5^2 - 3 \times (ab + bc + ca)]$

$\Rightarrow 185 = 5 [25 - 3 \times (ab + bc + ca)]$

$\Rightarrow 3 \times (ab + bc + ca) = 25 - 37$

$\Rightarrow 3 \times (ab + bc + ca) = -12$

$\Rightarrow ab + bc + ca = (-12/3)$

$\Rightarrow -4$

∴ The value of ab + bc + ac lies between -7 and -3.

11. **Answer: (A)**

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

$\Rightarrow (yz + zx + xy)/xyz = 0$

$\Rightarrow (xy + yz + zx) = 0 \qquad (1)$

Using the formula, $(x^3 + y^3 + z^3) - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

$\Rightarrow 151 - 3 \times 12 = 5 \times (x^2 + y^2 + z^2 - 0)$

∵ $(xy + yz + zx) = 0$

$\Rightarrow 115/5 = x^2 + y^2 + z^2$

∴ $x^2 + y^2 + z^2 = 23$

12. **Answer: (D)**

$\Rightarrow (7x + 3)^3 + (x - 2)^3 + 3(2x - 5)^3 = 3 \times (7x + 3) \times (x - 2) \times 3(2x - 5)$

So,

$\Rightarrow (7x + 3) + (x - 2) + 3(2x - 5) = 0$

$\Rightarrow 7x + 3 + x - 2 + 6x - 15 = 0$

$\Rightarrow 14x - 14 = 0$

$\Rightarrow x = 1$

So,

$\Rightarrow 5x + 3 = 5 \times 1 + 3 = 8$

∴ $5x + 3 = 8$

13. **Answer: (B)**

$\Rightarrow x^2 + y^2 + z^2 = (x + y + z)^2 - 2(xy + yz + xz)$

$\Rightarrow x^2 + y^2 + z^2 = 16 - 2 = 14$

$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - xz)$

$\Rightarrow 34 - 3xyz = 4 \times (14 - 1)$

$\Rightarrow 3xyz = 34 - 52$

$\Rightarrow 3xyz = -18$

$\Rightarrow xyz = -6$

∴ $2xyz = -6 \times 2 = -12$

14. **Answer: (A)**

$a^3 + b^3 + c^3 - 3abc = 250$

$\Rightarrow (a + b + c)\{a^2 + b^2 + c^2 - (ab + bc + ca)\} = 250$

$\Rightarrow \{a^2 + b^2 + c^2 - (ab + bc + ca)\} = 25 \quad ----(i)$

$a + b + c = 10$

$\Rightarrow (a + b + c)^2 = 100$

$\Rightarrow a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = 100 \quad ----(ii)$

By doing (ii) – (i) we get

$3ab + 3bc + 3ca = 75$

$\Rightarrow ab + bc + ca = 25$

$\frac{1}{5}(ab + bc + ca)$

$\Rightarrow 1/5 \times 25$

$\Rightarrow 5$

∴ The value of 1/5(ab+bc+ca) will be 5.

15. **Answer: (D)**

$x + y + z = 3$, $x^2 + y^2 + z^2 = 45$ and $x^3 + y^3 + z^3 = 69$

$\Rightarrow (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow (3)^2 = 45 + 2(xy + yz + zx)$

$\Rightarrow 9 = 45 + 2(xy + yz + zx)$

$\Rightarrow -36 = 2(xy + yz + zx)$

$\Rightarrow (xy + yz + zx) = -18$

Now,

$x^3 + y^3 + z^3 - 3xyz = x + y + z (x^2 + y^2 + z^2) - (xy + yz + zx)$

$\Rightarrow 69 - 3xyz = 3 (45) - (-18)$

$\Rightarrow 69 - 3xyz = 3 \times (45 + 18)$

$\Rightarrow 69 - 3xyz = 3 \times 63$

$\Rightarrow 69 - 3xyz = 189$

$\Rightarrow 3xyz = (69 - 189)$

$\Rightarrow 3xyz = -120$

$\Rightarrow xyz = -40$

∴ The value of xyz is -40.

16. **Answer: (A)**

$x + y + z = 19$

on squaring both sides

$\Rightarrow (x + y + z)^2 = 19^2$

$\Rightarrow x^2 + y^2 + z^2 + 2(xy + yz + zx) = 361$

$\Rightarrow x^2 + y^2 + z^2 = 361 - 2 \times 114$

$\Rightarrow x^2 + y^2 + z^2 = 133$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[x^2 + y^2 + z^2 - (xy + yz + zx)]$

$\Rightarrow x^3 + y^3 + z^3 = 19(133 - 114) + 648$

$\Rightarrow x^3 + y^3 + z^3 = 19 \times 19 + 648$

$\Rightarrow x^3 + y^3 + z^3 = 1009$

$x^3 + y^3 + z^3 + xyz$

$\Rightarrow 1009 + 216$

$\Rightarrow 1225$

∴ The value is 1225.

17. **Answer: (B)**

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow 17^2 = x^2 + y^2 + z^2 + 2 \times 111$

$\Rightarrow x^2 + y^2 + z^2 = 289 - 222$

$\Rightarrow x^2 + y^2 + z^2 = 67$

using algebraic identities

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[x^2 + y^2 + z^2 - (xy + yz + zx)]$

$\Rightarrow x^3 + y^3 + z^3 - 3 \times 171 = 17 \times (67 - 111)$

$\Rightarrow x^3 + y^3 + z^3 - 513 = -748$

$\Rightarrow x^3 + y^3 + z^3 = -748 + 513$

$\Rightarrow x^3 + y^3 + z^3 = -235$

$\sqrt[3]{(x^3 + y^3 + z^3 + xyz)} = \sqrt[3]{(-235 + 171)}$

$\Rightarrow -4$

18. **Answer: (B)**

$\Rightarrow 132 = 133 + 2(xy + yz + zx)$

From equation (2)

$\Rightarrow 169 - 133 = 2(xy + yz + zx)$
$\Rightarrow (xy + yz + zx) = 36/2$
$\Rightarrow (xy + yz + zx) = 18$
$\Rightarrow 847 - 3xyz = 13(133 - 18)$
$\Rightarrow 847 - 115 \times 13 = 3(xyz)$
$\Rightarrow -216 = xyz$
$\Rightarrow -(216)1/3 = (xyz)1/3$
$\Rightarrow -(216)1/3 = \sqrt[3]{xyz}$
$\Rightarrow \sqrt[3]{xyz} = -6$

19. **Answer: (D)**

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + xz)$
$\Rightarrow (19)^2 = x^2 + y^2 + z^2 + 2(114)$
$\Rightarrow x^2 + y^2 + z^2 = (19)^2 - 2(114)$
$\Rightarrow x^2 + y^2 + z^2 = 361 - 228$
$\Rightarrow x^2 + y^2 + z^2 = 133$

Now,

$x^3 + y^3 + z^3 = 3(xyz) + (x + y + z)\{(x^2 + y^2 + z^2 - (xy + yz + xz)\}$
$\Rightarrow x^3 + y^3 + z^3 = 3(216) + (19)(133 - 114)$
$\Rightarrow x^3 + y^3 + z^3 = 648 + 19(19)$
$\Rightarrow x^3 + y^3 + z^3 = 648 + 361$
$\Rightarrow x^3 + y^3 + z^3 = 1,009$

$\sqrt{x^3 + y^3 + z^3 + xyz}$
$\Rightarrow \sqrt{(1,009 + 216)}$
$\Rightarrow \sqrt{1225} = 35$

20. **Answer: (D)**

Substituting the value of $a^3 + b^3 + c^3 = 3abc$ in the expression

$\Rightarrow \frac{a^3+b^3+c^3}{abc} = \frac{3abc}{abc}$
$\Rightarrow \frac{a^3+b^3+c^3}{abc} = 3$

21. **Answer: (C)**

$a + b + c = 11$, $ab + bc + ca = 3$ and $abc = -135$

As we know that,

$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$
$\Rightarrow a^3 + b^3 + c^3 - 3 \times (-135) = 11 [11^2 - 3 \times 3]$
$\Rightarrow a^3 + b^3 + c^3 + 405 = 11 \times [121 - 9] = 11 \times 112$
$\Rightarrow a^3 + b^3 + c^3 = 1232 - 405 = 827$

22. **Answer: (A)**

$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$
$\Rightarrow a^3 + b^3 + c^3 - 3abc = 7 [7^2 - 3(-6)] = 7[49 + 18] = 7 \times 67 = 469$

23. **Answer: (B)**

since we know
$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$3^2 = 101 + 2(xy + yz + zx)$
$\Rightarrow 2(xy + yz + zx) = 9 - 101$
$\Rightarrow 2(xy + yz + zx) = -92$

$\Rightarrow (xy + yz + zx) = -92/2$
$\Rightarrow (xy + yz + zx) = -46$
Again, we know that,
$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = 3[3^2 - 3 \times (-46)] = 3[9 + 138] = 3 \times 147 = 441$
$\Rightarrow \sqrt{[x^3 + y^3 + z^3 - 3xyz]} = \sqrt{441} = 21$

24. **Answer: (C)**

$a + b + c = 9$ and $ab + bc + ca = -22$
since we know,
$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$
$\Rightarrow a^3 + b^3 + c^3 - 3abc = 9[9^2 - 3 \times (-22)]$
$\Rightarrow a^3 + b^3 + c^3 - 3abc = 9[81 + 66] = 9 \times 147 = 1323$

25. **Answer: (A)**

$x + y + z = 10$ and $xy + yz + zx = 15$
since we know,
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = 10[10^2 - 3 \times 15] = 10[100 - 45] = 10 \times 55 = 550$

26. **Answer: (B)**

$(a + b + 2c)(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$
$\Rightarrow a^2 + b^3 + 8c^3 - 6abc$
since we know,
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

27. **Answer: (C)**

as we know,
If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
Similarly,
$x + 3y + 2 = 0$, then
$\Rightarrow x^3 + 27y^3 + 8 - 18xy$
$\Rightarrow x^3 + (3y)^3 + 2^3 - 3 \times x \times 3y \times 2 = 0$

28. **Answer: (B)**

$x + y + z = 2$
$\Rightarrow (x + y + z)^2 = 4$
$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 4$
$\Rightarrow x^2 + y^2 + z^2 = 4 - 2 \times (-11) = 26$
Substituting the values in the given formula, we get,
$\Rightarrow 2 \times [26 - (-11)]$
$\Rightarrow 2 \times 37$
$\Rightarrow 74$

29. **Answer: (C)**

$\Rightarrow 7^2 = 85 + 2(xy + yz + zx)$
$\Rightarrow 49 - 85 = 2(xy + yz + zx)$
$\Rightarrow -36 = 2(xy + yz + zx)$
$\Rightarrow (xy + yz + zx) = -36/2$
$\Rightarrow (xy + yz + zx) = -18$

$\Rightarrow 913 - 3xyz = 7(85 + 18)$
$\Rightarrow 913 - 7 \times 103 = 3xyz$
$\Rightarrow 913 - 721 = 3xyz$
$\Rightarrow 192 = 3xyz$
$\Rightarrow 64 = xyz$
$\Rightarrow (4)^3 = \sqrt[3]{xyz}$
$\therefore$ The value of $\sqrt[3]{xyz}$ is 4.

30.   Answer: (B)
According to the question
$x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - 3(-4) = (1) [(1)^2 - 3(-4)]$
$\Rightarrow x^3 + y^3 + z^3 + 12 = (1 + 12)$
$\Rightarrow x^3 + y^3 + z^3 + 12 = 13$
$\Rightarrow x^3 + y^3 + z^3 = (13 - 12)$
$\Rightarrow (x^3 + y^3 + z^3) = 1$
$\therefore$ The required value is 1

31.   Answer: (A)
According to the question
$x^3 + y^3 + z^3 - 3xyz = (x + y + z) [(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - 3 (-16) = 3 [(3)^2 - 3(-12)]$
$\Rightarrow x^3 + y^3 + z^3 + 48 = 3(9 + 36)$
$\Rightarrow x^3 + y^3 + z^3 + 48 = 3(45)$
$\Rightarrow x^3 + y^3 + z^3 + 48 = 135$
$\Rightarrow x^3 + y^3 + z^3 = (135 - 48)$
$\Rightarrow x^3 + y^3 + z^3 = 87$
Now,
$\sqrt{x^3 + y^3 + z^3 + 13} = \sqrt{(87 + 13)}$
$\Rightarrow \sqrt{100}$
$\Rightarrow 10$
$\therefore$ Expected value is 10

32.   Answer: (C)
$(x + 6)^3 + (2x + 3)^3 + (3x + 5)^3 = (3x + 18)(2x + 3)(3x + 5)$
$\Rightarrow (x + 6)^3 + (2x + 3)^3 + (3x + 5)^3 = 3(x + 6) (2x + 3) (3x + 5)$
Now,
According to Question,
If $(a + b + c) = 0$ then,
$a^3 + b^3 + c^3 = 3abc$
$\Rightarrow (x + 6) (2x + 3) (3x + 5) = 0$
$\Rightarrow 6x + 14 = 0$
$\Rightarrow 6x = -14$
$\Rightarrow x = -14/6$
$\Rightarrow x = -7/3$

33.   Answer: (D)
According to the formula
$2/2 [3(x^2 + y^2 + z^2) - 2^2] = 74$
$\Rightarrow 3((x^2 + y^2 + z^2) = 74 + 4$
$\Rightarrow (x^2 + y^2 + z^2 = 78/3 = 26$

34.   Answer: (C)

According to Question,
$2x + 3y + 1 = 0$
$\Rightarrow 2x + 3y = -1$
Now,
$(2x + 3y)^3 = (2x)^3 + (3y)^3 + 3 \times 2x \times 3y (-1) = -1$
$\Rightarrow 8x^3 + 27y^3 - 18xy = -1$
Now,
Value of $(8x^3 + 8 + 27y^3 - 18xy) = (8 - 1)$
$\Rightarrow 7$

35.   Answer: (D)
$x + y + z = 11$
$\Rightarrow (x + y + z)^2 = 11^2$ [Squaring both sides]
$\Rightarrow x^2 + y^2 + z^2 + 2 (xy + yz + zx) = 121$
$\Rightarrow x^2 + y^2 + z^2 + 2 \times (-6) = 121$
$\Rightarrow x^2 + y^2 + z^2 = 121 + 12$
$\Rightarrow x^2 + y^2 + z^2 = 133$ .....(1)
as well as, $x^3 + y^3 + x^3 - 3xyz = (x + y + z) (x^2 + y^2 + z^2 - xy - yz - zx)$
$\Rightarrow x^3 + y^3 + x^3 - 3xyz = (x + y + z) [(x^2 + y^2 + z^2) - (xy + yz + zx)]$
$\Rightarrow 1604 - 3xyz = 11 \times [133 - (-6)]$ [$\because x^2 + y^2 + z^2 = 133$]
$\Rightarrow 1604 - 3xyz = 11 \times (133 + 6)$
$\Rightarrow 3xyz = 1604 - (11 \times 139)$
$\Rightarrow 3xyz = 1604 - 1529 = 75$
$\Rightarrow xyz = 75/3 = 25$

36.   Answer: (D)
$(a + b + c)^2 = a^2 + b^2 + c^2 + 2 (ab + bc + ca)$
$\Rightarrow 6^2 = 32 + 2 (ab + bc + ca)$
$\Rightarrow 36 = 32 + 2 (ab + bc + ca)$
$\Rightarrow 2 (ab + bc + ca) = 36 - 32 = 4$
$\Rightarrow (ab + bc + ca) = 4/2 = 2$
And, $a^3 + b^3 + c^3 - 3abc = (a + b + c) [a^2 + b^2 + c^2 - (ab + bc + ca)]$
$\Rightarrow 189 - 3abc = 6 (32 - 2)$
$\Rightarrow 189 - 3abc = 6 \times 30$
$\Rightarrow 3abc = 189 - 180 = 9$
$\Rightarrow abc = 9/3 = 3$
$\Rightarrow abc - 3 = 3 - 3 = 0$

37.   Answer: (D)
$x + y + z = 18$
$(x + y + z)^2 = 324$ [Squaring both sides]
$x^2 + y^2 + z^2 + 2 (xy + yz + zx) = 324$
$x^2 + y^2 + z^2 + 2 \times 90 = 324$
$x^2 + y^2 + z^2 = 324 - 180 = 144$
Now,
$x^3 + y^3 + z^3 - 3xyz = (x + y + z) (x^2 + y^2 + z^2 - xy - yz - zx)$
$x^3 + y^3 + z^3 - 3xyz = (x + y + z) \{x^2 + y^2 + z^2 - (xy + yz + zx)\}$
$x^3 + y^3 + z^3 - (3 \times 81) = 18 \{144 - 90\}$
$x^3 + y^3 + z^3 - 243 = 18 \times 54 = 972$

$x^3 + y^3 + z^3 = 972 + 243 = 1215$
Therefore, $x^3 + y^3 + z^3 + xyz = 1215 + 81 = 1296$

38. Answer: (A)
$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - (3 \times 81) = 18[18^2 - (3 \times 90)]$
$\Rightarrow x^3 + y^3 + z^3 - 243 = 18(324 - 270)$
$\Rightarrow x^3 + y^3 + z^3 - 243 = 18 \times 54$
$\Rightarrow x^3 + y^3 + z^3 = 972 + 243 = 1215$
$\Rightarrow x^3 + y^3 + z^3 + xyz = 1215 + 81 = 1296$
$\Rightarrow x^3 + y^3 + z^3 + xyz = 6^4$
$\Rightarrow \sqrt[4]{x^3 + y^3 + z^3 + xyz} = 6$
∴ The value of $\sqrt[4]{x^3 + y^3 + z^3 + xyz}$ is 6.

39. Answer: (A)
$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$\Rightarrow x^3 + y^3 + z^3 - [3 \times (-12)] = 2[2^2 - \{3 \times (-11)\}]$
$\Rightarrow x^3 + y^3 + z^3 + 36 = 2(4 + 33)$
$\Rightarrow x^3 + y^3 + z^3 + 36 = 2 \times 37$
$\Rightarrow x^3 + y^3 + z^3 = 74 - 36 = 38$
∴ The value of $x^3 + y^3 + z^3$ is 38

40. Answer: (A)
Substituting the values in the formula, we get,
$x^3 + y^3 + z^3 - 3xyz = 7 \times (72 - 3 \times 8)$
$\Rightarrow 7 \times (49 - 24)$
$\Rightarrow 7 \times 25$
$\Rightarrow 175$
∴ The value of $x^3 + y^3 + z^3 - 3xyz$ is 175.

41. Answer: (C)
$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
$\Rightarrow 342 = 6 \times (50 - ab - bc - ca)$
$\Rightarrow (342/6) = 50 - (ab + bc + ca)$
$\Rightarrow 57 = 50 - (ab + bc + ca)$
$\Rightarrow (ab + bc + ca) = 50 - 57$
$\Rightarrow (ab + bc + ca) = -7$
∴ The value of $(ab + bc + ca)$ is -7

42. Answer: (A)
$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$
$\Rightarrow 175 = 7 \times [(7)^2 - 3(ab + bc + ca)]$
$\Rightarrow 25 = 49 - 3(ab + bc + ca)$
$\Rightarrow 24 = 3(ab + bc + ca)$
$\Rightarrow ab + bc + ca = 8$
∴ The value of the given identity is 8.

43. Answer: (D)

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + 2bc + 2ac)$
$\Rightarrow (1)^2 = a^2 + b^2 + c^2 + 2(-22)$
$\Rightarrow 1 = a^2 + b^2 + c^2 - 44$
$\Rightarrow a^2 + b^2 + c^2 = 45$
Now,
$a^3 + b^3 + c^3 - 3abc$
$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
$\Rightarrow a^3 + b^3 + c^3 - 3(-40) = (1)(45 + 22)$
$\Rightarrow a^3 + b^3 + c^3 - (-120) = 67$
$\Rightarrow a^3 + b^3 + c^3 = (67 - 120)$
$\Rightarrow a^3 + b^3 + c^3 = -53$

44. Answer: (A)
$x = 32.5, y = 34.6$ and $z = 30.9$
$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - a)^2]$
$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(32.5 + 34.6 + 30.9)[(32.5 - 34.6)^2 + (34.6 - 30.9)^2 + (30.9 - 32.5)^2] = 0.98k$
$\Rightarrow \frac{1}{2}(98)(-2.1)^2 + (3.7)^2 + (-1.6)^2 = 0.98k$
$\Rightarrow 49(4.41 + 13.69 + 2.56) = 0.98k$
$\Rightarrow 49 \times 20.66 = 0.98k$
$\Rightarrow 1012.34 = 0.98k$
$\Rightarrow k = \frac{1012.34}{0.98}$
$\Rightarrow k = 1033$

TYPE – XII

1. Answer: (D)
Putting $a^{1/6} = k$, then
$\Rightarrow (k^4 + 2k^3 + 3k^2 + 2k + 1)(k^2 - 2k + 1) - k^3(k^3 - 2)$
$\Rightarrow k^6 + 2k^5 + 3k^4 + 2k^3 + k^2 - 2k^5 - 4k^4 - 6k^3 - 4k^2 - 2k + k^4 + 2k^3 + 3k^2 + 2k + 1 - k^6 + 2k^3$
$\Rightarrow 1$

2. Answer: (D)
If $a + b + c = 0$
So, $a^3 + b^3 + c^3 = 3abc$
$(2a^2/3bc + 2b^2/3ca + 2c^2/3ab)$
$\Rightarrow (2a^3 + 2b^3 + 2c^3)/3abc$
$\Rightarrow 2(a^3 + b^3 + c^3)/3abc$
$\Rightarrow 2(3abc)/3abc$
$\Rightarrow 2$

3. Answer: (A)
$x - y - z = 0$
$\Rightarrow x - z = y$
On squaring both sides,
$\Rightarrow (x - z)^2 = y^2$
$\Rightarrow x^2 + z^2 - 2xz = y^2$
$\Rightarrow x^2 + z^2 = y^2 + 2xz$
Adding y^2 to both sides,
$\Rightarrow x^2 + z^2 + y^2 = 2y^2 + 2xz$
$\Rightarrow (x^2 + z^2 + y^2) \div (y^2 + xz) = 2$

$\therefore$ desired result = 2

4. Answer: (C)

$(a + b - c)^3 + (a - b + c)^3 - 8a^3$

Agreed $a = b = c = 1$

$1 + 1 - 8$

$\Rightarrow (-6)$

checking the third option

$6a(a - b + c)(c - a - b)$

$\Rightarrow 6 \times 1 \times (-1)$

$\Rightarrow (-6)$

5. Answer: (D)

as we know,

$a^2 + b^2 - c^2 = 0, then$

$a^6 + b^6 - c^6 = 3a^2b^2c^2$

Now,

$\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$

$\Rightarrow \frac{2 \times 3a^2b^2c^2}{3a^2b^2c^2}$

$\Rightarrow 2$

6. Answer: (D)

$x/y + y/x = 2$

$\Rightarrow \{(x \times x) + (y \times y)\}/(x \times y) = 2$

$\Rightarrow (x^2 + y^2)/xy = 2$

$\Rightarrow (x^2 + y^2) = 2xy$ ....(1)

Now,

$(x - y)$

$\Rightarrow \sqrt{(x - y)^2}$

$\Rightarrow \sqrt{(x^2 - 2xy + y^2)}$

$\Rightarrow \sqrt{(x^2 + y^2 - 2xy)}$

$\Rightarrow \sqrt{(2xy - 2xy)}$ (From (1))

$\Rightarrow 0$

$\therefore$ The required value of $(x - y)$ is 0.

7. Answer: (A)

$x + y = -3$ ....(1)

On squaring both the sides of equation (1) –

$x^3 + y^3 + 3xy(x + y) = -27$

$x^3 + y^3 + 3xy(-3) = -27$

$x^3 + y^3 - 9xy = -27$

Putting the value of equation (2) in $(x^3 + y^3 - 9xy + 9x^3 + y^3 - 9xy + 9)$, in –

$x^3 + y^3 - 9xy + 9$

$= -27 + 9 = -18$

$x + y + 3 = 0$

8. Answer: (A)

Let $x = 1; y = 2;$ and $z = 1$

Therefore, $x - y + z = 1 - 2 + 1 = 0$

[Satisfied]

So, $(y^2/2xz) - (x^2/2yz) - (z^2/2xy)$

$= (2^2/2 \times 1 \times 1) - (1^2/2 \times 2 \times 1) - (1^2/2 \times 1 \times 2) = (4/2) - (1/4) - (1/4) = 2 - 1/4 - 1/4$

$= 3/2$

TYPE – XIII

1. Answer: (B)

$x - 3 = 0$

Then, $x = 3$

Substituting the value of x, we get

$kx^3 + 4x^2 + 3x - 4 = k(3)^3 + 4(3)^2 + 3(3) - 4 = 27k + 36 + 9 - 4 = 27k + 41$ ----(i)

$x^3 - 4x + k = 33 - 4(3) + k = 27 - 12 + k = 15 + k$ ----(ii)

Both the quotients have the same remainder, then equating (1) and (2)

$27k + 41 = 15 + k$

$\Rightarrow 26k = -26$

$\Rightarrow k = -1$

2. Answer: (C)

$x^2 - 3x + 2 = 0$

$\Rightarrow x^2 - 2x - x + 2 = 0$

$\Rightarrow x(x - 2) - 1(x - 2) = 0$

$\Rightarrow (x - 2)(x - 1) = 0$

So, $(x - 2) = 0$

$\Rightarrow x = 2$

And $(x - 1) = 0$

$\Rightarrow x = 1$

the values of x are 2 and 1

After substituting the value of $x = 2$ in the given factor, we get,

$x^3 - 6x^2 + ax + b = 0$

$\Rightarrow 2^3 - 6 \times 2^2 + a \times 2 + b = 0$

$\Rightarrow 8 - 24 + 2a + b = 0$

$\Rightarrow 2a + b = 16$ ----(i)

After substituting the value of $x = 1$ in the given factorial, we get,

$x^3 - 6x^2 + ax + b = 0$

$\Rightarrow 1^3 - 6 \times 1^2 + a \times 1 + b = 0$

$\Rightarrow 1 - 6 + a + b = 0$

$\Rightarrow a + b = 5$ ----(ii)

After subtracting equation (ii) from equation (i), we get

$2a - a = 16 - 5$

$\Rightarrow a = 11$

Using the value of $a = 11$ in equation (ii), we get

$11 + b = 5$

$\Rightarrow b = 5 - 11$

$\Rightarrow b = -6$

$\therefore$ The values of a and b are 11 and – 6 respectively

3. Answer: (B)

$3x^2 - 8x + 3x - 8$

$\Rightarrow x(3x - 8) + 1(3x - 8)$

$\Rightarrow (x + 1)(3x - 8)$

4. Answer: (A)

If $2x^3 + ax^2 + bx - 2$ is divided by $(2x - 3)$,
then remainder = 7
$2x - 3 = 0$
$2x = 3$
$x = 3/2$
Putting $x = 3/2$ in $2x^3 + ax^2 + bx - 2 = 7$
$\Rightarrow 2 \times (3/2)^3 + a \times (3/2)^2 + b \times (3/2) - 2 = 7$
$\Rightarrow 2 \times (27/8) + a \times (9/4) + 3b/2 = 7 + 2$
$\Rightarrow 27/4 + 9a/4 + 3b/2 = 9$
$\Rightarrow 9a/4 + 3b/2 = 9 - (27/4)$
$\Rightarrow 9a/4 + 3b/2 = (36 - 27)/4$
$\Rightarrow (9a + 6b)/4 = 9/4$
$\Rightarrow 9a + 6b = 9$ ----(1)
Similarly,
If $2x^3 + ax^2 + bx - 2$ is divided by $(x + 2)$,
then remainder = 0
$x + 2 = 0$
$x = -2$
Putting $x = -2$ in $2x^3 + ax^2 + bx - 2 = 0$
$\Rightarrow 2 \times (-2)^3 + a \times (-2)^2 + b \times (-2) - 2 = 0$
$\Rightarrow 2 \times (-8) + a \times (4) - 2b - 2 = 0$
$\Rightarrow -16 + 4a - 2b - 2 = 0$
$\Rightarrow 4a - 2b = 18$ ----(2)
Multiplying equation (2) by 3
$\Rightarrow 12a - 6b = 54$ ----(3)
Adding equation (1) and equation (3) we get
$\Rightarrow 21a = 63$
$\Rightarrow a = 63/21$
$\therefore a = 3$
Putting $a = 3$ in equation (2)
$\Rightarrow 4 \times 3 - 2b = 18$
$\Rightarrow 12 - 2b = 18$
$\Rightarrow 2b = 12 - 18$
$\Rightarrow 2b = -6$
$\therefore b = -3$

5. **Answer: (D)**
$3x^2 + 5x - 2 = 0$
$\Rightarrow 3x^2 + 6x - x - 2 = 0$
$\Rightarrow 3x(x + 2) - 1(x + 2) = 0$
$\Rightarrow (3x - 1)(x + 2) = 0$
On taking,
$3x - 1 = 0$
$\Rightarrow 3x = 1$
$\Rightarrow x = 1/3$
On taking,
$(x + 2) = 0$
$\therefore x = -2$

6. **Answer: (D)**
$\Rightarrow 2x^2 - 5x - 12$
$\Rightarrow$ First term = $2x^2$
$\Rightarrow$ Second term = $-5x$
$\Rightarrow$ Third term = -12

$\Rightarrow$ Product of first and last term = $2x^2 \times -12$
$\Rightarrow$ Product of first and last term = $-24x^2$
Now break the second term into two terms such that the sum is equal to $-5x$ and their product is equal to $-24x^2$
$\Rightarrow -5x = -8x + 3x$
$\Rightarrow 2x^2 - 5x - 12 = 2x^2 - 8x + 3x - 12$
Now,
$\Rightarrow 2x(x - 4) + 3(x - 4)$
$\Rightarrow (x - 4) \times (2x + 3)$
$\Rightarrow$ The factors are $(x - 4)$ and $(2x + 3)$
$\therefore$ Factors are $(x - 4)$ and $(2x + 3)$

7. **Answer: (A)**
$x^4 - 8x^3 + 16x^2$
$\Rightarrow x^2(x^2 - 8x + 16)$
$\Rightarrow x^2(x - 4)^2$
$\Rightarrow (2 + \sqrt{3})^2(2 + \sqrt{3} - 4)^2$
$\because$ Putting the value of $x = 2 + \sqrt{3}$
$\Rightarrow (\sqrt{3} + 2)^2(\sqrt{3} - 2)^2$
$\Rightarrow \{(\sqrt{3} + 2)(\sqrt{3} - 2)\}^2$
$\Rightarrow (-1)^2$
$\Rightarrow 1$
$\therefore x^4 -$ value of $8x^3 + 16x^2 = 1$

8. **Answer: (A)**
$(2x - 3y)^2 = 4x^2 + 9y^2 - 12xy$
We can see that option 1 has the same value.

9. **Answer: (C)**
$(ax + by)^2 = a^2x^2 + 2abxy + b^2y^2$
Out of all the options we can see only one option which is matching with the answer.

10. **Answer: (D)**
Sum of roots $(\alpha + \beta) = -(-b/a) = b/a$
Product of roots $(\alpha \times \beta) = c/a$
Now,
$(1/\alpha) + (1/\beta) = (\alpha + \beta)/(\alpha\beta)$
$\Rightarrow (b/a)/(c/a)$
$\Rightarrow b/c$

11. **Answer: (C)**
$\Rightarrow g(x) = 0$
$\Rightarrow (x^2 - 1) = 0$
$\Rightarrow x = 1, -1$
$\Rightarrow p(1) = 0$
$\Rightarrow 1^3 + 2(1)^2 - a - b = 0$
$\Rightarrow a + b = 3$ ----(i)
$\Rightarrow p(-1) = 0$
$\Rightarrow (-1)^3 + 2(-1)^2 + a - b = 0$
$\Rightarrow a - b = -1$ ----(ii)
$\Rightarrow$ From equation (i) and (ii)
$\Rightarrow a = 1, b = 2$

12. **Answer: (A)**
$\Rightarrow ? = (x^4 + 2x^2 + 1 - x^2)/(x^2 + x + 1)$
$\Rightarrow ? = [(x^2 + 1) - x^2]/(x^2 + x + 1)$

⇒ ? = [(x² + 1 - x)(x² + 1 + x)]/(x² + x + 1)
⇒ ? = x² - x + 1

$$\therefore \frac{(x^4 + x^2 + 1)}{(x^2 + x + 1)} = x^2 - x + 1$$

13. **Answer: (C)**
⇒ a - 12/a = 1
⇒ a² - a - 12 = 0
⇒ a² - 4a + 3a - 12 = 0
⇒ a(a - 4) + 3(a - 4) = 0
⇒ (a - 4)(a + 3) = 0
a = 4 Or a = -3
But a > 0 so, a = 4
Then,
⇒ a² + 16/a² = 4² + 16/4² = 17
∴ a² + 16/a² = 17

TYPE – XIV

1. **Answer: (B)**
If a + b + c + d = 2
For max value a = b = c = d
⇒ 4a = 2
⇒ a = 2/4
⇒ a = 1/2
Substituting the value of a in (1 + a)(1 + b)(1 + c)(1 + d)
⇒ (1 + 1/2)(1 + 1/2)(1 + 1/2)(1 + 1/2)
⇒ (3/2)(3/2)(3/2)(3/2)
⇒ 81/16

2. **Answer: (B)**
2x + (9/x) = 9
$2x^2 + 9 = 9x$
$2x^2 - 9x + 9 = 0$
$(x - 3)(2x - 3) = 0$
$x = 3, \frac{3}{2}$
For lowest value of x = 3/2
x² + (1/x²) = 97/36

TYPE – XV

1. **Answer: (C)**
On squaring both sides
(√x)² = (√3 − √5)²
⇒ x = 3 + 5 − 2√15
⇒ x − 8 = -2√15
Again, squaring both sides
(x − 8)² = (-2√15)²
⇒ x² + 64 − 16x = 4 × 15
⇒ x² + 4 − 16x = 0
⇒ x² − 16x + 6 = 2

2. **Answer: (A)**
⇒ A = 1/B
⇒ (A + B)/(A - B) = [{(1 + B²)/B}/{(1 - B²)/B}]
⇒ (A + B)/(A - B) = (1+ B²)/(1 - B)
⇒ (A + B)/(A - B) = (8x² + 2)/8x = x + 1/4x

3. **Answer: (A)**
a = (2 + √3)/(2 - √3)

⇒ a = (2 + √3)²/(4 − 3)
⇒ a = (4 + 3 + 4√3)
⇒ a = (7 + 4√3)
∴ b = (2 - √3)/(2 + √3)
Similarly,
⇒ b = (7 − 4√3)
So, ab = (7 + 4√3)(7 − 4√3) = (49 − 48) = 1
Again, (a + b) = 14
On squaring both sides, we have –
⇒ a² + b² + 2ab = 196
⇒ a² +b² + ab + ab = 196
⇒ a² + b² + ab + 1 = 196
⇒ a² + b² + ab = 195

4. **Answer: (C)**
Using the above formula;
(ax + by)² + (ay - bx)² = (a² + b²) × (x² + y²)
⇒ 82 + (ay - bx)² = 25 × 17
⇒ (ay - bx)² = 425 - 64 = 361
⇒ (ay - bx) = √361 = 19
∴ (ay - bx) = 19

5. **Answer: (A)**
4√3x² + 5x − 2√3
⇒ 4√3x² + 8x − 3x − 2√3
⇒ 4x(√3x + 2) − √3(√3x + 2)
⇒ (√3x + 2) (4x (4x − √3))
Now,
⇒ A = √3, B = 4 and C = -√3
(A + B + C) = (√3 + 4 + (-√3)
⇒ (√3 + 4 − √3)
⇒ 4

6. **Answer: (D)**
x²a = y²b = z²c ≠ 0
Let x²a = y²b = z²c = k, then
x = k^{1/2a}, y = k^{1/2b}, z = k^{1/2c}
Now,
x² = yz
x × x = y × z
k^{1/2a} × k^{1/2a} = k^{1/2b} × k^{1/2c}
k^{(1/2a + 1/2a)} = k^{(1/2b + 1/2c)}
compare power
1/2a + 1/2a = 1/2b + 1/2c
⇒ 2/2a = (c + b)/2bc
⇒ 1/a = (c + b)/2bc
⇒ 2bc = ac + ab
Now,
$\frac{ab+bc+ca}{bc}$
⇒ (2bc + bc)/bc
⇒ 3bc/bc
⇒ 3

TYPE – XVI

1. **Answer: (B)**
Let the numbers be x and y
According to the question

x - y = 43
xy = 50
Now on squaring (x-y)
$(x - y)^2 = x^2 + y^2 - 2xy$
$x^2 + y^2 = (x - y)^2 + 2xy$
$\Rightarrow (43)^2 + 2 \times 50$
$\Rightarrow 1849 + 100$
$\Rightarrow 1949$

2. **Answer: (B)**
Let the two numbers be x and y respectively.
Accordingly,
(x + y) = 59 and xy = 840
Now,
$(x + y)^2 = x^2 + y^2 + 2xy$
$\Rightarrow 59^2 = x^2 + y^2 + 2(840)$
$\Rightarrow x^2 + y^2 = 3481 - 1680 = 1801$
∴ The sum of their squares is 1801.

3. **Answer: (A)**
Let two numbers be x and y
x + y = 11
$x^2 + y^2 = 65$
$\Rightarrow (x + y)^2 = x^2 + y^2 + 2xy$
$\Rightarrow 11^2 = 65 + 2xy$
$\Rightarrow 2xy = 121 - 65$
$\Rightarrow xy = 56/2$
$\Rightarrow xy = 28$
$x^3 + y^3 = (x + y)[(x + y)^2 - 3xy]$
$\Rightarrow x^3 + y^3 = 11(11^2 - 3 \times 28)$
$\Rightarrow x^3 + y^3 = 11 \times (121 - 84)$
$\Rightarrow x^3 + y^3 = 11 \times 37$
∴ $x^3 + y^3 = 407$

4. **Answer: (D)**
The area of a rectangle is $a^2 - b^2$
Its length is a + b
Area of rectangle = length × breadth
$\Rightarrow a^2 - b^2 = (a + b) \times$ breadth
$\Rightarrow (a + b)(a - b) = (a + b) \times$ breadth
$\Rightarrow$ breadth = (a - b)
∴ Its breadth will be (a - b).

5. **Answer: (A)**
$a^3 + b^3 = (a + b)^3 - 3ab(a + b)$
$\Rightarrow a^3 + b^3 = (20)^3 - 3 \times 4 \times 20$ [∵ Given a + b = 20 and ab = 4]
$\Rightarrow a^3 + b^3 = 20 \times (20^2 - 12)$
$\Rightarrow a^3 + b^3 = 20 \times (400 - 12)$
$\Rightarrow a^3 + b^3 = 20 \times 388$
$\Rightarrow a^3 + b^3 = 7760$
∴ The value of $a^3 + b^3$ is 7760.

6. **Answer: (C)**
$a^3 + b^3 = (a + b)[(a + b)^2 - 3ab]$
$\Rightarrow 5427 = 27[27^2 - 3ab]$
$\Rightarrow 5427/27 = (729 - 3ab)$

$\Rightarrow 201 = 729 - 3ab$
$\Rightarrow 3ab = 729 - 201$
$\Rightarrow 3ab = 528$
$\Rightarrow ab = 528/3$
$\Rightarrow ab = 176$

7. **Answer: (C)**
Let the two numbers be x and y respectively
On squaring both the sides, we get
$(x + y)^2 = (47)^2$
$\Rightarrow x^2 + y^2 + 2xy = 2209$
$\Rightarrow x^2 + y^2 + 2 \times 550 = 2209$
$\Rightarrow x^2 + y^2 = 2209 - 1100$
$\Rightarrow x^2 + y^2 = 1109$
∴ The sum of the squares of 2 numbers is 1109.

8. **Answer: (A)**
Let the two numbers be x, y
As per question-
x - y = 3 -------(i)
$x^3 - y^3 = 999$ ------------(ii)
$\Rightarrow (x - y)^3 + 3xy(x - y) = 999$
$\Rightarrow 27 + 9xy = 999$
$\Rightarrow xy = 108$
Now,
$(x + y)^2 = (x - y)^2 + 4xy$
$\Rightarrow (x + y)^2 = 9 + 432$
$\Rightarrow x + y = 21$
$x^2 - y^2 = (x + y)(x - y)$
$\Rightarrow x^2 - y^2 = 21 \times 3$
$\Rightarrow 63$
∴ Difference between their squares = 63

9. **Answer: (A)**
$16x^2 + 8x + 1 = 0$
$\Rightarrow (4x)^2 + 2 \times 4x + (1)^2$
$\Rightarrow (4x + 1)^2$
Now, area of square = (side)²
$\Rightarrow$ Length of the park = (4x + 1)
∴ Length of the park is (4x + 1) units.

10. **Answer: (C)**
Let the numbers be x and y
according to the question
x - y = 5 and $x^3 - y^3 = 1850$
Now,
$\Rightarrow (x - y)^3 = x^3 - y^3 - 3xy(x - y)$
$\Rightarrow 125 = 1850 - 3xy(5)$
$\Rightarrow 125 - 1850 = 3xy(5)$
$\Rightarrow 15xy = 1725$
$\Rightarrow xy = 115$
$\Rightarrow x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$
$\Rightarrow 1850 = (5)(x^2 + y^2 + 115)$
$\Rightarrow x^2 + y^2 = 255,$
Now,
$(x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow 255 + 2 \times 115$

$\Rightarrow \sqrt{485}$

Eventually,

$x^2 - y^2 = (x + y)(x - y)$

$\Rightarrow 5 \times \sqrt{485}$

$\Rightarrow 5\sqrt{485}$

11. **Answer: (D)**

Let the numbers be x and y

according to the question

x + y = 59 and xy = 1150

Now,

$\Rightarrow (x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow (59)^2 = x^2 + y^2 + 2300$

$\Rightarrow x^2 + y^2 = 3481 - 2300$

$\Rightarrow x^2 + y^2 = 1181$

Coordinate Geometry

All Formulas of Coordinate Geometry	
General Form of a Line	$Ax + By + C = 0$
Slope Intercept Form of a Line	$y = mx + c$
Point-Slope Form	$y - y_1 = m(x - x_1)$
The slope of a Line Using Coordinates	$m = \Delta y / \Delta x = (y_2 - y_1)/(x_2 - x_1)$
The slope of a Line Using General Equation	$m = -(A/B)$
Intercept-Intercept Form	$x/a + y/b = 1$
Distance Formula $(x_1, y_1), (x_2, y_2)$	$\lvert P_1P_2 \rvert = \sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$
For Parallel Lines,	$m_1 = m_2$
For Perpendicular Lines,	$m_1 m_2 = -1$
Midpoint Formula	$M(x, y) = [\tfrac{1}{2}(x_1 + x_2), \tfrac{1}{2}(y_1 + y_2)]$
Angle Formula	$\tan \theta = [(m_1 - m_2)/1 + m_1 m_2]$
Area of a Triangle Formula $(x_1, y_1), (x_2, y_2)$ or (x_3, y_3)	$\tfrac{1}{2} \lvert x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \rvert$
Distance from a Point to a Line (x_0, y_0)	$d = [\lvert Ax_0 + By_0 + C \rvert / \sqrt{(A^2 + B^2)}]$
Section Formula (Internal division)	$P(x, y) = [(m_1 x_2 + m_2 x_1)/(m_1 + m_2), (m_1 y_2 + m_2 y_1)/(m_1 + m_2)]$
Section Formula (External division)	$P(x, y) = [(m_1 x_2 - m_2 x_1)/(m_1 - m_2), (m_1 y_2 - m_2 y_1)/(m_1 - m_2)]$

Exercise

1. The two lines 4x + 3y = 0 and 7x + 5y = 0 will _____ in their graphical representation.
(A) be parallel to each othe r
(B) intersect each other at one point only
(C) intersect each other at three points only
(D) coincide each other

2. If the two lines px + 6y + 3 = 0 and 2x + qy + 3 = 0 have infinite solutions then find the value of p and q respectively.
(A) 2, 6   (B) 6, 2
(C) 2, 2   (D) 6, 6

3. What is the reflection of the point (-1 , 3) in the line x = -4?
(A) (-7 ,-3)   (B) (-7 ,3)
(C) (7 ,-3)   (D) (7 ,3)

4. What is the reflection of the point (-1, 5) in the line x = 1?
(A) (3 , -5)   (B) (-3 , -5)
(C) (3 , 5)   (D) (-3 , 5)

5. What is the reflection of the point (4 , -3) in the line y = 1?
(A) (4, -5)   (B) (4, 5)
(C) (-4, -5)   (D) (-4, 5)

6. What is the reflection of the point (-2, 5) in the line x = -1?
(A) (-2 , -7)   (B) (0 , 5)
(C) (2 , 5)   (D) (-2 , 7)

7. What is the reflection of the point (1 , 2) in the line y = 3?
(A) (1, -4)   (B) (1, 4)
(C) (-1, -4)   (D) (-1, 4)

8. What is the reflection of the point (5, 2) in the line x = -3?
(A) (-11 ,2)   (B) (-11 ,-2)
(C) (11 ,-2)   (D) (11 ,2)

9. What is the reflection of the point (5 , -1) in the line y = 2?
(A) (5, -5)   (B) (-5, -5)
(C) (5, 5)   (D) (-5, 5)

10. What is the reflection of the point (-3, 1) in the line x = -2?
(A) (-1 , 1)   (B) (-3 , -5)
(C) (1 , 1)   (D) (-3 , 5)

11. What is the reflection of the point (2, 3) in the line y = 4?
(A) (2, 5)   (B) (2, -5)
(C) (-2, -5)   (D) (-2, 5)

12. What is the reflection of the point (4, -3) in the line y = -2?
(A) (4, 1)   (B) (-4, 1)
(C) (-4, -1)   (D) (4, -1)

13. What is the reflection of the point (5, -2) in the line x = -1?
(A) (-7 , -2)   (B) (5 , 0)
(C) (7 , -2)   (D) (5 , 2)

14. What is the reflection of the point (3,-5) in the origin?
(A) (−3, −5)   (B) (5, −3)
(C) (−5,−3)   (D) (−3, 5)

15. What is the reflection of the point (3, 2) in the line y = −2?
(A) (−7 , 2)   (B) (−3 , −6)
(C) (−7 , −2)   (D) (3 , −6)

16- What is the reflection of the point (–0.5, 6) in the x-axis?
(A) (0.5, –6)   (B) (–6, –0.5)
(C) (6, –0.5)   (D) (–0.5, –6)

17- What is the reflection of the point (-3, 2) in the line x = 2?
(A) (-3, -6)   (B) (-1, 2)
(C) (-3, 6)   (D) (7, 2)

18- What is the reflection of the point (6, -1) in the line y = 2?
(A) (-2, -1)   (B) (-6, 5)
(C) (6, 5)   (D) (-2, 1)

19- What is the reflection of the point (4, 7) in the line y = -1?
(A) (-6, 7)   (B) (-4, -9)
(C) (4, -9)   (D) (-6, -7)

20- The point P (a, b) is first reflected in origin to P1 and P1 is reflected in Y-axis to (4, -3). What are the co-ordinates of point P?
(A) (4, 3)   (B) (-4, 3)
(C) (3, 4)   (D) (-3, 4)

21- What is the reflection of the point (2, -3.5) in the y-axis?
(A) (–2, 3.5)   (B) (–2, –3.5)
(C) (–3.5, –2)   (D) (3.5, –2)

22- What is the reflection of the point (5, 3) in the line y = –2?
(A) (–9, 3)   (B) (–5, –7)
(C) (–9, –3)   (D) (5, –7)

23- What is the reflection of the point (5, -2) in the line y = -1?
(A) (-7, -2)   (B) (-5, 0)
(C) (5, 0)   (D) (-7, 2)

24- What is the reflection of the point (-4, 3) in the line x = -2?
(A) (-4, -7)   (B) (4, 3)
(C) (0, 3)   (D) (-4, 7)

25- What is the reflection of the point (6, -3) in the line y = 2?

(A) (-2, -3)   (B) (6, 7)
(C) (-6, 7)   (D) (-2, 3)

26 - The co-ordinates of the centroid of a triangle ABC are (1 , -4). What are the co-ordinates of vertex C if co-ordinates of A and B are (3 , -4) and (0 , 5) respectively?
(A) (0 , 13)   (B) (0, 5)
(C) (0, -5)   (D) (0, -13)

27. What are the co-ordinates of the centroid of a triangle, whose vertices are A(1, –5), B(–4, 0) and C(3, –4)?
(A) (0, 6)   (B) (0, -3)
(C) (0, -5)   (D) (0, 5)

28 - In what ratio does the point T(x, 0) divide the segment joining the points S(5, 1) and U(-1, -2)?
(A) 2 : 1   (B) 1 : 2
(C) 3 : 1   (D) 2 : 3

29 - Point P is the midpoint of segment AB. Co-ordinates of P are (3 , 1) and B are (5, -4). What are the co-ordinates of point A?
(A) (-1 , 7)   (B) (1 , -7)
(C) (1 , 6)   (D) (-1 , -7)

30 - Point A (2, 1) divides segment BC in the ratio 2:3. Co-ordinates of B are (1, -3) and C are (4, y). What is the value of y?
(A) 8   (B) -7
(C) -8   (D) 7

31 - What are the co-ordinates of the centroid of a triangle, whose vertices are A(1, -5), B(4, 0) and C(-2, 2)?
(A) (1 , -1)   (B) (-1 , 1)
(C) (2 , -2)   (D) (-2 , 2)

32 - In what ratio is the segment joining points (2, 3) and (-2, 1) divided by the Y-axis?
(A) 1 : 2   (B) 1 : 1
(C) 3 : 1   (D) 2 : 3

33 - The co-ordinates of the centroid of a triangle ABC are (2 , 2). What are the co-ordinates of

vertex C if co-ordinates of A and B are (7 , -1) and (1 , 2) respectively?

(A) (-2 , 5)   (B) (2 , 5)
(C) (-2 , -5)   (D) (2 , -5)

34 - Point P (-2, 5) is the midpoint of segment AB. Co-ordinates of A are (-5, y) and B are (x, 3). What is the value of x?

(A) 1   (B) -1
(C) 2   (D) -2

35 - The distance between the points (2, 7) and (k, -5) is 13. What is the value of k?

(A) -7   (B) 7
(C) 6   (D) -6

36 - Point A divides segment BC in the ratio 4:1. Co-ordinates of B are (6 , 1) and C are (7/2 , 6). What are the co-ordinates of point A?

(A) (4 , 3)   (B) (4 , 5)
(C) (2 , 5)   (D) (3 , 5)

37- Point P is the midpoint of segment AB. Co-ordinates of P are (5, −1) and A are (2, −4). What are the co-ordinates of point B?

(A) (6, 4)   (B) (8, 2)
(C) (1, −2)   (D) (−6, −2)

38- What is the distance between the points (3 , 6) and (−2 , −6)?

(A) 15   (B) 13
(C) 11   (D) 12

39- In what ratio does the point T(x,0) divide the segment joining the points S(−4, −1) and U(1,4)?

(A) 1 : 4   (B) 4 : 1
(C) 1 : 2   (D) 2 : 1

40- What is the reflection of the point (-3, 2) in the line x = 2?

(A) (-3, -6)   (B) (-1, 2)
(C) (-3, 6)   (D) (7 , 2)

41- Point P (8, 5) is the midpoint of segment AB. Co-ordinates of A are (5, y) and B are (x, -3). What is the value of x?

(A) -11   (B) 11

(C) 7   (D) -7

42- What are the co-ordinates of the centroid of a triangle, whose vertices are A(2 , 5), B(-4 , 0) and C(5 , 4)?

(A) (-1, 3)   (B) (1, 3)
(C) (1, -3)   (D) (-1, -3)

43- In what ratio is the segment joining (-1, 3) and (2, -4) divided by the Y axis?

(A) 2: 1   (B) 1: 4
(C) 1: 2   (D) 4: 1

44- Point A divides segment BC in the ratio 1:3) Co-ordinates of B are (4, −4) and C are (0,6). What are the co-ordinates of point A?

(A) (−3, 1.5)   (B) (−1.5, 3)
(C) (3, −1.5)   (D) (1.5, 3)

45- The distance between the points (4, 8) and (k, −4) is 13. What is the value of k?

(A) 1   (B) 3
(C) −1   (D) −3

46- The co-ordinates of the centroid of a triangle ABC are (-1, 4). What are the co-ordinates of vertex C if co-ordinates of A and B are (-3, -1) and (3, 5) respectively?

(A) (-3, 8)   (B) (3, 8)
(C) (-3, -8)   (D) (3, -8)

47- Point A divides segment BC in the ratio 5:1) Co-ordinates of B are (6, -4) and C are (0,8). What are the co-ordinates of point A?

(A) (-1, 6)   (B) (1, -6)
(C) (-1, -6)   (D) (1, 6)

48- Point A (4, 2) divides segment BC in the ratio 2:5. Co-ordinates of B are (2, 6) and C are (7, y). What is the value of y?

(A) 8   (B) -8
(C) 6   (D) -6

49 - ax + 5y = 8 has slope of -4/3. What is the value of a?

(A) 20/3   (B) 3/20
(C) -20/3   (D) -3/20

50. Slope of the line AB is 4/3. Co-ordinates of points A and B are (x , −5) and (2 , -3) respectively. What is the value of x?
(A) 1/2   (B) −1/4
(C) 4   (D) −4

51 - At what point does the line 3x + 2y = 12 cuts the Y-axis?
(A) (0, 6)   (B) (0, -6)
(C) (6, 0)   (D) (-6, 0)

52 - What is the slope of the line perpendicular to the line passing through the points (-5 , 1) and (-2 , 0)?
(A) -3   (B) 3
(C) -1/3   (D) 1/3

53 - At what point does the line 2x + 5y = -6 cuts the X-axis?
(A) (3, 0)   (B) (0, 3)
(C) (-3, 0)   (D) (0, -3)

54 - Slope of the line AB is -4/3. Co-ordinates of points A and B are (x, -5) and (-5, 3) respectively. What is the value of x?
(A) -1   (B) 2
(C) -2   (D) 1

55 - What is the slope of the line 2x - 5y = 12?
(A) 2/5   (B) 5/2
(C) -2/5   (D) -5/2

56 - If ax - 4y = -6 has a slope of -3/2. What is the value of a?
(A) 6   (B) 3
(C) -6   (D) -3

57 - What is the equation of a line having a slope -1/3 and y-intercept equal to 6?
(A) x + 3y = 18   (B) x - 3y = 6
(C) x + 3y = -18   (D) x - 3y = -6

58 - What is the equation of the line perpendicular to the line 5x + 3y = 6 and having Y-intercept -3?
(A) 3x - 5y = 15   (B) 3x + 5y = 15
(C) 3x - 5y = -15   (D) 3x + 5y = -15

59 - What is the slope of the line parallel to the line passing through the points (5, -1) and (4, -4)?
(A) -3   (B) -1/3
(C) 3   (D) 1/3

60- What is the slope of the line perpendicular to the line passing through the points (−2, 3) and (2, 0)?
(A) 4/3   (B) 3/4
(C) −3/4   (D) −4/3

61- What is the equation of a line which has 3 as x-intercept and -5 as y-intercept?
(A) 3x − 5y = 15   (B) 5x − 3y = 15
(C) 5x + 3y = 15   (D) 3x + 5y = 15

62- At what point does the line 2x − 3y = 6 cuts the Y axis?
(A) (0, 2)   (B) (−2, 0)
(C) (2, 0)   (D) (0, −2)

63- What is the slope of the line perpendicular to the line passing through the points (3, -2) and (4, 2)?
(A) ¼   (B) 4
(C) -4   (D) -1/4

64- What is the equation of a line of slope 1/3 and y-intercept 5?
(A) x - 3y = -15   (B) x - 3y = 15
(C) x + 3y = -15   (D) x + 3y = 15

65- Slope of the line AB is -2/3 Co-ordinates of points A and B are (x , -3) and (5 , 2) respectively. What is the value of x?
(A) 4   (B) -14
(C) 12.5   (D) -4

66- What is the slope of the line 2x + 3y = 12?
(A) 2/3   (B) 3/2
(C) −3/2   (D) −2/3

67- What is the slope of the line parallel to the line passing through the points (−2, −1) and (4, −3)?
(A) 1/3   (B) −1/3
(C) −3   (D) 3

68- What is the equation of the line perpendicular to the line $2x + 3y = -6$ and having Y-intercept 3?

(A) $3x - 2y = 6$ (B) $3x - 2y = -6$
(C) $2x - 3y = -6$ (D) $2x - 3y = 6$

69- $ax + 3y = 6$ has slope -2/3. What is the value of a?

(A) -2   (B) 2
(C) 3   (D) -3

70- What is the slope of the line parallel to the line passing through the points (3, -4) and (-2, 5)?

(A) 9/5   (B) -5/9
(C) -9/5   (D) 5/9

71- At what point does the line $2x - 3y = 6$ cuts the X axis?

(A) (-3, 0)   (B) (0, 3)
(C) (0, -3)   (D) (3, 0)

Solution

1. **Answer: (B)**
$4x + 3y = 0$
When $x = 0$ then $y = 0$
When $x = -3$ then $y = 4$
And, $7x + 5y = 0$
When $x = 0$ then $y = 0$
When $x = 5$ then $y = -7$
The two lines $4x + 3y = 0$ and $7x + 5y = 0$ will intersect each other at one point only in their graphical representation

2. **Answer:(A)**
Line $px + 6y + 3 = 0$ when compared with $a_1x + b_1y + c_1 = 0$
So, $a_1 = p$, $b_1 = 6$ and $c_1 = 3$
Line $2x + qy + 3 = 0$ when compared with $a_2x + b_2y + c_2 = 0$
So, $a_2 = 2$, $b_2 = q$ and $c_2 = 3$
For infinite solutions,
$a_1/a_2 \Rightarrow p/2 = 6/q = 3/3$
$\Rightarrow p/2 = 3/3$
$\Rightarrow p = 2$
And, $6/q = 3/3$
$\Rightarrow q = 6$
So, value of p and q = 2, 6

3 - **Answer:(B)**
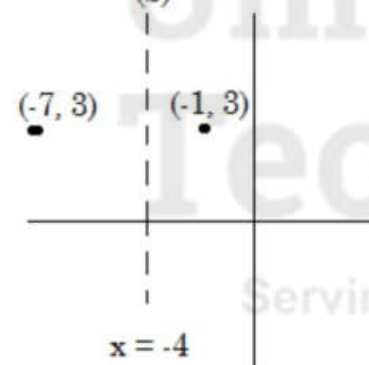
4. **Answer:(C)**
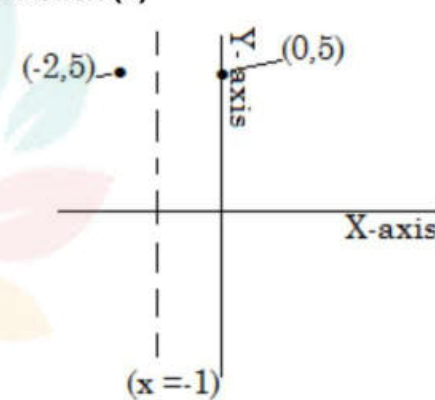Reflection of a point (x, y) and line $x = a$
Image $\rightarrow (-x + 2a, y)$
$\therefore$ image $\rightarrow (+1 + 2 \times 1, 5$
$= (3, 5)$

5 - **Answer: (B)**
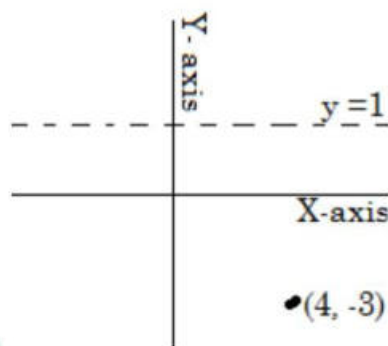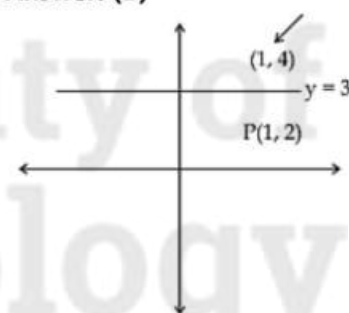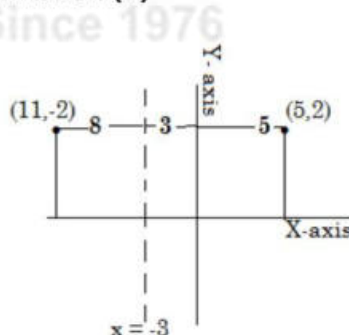
6 - **Answer: (B)**

7 - **Answer: (B)**

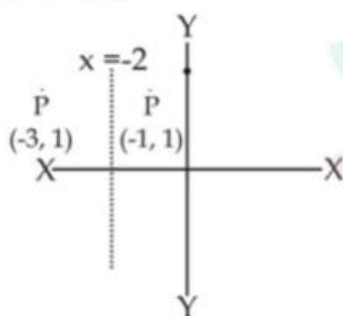**8 -** **Answer: (A)**

9 -   **Answer: (C)**
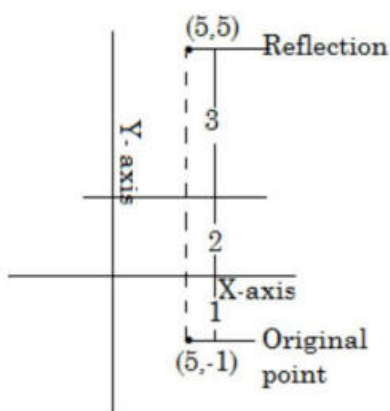
(5,5) — Reflection

3

Y - axis

2

X-axis

1

(5,-1) — Original point

10 -   **Answer:(A)**

x = -2

P (-3, 1)   P (-1, 1)

11 -   **Answer: (A)**

Y - axis

. A'(2,5)

------------ (y = 4)

. A(2,3)

X-axis

12 -   **Answer: (D)**

Y - axis

X-axis

. (4, -1)

(y= -2)---------

. (4, -3)

13 -   **Answer: (A)**

(x = -1)   Y - axis

X-axis

.(-7,-2)   . (5, -2)

14-   **Answer:(D)**

Reflection   Y axis

Y   (-3, 5)

x-axis

(3, -5)

x

15-   **Answer:(D)**

Reflection point

(3, 2)

4 points

O

y = - 2

4 points

(+3, -6)

-y-axis

16-   **Answer:(D)**

Reflection point (0.5, 6) is on x axis

y-axis

6

-0.5

x-axis

(-0.5, -6)   -6
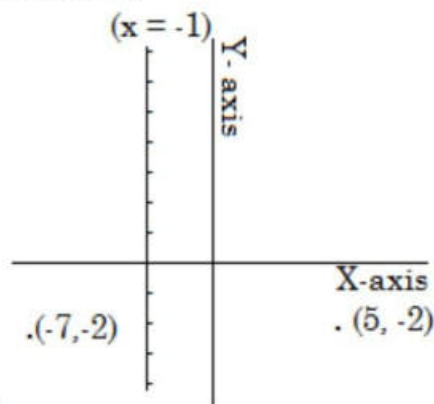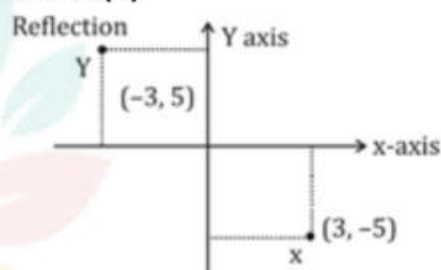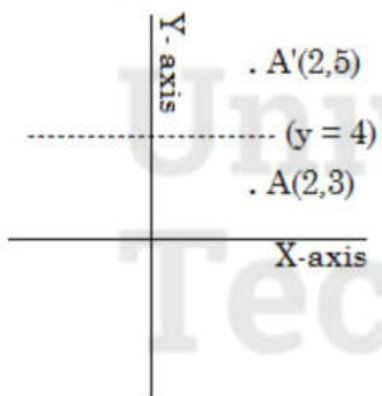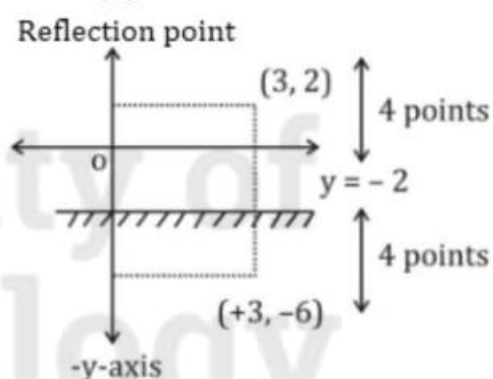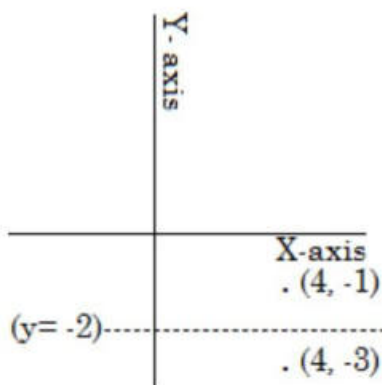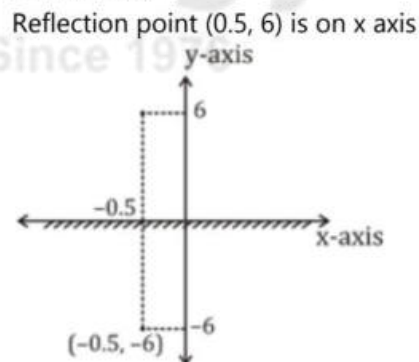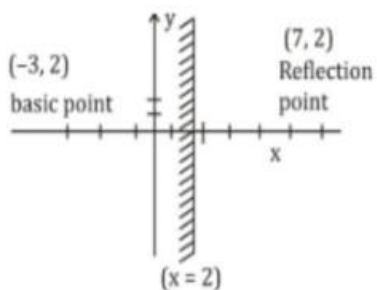
17-   **Answer:(D)**
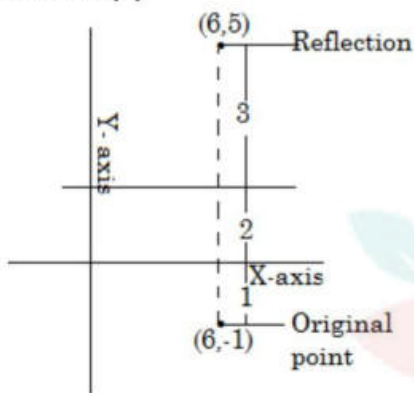
18-   **Answer:(C)**

19-   **Answer:(C)**
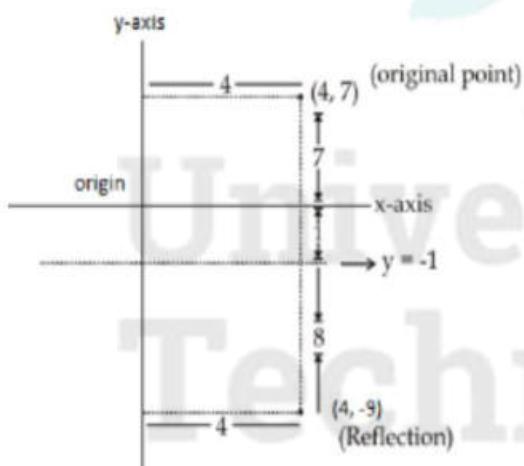
20-   **Answer:(A)**
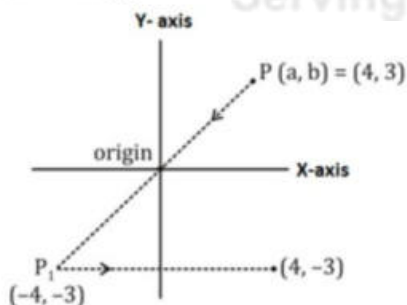
21-   **Answer:(B)**
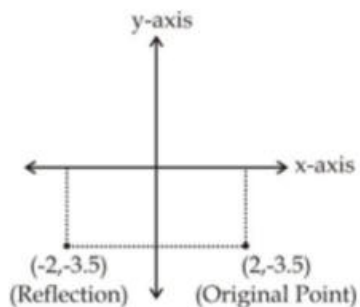
22-   **Answer:(D)**
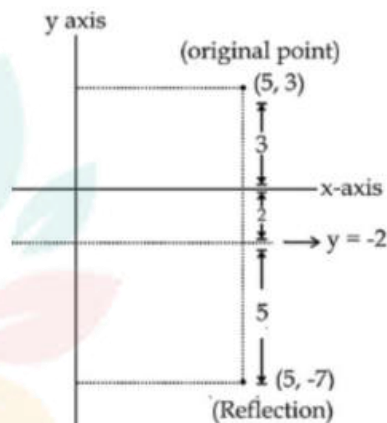
23-   **Answer:(C)**
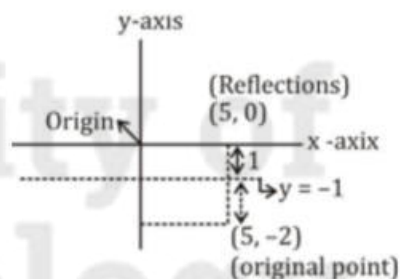
24-   **Answer:(C)**

25- Answer:(B)

26 - Answer:(D)

Let vertex of C be (x, y)

$$\therefore \frac{3+0+x}{3} = 1 \Rightarrow x = 0$$

and $\dfrac{-4+5+y}{3} = -4 \Rightarrow y = -13$

27. Answer:(B)

Coordinates of centroid of triangle

$$= \frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}$$

$$= \frac{1-4+3}{3}, \frac{-5+0-4}{3}$$

$$= (0, -3)$$

28 - Answer: (B)

$$\underset{\substack{S \\ (5,1)}}{\overline{\quad\quad}} \overset{K:1}{\underset{\substack{T \\ (x,0)}}{\quad\quad}} \underset{\substack{U \\ (-1,-2)}}{\quad\quad}$$

We know,

$$0 = \frac{1 \times 1 - 2k}{k+1} \rightarrow k = \frac{1}{2}$$

∴ Required ratio = 1 : 2

29 - Answer: (C)

$$\underset{\substack{A \\ (x,y)}}{\overline{\quad\quad}} \overset{P}{\underset{(3,1)}{\bullet}} \underset{\substack{B \\ (5,-4)}}{\quad\quad}$$
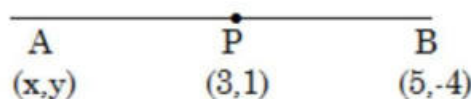
We know,

$$\frac{y-4}{2} = 1 \Rightarrow y = 6$$

And,

$$\frac{x+5}{2} = 3 \Rightarrow x = 1$$

∴ A(1, 6) is the required coordina

30 - Answer: (D)

$$\overset{A(2,1)}{\underset{\substack{B \\ }}{\bullet}} \quad 2 \quad \bullet \quad 3 \quad \underset{C}{\bullet}$$
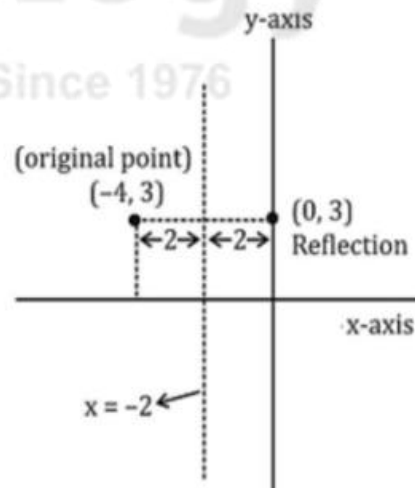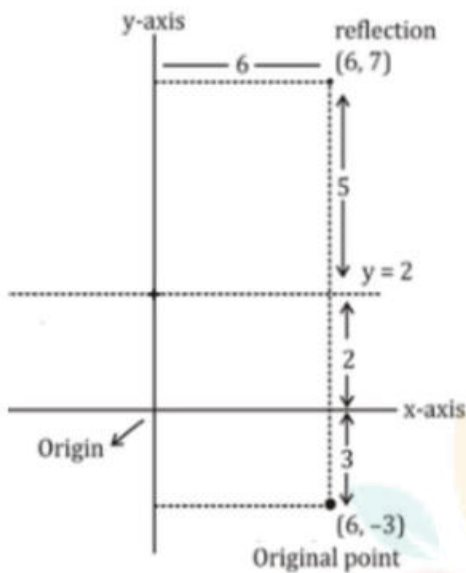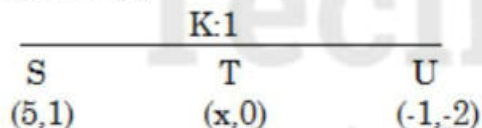
$$\frac{2 \times y - 3 \times 3}{2+3} = 1$$

$$\Rightarrow 2y - 9 = 5$$

$$\Rightarrow y = 7$$
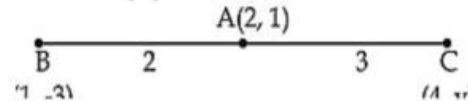
31 - Answer: (A)

$$\text{Centroid} = \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$

$$= \left(\frac{1+4+(-2)}{3}, \frac{-5+0+2}{3} \right)$$

$$= (1, -1)$$

32 - Answer: (B)

$$\overset{k:1}{\overline{\quad\quad\quad\quad}}$$

$$(2,3) \quad\quad (0,y) \quad\quad (-2,1)$$
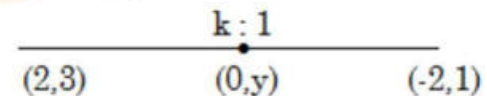
By section formula,

$$\frac{-2k+2}{k+1} = 0$$

$$-2k + 2 = 0$$

$$k = 1$$

∴ ratio = 1 : 1

33 - Answer:(A)

We know,

$$\text{Centroid of triangle} = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3} \right)$$

$$(2, 2) = \left(\frac{7+1+x}{3}, \frac{-1+2+y}{3} \right)$$

$$\therefore \frac{7+1+x}{3} = 2 \Rightarrow x = -2$$

and,

$$\frac{-1+2+y}{3} = 2 \Rightarrow y = 5$$

34 - Answer: (A)

$$\underset{\substack{A \\ (-5,y)}}{\overline{\quad\quad}} \overset{P}{\underset{(-2,5)}{\bullet}} \underset{\substack{B \\ (x,3)}}{\quad\quad}$$

Now, ATQ,

$-2 = \dfrac{-5 + x}{2}$

$\Rightarrow -4 = -5 + x$

$\Rightarrow x = 1$

35 - **Answer: (B)**

We know

Distance b/w two points = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\Rightarrow 13 = \sqrt{(k - 2)^2 + (-5 - 7)^2}$

$\Rightarrow 169 = k^2 + 4 - 4k + 144$

$\Rightarrow k^2 - 4k - 21 = 0$

$\Rightarrow k^2 - 7k + 3k - 21 = 0$

$\Rightarrow k(k - 7) + 3(k - 7) = 0$

$\Rightarrow k = -3, 7$

36 - **Answer: (B)**

B—— 4 ——A—— 1 ——C
(6,1)   (7/2,6)
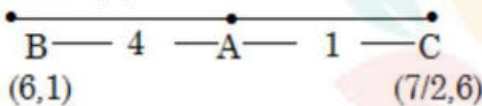
By section formula,

Point A = $\left(\dfrac{4 \times \frac{7}{2} + 1 \times 6}{4 + 1}, \dfrac{4 \times 6 + 1 \times 1}{4 + 1} \right)$

= (4, 5)

37- **Answer:(B)**

A   P   B
(2,-4)   (5,-1)   (x,y)
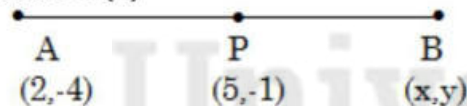
∵ P is a mid-point

∴ $\dfrac{x + 2}{2} = 5$ and $\dfrac{y - 4}{2} = -1$

x = 8 and y = 2

∴ B (x, y) = (8, 2)
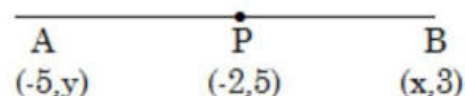
38- **Answer:(B)**

Distance between points =

$\sqrt{(-2 - 3)^2 + (-6 - 6)^2} = 13$

39- **Answer:(A)**

Let the ratio be K:1

K:1

S   T   U
(-4,-1)   (x,0)   (1,4)
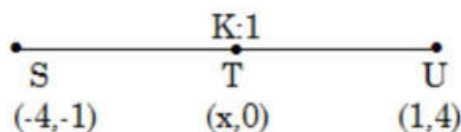
By section formula

$\dfrac{4K + 1 \times (-1)}{K + 1} = 0$

$4K = 1$

$K = \dfrac{1}{4}$

∴ The required ratio is 1 : 4

40- **Answer:(D)**

(-3, 2)
basic point

(7, 2)
Reflection point

(x = 2)

41- **Answer:(B)**

Mid point

A   P   B
(5,y)   (8,5)   (x,-3)
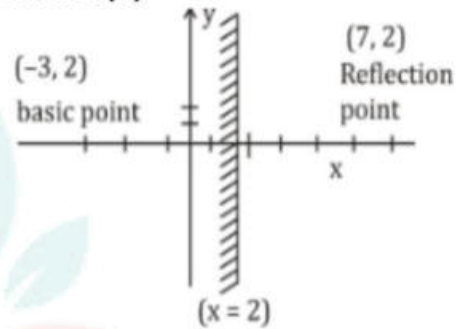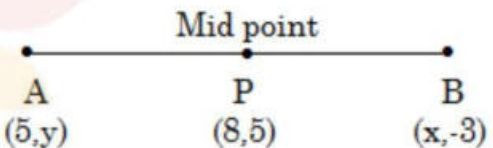
ATQ, $\dfrac{5 + x}{2} = 8$ and $\dfrac{y - 3}{2} = 5$

x = 11 and y = 13

42- **Answer:(B)**

Centroid = $\left(\dfrac{x_1 + x_2 + x_3}{3}, \dfrac{y_1 + y_2 + y_3}{3} \right)$

= $\left(\dfrac{2 - 4 + 5}{3}, \dfrac{5 + 0 + 4}{3} \right)$

= (1, 3)

43- **Answer:(C)**

K:1

(-1,3)   (0,y)   (2,-4)

Let the ratio be K:1

By section formula

$\dfrac{2k - 1}{k + 1} = 0$

$k = \dfrac{1}{2}$

∴ The required Ratio = 1:2

44- **Answer:(C)**

$$\overset{1:3}{\underset{\underset{(4,-4)}{B} \qquad \underset{(x,y)}{A} \qquad \underset{(0,6)}{C}}{\rule[0.5ex]{6cm}{0.4pt}}}$$
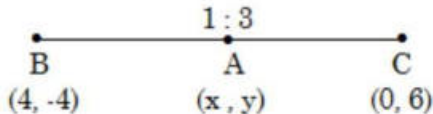
By section formula,

$$\frac{1 \times 0 + 3 \times 4}{1+3} = x \text{ and } \frac{1 \times 6 + 3(-4)}{1+3} = y$$

So, $x = 3$ and $y = -1.5$

$\therefore$ A (x, y) = (3, -1.5)

45- Answer:(C)

ATQ,

$\sqrt{(-4-8)^2 + (K-4)^2} = 13$

$144 + (K-4)^2 = 169$

$(K-4)^2 = 25$

$(K-4) = \pm 5$

K – 4 = 5 or K – 4 = -5

K = 9 or K = -1

K = -1 {as it is given in options}

46- Answer:(A)

Let C = (x, y)

ATQ,

$\frac{x + (-3) + 3}{3} = -1$ and $\frac{y + (-1) + 5}{3} = 4$

x = – 3 and y = 8

$\therefore$ c(x, y) = (– 3, 8)

47- Answer:(D)

$$\overset{5:1}{\underset{\underset{(6,-4)}{B} \qquad \underset{(x,y)}{A} \qquad \underset{(0,8)}{C}}{\rule[0.5ex]{6cm}{0.4pt}}}$$
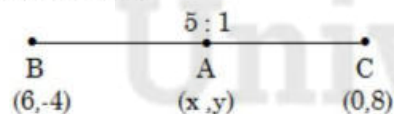
By section formula,

$$x = \frac{5 \times 0 + 1 \times 6}{5+1} \text{ and } y = \frac{5 \times 8 + 1 \times (-4)}{5+1}$$

x = 1 and y = 6

Point A (x, y) = (1, 6)

48- Answer:(B)

$$\overset{2:5}{\underset{\underset{(2,6)}{B} \qquad \underset{(4,2)}{A} \qquad \underset{(7,y)}{C}}{\rule[0.5ex]{6cm}{0.4pt}}}$$
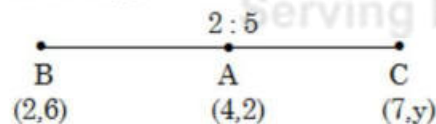
By section formula,

$$\frac{2 \times y + 5 \times 6}{2+5} = 2$$

2y + 30 = 14

y = – 8

49 - Answer:(A)

ATQ,

ax + 5y = 8

$\Rightarrow 5y = -ax + 8$

$\Rightarrow y = \frac{-a}{5}x + \frac{8}{5}$

Slope, $-\frac{4}{3} = -\frac{a}{5} \Rightarrow a = \frac{20}{3}$

50. Answer:(A)

We know

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$\Rightarrow \frac{4}{3} = \frac{-3+5}{2-x}$

$\Rightarrow 4(2- x) = 3(2)$

$\Rightarrow 8 - 4x = 6$

$\Rightarrow 4x = 2$

$\Rightarrow x = \frac{1}{2}$
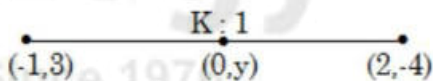
51 - Answer: (A)

at y-axis, x – coordinate = 0

$\therefore 3 \times 0 + 2y = 12$

$\Rightarrow y = 6$

Required point = (0, 6)

52 - Answer: (B)

Slope of line passing through (-5, 1) and (-2, 0)

$m_1 = \frac{0-1}{-2+5} = \frac{-1}{3}$

Slope of line 1 $\Rightarrow m_2 = 3$

53 - Answer: (C)

At x-axis, value of y is 0

$\therefore 2x + 5y = -6$

$\Rightarrow 2x = -6$

$\Rightarrow x = -3$

$\therefore$ Required coordinate = (-3, 0)

54 - Answer: (D)

ATQ,

$\frac{3 - (-5)}{-5 - x} = \frac{-4}{3}$

$8 \times 3 = -4(-5 - x)$

$24 = 20 + 4x$

x = 1

55 - Answer: (A)

$2x - 5y = 12$

$y = \frac{2}{5}x - \frac{12}{5}$

Compare the above Eqn. with

$y = mx + c$

∴ Slope$(m) = \frac{2}{5}$

56 - **Answer:(C)**

$ax - 4y = -6$

$\Rightarrow 4y = ax + 6$

$\Rightarrow y = \frac{a}{4}x + \frac{6}{4}$

∴ slope $= \frac{a}{4} = \frac{-3}{2}$

∴ $a = -6$

57 - **Answer: (A)**

$y - y_1 = m(x - x_1)$

$\Rightarrow y - 6 = \frac{-1}{3}(x - 0)$

$\Rightarrow 3y - 18 = -x$

$\Rightarrow x + 3y = 18$

58 - **Answer: (A)**

$3y = 6 - 5x$

$\Rightarrow y = \frac{-5x}{3} + 2$

Slope of line perpendicular to this will be, m_2

$= 3/5$

$(y + 3) = \frac{3}{5}(x - 0)$

$\Rightarrow 5y + 15 = 3x$

$\Rightarrow 3x - 5y = 15$

59 - **Answer: (C)**

Slope $= (y_2 - y_1)/(x_2 - x_1) = (-4+1)/(4-5) = 3$

60- **Answer:(A)**

Slope of given line $\frac{0-3}{2-(-2)} = \frac{-3}{4}$

∴ Slope of ⊥ line $= \frac{4}{3}$

61- **Answer:(B)**

Put $x = 0$ then $y = -5$, and put $y = 0$ then $x = 3$

So, only option (b) satisfied the condition.

62- **Answer:(D)**

$2x - 3y = 6$, cuts the y-axis

Means put $x = 0$,

$0 - 3y = 6 \Rightarrow y = -2$ so, $(0, -2)$

63- **Answer:(D)**

$m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-(-2)}{4-3} = 4$

$m_2 = -\frac{1}{m_1} = -\frac{1}{4}$

64- **Answer:(A)**

Eqⁿ of line $\Rightarrow (y - 5) = \frac{1}{3}(x - 0)$

$3y - 15 = x$

$x - 3y = -15$

65- **Answer:(C)**

ATQ,

$\frac{2 - (-3)}{5 - x} = \frac{-2}{3}$

$15 = -10 + 2x$

$x = \frac{25}{2}$

$x = 12.5$

66- **Answer:(D)**

$2x + 3y = 12$

$y = \frac{-2}{3}x + 4$

Compare the above Eqn. with $y = mx + c$

∴ slope $(m) = \frac{-2}{3}$

67- **Answer:(B)**

Slope of given line $= \frac{-3-(-1)}{4-(-2)} = -\frac{1}{3}$

because lines are parallel, hence slope will be the same for both lines.

68- **Answer:(B)**

Slope of given line $= \frac{-2}{3}$

Slope of ⊥ line $= \frac{3}{2}$

Equation of ⊥ line $\Rightarrow (y - 3) = \frac{3}{2}(x - 0)$

$\Rightarrow 2y - 6 = 3x$

$\Rightarrow 3x - 2y = -6$

69- **Answer:(B)**

Slope of given line $= \frac{-2}{3}$

$\frac{-a}{3} = \frac{-2}{3}$

$a = 2$

70- **Answer:(C)**

Slope of given line $= \frac{5-(-4)}{-2-3} = -\frac{9}{5}$

Since both lines are parallel, so both lines have same slope.

71- **Answer:(D)**

Data Interpretation

Direction (1–4): The given bar graph represents the number of students from Science and arts streams from school in different years.
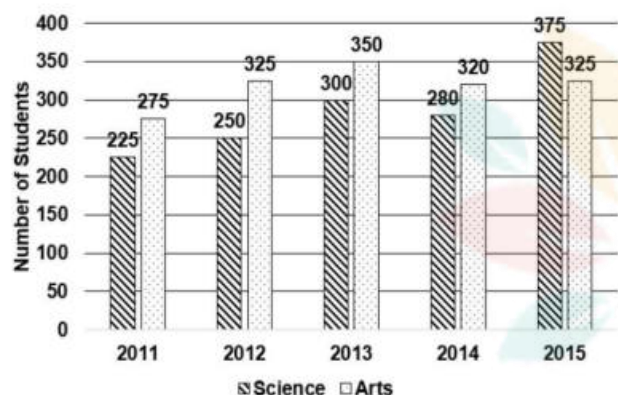
1. In which year the number of **arts** students is 30% more than that of Science?
   (A) 2013   (B) 2014
   (C) 2012   (D) 2011

2. The total number of **arts** students in 2011, 2013 and 2015 is what percentage less than that of Science in the given five years (correct to one decimal place)?
   (A) 34.2%   (B) 33.6%
   (C) 31.4%   (D) 32.8%

3. The average number of Science students in 2011, 2013 and 2015 is what percentage more than the number of **arts** students in 2011?
   (A) $11\frac{1}{9}$ %   (B) $9\frac{1}{31}$ %
   (C) $9\frac{1}{11}$ %   (D) $8\frac{1}{9}$ %

4. What is the ratio of the total number of Science students in 2011 and 2015 to that of Arts in 2012 and 2015?
   (A) 9 : 10   (B) 8 : 9
   (C) 12 : 13   (D) 11 : 12

Direction: (5-8): The given Bar graph represents the demand and Production of motorcycles of five companies (in lakhs).
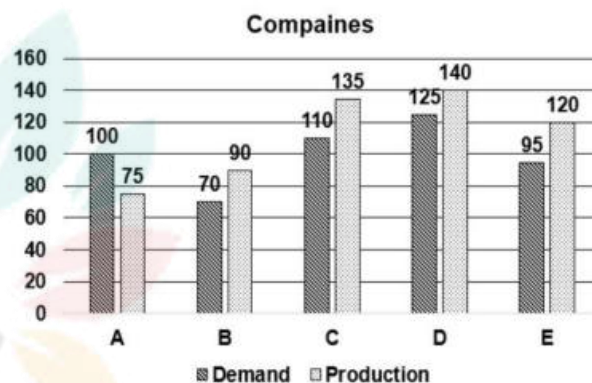
5. The average Production of motorcycles of companies B, C and E taken together is what percent less than the demand of motorcycles of company D?
   (A) 8%   (B) 8.7%
   (C) 9.3%   (D) 6%

6. Which company has the Production of motorcycles approximately 23% more than the demand?
   (A) B   (B) C
   (C) D   (D) E

7. The total Production of motorcycles of companies B and D taken together is what percent of the demand of motorcycles of all the companies taken together?
   (A) 46%   (B) 38%
   (C) 48%   (D) 40%

8. What is the ratio of the total demand of motorcycles of companies A and D taken together to the Production of motorcycles of company C?

(A) $13 : 9$ (B) $8 : 5$

(C) $5 : 3$ (D) $9 : 7$

Direction: (9-12) The given Bar Graph presents the number of students enrolled for a vocational course in institutes A and B during a period of five years. Institute

Years

□ Institute A   ■ Institute B
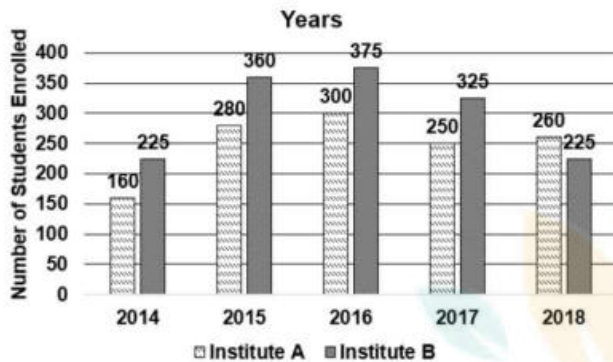
9. In which year the number of students enrolled in B is x% more, where $25 < x < 30$, then the number of students enrolled in A in the same year?

(A) 2015   (B) 2017

(C) 2016   (D) 2014

10. The average number of students (per year) enrolled in B during 2015, 2016 and 2018 is what percentage more than the number of students enrolled in A during 2017?

(A) 28   (B) 25

(C) 30   (D) 22

11. The total number of students enrolled in A during 2014, 2016 and 2018 is what percentage (correct to one decimal place) of the total number of students enrolled in B during the five years?

(A) 43.4   (B) 47.7

(C) 44.6   (D) 46.8

12. What is the ratio of the total numbers of students enrolled in A during 2015 and 2018 to that of students enrolled in B during 2014 and 2016?

(A) $9 : 10$ (B) $16 : 15$

(C) $27 : 25$ (D) $11 : 12$

Direction: (13-16) The given Bar Graph presents Income and Expenditure (in crores of Rupees) of a company for the five years, 2014 to 2018.

Income and Expenditure (in Rs crores) of a Company in 5 years

■ Income   ▨ Expenditure
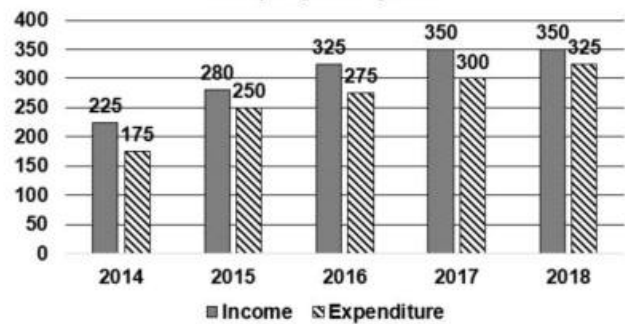
13. The average Income (per year) of the company in five years is what percentage more than its Expenditure in 2015?

(A) 24.2   (B) 20.8

(C) 24.6   (D) 22.4

14. The total Income of the company in 2015, 2017 and 2018 is approximately what percent less than the total Expenditure in the five years?

(A) 26   (B) 22

(C) 24   (D) 21

15. In which year is the Expenditure more than 40% as compared to the Expenditure in the previous year?

(A) 2016   (B) 2015

(C) 2018   (D) 2017

16. What is the ratio of total Expenditure to total Income of the company in 2014, 2016 and 2017?

(A) $13:18$ (B) $3:4$

(C) $15:16$ (D) $5:6$

Double Direction: (17-20) The given Bar Graph presents the Imports and Exports of an item (in tonnes) manufactured by a company for the five financial years, 2013–2014 to 2017–2018
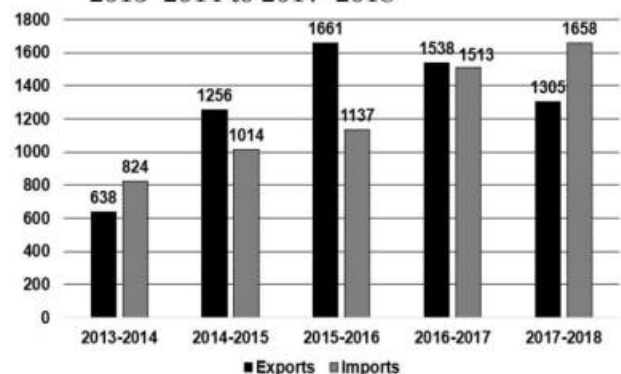
■ Exports   ■ Imports

17. In which financial year the percentage increase in total to Exports and Imports is the highest in comparison to its previous financial year?
(A) 2015 – 2016   (B) 2017 – 2018
(C) 2014 – 2015   (D) 2016 – 2017

18. What is the ratio of total Imports to total Exports during 2013-2014, 2015-2016 and 2017-2018?
(A) 3604 : 3073   (B) 4011 : 4175
(C) 3619 : 3604   (D) 4175 : 4011

19. What is the average of total Import and Export (in tonnes) during the five financial year?
(A) 2279.5   (B) 2508.8
(C) 2552.4   (D) 2325.9

20. In which financial year the total of the Exports and Imports is the lowest?
(A) 2014–2015   (B) 2013–2014
(C) 2015–2016   (D) 2017–2018

Direction: (21-24) The given Bar Graph presents the Imports and Exports of an item (in tonnes) manufactured by a company for the five financial years, 2013–2014 to 2017–218
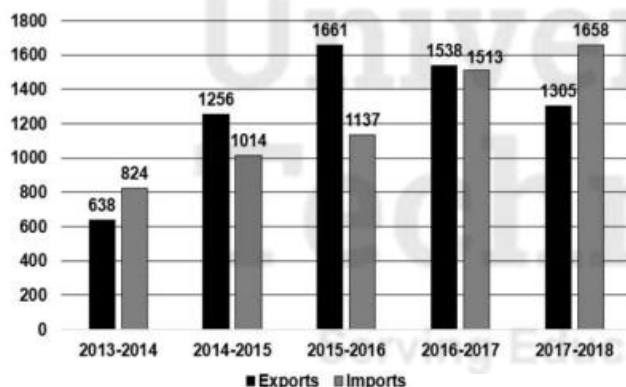
21. In which financial year, the absolute difference of the Exports to those of Imports is the lowest?
(A) 2016-2017   (B) 2015-2016
(C) 2014-2015   (D) 2013-2014

22. What is the ratio of total imports to total Exports during 2014-2015, 2015-2016 and 2016-2017?
(A) 4175 : 4011   (B) 3664 : 4455

(C) 4455 : 3664   (D) 4011 : 4175

23. What is the average of absolute difference between Exports and Imports (In tonnes) during the five financial years?
(A) 50.4   (B) 52
(C) 57.4   (D) 56.2

24. In which financial year the percentage increase in Imports and Exports taken together is the lowest in comparison to its previous financial year?
(A) 2015–2016   (B) 2014–2015
(C) 2016–2017   (D) 2017–2018

Direction: (25-28) The given Bar Graph presents the Imports and Exports of an item (in tonnes) manufactured by a company for the five financial year, 2013- 2014 to 2017-2018.
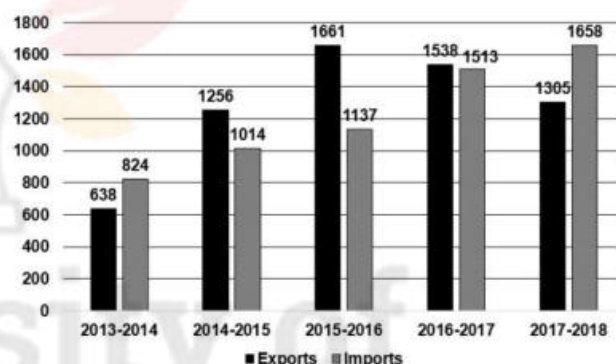
25. What is the ratio of Imports to total Exports during the five financial years?
(A) 3199 : 3073   (B) 4175 : 4011
(C) 3073 : 3199   (D) 4011 : 4175

26. In which financial year, total of Exports and Imports is the highest?
(A) 2017-2018   (B) 2015-2016
(C) 2016-2017   (D) 2014-2015

27. In which financial year the percentage increase in the imports is the highest in comparison to its previous financial year?
(A) 2014-2015   (B) 2016-2017
(C) 2017-2018   (D) 2015-2016

28. What is the average of Export (in tonnes) during the five financial years?
(A) 1279.6   (B) 1279.5
(C) 1552.4   (D) 1025.9

Direction: (29-32) The given Bar Graph presents the number of students of two schools for six years.

☐ School A ▧ School B
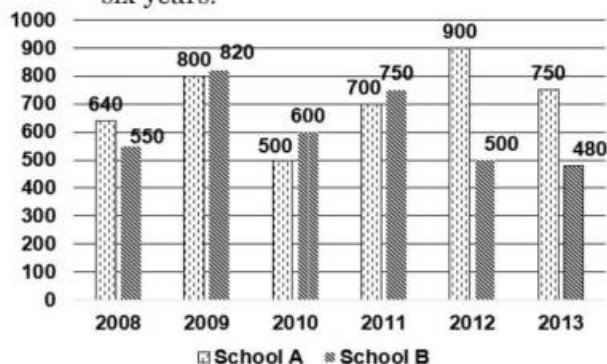
29. What is the average of the number of students from schools A during the six year period?
   (A) 760   (B) 700
   (C) 715   (D) 765

30. In which year, the absolute difference of the students in two schools is the lowest?
   (A) 2008   (B) 2011
   (C) 2009   (D) 2012

31. In which year, the percentage increase of students in schools A is the highest in comparison to its previous year?
   (A) 2010   (B) 2012
   (C) 2011   (D) 2009

32. What is the ratio of the number of students takes for all years together from school A to that from school B?
   (A) 417 : 401   (B) 370 : 429
   (C) 429 : 370   (D) 401 : 417

Direction: (33-36) The given Bar Graph presents the number of students of two schools for six years.

☐ School A ▧ School B
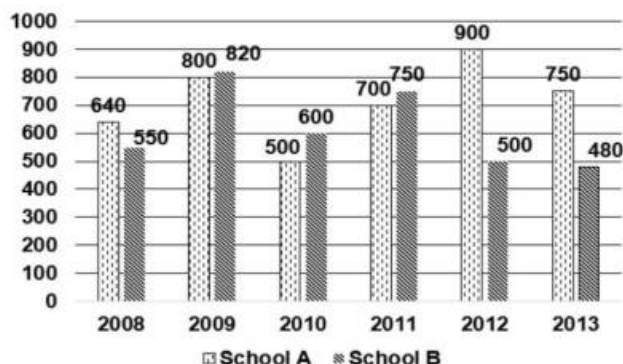
33. What is the average (Correct to two decimal places) of total students in schools A and B taken together during the six years period?
   (A) 1221.67   (B) 1122.57
   (C) 1331.67   (D) 1133.57

34. What is the ratio of the number of students taken together for the years 2008, 2012 and 2013 in School A to the number of students taken together for the years 2008, 2012 and 2013 in school B?
   (A) 229 : 153   (B) 101 : 117
   (C) 153 : 229   (D) 117 : 101

35. In which year the percentage increase in the number of total students in schools A and B taken together is the highest in comparison to its previous year?
   (A) 2012   (B) 2011
   (C) 2010   (D) 2009

36. In which year the sum of the students in two schools is the highest?
   (A) 2009   (B) 2012
   (C) 2011   (D) 2008

Direction: (37-40) The given Bar Graph presents the number of students of two schools for six years
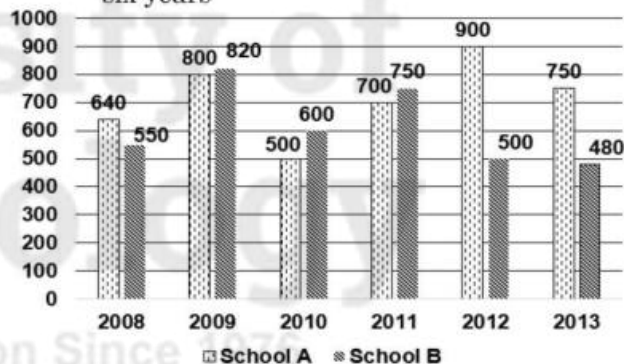
☐ School A ▧ School B

37. In which year, the absolute difference between the numbers of students in two schools in the highest?
   (A) 2013   (B) 2010
   (C) 2012   (D) 2011

38. What is the ratio of students taken for all years together from School B to that from school A?
   (A) 370 : 429   (B) 415 : 401
   (C) 429 : 370   (D) 401 : 415

39. What is the average number of students from school B during the six year period (correct to two decimal places)?
    (A) 656.17   (B) 616.67
    (C) 664.37   (D) 660.17

40. In which year, the percentage increase in students in school B is the highest in comparison to its previous year?
    (A) 2011   (B) 2013
    (C) 2009   (D) 2010

Direction: (41-44) The given Bar Graph presents the sales of the number of books (in thousands) by six branches of a publishing company during two consecutive years 2000 and 2001.

Sales of Books (in thousand numbers) for six Branches -
B1, B2, B3, B4, B5 and B6 of a publishing Company in
2000 and 2001
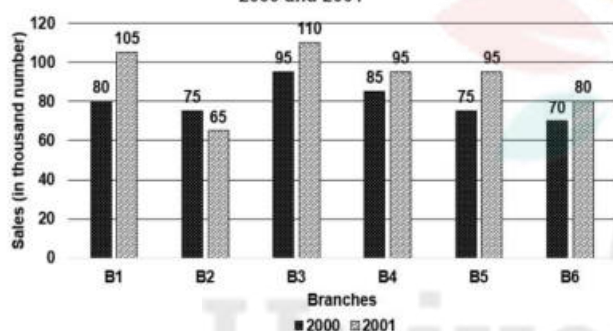
41. The ratio of total sales by all branches for the years 2001 to total sales by all branches for the year 2000 is:
    (A) 48 : 55   (B) 25 : 23
    (C) 55 : 48   (D) 23 : 25

42. The average of total sales (in thousands and Correct to two decimal places) by all branches for both the years is :
    (A) 171.37   (B) 171.57
    (C) 171.27   (D) 171.67

43. The ratio of total sales by branches B1, B3 and B5 for both the years to total sales by branches B2, B4, B6, for both the years is:
    (A) 21 : 23   (B) 56 : 47
    (C) 23 : 21   (D) 47 : 56

44. The total sales (in thousands) by all branches for both the years is:
    (A) 470   (B) 560
    (C) 1100   (D) 1030

Direction: (45-48) The given Bar Graph presents the sale (in 1000 kg) of a particular brand of tea by three outlets, A, B and C during the months Jan, Feb, Mar and Apr, 2018.
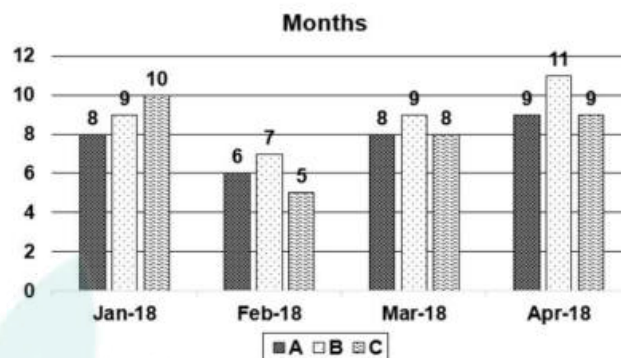
45. Arrange the ratio of sales from B to that from A and C, taken together, month wise in ascending order.
    (A) Jan, Mar, Feb, Apr
    (B) Jan, Mar, Apr, Feb
    (C) Jan, Feb, Mar, Apr
    (D) Jan, Apr, Mar, Feb

46. What is the ratio of rate of growth in sales from B to the rate of growth in sales from C in Mar 2018 with reference to its previous month?
    (A) 9 : 16   (B) 10 : 19
    (C) 9 : 19   (D) 10 : 21

47. What is the average sale per month by A during Jan-Mar, 2018?
    (A) 7333.33 kg   (B) 7505 kg
    (C) 7334.67 kg   (D) 5500 kg

48. By how much quantity is the average sale per month from B more or less than that from C?
    (A) More by 500 kg
    (B) Less by 1000 kg
    (C) Less by 800 kg
    (D) More by 1000 kg

Direction: (49-52) The given Bar Graph presents the results in terms of the number of students in a school for the five academic years, 2013-2014 to 2017- 2018.

Result in a School
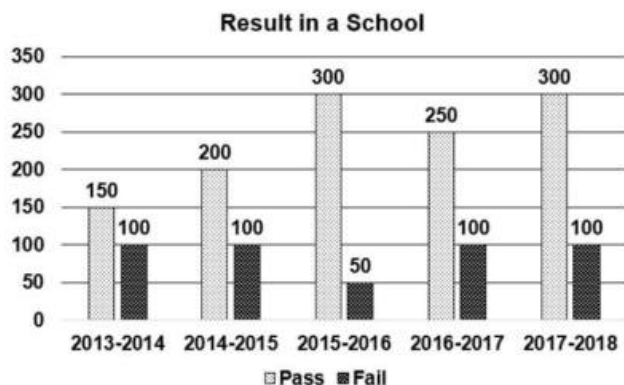
49. What is the approximate percentage (correct to nearest integer) of the students who failed during the five academic years taken together?
    (A) 28%   (B) 27%
    (C) 21%   (D) 22%

50. What is the average number of students who passed in the five academic years?
    (A) 300   (B) 250
    (C) 225   (D) 240

51. In which academic year the difference between the number of students passed and that of those failed is the lowest?
    (A) 2013-2014   (B) 2014-2015
    (C) 2016-2017   (D) 2015-2016

52. In which year the percentage increase in total number of students is the lowest in comparison to its previous of academic year?
    (A) 2016 – 2017 (B) 2017 – 2018
    (C) 2015 – 2016 (D) 2014 – 2015

Direction: (53 – 56) The line chart given below shows profit of a shopkeeper in 6 consecutive years.

Profit % = [(Revenue – Expenditure)/Expenditure] × 100
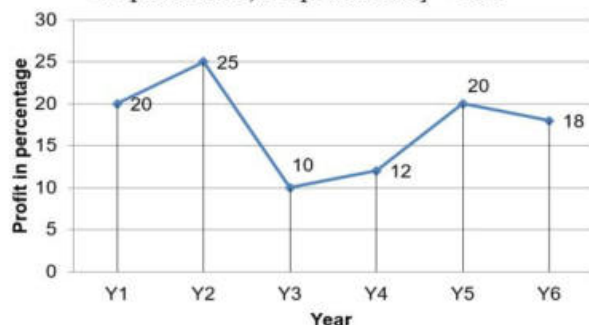
53. If the expenditure in year Y2 is Rs. 40000, then what is the revenue (in Rs) in that year?
    (A) 50000   (B) 35000
    (C) 30000   (D) 46000

54. If the revenue in year Y5 is Rs. 96000, then what is the expenditure (in Rs.) in that year?
    (A) 66000   (B) 80000
    (C) 84000   (D) 74000

55. The expenditure of Y1 and Y4 is Rs. 40000 and Rs. 60000 respectively. What is the total profit (in Rs.) of Y1 and Y4?
    (A) 16800   (B) 13400
    (C) 15200   (D) 19500

56. The expenditure of Y3 and Y6 is Rs. 100000 and Rs 200000 respectively. What is the average revenue (in Rs.) for these 2 years?
    (A) 148000   (B) 156000
    (C) 152000   (D) 173000

Directions: (57–60) The line chart given below shows the number of engineering colleges in Delhi and Mumbai for give 5 years?
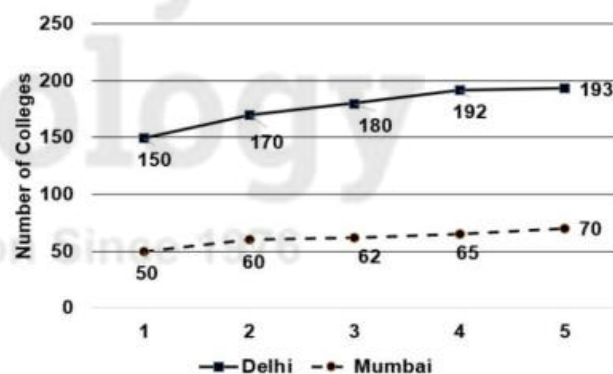
57. In year 2000, number of engineering colleges in Delhi is how much percent more than number of engineering colleges on Mumbai?
    (A) 300   (B) 200
    (C) 100   (D) 66

58. What is the total number of engineering colleges in Mumbai from year 2000 to 2004?
    (A) 311   (B) 319
    (C) 288   (D) 307

59. What is the average number of engineering colleges in Delhi for given 5 years?
    (A) 173   (B) 178
    (C) 177   (D) 181

60. In Delhi, number of engineering colleges in year 2002 is what percent of number engineering colleges in year 2000?
    (A) 120   (B) 130
    (C) 125   (D) 150

Direction: (61–64) The bar chart given below shows the runs scored by a batsman in 10 different innings.
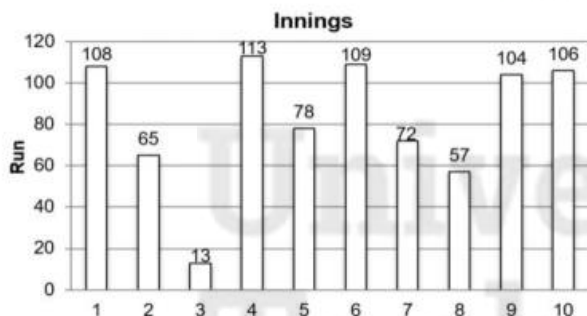
61. In how many innings has the batsman scored more than the average runs?
    (A) 5   (B) 7
    (C) 6   (D) 8

62. Runs scored in inning 1 is what percent of runs scored in inning 5?
    (A) 131.29%   (B) 138.46%
    (C) 126.17%   (D) 142.93%

63. What are the average runs per innings?
    (A) 78.5   (B) 82.5
    (C) 80.6   (D) 85

64. The runs of first 5 innings are added and the value is called S1. The runs of last 5 innings are added and the value is called S2. What is the value of S2–S1?
    (A) 67   (B) 68
    (C) 73   (D) 71

Directions: (65–68) The table given below shows the selling price (in Rs./kg) of 4 different items at 5 different shops.

Item	Selling Price (in Rs/kg)				
	Shop 1	Shop 2	Shop 3	Shop 4	Shop 5
A	10	12	14	11	13
B	21	10	22	21	21
C	18	12	14	15	17
D	20	20	19	19	20

65. If a customer purchases 2 kg quantity of each item from Shop 2, then what is the total selling price (in Rs.)?
    (A) 108   (B) 164
    (C) 140   (D) 132

66. If a customer purchases 3 kg quantity of item A from each Shop, then what is the total selling price (in Rs.)?
    (A) 140   (B) 120
    (C) 180   (D) 160

67. What is the average selling price (in Rs/kg) of item C?
    (A) 16.8   (B) 15.2
    (C) 14.6   (D) 13.8

68. If one kg of each item is purchased from each shop, then which shop will have the least total selling price?
    (A) Shop 1   (B) Shop 4
    (C) Shop 2   (D) None of these

Direction: (69–72) The bar chart given below shows the number of flights of Air India in 6 consecutive years.
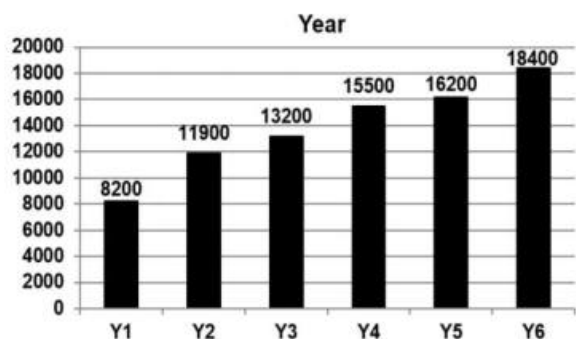
69. What is average number of flights per year?

(A) 14200   (B) 13900

(C) 13500   (D) 14400

70. As compared to previous year, which year shows the maximum increase in number of flights?

(A) Y_4 (B) Y_2

(C) Y_6 (D) None of these

71. Number of flights in Y_6 are how much percent more than number of flights in Y_1?

(A) 124.4   (B) 126.8

(C) 118.2   (D) 114.3

72. Number of flights of Y_2 are what percent of number of flights of Y_5?

(A) 69.26   (B) 71.66

(C) 67.18   (D) 73.45

Direction (73–76) The table given below shows cost of journey (in Rs) from Delhi to 4 different towns on 4 different trains.

Town	Train 1	Train 2	Train 3	Train 4
A	4300	3100	4000	6000
B	4500	3300	3900	6300
C	4800	2600	4200	5600
D	4700	3200	3600	5700

73. What is average cost (in Rs) of journey to Town A?

(A) 4400   (B) 4350

(C) 4150   (D) 4200

74. What of the following has the least cost?

(A) Train 2 to A   (B) Train 1 to A

(C) Train 2 to C   (D) Train 1 to B

75. What is total least cost (in Rs) of Journey from Delhi to town A and Delhi to town D?

(A) 6300   (B) 5700

(C) 6400   (D) 6600

76. What will be the maximum cost (in Rs) of travelling from Delhi to the four towns?

(A) 23600   (B) 22700

(C) 24500   (D) 21900

Direction (77–80) The bar chart given below shows the import of Soybean (in quintals) for the year 2011 to 2016.
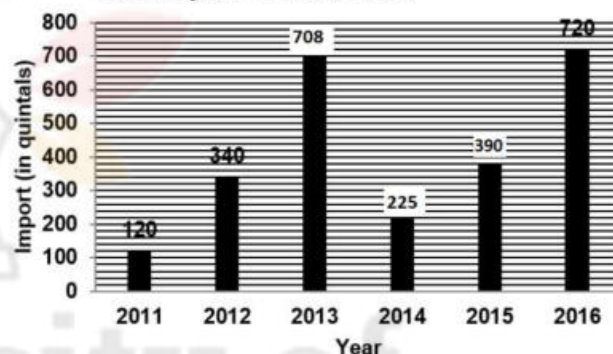
77. What is the average import (in quintals) of Soybean for the given years?

(A) 521.33   (B) 366.66

(C) 417.16   (D) 471.16

78. What is the percentage increase in Soybean import in the year 2012 in comparison to year 2011?

(A) 179.66   (B) 183.33

(C) 283.33   (D) 135.29

79. In how many years the import of Soybean is more than the average import of Soybean for the given years?

(A) 4   (B) 1

(C) 3   (D) 2

80. The import of Soybean in the year 2015 is what percent of the import of Soybean in

year 2012?
(A) 116.66   (B) 87.17
(C) 114.7   (D) 14.7

Direction (81–84) The line chart given below shows the sales (in crores) of company A and B from July to December.
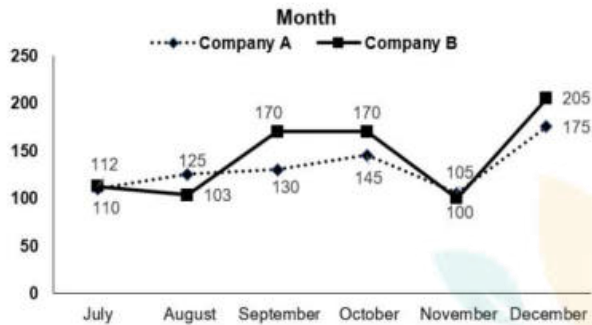
Month

81. The sales of company A in November is how much percent more than the sales of company B in November?
(A) 5   (B) 10
(C) 8   (D) 15

82. The sales of company B is same in which two months?
(A) September and October
(B) October and November
(C) August and November
(D) July and August

83. What is the average sale (in crore Rs.) of company B in the given six months?
(A) 143   (B) 140
(C) 154   (D) 135

84. For how many months the sales of company B is more than the sales of company A?
(A) 2   (B) 3
(C) 1   (D) 4

Direction (85–88) The bar chart given below shows the number of students (in '100) in a school from year 2000 to year 2004.
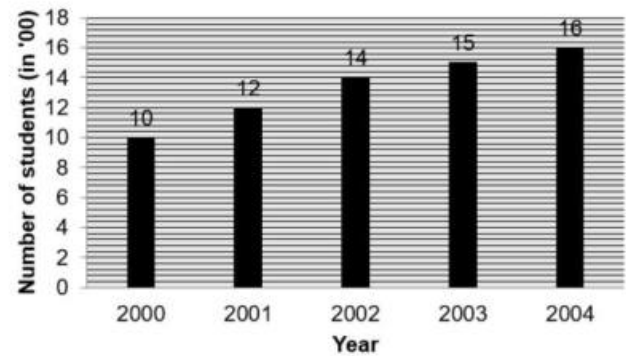
85. What is the average number of students from year 2000 to 2002?
(A) 1000   (B) 1200
(C) 1100   (D) 800

86. What is the total number of students in year 2002 and 2003?
(A) 2900   (B) 2700
(C) 3100   (D) 2800

87. What is the difference between the total number of students in year 2004 and 2000?
(A) 1600   (B) 1000
(C) 800   (D) 600

88. Students in year 2003 is how much percent a more than the students in year 2000?
(A) 150   (B) 25
(C) 50   (D) 33

Direction (89–92): The bar chart given below shows the sales (in crores) of 2 companies A and B from years 2010 to 2015
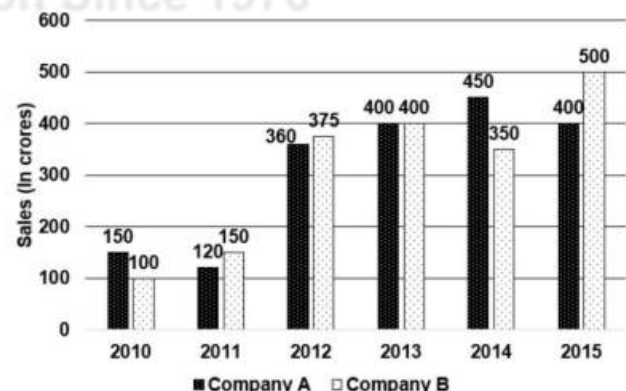
■ Company A   □ Company B

89. What is the average sale (in crores) of the company A from years 2010 to 2015?
(A) 315
(B) 313.27
(C) 350
(D) 313.33

90. For how many years was the sale of company A greater than that of company B?
(A) 1
(B) 2
(C) 3
(D) 4

91. What is the percentage change in sale of company B from year 2011 to 2012?
(A) 100
(B) 225
(C) 150
(D) 125

92. What is the difference (in crores) between the sale of company A in 2012 and company B in 2015?
(A) 15
(B) 150
(C) 40
(D) 140

Direction.(93 -96) The table given below shows the ratio of cars and Bikes manufactured by 5 different companies. The table also shows the ratio of three different types of cars C1, C2 and C3 and three different types of bikes B1, B2 and B3 manufactured by these 5 different companies. Total numbers of car and bikes together manufactured by D, E, F, G and H are 300000, 280000, 320000, 400000 and 480000 respectively.

Company/कंपनी	Car:Bike/कार:बाइक	C1: C2: C3	B1: B2: B3
D	1 : 2	2 : 3 : 5	2 : 2 : 1
E	3 : 1	1 : 1 : 1	2 : 3 : 2
F	1 : 1	2 : 1 : 1	1 : 1 : 2
G	3 : 1	2 : 3 : 1	1 : 2 : 2
H	1 : 2	1 : 2 : 1	2 : 1 : 5

93. Total number of bikes manufactured by company D is what percentage of total number of cars of type C1 manufacture by company G?
(A) 50
(B) 100
(C) 200
(D) 150

94. What is the average of the total number of cars of type C1 manufactured by the given 5 companies?
(A) 58000
(B) 60000
(C) 56000
(D) 62000

95. What is the difference between the total number of C3 type car manufactured by company E and G together and the number of bikes of type B1 manufactured by company H?
(A) 44000
(B) 40000
(C) 48000
(D) 42000

96. H = Total number of B2 type bike manufactured by all the companies.
R = Total number of C1 type car manufactured by company F, G and D together.
What is the value of H/R?
(A) 0.625
(B) 1.35
(C) 1.15
(D) None of these

Direction (97–100) The table given below shows the number of customers (in thousands) visiting 2 shopping complexes A and B from January 2017 to June 2017.

Month/महीना	Number of customers (in thousands)/ग्राहकों की संख्या (हजार में)	
	Complex/कॉम्प्लेक्स A	Complex/कॉम्प्लेक्स B
January/जनवरी	20	22
February/फरबरी	25	24
March/मार्च	15	20
April/अप्रैल	25	28
May/मई	14	20
June/जून	20	15

97. What was the percentage change in number of customers visiting complex B from March to April?
(A) 20
(B) 40
(C) 28
(D) 56

98. What is the maximum difference (in thousands) between the numbers of customers in the 2 complexes among the given months?
(A) 5
(B) 6
(C) 8
(D) 4

99.   What is the total number of customers (in thousands) in the 2 complexes in the month of April?
    (A) 52   (B) 53
    (C) 50   (D) 56

100.   What is the average number of customers (in thousands) in complex B from February to May?
    (A) 22   (B) 24
    (C) 23   (D) 25

Directions: (101–104) The bar chart given below shows the sales (in crores) of company P from years 2009 to 2015.
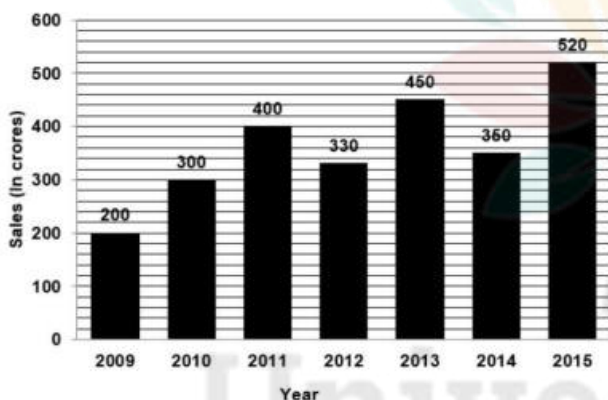
101.   What is the percentage change in sales from year 2010 to 2014?
    (A) 75   (B) 175
    (C) 16.67   (D) 25

102.   What is the average sale (in crores) from year 2009 to 2013?
    (A) 340   (B) 336
    (C) 360   (D) 350

103.   In how many years, the sale was more than that in year 2012?
    (A) 2   (B) 3
    (C) 4   (D) 5

104.   What is the percentage change in the sales from year 2009 to 2013?
    (A) 225   (B) 150
    (C) 100   (D) 125

Direction (105–108) The table given below shows the number of students who have taken admission in school A and B from the years 2010 to 2015.

Year	School	
	A	B
2010	428	392
2011	442	410
2012	480	423
2013	436	428
2014	465	456
2015	452	450

105.   What is the average difference of the number of students in school A and B in the given period?
    (A) 24   (B) 27
    (C) 96   (D) 144

106.   The difference between the number of students in both schools is maximum in which year?
    (A) 2010   (B) 2012
    (C) 2014   (D) 2015

107.   If the total student intake capacity for School B was 500 then what percentage of seats remained vacant in school B in 2015?
    (A) 1   (B) 5
    (C) 10   (D) 20

108.   Across all the years, for how many years, the number of students in school A was less than the average number of students in school B?
    (A) 0   (B) 1
    (C) 2   (D) 3

Directions (109 –112) The line chart given below shows the number of students who have taken admission in college A and B from the years 2010 to 2015.
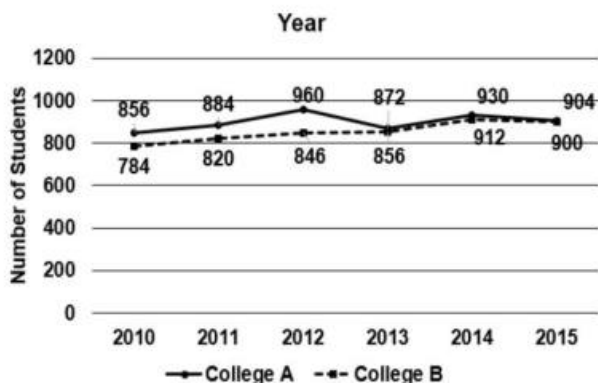
Year

109. In how many years, the number of students in college A is less than the average number of students in college B across all the years?

(A) 0   (B) 1

(C) 2   (D) 3

110. What percentage of seats remained vacant in college B in 2015 if the capacity was 1000?

(A) 2   (B) 10

(C) 20   (D) 40

111. The difference between the number of students in both colleges is maximum in which year?

(A) 2010   (B) 2012

(C) 2014   (D) 2015

112. What is the average difference of number of students in college A and B in the given period?

(A) 24   (B) 48

(C) 96   (D) 144

Directions: (113–116) The pie chart below shows the distribution on land under various food crops in a village for a total cultivation are of 3000 acres. Answer the questions below based on the share of different cropts as shown in the chart below.
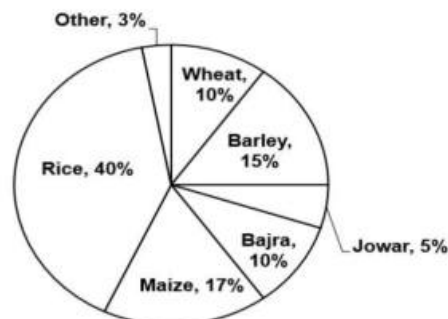
113. What is the cultivation area for Maize?

(A) 540 Acre   (B) 510 Acre

(C) 480 Acre   (D) 490 Acre

114. What is the total cultivation area under the food crops of Rice and Barley?

(A) 1650 Acre   (B) 1830 Acre

(C) 1800 Acre   (D) 1860 Acre

115. Jowar, Maize and Wheat together account for how much cultivation area of the village?

(A) 930 Acre   (B) 990 Acre

(C) 950 Acre   (D) 960 Acre

116. How much cultivation area is covered under Bajra and Maize?

(A) 840 Acre   (B) 870 Acre

(C) 810 Acre   (D) 960 Acre

Direction: (117–120) The bar chart given below shows the export (in lacs) from India from year 2008 to 2015.
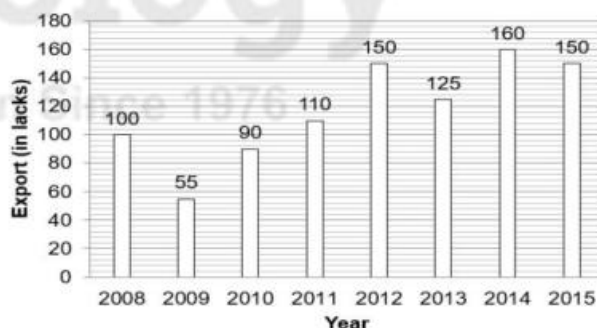
117. What is the percentage change in the exports from year 2012 to year 2013?

(A) 16.66   (B) 33.33

(C) 25   (D) 66.67

118. For how many years was the exports from India (in lacs) more than 110 lacs?
    (A) 5
    (B) 4
    (C) 6
    (D) 2

119. What was the difference (in lacs) between exports from India in year 2011 and year 2014?
    (A) 75
    (B) 25
    (C) 50
    (D) 100

120. In which year was the export more than that of the year 2015?
    (A) 2012
    (B) 2014
    (C) 2013
    (D) None of these

Direction (121–124): The table given below shown the number of students admitted in 2 sections X and Y from Year 2011 to 2015.

Year	Section X	Section Y
2011	50	52
2012	60	65
2013	72	50
2014	80	58
2015	62	64

121. What is the percentage change in the number of students admitted in section X from year 2011 to 2013?
    (A) 22
    (B) 50
    (C) 44
    (D) 72

122. In which two years was the difference in the number of students admitted in the two sections was same?
    (A) 2011 and 2012
    (B) 2013 and 2014
    (C) 2011 and 2015
    (D) 2 and 3

123. In year 2012, the number of students admitted in section Y is what percent of that of the number of students admitted in section X?

    (A) 108.33
    (B) 65
    (C) 60
    (D) 200

124. What is the percentage change in the number of students admitted in section Y from year 2011 to 2014?
    (A) 13.81
    (B) 11.54
    (C) 6
    (D) 58

Direction (125–128) A college collect Rs. 200 crores of funds from different sources. Answer the question below based on the fund collection share from different sources as in given the pie chart below.
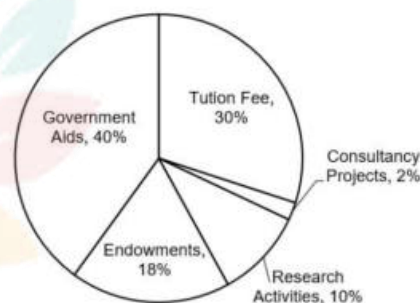
125. What is the amount of fund collected through Consultancy Projects and Research Activities together?
    (A) Rs. 20 Crore
    (B) Rs. 30 Crore
    (C) Rs. 24 Crore
    (D) Rs. 27 Crore

126. How much amount is collected from endowments?
    (A) Rs. 36 Crore
    (B) 18 Crore
    (C) Rs. 30 Crore
    (D) Rs. 40 Core

127. What is the difference between the amount collected from Government Aids and Tution Fee?
    (A) Rs. 60 Core
    (B) Rs. 100 Core
    (C) Rs. 10 Core
    (D) Rs. 20 Core

128. If one–fifth of the fund collected from research activities is invested in research development facilities at the collage, how much total amount is invested in research development facilities?

(A) Rs. 9 Core   (B) Rs. 4 Core
(C) Rs. 6 Core   (D) Rs. 12 Core

Direction (129 – 132) The bar chart given below shows the number of mobile phone thefts in 2 cities Delhi and Jaipur from month February 2015 to June 2015.
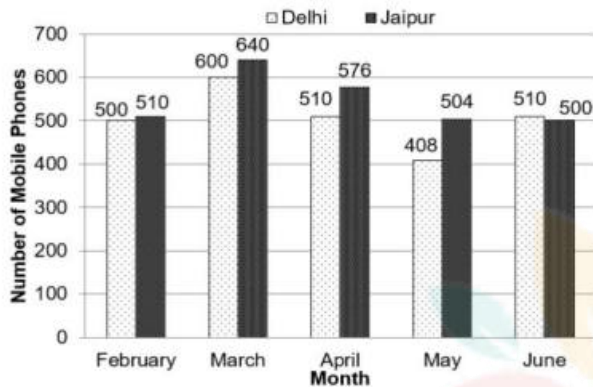
129. What was the average number of mobile phones thefts in Jaipur from February 2015 to June 2015?
   (A) 550   (B) 576
   (C) 408   (D) 546

130. In Delhi, what was the percentage change in the number of mobile phones theft from April 2015 to May 2015?
   (A) 30%   (B) 28%
   (C) 20%   (D) 25%

131. What is the percentage change in the number of mobile phones thefts in Jaipur from February 2015 to April 2015?
   (A) 66   (B) 15.15
   (C) 12.94   (D) 50

132. For how many months, was the number of mobile phones thefts in Jaipur higher than that in Delhi?
   (A) 5   (B) 4
   (C) 0   (D) 3

Direction (133–136) The pie chart shows the breakup of expenditure of a college for the year 2017. Study the diagram and answer the following questions.
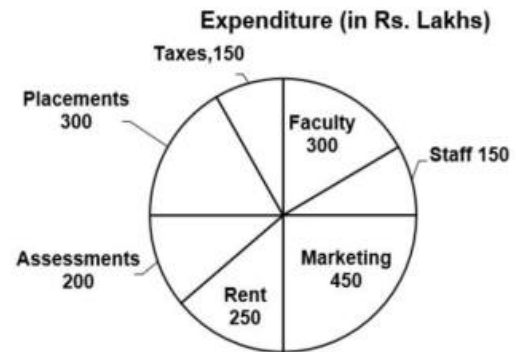
133. The highest expenditure is for which category?
   (A) Rent   (B) Marketing
   (C) Assessments   (D) Placements

134. What is the total expenditure (in Rs. lakhs)?
   (A) 1800   (B) 900
   (C) 2000   (D) 1000

135. The measure of the central angle of the sector representing Faculty is _____ degrees.
   (A) 30   (B) 45
   (C) 75   (D) 60

136. Expenditure on Assessments and Placements constitute what percent of total expenditure?
   (A) 33.3%   (B) 25%
   (C) 30%   (D) 27.77%

Direction (137–140) The bar graph shows results of a survey carried out within a health club. The members of the club were asked which energy drink they consumed? Study the diagram and answer the following question.
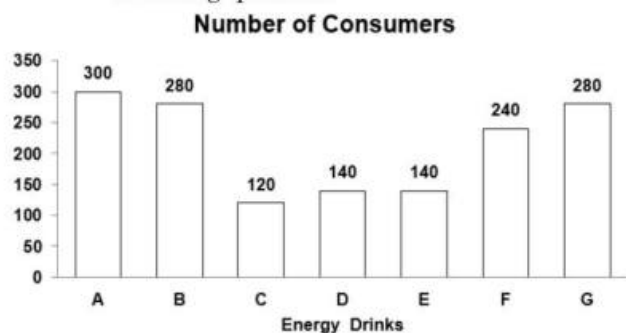
137. Which energy drink was consumed the least?
(A) A   (B) C
(C) D   (D) E

138. What is the ratio of consumers of energy drink C to consumers of energy drink G?
(A) 7 : 3   (B) 3 : 7
(C) 5 : 9   (D) 9 : 5

139. Consumers of drink B are greater than that of drink E by _____
(A) 50%   (B) 100%
(C) 200%   (D) 150%

140. If 40% of consumers of drink C start consuming drink F then the consumers of drink F would increase
(A) 20%   (B) 40%
(C) 48%   (D) 24%

Direction (141–144) The pie chart shows the results of an online survey which asked people about their favourite travel destination. Study the diagram and answer the following question.
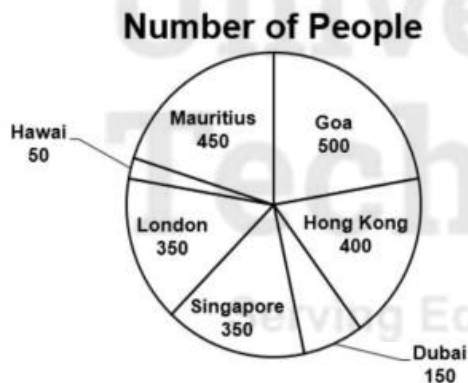
Number of People

141. Which travel destination is the favorite of most people surveyed?
(A) Hong Kong   (B) Mauritius
(C) Singapore   (D) Goa

142. What is the total number of people who have responded to the survey?
(A) 2150   (B) 2400
(C) 2250   (D) 2100

143. The measure of the central angle of the sector representing number of people whose favorite travel destination is Hawaii is _____ (in degree).
(A) 10   (B) 12
(C) 15   (D) 8

144. Respondents who say their favourite travel destination is Goa and those who say their favourite travel destination is Hong Kong constitute what percent of the total respondents?
(A) 25%   (B) 33.33%
(C) 30%   (D) 40%

Direction (145–148) The pie chart shows the results of an online survey which asked people about their favourite author. Study the diagram and answer the following question.

Number of people
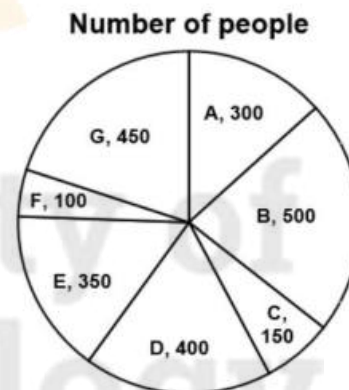
145. Which author is the favourite of most people surveyed?
(A) F   (B) B
(C) D   (D) E

146. Respondents who say their favourite author is A and those who say their favourite author is B constitute what percent of the total respondents?
(A) 30%   (B) 20%
(C) 44.44%   (D) 35.55%

147. The measure of the central angle of the sector representing number of people

whose favourite author is D is _____ degrees.
(A) 60   (B) 64
(C) 56   (D) 52

148. What is the total number of people who have responded to the survey?
(A) 2250   (B) 2100
(C) 2400   (D) 2000

Directions (149–152) The bar graph shows 1 month's sales figures of different brands of televisions of a certain electronics store. Study the diagram and answer the following question:

Sales (in Rs. 1000s)
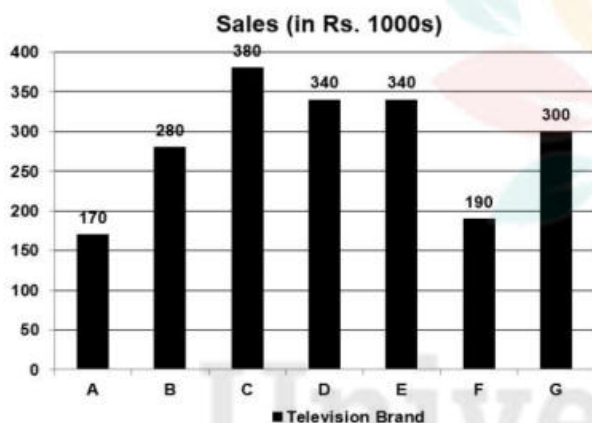
149. Sales of which television brand were the second lowest?
(A) A   (B) C
(C) G   (D) F

150. Find the ratio of the sales of brand E to that of brand A.
(A) 1 : 2   (B) 2 : 1
(C) 4 : 1   (D) 1 : 4

151. Sales of brand B Television was lesser than that of brand G by_____
(A) 3.75%   (B) 6.67%
(C) 7.17%   (D) 5.25%

152. If the sales figures are exclusive of tax, then at the rate of 12% tax how much is the tax to be paid (in Rs.) on the sales of

all the 7 brands of televisions?
(A) 240000   (B) 24000
(C) 420000   (D) 42000

Direction (153–156) The HR department of an MNC prepared a repot. The pie chart from this report shows number of employees the MNC has in different countries. Study the diagram and answer the following questions.

Number of employees
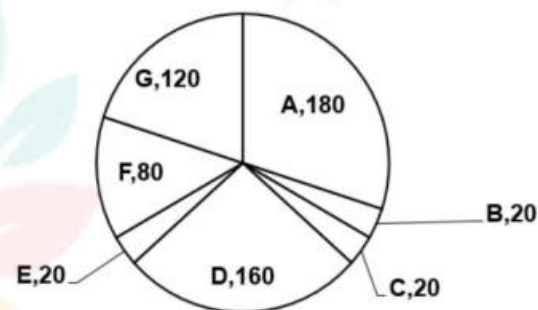
153. The most number of employees are from which country?
(A) F   (B) C
(C) D   (D) A

154. What is the total number of employees of the MNC?
(A) 400   (B) 600
(C) 500   (D) 300

155. The measure of the central angle of the sector representing country F is _____ degrees.
(A) 48   (B) 80
(C) 60   (D) 56

156. If the average monthly salary of the employees of this MNC is $6000 then what is the total of the salaries (in $ millions) paid to all the employees of this MNC?
(A) 36   (B) 1.8
(C) 3.6   (D) 18

Direction (157–160) The line graph shows the number of vacancies for sales officers in a certain company. Study the diagram and answer the following questions.

Number of vacancies

157. In which year were the number of vacancies are lesser than that of the previous year?
(A) 2015   (B) 2012
(C) 2016   (D) 2013

158. What was the difference in the number of vacancies between the years 2015 and 2012?
(A) 55   (B) 40
(C) 50   (D) 45

159. The number of vacancies in 2014 were greater than that in 2017 by _____.
(A) 116.70%   (B) 50%
(C) 200%   (D) 100%

160. The salary of a Sales officer in the company is Rs. 20,000, then what was the expense (in Rs. lakhs) due to salaries that had to be paid when posts were filled for the vacancies in the year 2015?
(A) 25   (B) 15
(C) 20   (D) 10

Direction (161–164) The pie chart shows the distribution of wealth between 7 children according to their father's will. Study the diagram and answer the following questions.

Wealth (in Rs. lakhs)
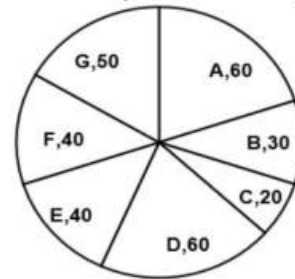
161. Which child got the least share of wealth according to the will?
(A) C   (B) B
(C) D   (D) E

162. What is the total wealth (in Rs lakhs) of the father which was distributed according to the will?
(A) 300   (B) 400
(C) 360   (D) 240

163. The measure of the central angle of the sector representing the share of wealth that D gets is _____ degrees.
(A) 72   (B) 60
(C) 50   (D) 75

164. If 40% wealth tax has to be paid on the wealth that each child receives then how much wealth tax (in Rs lakhs) does C have to pay?
(A) 8   (B) 10
(C) 12   (D) 4

Direction: (165–168) The line graph shows the production of steel of a certain country. Study the diagram and answer the following questions.

Steel Production (In Million Tonnes)
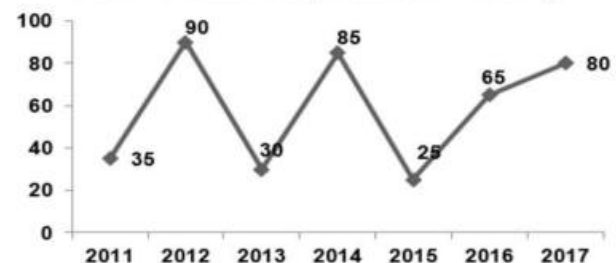
165. In which year was the steel production lesser than that of the previous year?
(A) 2013
(B) 2014
(C) 2012
(D) 2016

166. What was the difference (in million tonnes) in the steel production between the years 2011 and 2015?
(A) 10
(B) 5
(C) 15
(D) 20

167. By what percent the steel production in 2012 was greater than that of 2015?
(A) 80%
(B) 73.6%
(C) 200%
(D) 260%

168. If 1 tonne of steel costs Rs. 30,000, then what was the cost (in Rs billion) of the steel production in the year 2017?
(A) 240
(B) 3000
(C) 2400
(D) 300

Directions (169–172) The HR department of a company prepared a report. The pie chart from this report shows number of employees in all the departments that the company has. Study the diagram and answer the following questions.

Number of Employees
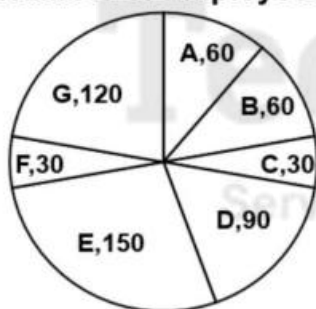
169. The most number of employees belong to which department?
(A) E
(B) F
(C) G
(D) A

170. What is the total number of employees of the company?

(A) 400
(B) 600
(C) 480
(D) 540

171. The measure of the central angle of the sector representing department B is _____ degrees.
(A) 30
(B) 40
(C) 50
(D) 60

172. If the average monthly salary of the employees of this company is Rs. 20,000 then what is the total of the salaries (in Rs lakhs) paid to all the employees of this company?
(A) 112
(B) 120
(C) 124
(D) 108

Direction (173–176) The bar graph shows the number of soldiers in the armies of different countries. Study the diagram and answer the following questions?

Number of Soldiers (In 10,000s)
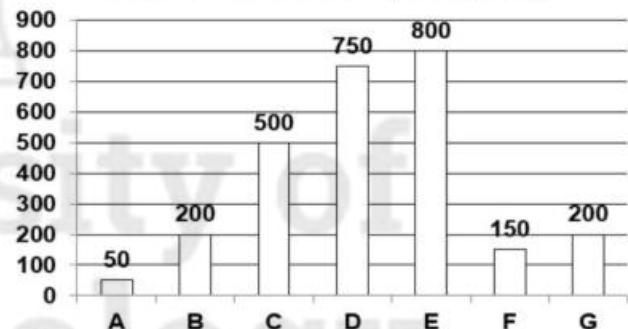
173. Which country has the least number of soldiers?
(A) A
(B) D
(C) F
(D) B

174. What is the ratio of the number of soldiers of country B to those of country D?
(A) 15 : 4
(B) 8 : 15
(C) 15 : 8
(D) 4 : 15

175. Number of soldiers of country F is greater than those of country A by _____.
(A) 50%
(B) 66.7%
(C) 300%
(D) 200%

176. If country D spends $20000 per soldier annually, then how much does it spend (in $ millions) on all its soldiers annually?
     (A) 15000　　　　　(B) 37500
     (C) 150000　　　　(D) 375000

Direction (177–180) The pie chart shows the results of an onine survey which asked people about their favourite game. Study the diagram and answer the following questions.
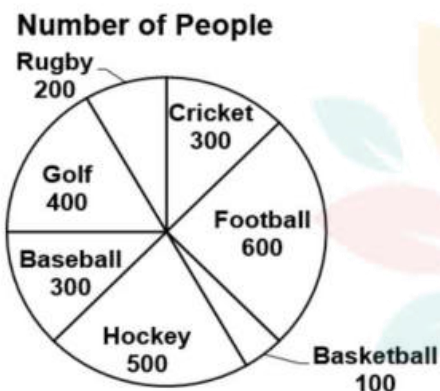
Number of People

177. Which game is the favourite of most people surveyed?
     (A) Basketball　　　(B) Football
     (C) Hockey　　　　(D) Baseball

178. What is the total number of people who have responded to the survey?
     (A) 2100　　　　　(B) 2200
     (C) 2400　　　　　(D) 2500

179. The measure of the central angle of the sector representing Baseball is _____ degrees.
     (A) 30　　　　　　(B) 60
     (C) 75　　　　　　(D) 45

180. Respondents who say their favourite game is Cricket and those who say their favourite game is Hockey constitute what percent of the total respondents?
     (A) 30%　　　　　(B) 33.33%
     (C) 25%　　　　　(D) 40%

Directions (181–184) The bar graph shows the number of employees working in the different departments of a company. Study the diagram and answer the following questions.

Number of Employees
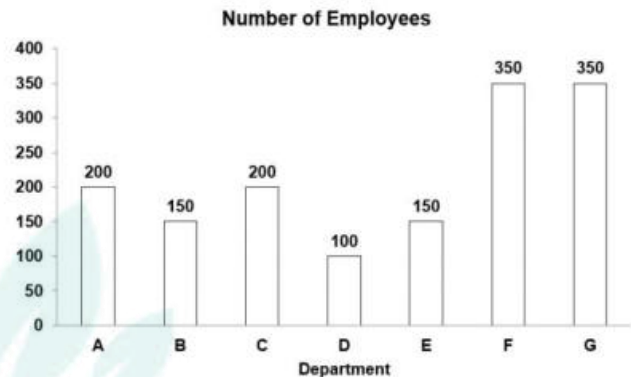
181. Which department has the lowest number of employees?
     (A) C　　　　　　(B) D
     (C) A　　　　　　(D) B

182. What is the ratio of number of employees of department A to that of department F
     (A) 7 : 4　　　　　(B) 5 : 7
     (C) 7 : 5　　　　　(D) 4 : 7

183. The number of employees of department G are greater than those of department C by _____.
     (A) 42.8%　　　　(B) 75%
     (C) 150%　　　　　(D) 84.2%

184. If the average compensation of an employee of department A is Rs 40,000 per month, then what is the total compensation (in Rs lakhs) of all employees of department A per month?
     (A) 800　　　　　(B) 40
     (C) 80　　　　　　(D) 400

Direction (185–188) The pie chart shows the value of the total annual production of dry fruits of a country. Study the diagram and answer the following questions.
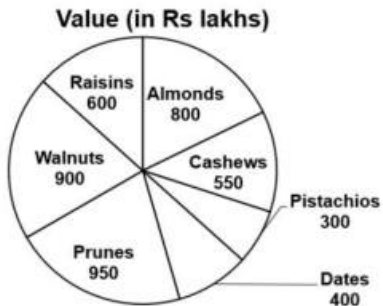
Value (in Rs lakhs)

185. The value of annual production of which dry fruit item is the most?
(A) Walnuts
(B) Raisins
(C) Prunes
(D) Almonds

186. What is the total value (in Rs lakhs) of the annual dry fruit production of the country?
(A) 4000
(B) 4500
(C) 3600
(D) 3000

187. The measure of the central angle of the sector representing the annual production of dates is _____ degrees.
(A) 36
(B) 28
(C) 32
(D) 24

188. If the average value of almonds produced is Rs 800 per kg then how many kgs of almonds were produced?
(A) 10000
(B) 1000
(C) 100000
(D) 1000000

Direction: (189–192) The line graph shows the average hours per day spent by teenagers in playing outdoors games. Study the diagram and answer the following questions.

Average hour/day spent playing outdoor games
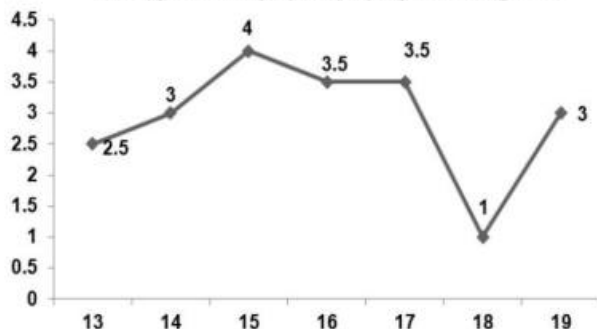
189. In which age do teenagers spend most number of hours playing outdoor games
(A) 15
(B) 16
(C) 17
(D) 13

190. What is the ratio of hours per day spent in playing outdoor games by 13 year olds and 18 year olds?
(A) 1 : 5
(B) 5 : 2
(C) 2 : 5
(D) 5 : 1

191. The number of hours per day spent in playing outdoor games is _____ more by 17 year old as compared to 14 year old.
(A) 14.28%
(B) 16.67%
(C) 12.65%
(D) 10.79%

192. How many hours does a 16 year old spend playing outdoor games in a week?
(A) 24.5
(B) 25.5
(C) 24
(D) 25

Direction (193–196) The bar graph given below represents the total population and male population (in '000) of a city, during the period of 2013 to 2016.
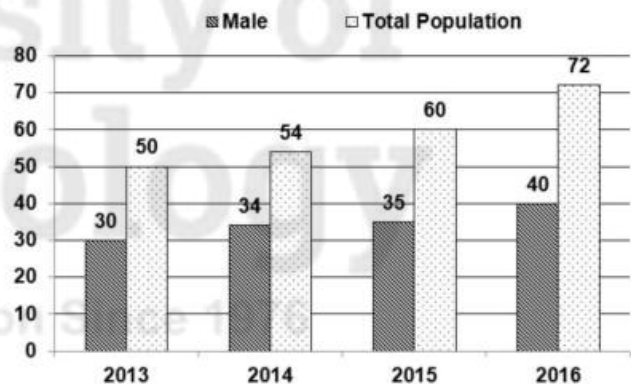
193. What is the ratio of male and female population respectively in 2015?
(A) 12 : 7
(B) 5 : 7
(C) 7 : 5
(D) 5 : 3

194. In 2016 male population is how much percent more than the female population?

(A) 25   (B) 20
(C) 23   (D) 28

195. In 2014 female population is what percent of total population?
(A) 62.96   (B) 37.03
(C) 20   (D) 31.13

196. Female population in 2015 is what percent of female population in 2014?
(A) 25   (B) 80
(C) 150   (D) 125

Direction (197–201) The pie chart given below shows the expenditure (in percentage) of Mahesh. The monthly income of Mahesh is Rs. 26000.
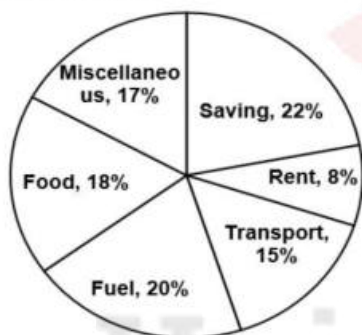
197. How much does he spend (in Rs) on Rent?
(A) 2080   (B) 2275
(C) 2470   (D) 2840

198. How much more does he spend (in Rs) on the Saving and Fuel taken together than Transport?
(A) 5850   (B) 6060
(C) 7020   (D) 8420

199. Had his income been Rs. 22, 000, how much less he would have spent on Miscellaneous (in Rs.)?
(A) 510   (B) 680
(C) 765   (D) 935

200. If he invests 65% of his savings on purchasing gold, then how much amount (in Rs) does he spend on gold?

(A) 3312   (B) 4124
(C) 3522   (D) 3718

201. What will be the approximate difference (in Rs) between the average expenditure on Saving, Rent and Fuel and average expenditure on Food, Transport and Savings?
(A) 433   (B) 444
(C) 417   (D) 467

Direction (202–205) The line chart given below represents the revenue (in Rs. Crores) of a company for 6 years.

202. What is the average revenue (in Rs crores) for given 6 years?
(A) 423.31   (B) 492.21
(C) 468.33   (D) 462.22

203. What is the percentage decrease in the revenue from year 2011 to 2012?
(A) 18   (B) 44
(C) 22   (D) 36

204. Revenue in year 2015 is what percent of revenue in year 2014?
(A) 61.53   (B) 62.5
(C) 38.46   (D) 55.14

205. Total revenue in year 2013, 2014 and 2015 is what percent of total revenue in given 6 years?
(A) 47.34   (B) 59.61
(C) 49.33   (D) 54.09

Direction (206–210) The given pie chart shows the expenditure incurred on making a motorcycle.
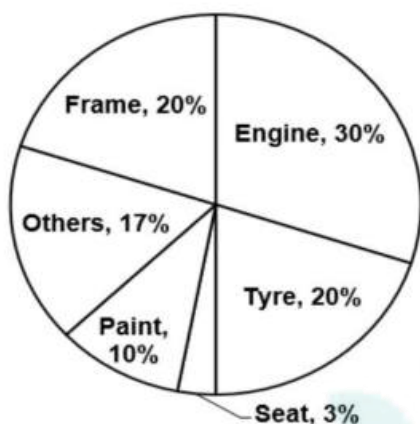
206. If the total expenditure incurred is Rs. 60000, then what is the expenditure on seat?
    (A) 12000   (B) 3000
    (C) 6000   (D) 1800

207. If the expenditure incurred on tyres is Rs. 15000, then what is the expenditure incurred on painting?
    (A) 30000   (B) 8000
    (C) 7500   (D) 6000

208. Expenditure incurred on others is how much percent more than the expenditure incurred on paint?
    (A) 24   (B) 40
    (C) 70   (D) 57.33

209. The expenditure incurred on seat is how much percent less than the expenditure incurred on tyres?
    (A) 85   (B) 66.66
    (C) 78.22   (D) 85.33

210. If the expenditure on tyres is Rs. 10000, then the expenditure on paint is how much more (in Rs.) more than the expenditure on seat?
    (A) 2733   (B) 3500
    (C) 3122   (D) 3555

Direction (211–214) The bar graph given below represents revenue of a firm for 8 years. All the revenue figures have been shown in terms of Rs. crores.
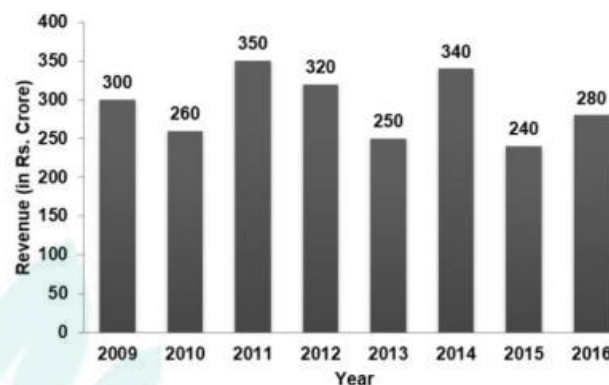
211. What is the total value of revenue of the firm (in crores Rs.) in years 2010, 2011 and 2012?
    (A) 910   (B) 930
    (C) 950   (D) 1050

212. By what percentage has the revenue of the firm decreased in 2010 with respect to the last year.
    (A) 15.38   (B) 14.44
    (C) 11.11   (D) 13.33

213. In how many years, the revenue of the firm is less than the average revenue for these 8 years?
    (A) 3   (B) 4
    (C) 5   (D) 6

214. In which year firm has shown the maximum percentage increase in its revenue with respect to the previous year?
    (A) 2011   (B) 2014
    (C) 2016   (D) All are equal

Directions (215–219) The given pie chart shows the distribution (in degrees) of cars sold of different models by a company in 2015 – 16.
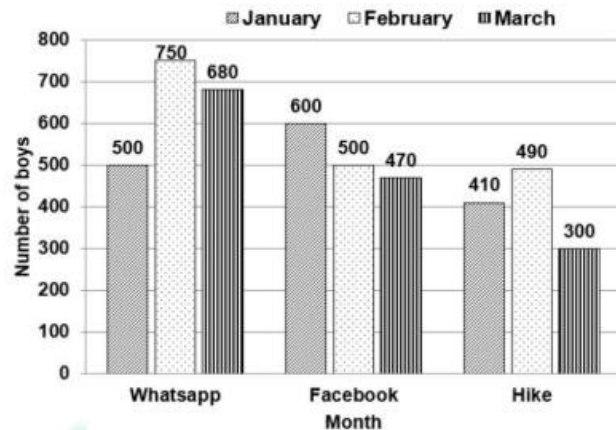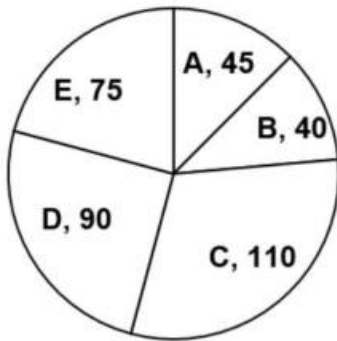
215. If the number of cars sold of model D is 40500, then how many more cars of model E are sold than that of A?
(A) 8100
(B) 16200
(C) 24300
(D) 13500

216. If the number of cars sold of model D is 40500, then what is the ratio between the number of cars sold of model D and E?
(A) 9 : 5
(B) 6 : 5
(C) 11 : 9
(D) 9 : 7

217. If the number of cars sold of model D is 72900, what is the total number of cars sold of all the models together by the company?
(A) 291600
(B) 208100
(C) 162000
(D) 214160

218. If the number of cars sold of model C is 22000, then what is the difference in the number of cars sold of model A and B?
(A) 800
(B) 1200
(C) 1000
(D) 1500

219. If 5% of the total cars sold of model E is 750, then what is the average number of cars sold of all the models?
(A) 15000
(B) 14400
(C) 16800
(D) 14000

Direction (220–223) The bar graph given below represents the number of boys in a school using three apps for three months.

220. Number of boys using Whatsapp in March is what percent of number of boys using Facebook in February?
(A) 126.47
(B) 136
(C) 128
(D) 131.3

221. What is the percentage decrease in number of boys using Facebook from January to February?
(A) 26.66
(B) 20
(C) 21.33
(D) 16.66

222. Number of boys using Whatsapp in February is how much percent more than the number of boys using Facebook in February?
(A) 50
(B) 33.33
(C) 66.66
(D) 44.22

223. What is the total number of boys using the three apps in month of March?
(A) 1420
(B) 1480
(C) 1450
(D) 1500

Direction (224–228) The pie chart given below shows the percentage distribution of annual expenditure on various items of a company. The annual expenditure of the company is Rs. 72 cores.

Playe r	Match			
	I	II	III	IV
A	70	105	55	135
B	40	35	95	72
C	60	68	75	85
D	95	45	55	60
E	105	110	125	122

224. Total amount spent on Raw material is 50% of the total amount spent on Interest. If the ratio of amount of expenditure on Rent and Raw material is 1 : 2 respectively, then what will be the amount (in Rs) spent on Rent annually?
(A) 28000000   (B) 36000000
(C) 40000000   (D) 32000000

225. By what percentage is the total expenditure on Interest and Miscellaneous more that the total expenditure on Tax and Salary?
(A) 20   (B) 15
(C) 8   (D) 10

226. If 5% of Miscellaneous is spent on research of nanotubes, then how much is spent (in Rs crores) on research of nanotubes annually?
(A) 0.864   (B) 0.362
(C) 0.544   (D) 0.962

227. What is the monthly expenditure (in Rs crores) on Miscellaneous by the company?
(A) 14.4   (B) 1.44
(C) 1.21   (D) 1.69

228. How much is the expenditure (in Rs crores) on Operations annually?
(A) 1.52   (B) 7.14
(C) 11.52   (D) 1.152

Direction (229–232) The table given below shows the runs scored by 5 players in Four matches.

229. What is the difference between total runs scored by A and B in four matches?
(A) 111   (B) 123
(C) 98   (D) 135

230. Runs scored by C in match II is how much percent more than the runs scored by C in match I?
(A) 11.76   (B) 16.66
(C) 17.12   (D) 13.33

231. Runs scored by A in match II is what percent of the total runs scored by these five players in match II?
(A) 71.07   (B) 35.14
(C) 28.92   (D) 55.13

232. What is the correct order of averages of the given players in the 4 matches?
(A) E > A > C > D > B
(B) E > A > D > C > B
(C) A > E > C > D > B
(D) A > E > B > C > D

Direction (233–237) The following pie chart shows the expenditure (in percentage) of five companies P, Q, R, S and T in the year 2016. Total Expenditure = Rs. 48 crores
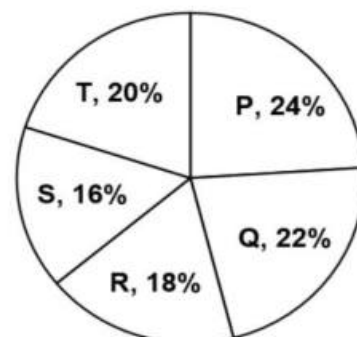
233. What was the total expenditure (in Rs. crores) of the company Q, R and T together?

(A) 19.2   (B) 28.8

(C) 24.3   (D) 31.4

234. What was the total expenditure (in Rs. crores) of the company Q, R and T together?

(A) 19.2   (B) 28.8

(C) 24.3   (D) 31.4

235. What is the respective ratio between the total expenditure of company P, Q and S together to the total expenditure?

(A) 31 : 60   (B) 50 : 31

(C) 60 : 31   (D) 31 : 50

236. What is the respective ratio between the total expenditure of company P, Q and S together to the total expenditure?

(A) 42.1   (B) 43

(C) 39.68   (D) 41

237. What is the respective ratio between the total expenditure of company P, Q and S together to the total expenditure?

(A) 3.24   (B) 4.28

(C) 2.64   (D) 5.66

Direction (238–241) The line chart given below represents the sales (in '00) of trousers and shirts for five months.
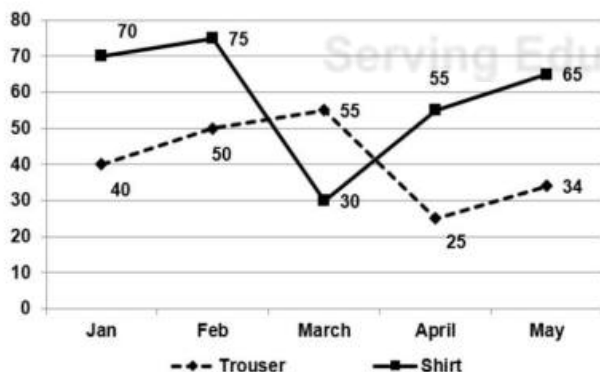
238. Total sale of shirts for five months is how much percent more than the total sale of trousers for five months?

(A) 30.84   (B) 38.46

(C) 44.61   (D) 49.94

239. In March sale of trousers is what percent of sale of shirts?

(A) 83.33   (B) 54.54

(C) 125   (D) 183.33

240. What is the percentage increase in the sales of the trousers from January to February?

(A) 25   (B) 20

(C) 10   (D) 28

241. What is the difference between sales of shirts for months January and April?

(A) 2700   (B) 1500

(C) 2000   (D) 2200

Direction (242–246) The given pie – chart shows the expenditure (in degrees) incurred in making a book.

Percentage division
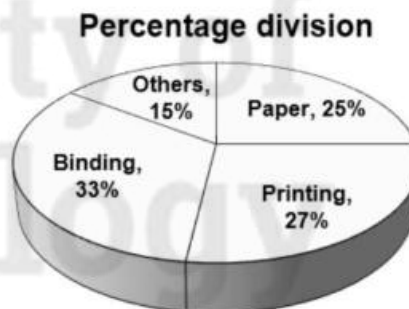
242. If the total expenditure is Rs. 60000, then what is the expenditure (in Rs.) on the Printing?

(A) 18400   (B) 14800

(C) 13400   (D) 16200

243. What is the central angle (in degrees) of the sector made by the expenditure on Paper?

(A) 25   (B) 75

(C) 90   (D) 120

244. The expenditure on Binding is how much percent more than the expenditure on Paper?

(A) 32
(B) 24.24
(C) 28.18
(D) 34

245. If expenditure on Paper is Rs 20000, then what is the expenditure (in Rs) on Binding?

(A) 24600
(B) 26400
(C) 28000
(D) 22800

246. In others there are only two types of expenditures viz. Marketing and Distribution in ratio 3 : 2 respectively. What will be the central angle (in degrees) made by the sector of expenditure on Marketing?

(A) 21.6
(B) 32.4
(C) 27
(D) 36

Direction (247–250) The table given below shows the production (in '000 tonnes) of five companies from 2012 to 2016.

Company	Year 2012	2013	2014	2015	2016
P	302	386	412	503	470
Q	376	402	444	529	501
R	250	268	302	298	276
S	350	360	372	398	362
T	403	450	504	597	602

247. What is the total production (in '000 tonnes) of company R from year 2012 to 2016?

(A) 1276
(B) 1444
(C) 1394
(D) 1502

248. What is the average (in '000 tonnes) of total production of all companies in year 2013?

(A) 371.1
(B) 373.2
(C) 378.4
(D) 362.3

249. Production of company R in year 2014 is how much percent more than the production of company R in year 2013?

(A) 12.68
(B) 11.56
(C) 14.42
(D) 15.31

250. Production of all companies in year 2014 is how much percent less than the production of all companies in year 2015?

(A) 8.25
(B) 11.3
(C) 14.4
(D) 12.5

Direction (251–255) The given pie chart shows the runs scored by 5 players in a match. Total run scored by 5 players = 380
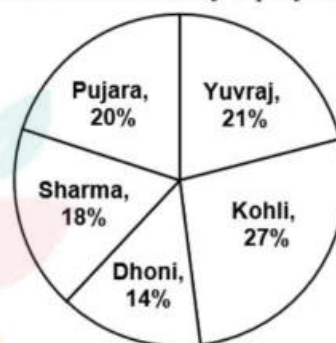
251. The runs scored by Kohli are how much percent more than the runs scored by Sharma?

(A) 100
(B) 33.33
(C) 66.66
(D) 50

252. Runs scored by Kohli is what percent of runs scored by Yuvraj?

(A) 128.57
(B) 134.21
(C) 113.13
(D) 126.67

253. Runs scored by Pujara is what percent of total runs scored by these 5 players?

(A) 25
(B) 30
(C) 20
(D) 23

254. What is the central angle (in degrees) made by the sector of runs scored by Yuvraj?

(A) 75.6
(B) 74.64
(C) 72.12
(D) 79.34

255. If runs scored by Rahane is 50% of the runs scored by Yuvraj, then runs scored by

Rahane is what percent of total runs scored by Kohli, Pujara and Dhoni?

(A) 16.41   (B) 17.82

(C) 18.92   (D) 16.31

Direction: (256–259) The table given below shows the marks obtained by six students in 5 different subjects.

student	P	Q	R	S	T
A	72	75	80	82	93
B	87	94	78	87	95
C	68	79	55	91	72
D	55	69	74	81	76
E	74	88	83	93	87
F	86	92	95	81	82

256. What are the total marks obtained by student D in all subjects?

(A) 343   (B) 355

(C) 338   (D) 362

257. What is the average of total marks obtained by all six students in subject R?

(A) 77.5   (B) 76.2

(C) 93   (D) 83.4

258. What is the aggregate percentage of marks obtained by student C in all the five subjects?

(A) 71   (B) 75

(C) 76   (D) 73

259. Marks obtained by student B is how much percent more than the marks obtained by A?

(A) 8.3   (B) 7.4

(C) 7.8   (D) 11.1

Directions: (260–264) The given pie chart shows the marks obtained (in degrees) by a student in different subjects. The total marks obtained by the student in the examination is 432.
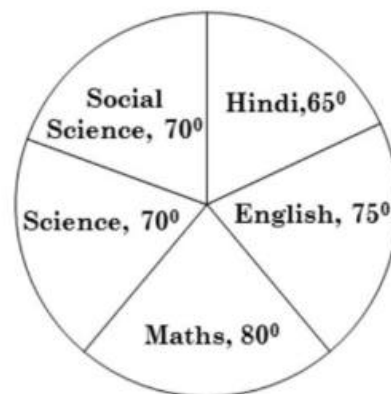
260. What is the total of marks obtained in Hindi and Maths?

(A) 178   (B) 172

(C) 174   (D) 182

261. The marks obtained in science is what percentage of the total marks?

(A) 20.14   (B) 18.12

(C) 17.16   (D) 19.44

262. The marks obtained in Maths is how much percent more than the marks obtained in Social Science?

(A) 7.14   (B) 14.28

(C) 9.13   (D) 10.41

263. In how many subjects marks obtained are more than the average marks per subject?

(A) 3   (B) 1

(C) 2   (D) 4

264. If the maximum marks per subject is 100, then what is the total marks (in percentage) obtained in English and Hindi together?

(A) 168   (B) 68

(C) 76   (D) 84

Direction (265–268) The line graph given below represents the runs scored by Kohli and Sharma against 5 teams.
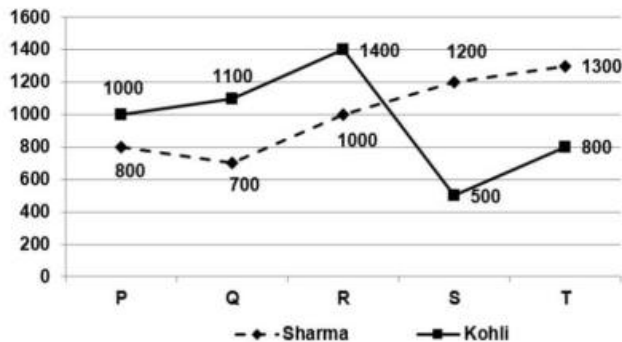
- ◆ -Sharma   ■ Kohli

265. Total runs scored by Sharma against 5 teams is what percent of total runs scored by Kohli against 5 teams?
(A) 104.16   (B) 96
(C) 98.13   (D) 108.24

266. Runs scored by Kohli against team S is how much percent less than the runs scored by Sharma against team S?
(A) 70.21   (B) 68.33
(C) 58.33   (D) 41.66

267. What is the difference between the total runs scored by Kohli against the teams Q and R and total runs scored by Sharma against the teams Q and R?
(A) 200   (B) 400
(C) 900   (D) 800

268. What is the total runs scored by Kohli against 5 teams?
(A) 5000   (B) 4800
(C) 4700   (D) 4500

Direction (269–273) The given pie chart shows the breakup (in percentage) of monthly expenditure of a person.
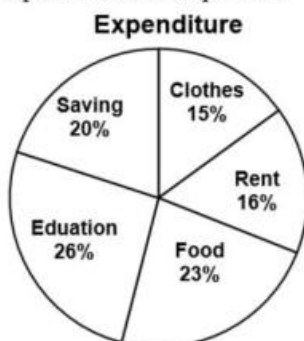
Expenditure

269. The central angle made by the sector of expenditure on Fuel is how much (in degrees) if the ratio of the expenditure on Fuel and Clothes is 4 : 3 respectively?
(A) 72°   (B) 32°
(C) 36°   (D) 45°

270. If the expenditure incurred on Clothes is Rs 3000, then what is the expenditure (in Rs) incurred on Education?
(A) 4300   (B) 5050
(C) 5200   (D) 5600

271. The expenditure on food is how much percent more than the expenditure on Savings?
(A) 12.21   (B) 15
(C) 13.04   (D) 11

272. What is the central angle (in degrees) made by the sector of expenditure on Education?
(A) 93.6°   (B) 88.2°
(C) 84.3°   (D) 95.2°

273. If the total salary of the person is Rs 50000, then what will be the expenditure (in Rs) on Rent?
(A) 16000   (B) 12000
(C) 7000   (D) 8000

Direction (274–277) The bar graph given below represents the number of players of a college taking part in three games for 3 year.
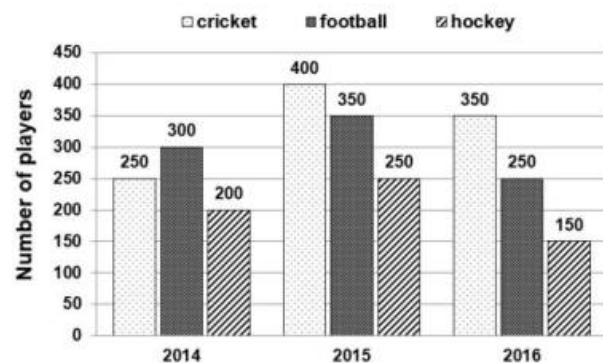
274. Total number of players in 2015 is what percent of total number of players in 2016?
(A) 75
(B) 112.5
(C) 141.11
(D) 133.33

275. Number of players playing hockey in 2015 is what percent of total players playing all the three games in 2015?
(A) 25
(B) 33.33
(C) 22
(D) 28

276. Number of players playing football in 2016 is how much percent less than the players playing football in 2014?
(A) 14.28
(B) 16.66
(C) 33.33
(D) 8.33

277. What is the total number of players playing all three games in 2015?
(A) 950
(B) 900
(C) 1000
(D) 1050

Direction (278–282) The following pie chart shows the distribution of expenses (in degrees) of a family during 2016. Total income of the family in 2016 = Rs. 1080000
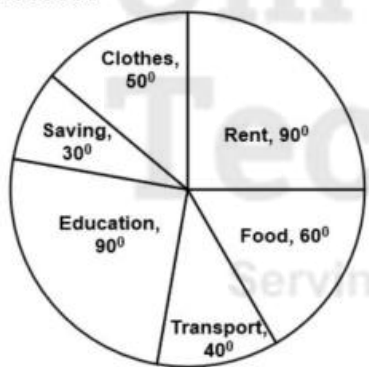
278. How much they spend (in Rs.) on clothes?
(A) 150000
(B) 180000
(C) 200000
(D) 240000

279. Their expenditure on rent is what percentage of their expenditure on Education?

(A) 33.33
(B) 50
(C) 100
(D) 90

280. What is the total expenditure (in Rs) on Rent, Food and Transport together?
(A) 450000
(B) 390000
(C) 570000
(D) 500000

281. What will be the average (in Rs.) of total income spent by the family on Education, Savings and Rent?
(A) 220000
(B) 215000
(C) 205000
(D) 210000

282. Income of the family in the year 2015 was 20% less than that in the year 2016 and the ratio of their savings in 2015 and 2016 is 2 : 5. Approximately what percentage they saved in the year 2015?
(A) 6.17
(B) 4.16
(C) 3.24
(D) 5.66

Direction (283–286) The table given below shows the number of students in five colleges in the given five years.

Year	College				
	M	N	O	P	Q
2009	450	330	400	500	500
2010	480	380	380	520	510
2011	430	390	440	440	440
2012	480	360	480	490	450
2013	490	340	360	550	550

283. If in year 2011, in college N, 80% of the total students appeared in an exam, out of which 50% students passed, then how many students passed the exam?
(A) 136
(B) 152
(C) 156
(D) 162

284. What is the ratio of the total number of students of college N in all years to the total number of students of all the colleges studying in the year 2011?
(A) 100 : 107
(B) 90 : 107
(C) 90 : 119
(D) 90 : 127

285. What is the average of the total number of students studying in college M in the given years?
(A) 412   (B) 420
(C) 400   (D) 466

286. In which of the given years the average number of students studying is maximum?
(A) 2011   (B) 2009
(C) 2010   (D) 2013

Direction (287–291) The given pie chart shows the various expenses (in percent) incurred by publisher on publishing a book.
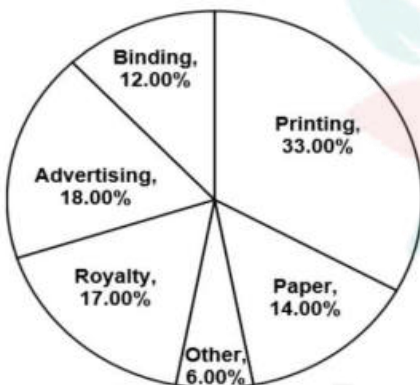
287. If the total amount spends on publishing the book is Rs. 68000, then what will be the amount (in Rs.) spend on Advertising?
(A) 11560   (B) 12240
(C) 9520   (D) 8160

288. If the amount spend on Binding is Rs. 14400, then what will be the amount (in Rs.) spend on Paper?
(A) 7200   (B) 20400
(C) 15600   (D) 16800

289. By how much percent the total amount spend on Paper and Binding is less than the amount spend on Printing?
(A) 21.21   (B) 45.45
(C) 30.3   (D) 33.33

290. By how much the average amount spend on Printing, Paper and Royalty is more (in Rs.) than the average amount spend on Advertising and Binding if total amount spend on Publication is Rs. 150000?
(A) 9500   (B) 10000
(C) 7500   (D) 9000

291. For 11000 books the expenses incurred on others is Rs. 36960. If publisher wants a profit of 25%, then what should be the marked price (in Rs.) of each book?
(A) 56   (B) 76
(C) 70   (D) 50

Direction (292–295) The line chart given below shows the revenue of a company (in lac rupees) from year 2009 to 2016.
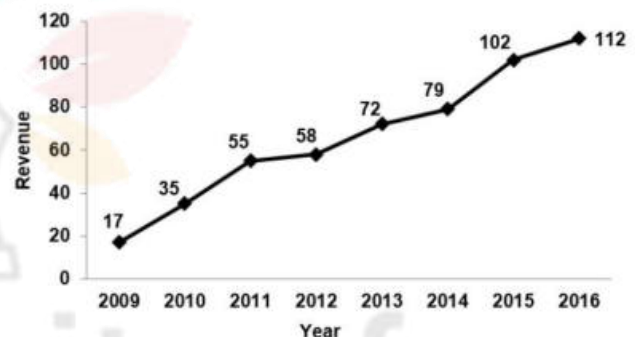
292. If from year 2007 to year 2009 the revenue has decreased by 20% each year, then what was the revenue (in lac Rs.) of the company in year 2007?
(A) 26.56   (B) 21.56
(C) 29.52   (D) 31.56

293. The average revenue of the company from 2013 to 2016 is how much percent more than the average revenue of the company from 2009 to 2012?
(A) 181.2   (B) 21.2
(C) 121.2   (D) 221.2

294. In how many years from 2010 to 2016 the increase in the revenue is more than 20% of the previous year value?
(A) 3   (B) 4
(C) 5   (D) 6

295. The revenue in year 2013 is what percent of the revenue in year 2011?
(A) 30.9
(B) 137.2
(C) 130.9
(D) 45.9

Direction (296–300) The given pie chart shows the stream wise distribution (in degrees) of the candidates who applied for an entrance exam. The total number of candidates who applied was 720000 and out of which 5400 have qualified the exam.

Medical, 18°
Non-Medical 54°
Commerce, 108°
Arts, 180°
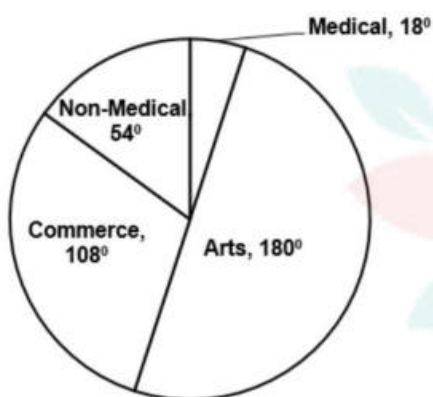
296. If from medical and non–medical both, 1.3% candidates have qualified the exam, then how many candidates have qualified the exam from commerce and arts in total?
(A) 3452
(B) 3168
(C) 2088
(D) 3528

297. What is the average of the total candidates from Arts, Commerce and Non–medical?
(A) 216000
(B) 296000
(C) 260000
(D) 228000

298. What percentage of the total candidates belong the non–medical?
(A) 18%
(B) 8.33%
(C) 15%
(D) 14.28%

299. What is the respective ratio of the Arts candidates and Commerce candidates?

(A) 3 : 1
(B) 2 : 1
(C) 5 : 3
(D) 7 : 5

300. What percentage of the total candidates who applied for the exams have qualified it?
(A) 0.85
(B) 0.75
(C) 0.6
(D) 0.8

Direction (301–304) The table given below shows the percentage of people reading various newspaper in society. It also shows the ratio of males and females for each newspaper. Each person reads exactly 1 newspaper. Total no. of people in society is 20000.

Newspaper/समाचार पत्र	Percentage of people व्यक्तियों का %	Male : Female पुरुष : महिला
A	30%	3 : 2
B	20%	2 : 3
C	16%	3 : 5
D	12%	1 : 2
E	22%	4 : 7

301. By how much percent females reading newspaper E are more than the males reading newspaper C?
(A) 233.33
(B) 133.33
(C) 266.66
(D) 333.33

302. For which two newspaper the number of females reading them is same?
(A) D and E
(B) C and E
(C) A and B
(D) A and C

303. What is difference in number of males reading newspaper B and number of males reading newspaper D?
(A) 1600
(B) 2000
(C) 2400
(D) 800

304. How many females read newspaper A?
(A) 3600
(B) 3200
(C) 2400
(D) 2800

Direction (305–309) The given pie chart shows the monthly expenditure on various items and monthly saving of a household. The same distribution is followed for all the months of the year.
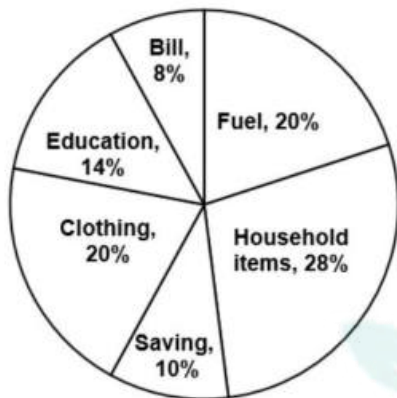
305. If the difference in monthly expenditure on clothing and education is Rs. 9000, then what is the difference (in Rs.) in yearly saving and yearly expenditure on Bills?
(A) 64000
(B) 76000
(C) 36000
(D) 48000

306. If the difference in monthly expenditure on Fuel and Bills is Rs 4800, then what is the annual income of household?
(A) 660000
(B) 600000
(C) 540000
(D) 480000

307. If Rs. 2400 are saved per month, then what is the monthly salary (in Rs) of the household?
(A) 24000
(B) 20000
(C) 30000
(D) 18000

308. If monthly income is Rs. 65000, then what is the difference (in Rs.) between expenditure on Household items and Clothing?
(A) 5200
(B) 6500
(C) 7200
(D) 4500

309. If monthly income is Rs. 50000, then how much is spent (in Rs.) on Fuel?
(A) 12000
(B) 10000
(C) 13500
(D) 15000

Direction: (310–313) The table given below shows the income and expenditure (in Rs) of two companies A and B form 2012 to 2016.
Also, Profit = Income – Expenditure
and Profit% = [(Income – Expenditure)/Expenditure] × 100

Year	Income of A	Expenditure of A	Income B	Expenditure of B
2012	250000	200000	180000	150000
2013	320000	300000	250000	220000
2014	425000	400000	320000	300000
2015	490000	450000	375000	350000
2016	600000	525000	450000	400000

310. What is the ratio of profit of A in year 2013 and profit of B in year 2016 respectively?
(A) 1 : 4
(B) 2 : 5
(C) 2 : 3
(D) 5 : 2

311. What is the average yearly profit (in Rs) of A for the given years?
(A) 42000
(B) 38000
(C) 45000
(D) 35000

312. For which year the profit percentage of B is the highest?
(A) 2013
(B) 2016
(C) 2015
(D) 2012

313. If the income and expenditure of A increases by same rate in 2017 over 2016 as they did in 2016 over 2015, then what is its profit percentage (approximate) in 2017?
(A) 15%
(B) 27%
(C) 20%
(D) 24%

Directions (314–318) The given pie chart shows the distribution of expenditure of a company (in percentage). The total expenditure of the company is Rs. 136000.

Pie chart: Rent, 9%; Furniture, 14%; Raw Material, 17%; Others, 20%; Salary, 40%
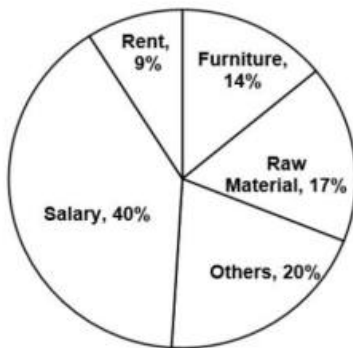
Directions: (319–322) The table shows the production of different types of cars (in thousands).

Cars/Year	2012	2013	2014	2015	2016
A	30	35	48	45	56
B	42	48	40	38	56
C	48	36	38	35	44
D	51	24	30	46	54
E	20	42	40	35	43

314. By what amount (in Rs.) expenditure on Raw material is more than the expenditure on Rent?
(A) 9880
(B) 10880
(C) 10680
(D) 4080

315. What is the total expenditure (in Rs) incurred on Furniture and Others by the company?
(A) 45200
(B) 54400
(C) 46240
(D) 42160

316. What will be the ratio of the expenditure incurred on Salary to the expenditure incurred on Rent?
(A) 10 : 9
(B) 31 : 5
(C) 40 : 9
(D) 5 : 31

317. What is the difference (in degrees) in the central angles formed by the total expenditure incurred on Furniture and Rent and expenditure incurred on Others?
(A) 10.8
(B) 11.2
(C) 39.6
(D) 27.4

318. A new expenditure of transportion is added and to meet this expenditure, all others expenditures are reduced. If the central angle formed by the expenditure incurred on Transportation is 72°, then how much amount (in Rs) all other expenses are reduced?
(A) 25200
(B) 23000
(C) 27200
(D) 20400

319. What is the ratio of the total production of cars of type A in 2014 and type C in 2013 taken together to the total production of cars of type B in 2016 and type E in 2015 taken together?
(A) 12 : 13
(B) 12 : 11
(C) 10 : 11
(D) 11 : 12

320. The total production of type B cars in 2012, 2014 and 2015 taken together is approximately what percent more than the total production of type A cars in 2013 and 2016 taken together?
(A) 33.2
(B) 31.9
(C) 34.4
(D) 36.3

321. The number of years, in which the production of cars of type B is less than the average production of type D cars over the years, is:
(A) 1
(B) 3
(C) 2
(D) 4

322. If the data related to the production of cars of type E is represented by a pie chart, then the central angle of the sector representing the data of production of cars in 2013 will be:
(A) 84°
(B) 102°
(C) 70°
(D) 80°

Direction (323 – 326) The table shows the production of different types of cars (in thousands).

Cars/ Year	2013	2014	2015	2016	2017
A	35	40	48	50	36
B	39	45	54	60	72
C	52	25	32	54	45
D	50	42	45	46	47
E	36	46	42	48	55

323. The ratio of the total production of cars of type C and E taken together in 2013 to the total production of cars of type D in 2014 and 2016 and type E in 2017 taken together is:
(A) 8 : 13   (B) 13 : 32
(C) 8 : 11   (D) 5 : 8

324. The production of cars of type A in 2015 and of type C in 2013 taken together is approximately what percent of the total production of cars of type D in five years?
(A) 43.5   (B) 40.2
(C) 42.4   (D) 42.8

325. The total production of cars of type B in 2013, 2014, 2015 and 2017 taken together is what percent less than the total production of all types of cars in 2017? (Correct to one decimal place)
(A) 17.6   (B) 18.4
(C) 18.2   (D) 15.8

326. If the data regarding the production of cars of type B is represented by a pie–chart, then the angle of the sector representing the production of cars in 2016 will be:
(A) 72°   (B) 60°
(C) 96°   (D) 80°

Direction: (327–330) The table shows the production of different types of cars (in thousands).

Cars/Year	2014	2015	2016	2017	2018
A	64	56	57	63	70
B	48	54	63	64	72
C	33	42	48	57	64
D	25	45	40	55	35
E	40	48	52	61	60

327. The ratio of the total production of type A cars in 2015 and type B cars in 2014 taken together to the total production of type C cars in 2017 and type E cars in 2018 taken together is:
(A) 4 : 5   (B) 8 : 9
(C) 34 : 39   (D) 16 : 19

328. The total production of type C cars in 2015 and type E cars in 2018 taken together is what percent of the total production of cars in 2014 and 2017 taken together?
(A) 20   (B) 27
(C) 22   (D) 25

329. The total production of type D cars during 2015 to 2017 is what percent less than the total production of type E cars during 2014, 2015, 2016 and 2018 taken together?
(A) 35   (B) 32
(C) 30   (D) 28

330. In the data related to the production of type D cars is represented by a pie chart, then the central angle of the sector representing production of cars in 2015 will be:
(A) 72°   (B) 81°
(C) 99°   (D) 63°

Direction: (331–334) The table shows the production of different types of cars by a company (in thousands) in 5 years.

Car Year	A	B	C	D	E
2014	52	54	48	46	64
2015	47	45	53	50	45
2016	48	47	56	54	65
2017	43	50	57	67	63
2018	38	40	54	68	70

331. The average production of type D cars in 5 years is what percent less than the production of type E cars in 2018?
(A) 16.8   (B) 15.9
(C) 17.4   (D) 18.6

332. If the data related to the production of cars in 2018 is represented by pie chart, then the central angle of the sector representing the production of type C cars will be:
(A) 93°   (B) 72°
(C) 59°   (D) 91°

333. The total production of type B cars in all the five years is what percent more than the total production of type A, B and D cars in 2017?
(A) 47.5   (B) 32.2
(C) 57.3   (D) 49.5

334. What is the ratio of the total production of type C cars in 2015 and type D cars in 2017 taken together to the total production of type B cars in 2016 and type A cars in 2017 taken together?
(A) 11 : 9   (B) 4 : 3
(C) 12 : 112   (D) 13 : 10

Direction: (335–338) The table shows the production of different types of cars (in thousands).

City/ Year	2012	2013	2014	2015	2016
A	54	58	60	63	55
B	40	54	56	61	67
C	46	50	63	73	77
D	33	35	48	45	49
E	47	43	53	48	52

335. If the data related to the production of type D cars is represented by a pie chart, then the central angle of the sector representing the production of cars in 2013 will be:
(A) 77°   (B) 84°
(C) 75°   (D) 60°

336. The total production of all type of cars, except type B, in 2012 is what percent less than the total production of all types of cars in 2016?
(A) 40   (B) 25.8
(C) 26.7   (D) 42

337. What is the ratio of the total production of type E cars in 2014 and type C cars in 2016 taken together to the total production of type B cars in 2014 and type D cars in 2013 taken together?
(A) 9 : 8   (B) 10 : 7
(C) 11 : 5   (D) 11 : 8

338. The total production of type E cars in 2012 and 2013 is approximately what percent more than the average production of type A cars during the years 2012 to 2016?
(A) 56.4   (B) 53.8
(C) 52.2   (D) 55.2

Direction: (339–342) The table shows the production of different types of cars (in thousands)

Years →	2013	2014	2015	2016	2017
Cars ↓					
A	48	47	50	61	64
B	47	55	58	54	66
C	52	58	62	66	72
D	60	53	56	65	66
E	43	47	54	64	62

339. The total production of type B cars in 2015 and type C cars in 2013 is what percent more that the total production of type E cars in 2013 and 2014? (Correct to one decimal place)
(A) 22.2   (B) 24.8
(C) 23.4   (D) 25.6

340. If the data related to the production of type D cars is represented by a pie–chart, then the central angle of the sector representing the production of the cars in 2016 of type D will be:
(A) 77°   (B) 67.2°
(C) 78°   (D) 79.2°

341. The total production of type B cars during 2013 to 2016 is approximately what percent less than total production of cars in 2017?

(A) 35%   (B) 38%
(C) 40%   (D) 32%

342. The ratio of the total production of type A cars in 2017 and type D cars in 2015 to the total production of type B and type E cars in 2013 is:
(A) 4 : 3   (B) 7 : 8
(C) 8 : 7   (D) 3 : 4

Direction: (343–346) The table shows the production of different types of cars (in thousands).

Car/ Year	2012	2013	2014	2015	2016
A	46	48	56	57	64
B	54	61	63	60	70
C	44	45	67	63	76
D	46	49	57	55	72
E	48	55	64	65	68

343. The average production of type C cars during 2012 to 2016 is approximately what percent less than the total production of type D cars in 2012 and type E cars in 2014?
(A) 49.2%   (B) 42.8%
(C) 48.6%   (D) 46.36%

344. The ratio of the total production of type A cars in 2014 and 2016 and type C cars in 2013 taken together to the total production of type B cars and type D cars taken together in 2014 is:
(A) 4 : 3   (B) 11 : 8
(C) 17 : 12   (D) 9 : 8

345. The total production of type E cars in 2015 and type C cars in 2013 taken together is what percent of the total production of type A cars and type D cars taken together during 2012 to 2016?
(A) 21.8%   (B) 21.4%
(C) 22%   (D) 20%

346. If the data related to the production of type E cars is represented by a pie–chart, then the central angle of the sector representing production of cars in 2013 will be:
(A) 76.8°   (B) 78°
(C) 81.6°   (D) 66°

Direction: (347 – 350) The table shows the production of different types of cars (in thousands). Read the table carefully and answer the following question.

Year / Car	2010	2011	2012	2013	2014
A	46	69	61	57	63
B	40	56	52	68	64
C	54	55	45	60	56
D	42	53	44	56	65
E	68	67	61	64	72

347. If the data related to the production of type C cars is represented by a pie–chart, then the central angle of the sector represented production of cars in 2012 will be:
(A) 80°   (B) 72°
(C) 147/2°   (D) 60°

348. The average production of all type of cars in 2014 is approximately what percent less than the production of type B cars in 2013 and type D cars in 2010 taken together?
(A) 44.4%   (B) 43.2%
(C) 41.8%   (D) 44.9%

349. The total production of type A cars in 2011 and type C cars and type E Cars in 2012 taken together is what percent of the total production of type B cars during 2010 to 2014?
(A) 54.7%   (B) 58.8%
(C) 60.4%   (D) 62.5%

350. What is the ratio of the total production of type B cars in 2011 and type E cars in

2013 taken together to the total production of type C cars in 2014 and type D cars in 2012 taken together?

(A) 16 : 11   (B) 5 : 6
(C) 6 : 5   (D) 8 : 9

Direction: (351 – 354) The table shows the production of different type of cars (in thousands).

Years Car	2014	2015	2016	2017	2018
A	42	53	44	66	65
B	46	49	57	64	72
C	54	45	45	50	56
D	48	56	63	65	68
E	46	48	56	57	64

351. The average production of cars in 2018 is approximately what percent less than the total production of type D cars in 2015 and type B cars in 2017 taken together?

(A) 45.83%   (B) 43.6%
(C) 42.4%   (D) 44.2%

352. What is the ratio of the total production of type A cars in 2017 and type C cars in 2014 taken together to the total production of type B cars in 2014, type C cars in 2017 and type E cars in 2018 taken together?

(A) 12 : 11   (B) 5 : 6
(C) 2 : 3   (D) 3 : 4

353. The total production of type A cars in 2016 and type E cars in 2014 taken together is what percent of the total production of type C cars during 2014 to 2018?

(A) 32   (B) 40
(C) 35   (D) 36

354. If the data related to the production of type D cars is represented by a pie chart, then the central angle of the sector representing the production of cars in 2017 will be:

(A) 50°   (B) 81.6°
(C) 75.6°   (D) 78°

Direction (355 – 358) The table shows the production of different types of cars (in thousands).

Cars/Year	2012	2013	2014	2015	2016
A	46	53	56	58	67
B	50	65	67	66	72
C	43	54	55	47	51
D	47	52	61	65	74
E	48	58	63	64	67

355. The total production of type B cars in 2015 and type D cars 2016 is what percent less than the total production of type E cars in five years?

(A) 151/3   (B) 140/3
(C) 160/3   (D) 158/3

356. The average production of type A cars during the five years is what percent of the total production of type C cars during the five years?

(A) 22.4   (B) 21.8
(C) 20.6   (D) 18.7

357. What is the ratio of the total production of type C and D cars in 2012 to the total production of type A cars in 2014 and type E cars in 2015?

(A) 5 : 6   (B) 9 : 11
(C) 3 : 4   (D) 11 : 12

358. If the data related to the production of type B cars is represented by a pie chart, then the central angle of the sector representing the production of cars in 2016 is:

(A) 73°   (B) 75°
(C) 81°   (D) 56°

Direction: (359 – 362) The table shows the number of students enrolled in different colleges.

Colleges Year	A	B	C	D	E
2010	400	270	350	430	470
2011	430	300	330	450	490
2012	370	250	360	470	410
2013	410	310	370	420	430
2014	420	290	340	480	480

359. What is the ratio of the total students enrolled in colleges A and B in the year 2012 to the total students enrolled in colleges D and E in the year 2013?

(A) 63 : 86   (B) 62 : 88

(C) 58 : 63   (D) 62 : 85

360. What is the average number of students studying in college D over the given years?

(A) 420   (B) 430

(C) 440   (D) 450

361. In the year 2014, what per cent of student were enrolled in college C in 2014? (correct to one decimal place)

(A) 16.9%   (B) 16.7%

(C) 17.1%   (D) 17.3%

362. The number of students studying in college E in the year 2013 is approximately what percent of the number of students studying in college B, C and D taken together in the year 2013 (nearest to one decimal place)?

(A) 38.2%   (B) 39.09%

(C) 39.4%   (D) 38.6%

Direction (363 – 366) The table below shows the percentage of students and the ratio of boys and girls in different colleges. Total students = 1800

College	% students	Boys : Girls
A	20	4 : 5
B	18	1 : 2
C	14	4 : 3
D	22	6 : 5
E	10	2 : 3
F	16	9 : 7

363. In which college is the percentage difference between the number of boys and girls minimum?

(A) A   (B) E

(C) D   (D) C

364. What is the percentage of girls in colleges D, E and F taken together, (nearest to one decimal place)?

(A) 47.9%   (B) 48.3%

(C) 48.1%   (D) 48.5%

365. If 10% of the girls from college A are transferred to college E, then what is the increase in the percentage of girls in college E?

(A) 4.2%   (B) 18.51%

(C) 4.4%   (D) 4.6%

366. What is the ratio of boys and girls in the colleges A and B taken together?

(A) 67 : 104   (B) 45 : 71

(C) 43 : 67   (D) 37 : 52

Direction (367 – 370) The following table indicates the number of students studying in three disciplines in five colleges :

Disciplines	Colleges				
	A	B	C	D	E
Science	300	350	275	400	275
Commerce	250	400	325	275	250
Economics	400	450	250	300	500

367. If a pie–chart is drawn representing the number of students in all five colleges, what is the central angel (correct to the nearest whole number) of the sector representing the students of college B?

(A) 82°   (B) 86°

(C) 84°   (D) 80°

368. What is the ratio of the total number of students studying in the science stream to that of studying in commerce stream in all five colleges taken together?

(A) 16 : 15   (B) 19 : 15

(C) 16 : 19   (D) 14 : 15

369. What percentage of students in college B is studying in the science stream. (correct to one decimal place)?
(A) 29.2%   (B) 29.6%
(C) 29.8%   (D) 29.4%

370. What percentage of total students are studying in the commerce stream in all five colleges together?
(A) 33%   (B) 32%
(C) 28%   (D) 30%

Direction (371–374) The table below indicates the percentage of students and the ratio of boys and girls in the various streams of a college.
(Total students = 2600)

Stream	CE	CS	IT	ME	EC
% Students	20%	18%	21%	22%	19%
Boys : Girls	3 : 2	4 : 5	3 : 4	6 : 5	9 : 10

371. What is the ratio of boys and girls in the college?
(A) 5 : 6   (B) 1 : 1
(C) 6 : 7   (D) 7 : 8

372. What is the ratio of students studying in CS and IT?
(A) 11 : 13   (B) 12 : 13
(C) 9 : 11   (D) 6 : 7

373. In which stream, is the difference in the percentage of boys and girls minimum?
(A) CS   (B) ME
(C) EC   (D) IT

374. If the data about the number of girls enrolled in the various streams is represented by a pie–chart, what is the central angle of the sector representing the number of girls in the ME stream, to the nearest whole degree?
(A) 70°   (B) 72°
(C) 74°   (D) 68°

Direction (375–378) This table shows the number of students studying in various streams in different colleges.

Streams	Collage				
	A	B	C	D	E
Arts	580	460	320	470	370
Science	620	680	540	360	400
Commerce	480	520	350	520	330

375. What is the average of the number of students in the arts stream in all the colleges taken together?
(A) 460   (B) 450
(C) 440   (D) 470

376. The number of students in the science stream of college C is approximately what percentage of students studying in that college?
(A) 43%   (B) 44%
(C) 45%   (D) 42%

377. What is the ratio of the number of students studying science in collages A and B together to the number of students studying commerce in colleges D and E together?
(A) 13 : 8   (B) 26 : 17
(C) 21 : 17   (D) 23 : 15

378. If the data about students of the commerce stream in all colleges is represented by a pie–chart, what is the central angel of the sector representing college D, to the nearest degree?
(A) 85°   (B) 82°
(C) 80°   (D) 88°

Directions (379–382) The following table shows the percentage distribution of students in various disciplines from five different colleges.

Disciplines अध्ययन का विषय	Colleges/कॉलेज				
	A	B	C	D	E
Science विज्ञान	25	35	45	28	35
Economics अर्थशास्त्र	35	40	20	42	25
Mathematics गणित	40	25	35	30	40
Total students कुल छात्र	8,000	10,000	15,000	9,000	11,000

379. If the data of the total students' college wise is represented by a pie–chart what is the central angle of the sector representing college E (to nearest whole number)?
(A) 78° (B) 75°
(C) 79° (D) 73°

380. The number of students from the discipline of Economics from college B is approximately what percentage of the number of students from the discipline of science from the college C?
(A) 61 (B) 56
(C) 58 (D) 59

381. What is the average number of students from the science discipline of all the colleges taken together?
(A) 3748 (B) 3762
(C) 3642 (D) 3724

382. What is the percentage of students from the discipline of Mathematics for colleges A and C taken together, (nearest to one decimal place)?
(A) 37.5 (B) 36.7
(C) 36.9 (D) 37.2

Direction (383–386) The table shows the production of rice (in million tonnes) of three states over six years.

States	Years					
	2011	2012	2013	2014	2015	2016
A	5.2	5.4	5.8	6.2	6.5	6.9
B	3.8	4.1	4.4	4.8	5.2	5.7
C	4.5	5.2	5.8	6.4	6.7	7.4

383. Which is the ratio of the production of rice in all three states in the year 2014 to that in 2016?
(A) 87 : 100 (B) 85 : 103
(C) 85 : 102 (D) 89 : 100

384. What is the percentage increase in the production of rice in B from 2014 to 2016?
(A) 18.25 (B) 18.75
(C) 17.75 (D) 17.25

385. What is the average production of rice in state A over the years (in million tonnes)?
(A) 5.9 (B) 5.8
(C) 6 (D) 6.1

386. If the total production in three states in all six years is represented by a pie–chart, what is the central angle of the sector representing production in the year 2014. (to nearest whole number)?
(A) 59° (B) 61°
(C) 63° (D) 65°

Direction (387–390) This table shows the percentage of students passing out of five different colleges over three years. It is given that from each college, 200 students appeared every year.

Years	Colleges				
	A	B	C	D	E
2015	68	65	80	92	72
2016	72	68	88	95	75
2017	74	77	92	98	73

387. Which is the ratio of the number of students passing to those failing from college E in the year 2015?
(A) 17 : 7 (B) 4 : 3
(C) 18 : 7 (D) 9 : 5

388. In which college the average percentage of passing students over the given three years is the least?
(A) E (B) B
(C) A (D) F

389. If the number of passed out students of all five colleges is represented by a pie chart, what is the central angle (to nearest whole number) of the sector representing the passed out students of college C?
(A) 67°   (B) 79°
(C) 77°   (D) 69°

390. What is the approximate percentage increase in the number of students passing out of college B in the year 2017 as compared to the previous year?
(A) 13.4%   (B) 13.2%
(C) 12.8%   (D) 13%

Direction (391 – 394) The table shows the number of students from different schools playing different games.

Games	Schools			
	A	B	C	D
Cricket	125	250	150	175
Football	175	200	250	125
Hockey	75	125	200	150

391. What is the ratio of the total students who play cricket in schools A and B together to the total students who play hockey in schools C and D?
(A) 15 : 13   (B) 16 : 11
(C) 16 : 13   (D) 15 : 14

392. If the data about the number of students who play hockey from different schools is represented by a pie–chart, what is the central angle of the sector representing students who play hockey from school C to the nearest whole number?
(A) 107°   (B) 80°
(C) 131°   (D) 95°

393. What is the average of the number of students who play cricket in all four schools?
(A) 180   (B) 175
(C) 185   (D) 200

394. The number of students who play football in school A is approximately what percent of the football playing students from all schools?
(A) 23.3   (B) 19.4
(C) 19.1   (D) 19.7

Direction (395 – 398) The table shows the number of cars sold by three showrooms over a period of six years.

Showroom	Year					
	2011	2012	2013	2014	2015	2016
A	500	480	520	620	650	630
B	450	420	530	480	520	400
C	400	450	460	520	540	430

395. If the total number of cars sold by all three showrooms over the years is represented as a pie–chart, what is the central angle of the sector representing the total number of cars sold in the year 2013 (to the nearest whole number)?
(A) 60°   (B) 58°
(C) 62°   (D) 56°

396. By what percent did the total number of cars sold by all three showrooms decrease during the year 2016, as compared to that in the year 2015 (nearest to one decimal place)?
(A) 14.8%   (B) 14.6%
(C) 14.4%   (D) 14.9%

397. What is the average number of cars sold by showroom A over the given six years (nearest to one decimal place?
(A) 566.7   (B) 592.7
(C) 586.7   (D) 594.7

398. What is the ratio of the total cars sold by showroom B during the years 2014 and 2016 and the total cars sold by showroom C during 2015 and 2016?
(A) 88 : 97   (B) 85 : 97
(C) 88 : 95   (D) 86 : 97

Direction: (399-400) The table shows the percentage of marks obtained by seven students in six different subjects in an examination. The numbers in the brackets are the maximum marks in each subject.

Student	Subject (Max. Marks)					
	Maths (150)	Chemistry (130)	Physics (120)	Geography (100)	History (60)	Computer Science (40)
A	90	50	90	60	70	80
B	100	80	80	40	80	70
C	90	60	70	70	90	70
D	80	65	80	80	60	60
E	80	65	85	95	50	90
F	70	75	65	85	40	60
G	65	35	50	77	80	80

399. What are the average marks obtained by all the seven students in Physics? (Correct to two decimal places)
(A) 91.16   (B) 93.14
(C) 89.14   (D) 77.26

400. What are the average marks obtained by all the seven students in Mathematics? (Correct to two decimal places)
(A) 111.21   (B) 101.21
(C) 123.21   (D) 139.21

Direction: (401-402) The table shows the annual expenditure of a company (in Lakh Rupees) over the years.

Year/Item of Expenditure	Salary	Fuel and Transport	Bonus	Interest on Loans	Taxes
1998	288	98	3.00	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

401. What is the average amount of interest on loans (in Lakh rupees) which the company paid during the period 1998 to 2002?
(A) 34.18   (B) 36.66
(C) 32.43   (D) 33.72

402. What is the average amount of Tax (in Lakh rupees) which the company paid during the period 1998 to 2002?
(A) 82.2   (B) 90.2
(C) 100   (D) 88.2

Direction: (403-404) The table shows the percentage distribution of the expenditure incurred on different itemsfor publishing a book.

Item of expenditure	Percentage of expenditure
Paper	25
Printing	20
Binding	20
Royalty	15
Promotion	10
Transportation	10

403. The expenditure on royalty is less than that on printing by :
(A) 20%   (B) 25%
(C) 15%   (D) 10%

404. The expenditure on Promotion is less than that on the Paper by:
(A) 15%   (B) 10%
(C) 60%   (D) 30%

Direction: (405-406) The table shows the sales of books (in thousands) from six branches of a publishing company during 2000 and 2001.

Year/Branches	B1	B2	B3	B4	B5	B6
2000	80	75	95	85	75	70
2001	105	65	110	95	95	80

405. What is the total sales of books from branches B1, B3 and B6 together for both the years (in thousands)?
(A) 310   (B) 540
(C) 650   (D) 240

406. What is the total sales of books from branches B1, B2 and B5 together for both the years (in thousands)?
(A) 310   (B) 240
(C) 495   (D) 650

Direction: (407–410) The table below shows the number of students of a college studying

Arts, Science, Commerce and Business for given 5 years.

Year (वर्ष)	Arts (कला)	Science (विज्ञान)	Commerce (वाणिज्य)	Business (व्यवसाय)
2012	48	105	148	32
2013	56	123	136	30
2014	64	125	144	36
2015	78	148	156	36
2016	92	161	168	48

407 – What is the percentage increase in number of students of Commerce from 2012 to 2016?
(A) 11.16   (B) 17.28
(C) 13.51   (D) 15.67

408 – What is the simple annual growth rate (in %) of the number of students of Business from 2012 to 2016?
(A) 10   (B) 12.5
(C) 15   (D) 17.5

409 – What is the ratio of average number of students studying Arts per year and average number of students studying Science per year?
(A) 169 : 331   (B) 66 : 169
(C) 127 : 261   (D) 32 : 75

410 – Which year shows the maximum percentage increase in the total number of students in these 4 subjects over the previous year?
(A) 2013   (B) 2014
(C) 2015   (D) 2016

Direction: (411-414) The table below represents the mark obtained by 5 students in 4 different subjects. Each student was given marks out of 100 in each of given subjects.

Students (छात्र)	English (अंग्रेजी)	Mathematics (गणित)	Science (विज्ञान)	Hindi (हिंदी)
1	87	96	90	81
2	74	99	94	89
3	89	99	99	92
4	62	89	96	91
5	95	92	92	86

411 - In which subject the total marks of all the students is highest?
(A) English   (B) Mathematics
(C) Science   (D) Hindi

412 - Which student scored the maximum marks in all the 4 subjects taken together?
(A) Student 1   (B) Student 2
(C) Student 3   (D) Student 5

413 - A new subject is added in which all the students have scored 100 marks. If total marks are calculated as sum of the marks of highest 4 subjects, then who will be second in terms of total marks?
(A) Student 3   (B) Student 2
(C) Student 5   (D) Student 4

414 - The average marks per student in English is what percent of the average marks per student in Hindi?
(A) 91.48   (B) 97.12
(C) 92.71   (D) 98.18

Direction: (415-418) The pie chart given below shows the number of shoes of 5 different brands in a multi brand store. There are total 1200 shoes.
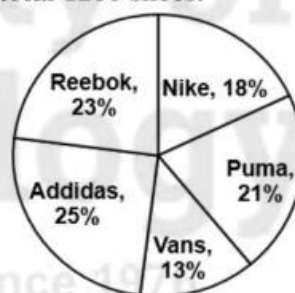
415 – How many shoes are there of Reebok brand?
(A) 230   (B) 276
(C) 286   (D) 216

416 – What is the difference in number of shoes of Puma and Vans?
(A) 96   (B) 156
(C) 84   (D) 112

417 – The difference between the number of shoes of Reebok and Nike is same as the difference between which of the following two brands?
(A) Puma and Adidas
(B) Reebok and Adidas
(C) Vans and Nike
(D) Nike and Adidas

418 – Puma shoes are how much percent more than the Nike Shoes?
(A) 14.28
(B) 16.66
(C) 25
(D) 21.33

Direction (419-422) The table below shows the distribution of number of people living in 8 different countries and the per capita income of each of the countries. The total population of these countries taken together is 200 crores.

Per capita income = total GDP of country/population of the country

Country/देश	Distribution of number of people/लोगों का वितरण	Per capita income (in crore dollars) प्रति व्यक्ति आय (करोड़ डॉलर में)
Country1/देश1	12%	11850
Country2/देश2	24%	5350
Country3/देश3	15%	9900
Country4/देश4	17%	4840
Country5/देश5	7%	2260
Country6/देश6	6%	6920
Country7/देश7	11%	3190
Country8/देश8	8%	10410

419. What is the difference (in crores) in population of the most and the least populated country?
(A) 18
(B) 32
(C) 34
(D) 36

420. What is the total GDP (in crore dollars) of ountry 5?
(A) 27120
(B) 31640
(C) 38280
(D) 44660

421. What is the total GDP (in crore dollars) for the country with the third lowest per capita income?
(A) 181900
(B) 108460
(C) 145200
(D) 164560

422. Which country has the hightest total GDP?
(A) country 1
(B) country 2
(C) country 3
(D) country 8

Direction (423-426) The table given below represents the cost, revenue and tax rate for XYZ limited for a period of 8 years.

Cost and revenue are given in Rs.000 crores.

Year (वर्ष)	Revenue (राजस्व)	Cost (लागत)	Tax Rate (कर की दर)
Y1	800	600	20%
Y2	1100	850	22%
Y3	1200	900	22%
Y4	1200	950	25%
Y5	1350	1050	30%
Y6	1500	1200	30%
Y7	1600	1240	33%
Y8	1850	1400	15%

Profit for any year=revenue - cost
Profit after tax for any year = profit of that year - tax of that year

Tax on any year = tax rate of that year × profit of the year

423 – How much tax (in Rs '000 crores) was paid by XYZ limited in Y7?
(A) 90
(B) 99
(C) 118.8
(D) 126

424 – Which of the following is correct about profit after tax for year Y2, Y6 and Y8?
(A) Y8 > Y6 = Y2
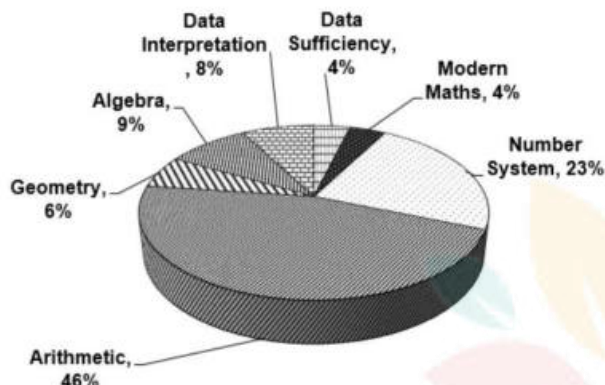(B) Y6 > Y2 > Y8
(C) Y8 > Y6 > Y2
(D) Y6 = Y8 > Y2

425 – How many distinct values of yearly profit are there?
(A) 3
(B) 4
(C) 5
(D) 6

426 - What is the total sum (in '000 crores) of profit after tax for Y1 to Y8?
(A) 1763.6   (B) 1803.2
(C) 1820.2   (D) 1872.4

Direction (427-430) Read the following Pie chart and answer the question.

427- If Mr. Raghav taught a total of 500 hours, then what is the difference in number of hours of teaching algebra and modern Maths?
(A) 15   (B) 20
(C) 25   (D) 40

428- Mr. Raghav taught Geometry for 36 hours. If the time taken in teaching Ratio consitutes one-fourth of the time for Arithmetic, then for how much time (in hours) did he taught the topic of Ratio?
(A) 46   (B) 51.75
(C) 69   (D) 103.5

429- If Data Interpretation and Modern Maths were taught for a combined time of 96 hours, then for how much time (in hours) were Number system and Geometry taught?
(A) 136   (B) 184
(C) 216   (D) 232

430- A new topic named Problem Solving was also introduced and it was decided that 10% time of all topics except Arithmetic will be devoted to it. What will be the

central angle (in degrees) made by Problem Solving in the new pie chart?
(A) 17.28   (B) 18
(C) 19.44   (D) 36

Direction (431-434) The table given below shows the percentage of litrate people in 6 cities. This table shows the ratio of males to females among litrate people.

City (शहर)	% of literate people (शिक्षित लोगों का प्रतिशत)	Males : Females (पुरुष : महिलायें)
City1	80	4 : 5
City2	85	7 : 4
City3	78	3 : 2
City4	63	1 : 1
City5	92	9 : 7
City6	58	2 : 3

% of literate people of any city = (Literate people of the city/ Total population of the city) $\times 100$

431. If the total population of City 4 is 600000, then how many literate people are there in city 4?
(A) 480000   (B) 378000
(C) 468000   (D) 348000

432. Total population of City 6 is 200000 and the total population of City 2 is 220000. What is the respective ratio of literate males of City 2 and literate females of City 6?
(A) 348 : 595   (B) 255 : 199
(C) 595 : 348   (D) 199 : 255

433. If there are 259210 literate females in City 5, then what is the total population of City 5?
(A) 644000   (B) 354200
(C) 690000   (D) 483000

434. The population of the 6 cities are 250000, 200000, 220000, 300000, 150000 and 400000 respectively. Which is the correct order of the number of literate people in these cities?

(A) City 6 > City 1 > City 4 > City 2 > City 3 > City 5

(B) City 4 > City 6 > City 1 > City 2 > City 3 > City 5

(C) City 6 > City 4 > City 1 > City 3 > City 2 > City 5

(D) City 6 > City 1 > City 4 > City 3 > City 2 > City 5

Direction (435-438): The bar chart given below shows the number of audience in a multiscreen theatre for 3 shows.
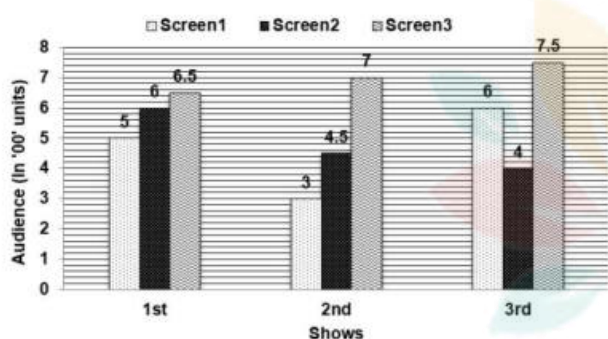
435 - What is the percentage increase in the number of audience in Screen 1 from second show to third how?

(A) 50 (B) 100

(C) 120 (D) 150

436. For the second show the number of audience in Screen 3 is how much more than the number of audience in Screen 1?

(A) 500 (B) 350

(C) 400 (D) 450

437. What is the percentage increase in the total number of audience from second show to third show?

(A) 20.69 (B) 25.13

(C) 22.24 (D) 18.15

438. If the tickets for Screen 1, Screen 2 and Screen 3 are Rs 350, Rs 300 and Rs 250 respectively, hen which screen has the maximum total revenue for three shows?

(A) Screen 1

(B) Screen 1 and Screen 3

(C) Screen 2

(D) Screen 3

Direction (439-442): The table given below shows the ratio of exports and imports of a country foe 5 years.

Total trade = exports + imports

Year (वर्ष)	Exports : Imports (निर्यात : आयात)
Year 1	10 : 9
Year 2	11 : 7
Year 3	4 : 3
Year 4	5 : 8
Year 5	12 : 13

439 - If the total trade of the country in year 3 was 1183 crore dollars, then what was the difference (in crore dollars) between exports and imports of the country in that year?

(A) 169 (B) 173

(C) 142 (D) 158

440 - The total trade for Year 2 and Year 4 is same. If exports of Year 4 are 315 crore dollars, then what are the imports (in crore dollars) of Year 2?

(A) 306.4 (B) 309.8

(C) 323.7 (D) 318.5

441 - Total trade of Year 1 is twice of the total trade of Year 5. If total trade of Year 1 is 5700 crore dollars, then what is the difference (in crore dollars) in exports of Year 1 and Year 5?

(A) 1835 (B) 1632

(C) 1368 (D) 1423

442 - The total trade of 5 years is 3800, 3600, 2800, 3900 and 5000 crore dollars respectively. What is the difference (in crore dollars) in the average exports and average imports respectively?

(A) 60 (B) −60

(C) −90 (D) 120

Direction (443-446) The table given below represents the production and sales of wheat in 4 different countries A, B, C and D over a period of 4 years. At the end of year 2010 A, B, C and D had a stock of 5200, 3500, 7835 and 1956 (in '000' quintals) of wheat respectively. For any given year the stock of wheat is calculated as

Stock of year (n+1) = stock at end of year (n) + production in year (n+1) - sales in year (n+1)

And surplus of year (n) = production in year (n) - sales in year (n)

Year (वर्ष)	Wheat production and sales (in '000' quintals) गेहूँ का उत्पादन और बिक्री ('000 क्विंटल में)							
	Country A देश A		Country B देश B		Country C देश C		Country D देश D	
	Prod. उत्पादन	Sales बिक्री	Prod. उत्पादन	Sales बिक्री	Prod. उत्पादन	Sales बिक्री	Prod. उत्पादन	Sales बिक्री
2011	1218	1413	1881	1798	2035	2247	3126	2417
2012	1554	1783	2067	2389	1821	2018	2987	2911
2013	1671	1641	1328	2063	1937	2563	2143	3188
2014	1103	1002	1578	1239	3014	2988	4126	3563

(A) 122
(B) 131
(C) 143
(D) 158

444 - What is the stock (in '000 quintals) of country C at end of the 4 year period?
(A) 5926
(B) 6213
(C) 6826
(D) 8844

445 - What is the difference (in '000 quintals) in average production and average sales respectively of country C in the given four years?
(A) 252.25
(B) – 415.50
(C) 350.75
(D) 275.25

446 - What can be said about total surplus of country B and country D over the 4 years?
(A) Surplus of B = Surplus of D
(B) Surplus of D > Surplus of B
(C) Surplus of B > Surplus of D
(D) No relation is there

Direction (447-450) The pie chart given below shows the percentage of time taken by different processes in making a car.
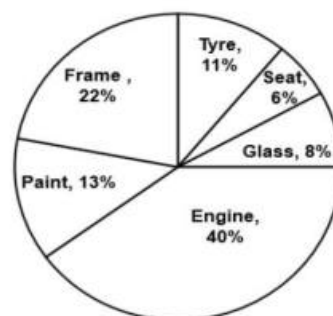
447 - If total time taken to make a car is 300 hours, then what is the total time (in hours) taken in paint and frame?
(A) 99
(B) 72
(C) 105
(D) 66

448. If time taken in seats is 192 hours, then what is the time taken (in hours) in glass?
(A) 256
(B) 352
(C) 416
(D) 278

449 - If total time taken in engine and tyres is 127.5 hours, then what is the difference (in hours) in time taken by frame and glass respectively?
(A) 27.5
(B) 12.5
(C) 40
(D) 35

450 - 15% of total time is spent on quality check and this time is equally taken from all other processes. So what will be the new sectorial angle (in degrees) made by total time of seats and glass?
(A) 28.6
(B) 32.4
(C) 35.8
(D) 31.6

Direction (451-554) The bar chart given below shows the sales of 3 types of cars in the india automotive industry in the four year. All the sales figures have been shown in terms of '000' units.
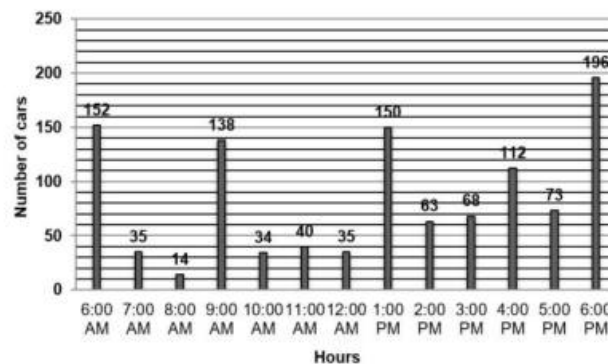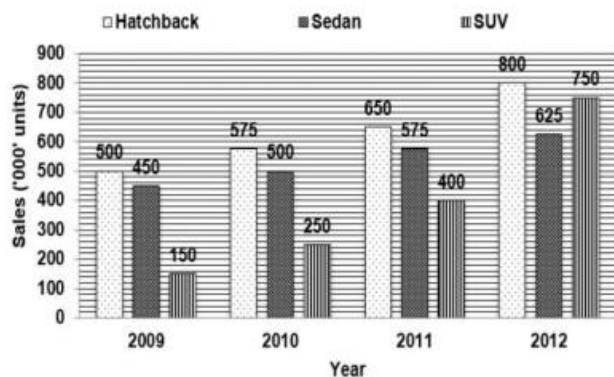
451- Which of the following type of car has the highest increase in sales from 2009 to 2012?
(A) Hatchback
(B) Both SUV and Hatchback
(C) SUV
(D) Sedan

452 – What is the simple annual growth rate (in %) in the sales of SUV from 2009 to 2012?
(A) 90   (B) 100
(C) 133.33   (D) 150

453 – What is the respective ratio of total sales of Sedan and total sales of SUV over the period of 4 years?
(A) 23 : 31   (B) 29 : 39
(C) 43 : 31   (D) 76 : 47

454 – If all the 3 categories increase by same rate in 2013 over 2012 as they did in 2012 over 2011, then what will be the total approximate sales (in '000 units) of all the 3 categories taken together in year 2013?
(A) 2152   (B) 2345
(C) 3069   (D) 3568

Direction(455-458) The bar chart given below shows the number of cars parked in a multi-level arking from 6 am to 6 pm on a given day.

455 – What is the average number (approximately) of cars parked per hour from 6 am to 6 pm on the given day?
(A) 80   (B) 85
(C) 73   (D) 78

456. At what time the percentage change in number of parked cars is the maximum?
(A) 9 am to 10 am   (B) 12 pm to 1 pm
(C) 8 am to 9 am   (D) 6 am to 7 am

457 – For how many hours the number of parked cars is less than the average on the given day?
(A) 5   (B) 8
(C) 6   (D) 7

458 – If the charges of parking are Rs 50 per hour, then what is the total income (in Rs) from 6 am to 6 pm on the given day?
(A) 55500   (B) 50500
(C) 57500   (D) 59500

Direction(459-462) The table given below represents the amount of education loan (in crores) disbursed by 5 banks of a country over 5 years.

Year (वर्ष)	Amount of education loan disbursed (in crores) वितरित शिक्षा ऋण (करोड़ में)				
	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5
2010	265	65	138	109	80
2011	295	118	165	123	103
2012	317	85	195	125	140
2013	323	103	178	142	143
2014	352	122	211	157	158

459. What is the percentage increase in education loan disbursed by Bank 2 from 2010 to 2014?
(A) 85.42 %　　　　(B) 87.69%
(C) 89.21%　　　　(D) 83.18%

460. Which banks show a continuous trend of increase/decrease in loan amount disbursed over 5 years?
(A) Bank 1 and Bank 4
(B) Bank 1, Bank 4 and Bank 3
(C) Bank 1, Bank 4 and Bank 5
(D) Bank 4 and Bank 5

461. What can be said about the two following ratios?
I. Loan amount disbursed by Bank 1 in 2011/ Loan amount disbursed by Bank 2 in 2014
II. Loan amount disbursed by Bank 3 in 2014/ Loan amount disbursed by Bank 4 in 2011
(A) I > II　　　　(B) I < II
(C) I = II　　　　(D) No relation

462. Which of the following is the correct order of percentage increase in loan amount disbursed by the given banks from 2010 to 2014?
(A) Bank 3 > Bank 5 > Bank 2 > Bank 1 > Bank 4
(B) Bank 2 > Bank 3 > Bank 5 > Bank 1 > Bank 4
(C) Bank 5 > Bank 2 > Bank 3 > Bank 4 > Bank 1
(D) Bank 2 > Bank 5 > Bank 4 > Bank 3 > Bank 1

Direction (463-466) The Pie chart 1 given below shows the segregation of 40000000 candidates who have filled the form of an examination. Pie chart 2 shows the segregation 35000000 candidates who were present in the examination. The segregation in both pie charts has been done on the basis of their highest qualification.

Pie Chart 1

MBA 8%, Other 16%, B. Tech 18%, B.com 21%, MBBS 17%, B.A. 20%

Pie Chart 2
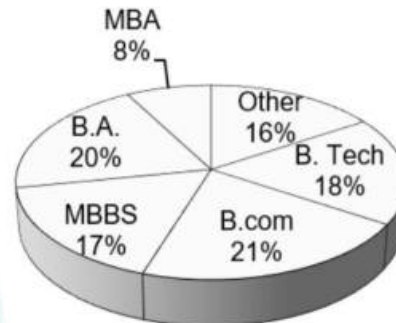
MBA 9%, Other 14%, B. Tech 19%, B.com 22%, MBBS 14%, B.A. 22%
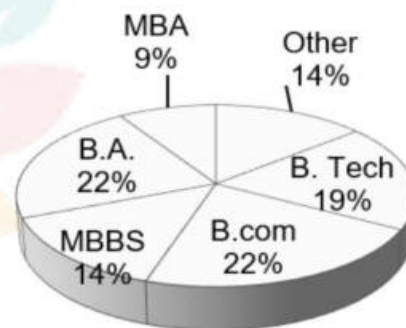
463- If 18% of M.B.B.S. who have filled the form are from XYZ University, then how many M.B.B.S. candidates from XYZ University have filled the form?
(A) 1512000　　　　(B) 1224000
(C) 1440000　　　　(D) None of these

464- What is the absolute difference in the B.Tech. candidates who have filled the form and M.B.A. candidates who were present in the examination?
(A) 3500000　　　　(B) 3000000
(C) 4050000　　　　(D) 4000000

465- 50% of others candidates who have filled the form are from B. Arch. and 45% of others candidates who were present in the exam are from B. Arch. How many B. Arch. candidates did not gave the exam?
(A) 995000　　　　(B) 685000
(C) 430000　　　　(D) 756000

466- Candidates of which qualification accounted for most number of absentees?

(A) B.A.　　　　　(B) Others

(C) B.com.　　　　(D) None of these

Direction (467-470) The line chart given below shows the per acre yield (in million tonnes) of tea of 7 countries.
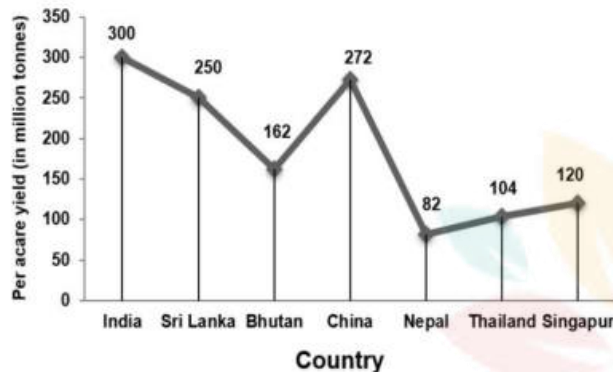
467- What is average per acre yield (in million tonnes) of these 7 countries?

(A) 163.14　　　　(B) 184.28

(C) 146.78　　　　(D) 198.26

468 - What is the respective ratio of average per acre yield of the 3 countries having the highest yield to average per acre yield of the 3 countries having the least yield?

(A) 148 : 65　　　(B) 201 : 149

(C) 89 : 69　　　　(D) 137 : 51

469 - Total per acre yield of India and China is what percent of the total per acre yield of the remaining countries?

(A) 44.34　　　　(B) 56.68

(C) 83.24　　　　(D) 79.66

470 - All the countries are arranged in ascending order of per acre yield. If bottom 2 countries increases their per acre yield by 20% and all other countries increase their per acre yield by 10%, then what is the new average per acre yield (in million tonnes)?

(A) 205.37　　　　(B) 210.82

(C) 201.19　　　　(D) 199.26

Direction (471-474) The bar chart below shows the sales (in '000' units) of 4 mobile brands in 3 years.
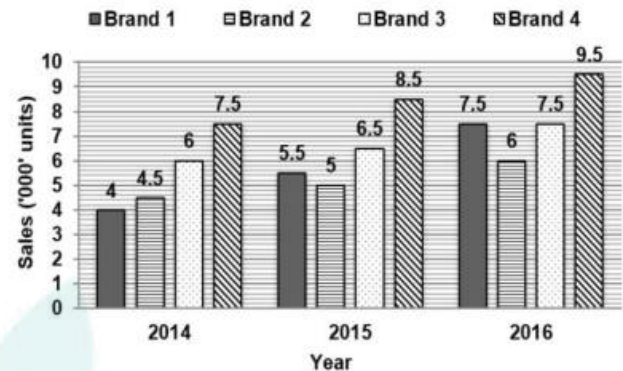

471- What is the percentage increase in number of mobile sold by Brand 2 from 2014 to 2015?

(A) 8.33　　　　(B) 33.33

(C) 37.5　　　　(D) 11.11

472 - What is the percentage increase in the total number of mobiles sold by these four brands from 2014 to 2016?

(A) 42.16　　　　(B) 38.63

(C) 32.43　　　　(D) 30.16

473 - In 2017 the sales of each brand increased by the same percentage as it did in the year 2016. What will be the approximate average sales (in units) of mobiles per brand in year 2017?

(A) 9175　　　　(B) 8360

(C) 9436　　　　(D) 9678

474 - If for any year, the sales of a brand is more than average sales of these four brands in that year, then it gets a star. Which brand has the maximum stars?

(A) Brand 3

(B) Brand 3 and 4 both

(C) Brand 4

(D) All brands

Direction (475-478) The Pie chart given below shows the runs scored by a player against

6 different countries. The total runs scored by the player against these countries are 1600.
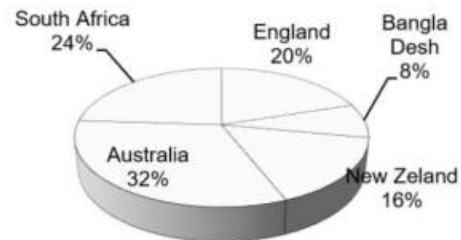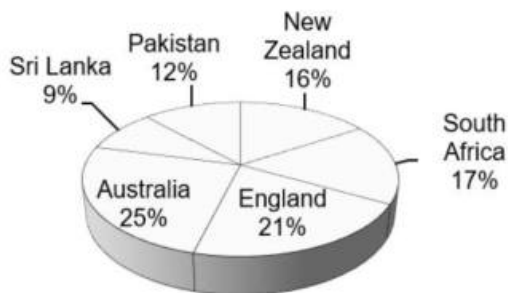
475 - How many runs has the player scored against Pakistan?
(A) 272 (B) 192
(C) 256 (D) 144

476 - The difference between the runs scored against England and Pakistan is same as the difference between which of the following two countries?
(A) South Africa and Sri Lanka
(B) South Africa and New Zealand
(C) Australia and Sri Lanka
(D) Australia and New Zealand

477 - What is the difference in runs scored by the player against Australia and Sri Lanka?
(A) 256 (B) 128
(C) 114 (D) 80

478 - Difference between the total runs scored against Australia and New Zealand and the total runs scored against Sri Lanka and Pakistan make what sectorial angle (in degrees) in the pie chart?
(A) 90 (B) 144
(C) 36 (D) 72

Direction (479-482) The Pie chart given below shows the runs scored by a pujara against team of different countries.

479- The runs scored by Pujara against South Africa is more than runs scored against Bangladesh by what percentage?
(A) 100 (B) 150
(C) 200 (D) 250

480 - If Pujara has scored 1875 runs in total, then what is the difference in runs scored by Pujara against South Africa and New Zealand?
(A) 150 (B) 175
(C) 200 (D) 250

481- What is the sectorial angle (in degrees) made by the runs scored against Australia in the given pie chart?
(A) 106.8 (B) 109.6
(C) 112.4 (D) 115.2

482 - What should be the least number of runs that Pujara must have scored in total (runs can only be integers)?
(A) 25 (B) 225
(C) 375 (D) 625

Direction (483-486) The bar graph shows GDP for the year 2016 in billion USD of six countries (A,B,C,D,E,F) of a regional trade block, study diagram and answer the following questions.
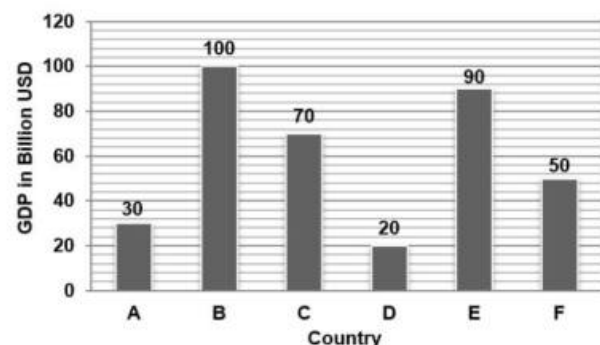
483- Which country is the third biggest in terms of Gross Domestic Product (GDP)?
(A) A
(B) C
(C) E
(D) F

484 - By what amount (in billion USD) is the Gross Domestic Product (GDP) of Country A lesser than that of Country F?
(A) 20
(B) 50
(C) 25
(D) 40

485 - What is the ratio of Gross Domestic Product (GDP) of Country E to Total of GDPs of countries A, C and F taken together?
(A) 3 : 5
(B) 5 : 3
(C) 9 : 5
(D) 5 : 9

486 - If the combined GDP of the six countries has grown by 50% in the last decade, then what was their combined annual Gross Domestic Product (in billion USD) before 10 years?
(A) 540
(B) 180
(C) 240
(D) 200

Direction (487-490) The pie chart shows tickets sold (in 1000s) oer month by six different airlines (A,B,C,D,E,F), study the diagram and answer the following questions.
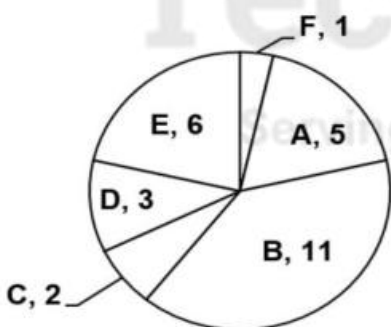
487- Which airline sold the second highest number of tickets?
(A) E
(B) A
(C) B
(D) D

488 - Airline E sold how many more tickets than Airline A?
(A) 25
(B) 16
(C) 20
(D) 10

**489 -** The ratio of tickets sold by Airlines A and D to tickets sold by Airline E is?
(A) 3 : 4
(B) 4 : 3
(C) 2 : 3
(D) 4 : 1

490 - If the price of an airline ticket is Rs 7000 then by what amount, monthly Revenue (in Rs. Millions) from sale of tickets of Airline B is greater than that of Airline E?
(A) 77
(B) 7
(C) 35
(D) 42

Direction (491-494): The line graph shows annual profits in rupees lakhs of a certain company.
From 2011 to 2016. Study the diagram and answer the following questions.
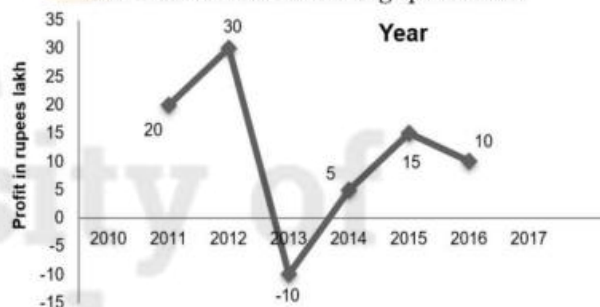
491 - The company reported a loss in which year?
(A) 2013
(B) 2016
(C) 2012
(D) 2014

492 - What is the cumulative profits (in lakh Rs) earned by the company in the given six years?
(A) 80
(B) 70
(C) 90
(D) 100

**493 -** By what value profit in 2012 was more (in %) than the profit of 2011?
(A) 10
(B) 33.33
(C) 50
(D) 40

494 - If the profits are added to the company's reserves and the reserves stood at Rs 150 lakhs at the end of 2015, what were the reserves (in Rs. lakhs) in the beginning of 2012?

(A) 130   (B) 90

(C) 110   (D) 40

Direction (495-498) The bar graph shows annual inflation in two years 2015 and 2016 of four ountries (A,B,C,D),study the diagram and answer the following questions.
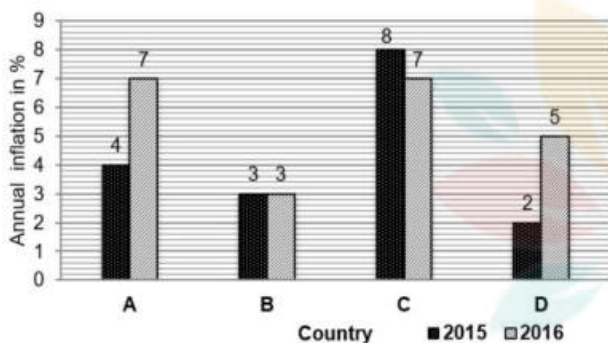

495 - In which country inflation in 2016 was lower than that of the previous year?

(A) C   (B) A

(C) B   (D) D

496 - By what percent inflation in 2016 was greater than the inflation in 2015 in country D?

(A) 60   (B) 100

(C) 150   (D) 120

497 - In the year 2015, what is the ratio of inflation in country C to country A?

(A) 1 : 2   (B) 2 : 3

(C) 3 : 2   (D) 2 : 1

498 - If inflation is measured as increase in price index and the price index was 200 in the beginning of 2015 in country D then what is the index at the end of 2016?

(A) 207   (B) 207.2

(C) 210   (D) 214.2

Direction (499-502) The line graph shows the record of number of admissions to a certain coaching centre from 2011 to 2016. Study the diagram and answer the following questions.
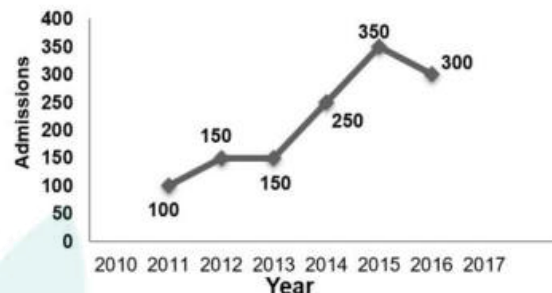

499 - In how many years was the number of admissions greater than that of the previous year?

(A) 2   (B) 3

(C) 1   (D) 4

500 - Ignoring year 2016 how many students took admission in the coaching centre since its inception in the year 2011?

(A) 1300   (B) 1200

(C) 900   (D) 1000

501 - Admissions in the year 2014 grew by _____ percent as compared to the previous year.

(A) 50   (B) 100

(C) 40   (D) 66.67

502 - If fees charged by the coaching centre was Rs 10000 for the first 3 years and Rs 12000 for the next three years then what is the total fees (in Rs. Crores) collected by the coaching centre in the last six years?

(A) 1.48   (B) 1.38

(C) 1.28   (D) 1.18

Direction (503-506) The pie chart shows the annual car production (in millions) of six countries (A,B,C,D,E,F), study the diagram and answer the following questions.

Pie chart: F, 0.2 | E, 0.9 | A, 0.4 | B, 0.8 | C, 0.3 | D, 0.1
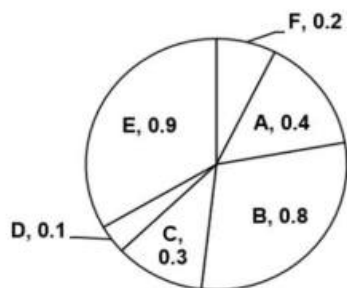
503 - Which country produced the second least number of cars?

(A) D   (B) F

(C) C   (D) A

504 - Country E produced how many more cars (in %) than country B?

(A) 10   (B) 12.5

(C) 11.11   (D) 8

505 - If 35% of the cars produced by these six countries are diesel and the rest are petrol, then how many petrol cars were produced (in millions)?

(A) 1.755   (B) 0.945

(C) 2.7   (D) 1.8

506 - If on an average the cost price of a car is 30000 USD and environmental tax levied on each car is 2.5% of its cost price, how much environmental tax was collected (in billion USD) from production of cars in these 6 countries?

(A) 1.03   (B) 2.03

(C) 3.03   (D) 4.03

Direction (507-510) The line graph shows net exports in million USD of a certain country (Net export = Exports-Imports).Study the diagram and answer the following questions.
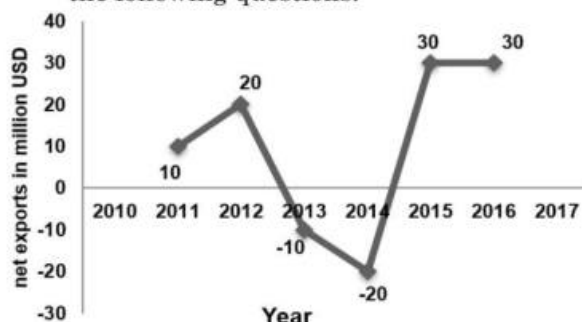
507 - In how many years were the net exports more than that of the previous year?

(A) 1   (B) 3

(C) 4   (D) 2

508 - If the exports in 2013 were 90 million USD then what was the imports (in million USD)?

(A) 80   (B) 110

(C) 70   (D) -100

509 - What is the ratio of net exports in year 2016 to that in year 2012?

(A) 2 : 3   (B) 3 : 1

(C) 1 : 3   (D) 3 : 2

510 - Cumulative net exports (in million USD) from the beginning of 2012 to the end of 2015 was?

(A) 80   (B) 40

(C) 20   (D) 60

Direction (511-514) The bar graph shows revenues in rupees lakhs from selling four different products (A,B,C,D) by a certain company. Study the diagram and answer the following questions.
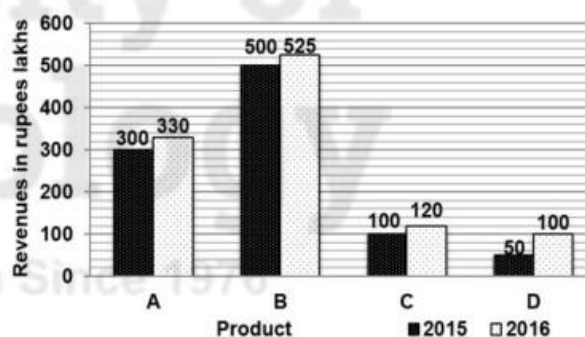
511 - Revenues from which product were the least in both the years 2015 and 2016?

(A) D   (B) A

(C) B   (D) C

512 - By what value (in %) the revenue from sale of product B in 2016 was greater than that of 2015?

(A) 0.5   (B) 5
(C) 25   (D) 2

513 - By what amount (in Rs crore) the total revenue by selling all the four products in 2016 is greater than that of 2015 ?
(A) 1   (B) 0.75
(C) 1.5   (D) 1.25

514 - If the cost of producing and selling the four products was Rs 10 crores each in 2015 and 2016 then what is the cumulative profit (in Rs Lakhs) earned in the years 2015 and 2016?
(A) 75   (B) 25
(C) 50   (D) 100

Direction (515-518) Students from different countries (A,B,C,D,E,F) participated in a certain seminar. The pie chart shows how many students came from each of the six participating countries. Study the diagram and answer the following questions.
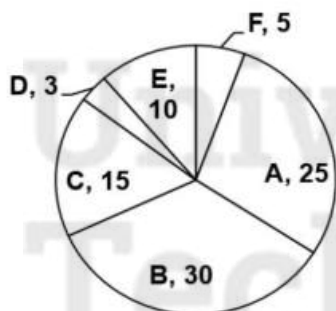
515- The biggest contingent of students was from which country?
(A) A   (B) C
(C) B   (D) D

516 - What is the angular measure (in degrees) of the sector representing Country A?
(A) 100   (B) 25
(C) 50   (D) 120

517 - By what count (in %) students from Country B at the seminar were more than the students from Country E?

(A) 40   (B) 200
(C) 20   (D) 18

518 - If the cost of total spending on transport for the seminar was Rs 9 lakhs and the cost of hosting the students was Rs 15000 per student then what was the ratio of hosting cost of all the students to that of spending on transport?
(A) 2 : 5   (B) 3 : 2
(C) 1 : 1   (D) 1 : 2

Direction (519-522) The Bar graph shows the population density of 6 countries. Study the diagram and answer the following questions.
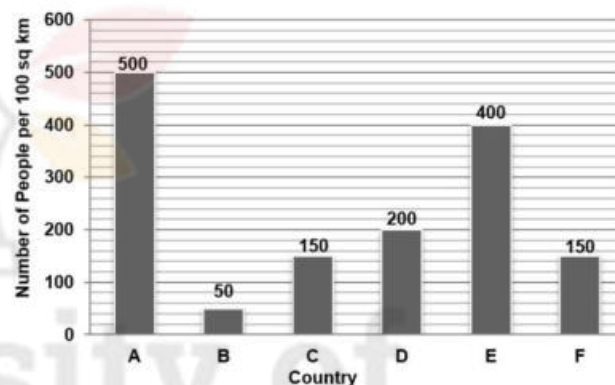
519- What is the ratio of the population density of country C and country D?
(A) 3:4   (B) 4:3
(C) 5:4   (D) 4:5

520- What is the difference in the average number of people living per 1000 sq km in countries E and F ?
(A) 250   (B) 4000
(C) 400   (D) 2500

521- population density of country E is greater than population density of country D by:
(A) 50%   (B) 100%
(C) 200%   (D) 300%

522- If area of country B is 2000000 sq km, what is its population?

(A) 10000000   (B) 2500000
(C) 25000000   (D) 1000000

Direction (523-526) The bar graph shows the internal memory size of 5 different smartphone models (A, B, C, D, E). Study the diagram and answer the following questions.
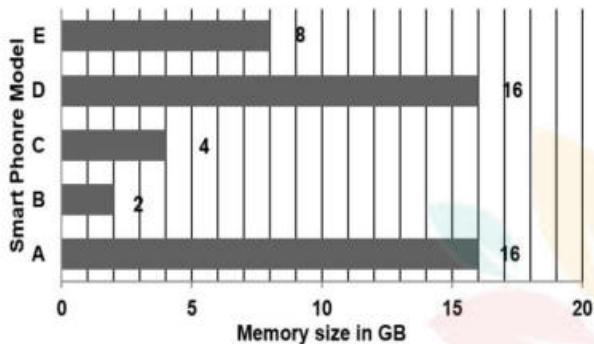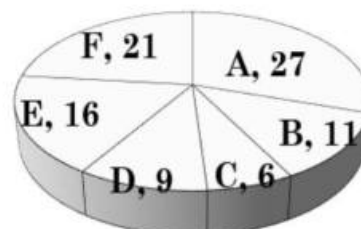

523- Which two models have the same memory size?
(A) E and C   (B) B and D
(C) D and A   (D) A and E

524- Even if memory of model C was doubled it would be lesser (in GB) than that of model A by?
(A) 8   (B) 12
(C) 4   (D) 16

525- even if memory of model D was halved it would be greater (in %) than that of model B by?
(A) 300   (B) 400
(C) 75   (D) 50

526- If price of model E is increased by Rs 12,000 and its memory is doubled the sales remain unchanged. This implies that people are willing to pay Rs _____ per extra GB of memory space.
(A) 1200   (B) 1500
(C) 1000   (D) 800

Direction (527-530) The pie chart shows the breakup in percentages of the various expenses of a company. Study the diagram and answer the following questions.

527- Which is the second biggest expence of the company?
(A) Raw material   (B) Salaries
(C) Transport   (D) Electricity

528- The ratio of company's expenditure on Raw material and Transport to Salaries is:
(A) 2 : 1   (B) 1 : 2
(C) 1 : 2   (D) 3 : 1

529- The company's expenditure on interest is greater than expenditure on rent by
(A) 100%   (B) 50%
(C) 200%   (D) 150%

530- If the total expenses of the company are Rs 50 crores, the total expenditure (in Rs crores) on Transport and Electricity is
(A) 7.5   (B) 12.5
(C) 20   (D) 10

Direction (531-534) The pie chart shows the votes in 1000s polled in favour of six condidates (A, B, C, D, E, F) contesting for a particular seat. Study the diagram and answer the following questions.

531- If Candidate A is disqualified then which candidate will be declared the winner?
(A) E (B) B
(C) F (D) D

532- The winning candidate got how many more votes than the one who came second?
(A) 6000 (B) 5000
(C) 11000 (D) 7000

533- Analysts believe that if candidate E had not stood in the fray then votes that he got would have been equally divided between F and C, then what would have been the result?
(A) A would have lost by 1000 votes
(B) F would have won by 2000 votes
(C) F would have lost by 2000 votes
D) A would have won by 1000 votes

534- If voting attendance was 60% then how many names must be there in the voter list?
(A) 225000 (B) 90000
(C) 144000 (D) 150000

Direction (535-538) The pie chart shows the share of tiger population six Wild life sanctuaries (A, B, C, D, E, F) of a country. Study the diagram and answer the following question.
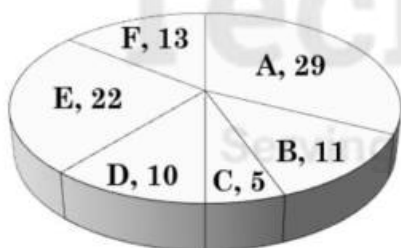
535- Which wild life sanctuary has more tigers than D but less than F?
(A) C (B) A
(C) E (D) B

536- What will be the total number of tigers left in the six sanctuaries, if 3 tigers are killed by poachers in sanctuary E and 9 tigers are added to sanctuary A?
(A) 93 (B) 96
(C) 99 (D) 95

537- What is the ratio of tigers in sanctuaries E and F to that of tigers in sanctuaries D and C?
(A) 3 : 7 (B) 7 : 3
(C) 5 : 2 (D) 2 : 5

538- If the total tiger population in these six sanctuaries had grown by 20% and 25% in the previous two decades, then what was the total tiger population in these six sanctuaries before 20 years?
(A) 135 (B) 150
(C) 60 (D) 45

Direction (539-542) There are six taxi companies (A, B, C, D, E, F) in a certain city. The bar graph shows the number of taxis run by each of these six companies. Study the diagram and answer the following questions.
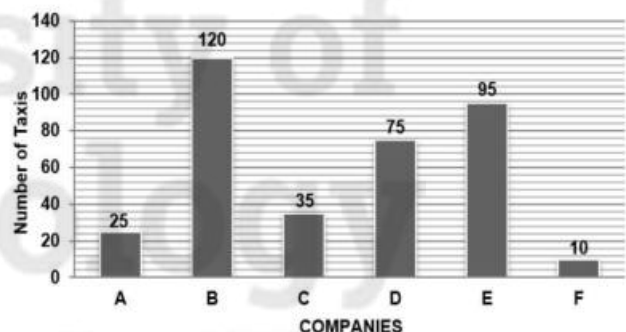
539- Which taxi company has more taxis than A but less than D?
(A) B (B) C
(C) F (D) E

540- If 30 taxis quit company B and joined company D then D will have how many more taxis than C?
(A) 40 (B) 30
(C) 110 (D) 70

541- Even if A and C decide to merge, still D will have how many more taxis (in %) than the merged A and C entity?
(A) 15   (B) 20
(C) 10   (D) 25

542- If each taxi on an average runs 100 kms every day and if fuel cost is Rs 3 per km, then all these taxis spend how much (in Rs.) on fuel every day?
(A) 128000   (B) 108000
(C) 118000   (D) 98000

Direction (543-546) The pie chart shows the shares of 6 partners in a certain company. Study the diagram and answer the following questions.
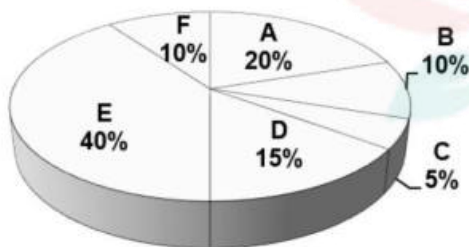
543- Which partner has the lowest share?
(A) C   (B) B
(C) D   (D) F

544- Share of E is equal to the combined shares of
(A) F, A and B   (B) D, C and B
(C) A, B and C   (D) F, C and D

545- Ratio of shares of E and B to those of A, C, D and F is
(A) 1:2   (B) 2:1
(C) 1:1   (D) 1:3

546- If the company earns Rs 20 lakh profit, and decides to distribute half of it to its shareholders, how much does D (in Rs) get?
(A) 15,00,000   (B) 3,00,000
(C) 30,000   (D) 1,50,000

Direction (547-550) The bar graph shows the numbers of employees working in 6 different companies. Study the diagram and answer the following questions.
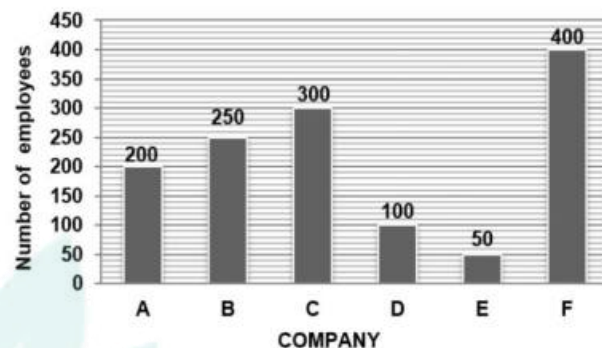
547- What is the difference in the number of employees of company D and company A?
(A) 100   (B) 50
(C) 150   (D) 200

548- If an insurance agent gets to sell policies to all employees of company B, D and F, then how many policies does he sell?
(A) 750   (B) 650
(C) 800   (D) 700

549- Number of employees in company E are lower than those of company B by:
(A) 60%   (B) 80%
(C) 40%   (D) 20%

550- If company B's department which employs 20% of its employees is sold off to company F, then company F will now have how many employees?
(A) 400   (B) 450
(C) 500   (D) 550

Direction (551-554) The bar graph shows the numbers of employees working in 6 different departments (A, B, C, D, E, F) of a certain company. Study the diagram and answer the following questions.
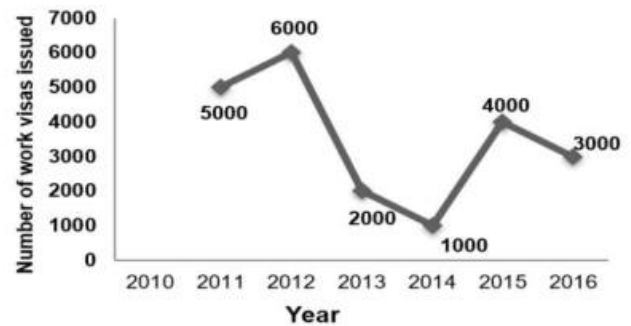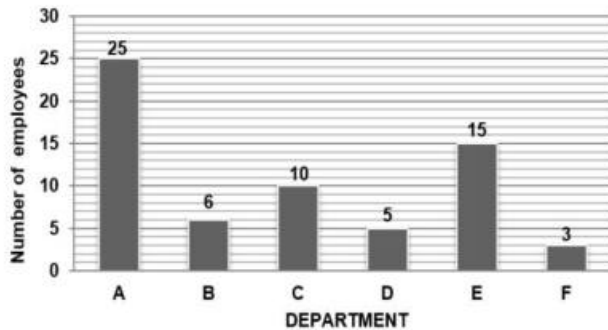
551- Which Department has the second highest number of employees?

(A) E   (B) A

(C) D   (D) F

552- If 5 employees are transferred from department A to department F, then number of employees in department F would be between those of which two departments?

(A) B and C   (B) A and E

(C) B and D   (D) C and E

553- If department F and D are merged to create a new department G, then which department will have the least number of employees?

(A) G   (B) F

(C) D   (D) B

554- If the average salary of these employees is Rs 8,000, then how much was the company's expense (in Rs. Lakhs) towards salaries?

(A) 4.86   (B) 5.12

(C) 3.24   (D) 5.88

Direction (555-558) The line graph shows the number of work visas issued by a country in each year from 2011 to 2016. Study the diagram and answer the following questions.

555- Number of work visas issued were more than those issued in the previous years in how many years?

(A) 1   (B) 3

(C) 4   (D) 2

556- Number of work visas issued in 2016 were lower (in %) than the previous year by?

(A) 20   (B) 100

(C) 50   (D) 25

557- What is the total number of visas issued from 2012 to 2015?

(A) 13000   (B) 18000

(C) 16000   (D) 7000

558- If 10% of people who are issued work visas do not use the visas then how many people from 2011 to 2016 have used the visas?

(A) 19800   (B) 17800

(C) 18700   (D) 18900

Direction (559-562) A survey was conducted to find what genre of movies people liked the most. 1200 people answered the survey. The pie chart shows the results of that survey. The numbers in the pie chart are the ratios. Study the diagram and answer the following questions.
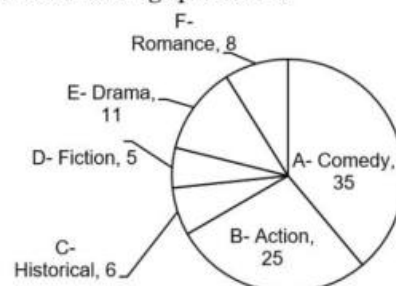
559- Which two genres of movies were liked the least?
(A) Fiction and Historical
(B) Fiction and Drama
(C) Drama and Historical
(D) Drama and Romance

560- How many surveyed said they liked Historical movies?
(A) 6   (B) 72
(C) 80   (D) 60

561- How many more people surveyed like Drama movies than those who like Romance movies?
(A) 3   (B) 36
(C) 40   (D) 30

562- 24% people who were mailed the survey questionnaire answered the survey. The survey questionnaire was mailed to how many people?
(A) 5000   (B) 10000
(C) 1200   (D) 288

Direction (563-566) The bar graph shows box office collections (in crores) of 6 different movies (A, B, C, D, E, F) of a certain company. Study the diagram and answer the following questions.
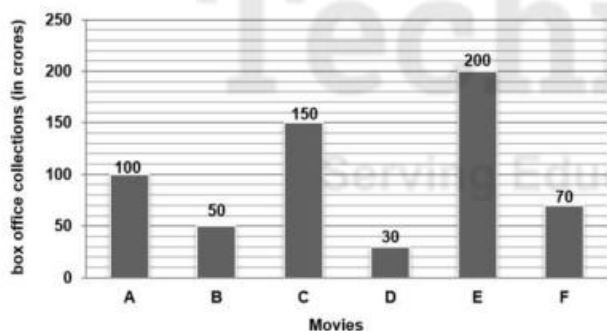
563- Which movie grossed the second highest box office collections?
(A) E   (B) C
(C) B   (D) D

564- By what percent collections of movie D were lower than that of movie B?
(A) 66.67   (B) 40
(C) 20   (D) 60

565- Collection of movie C is equal to the combine collections of which movies?
(A) F, A and D   (B) B, D and F
(C) B and D   (D) A, B and F

566- If the producer gets 60% of the box office collections, how much (in crores) did the producer of the movies A and E gets?
(A) 120   (B) 60
(C) 180   (D) 300

Direction (567-571) The table given below shows the number of applicants who have applied for exam at various centres as percentage of total number of applicants. The table also shows the number online applicants and absent applicants as a percentage of total applicants of each centre. Total number of applicants is 1200000.

Exam Centre परीक्षा केंद्र	Total Aplicants कुल आवेदक	Online Aplicants ऑनलाइन आवेदक	Absent Applicants अनुपस्थित आवेदक
F	15%	30%	36%
G	25%	44%	25%
H	20%	52%	32%
J	24%	46%	18%
K	16%	38%	20%

567. If A equals to 15% of total applicants who are present at exam centre F and B equals to present applicants at exam centre K, then A is what percent of B?
(A) 18.18   (B) 11.25
(C) 13.33   (D) 14.28

568. Total number of offline applicants from exam centre H, K and F are how much less than the total number of present applicants from exam centre G and J?
(A) 111420   (B) 100920
(C) 127370   (D) 109990

569. What are the total number of offline applicants from the exam centre F, H, J and G?
(A) 393720   (B) 963000
(C) 564720   (D) 428540

570. What is the ratio of total number of present applicants from exam centre K to total number of offline applicants from exam centre J?
(A) 40 : 41   (B) 80 : 81
(C) 10 : 9   (D) 7 : 11

571. What are the total number of present applicants from exam centre H and G together?
(A) 238200   (B) 151800
(C) 388200   (D) 442650

Direction (572-576) The table below shows the sales of milk in six different states as a percentage of total sales. In each state only two milkmen A and B sells the milk. The table below shows the sales of salesman A as percentage of total sale of milk in each state. The total sales of milk is 200000 litres.

State/राज्य	Sales of milk दूध की बिक्री	Sales by salesman A विक्रेता A द्वारा बिक्री
P	24%	65%
Q	10%	80%
R	17%	50%
S	13%	70%
T	22%	60%
U	14%	80%

572. What are the average sales of milk (in litres) by the salesmen A in all the given states?
(A) 21866.67   (B) 26466.6
(C) 19200   (D) 26000

573. What is the respective ratio of sales of milk in state P and Q by salesmen B and

the sales of milk in state R and T by salesmen A?
(A) 52 : 109   (B) 104 : 217
(C) 52 : 31   (D) 31 : 57

574. What will be the central angle (in degrees) formed by the average sale of milk in state Q, T and S together?
(A) 112.6   (B) 72
(C) 36   (D) 54

575. What will be difference (in litres) in the sale of milk in state T by salesmen B and the total sale of milk in state R and S together?
(A) 17600   (B) 42400
(C) 38800   (D) 19000

576. What is the difference (in litres) between the sale of milk in state R by salesmen A and the sale of milk in the same state by the salesmen B?
(A) 2000   (B) 0
(C) 12000   (D) 8000

Direction (577-175) The given table shows the number (in percent) of employees working in different departments of an organization. The table also shows the ratio of males and females and the ratio of employees living in city Z and employee living in city Y. The total number of employees in the organization are 80000.

Department विभाग	Number of employees कर्मचारियों की संख्या	Gender लिंग M : F	City शहर Z : Y
A	10%	7 : 3	1 : 9
B	22%	13 : 9	3 : 19
C	12%	1 : 2	5 : 1
D	20%	3 : 2	1 : 3
E	36%	8 : 1	5 : 13

577. How many employees of department A and C together are living in city Z?
(A) 9000   (B) 9200
(C) 8800   (D) 8200

578. Male employees of department E is what percent of the employees living in city Z from department A?
(A) 1600   (B) 2400
(C) 3200   (D) 4200

579. What is the ratio of male employee working in department B and D together to female employee working in department A and E together?
(A) 13 : 8   (B) 25 : 7
(C) 23 : 9   (D) 7 : 9

580. On an average how many residents of city Y are working in each department?
(A) 11360   (B) 12420
(C) 9130   (D) 10940

581. What are the total number of employee in department A and E together?
(A) 29400   (B) 17600
(C) 46400   (D) 36800

Direction (582-586) The table given below shows the information about bats manufactured by 6 different companies. Each company manufactures only plastic and wooden bats. Each company labels these bats as Brand A or Brand B. The table shows the number of plastic bats as a percentage of total bats manufactured by each company. It also shows the ratio of wooden bats labeled A and B. Each company manufactured a total of 550000 bats.

Company कंपनी	Plastic Bats प्लास्टिक के बल्ले	Brand A : Brand B ब्रांड A : ब्रांड B
R	55%	21 : 4
S	70%	8 : 7
T	45%	6 : 19
U	75%	41 : 14
V	60%	7 : 15
W	40%	5 : 6

582. What is the total number of wooden bats of brand A manufactured by company T?
(A) 23420   (B) 22990
(C) 68920   (D) 72600

583. N = Wooden bats of Brand B manufactured by U.
M = Total wooden bats manufactured by R and W together.
What is the value of N/M?
(A) 0.043   (B) 0.061
(C) 0.125   (D) 0.087

584. P = Sum of wooden bats of Brand B manufactured by S and wooden bats of Brand A manufactured by W.
Q = Difference of Brand B wooden bats and Brand A wooden bats manufactured by U.
What is the value P – Q?
(A) 67500   (B) 177700
(C) 159500   (D) 123500

585. Taking all 6 companies together, how many wooden bats of Brand A have been produced?
(A) 691000   (B) 724000
(C) 683000   (D) 716000

586. X = Average of plastic bats manufactured by V, U and T.
Y = Wooden bats of Brand A manufactured by V.
What is the value X – Y?
(A) 197600   (B) 432890
(C) 260000   (D) 293300

Direction (587-591) low shows the number of students who were absent and percentage of students who were present in the given two examinations from five different schools. The table also shows the percentage of students who were present in the Biology and Physics examination respectively.

School विद्यालय	Absent अनुपस्थित	Present (in %) वर्तमान (% में)	Biology (in %) जीवविज्ञान (% में)	Physics (in %) भौतिकी (% में)
K	83300	65	32	68
L	101520	60	29	71
M	113520	40	30	70
N	60830	65	42	58
O	24003	55	25	75

587. What is the difference between the number of students who were present in Physics and Biology examination from school N?

(A) 21150   (B) 14352

(C) 18076   (D) 24250

588. Number of students who were present in Physics examination from school M is what percent of number of students who were absent from school M, L and O?

(A) 22.16   (B) 29.28

(C) 9.09   (D) 13.4

589. What is the average of the number of the students who were present in Physics examination from school N, K and L?

(A) 92946   (B) 84632

(C) 74365   (D) 67894

590. What are the total number of students who were present in the Biology examination from all the schools together?

(A) 171153   (B) 249048

(C) 326438   (D) 211738

591. If the number of students who were present in the Physics examination from school A is 250% of the difference of the number of the students who were present in Physics and Biology examination, from school K, then what is the ratio of the number of students who were present from school L to number of students who were present in Physics examination from school A?

(A) 5079 : 4631   (B) 1692 : 1547

(C) 1547 : 4631   (D) 1692 : 2345

Direction (592-596) The table given below shows the production of maize by 5 different states as a percentage of total production. Each state produces only maize and rice. There are three types of rice R1, R2 and R3. The table also shows the R1 type of rice produced as a percentage of total rice production and the ratio of R2 and R3 type of rice. Total production by each state is 625000.

State राज्य	Maize मक्का	R1	R2 : R3
H	32%	60	6 : 11
R	62%	60	9 : 10
X	52%	60	3 : 5
S	52%	55	4 : 5
T	74%	80	3 : 10

592. What is the difference between the R1 type of rice produced by state X and the R2 type of rice produced by state H?

(A) 115000   (B) 120000

(C) 55000   (D) 65000

593. What is the sum of the total production of maize by state X and T and total production of R2 type of rice by State S and R?

(A) 868500   (B) 1025000

(C) 925000   (D) 892500

594. Production of R3 type of rice by state X is what percentage of production of R1 type of rice by state S?

(A) 45.45   (B) 52.52

(C) 42.5   (D) 39.5

595. A = Average of the R3 type of rice produced by state H, R, S and X together. B = Difference between the R2 type of rice produced by state T and R1 type of rice produced by state R. What is the value of B – A?

(A) 54750   (B) 56750

(C) 57500   (D) 57000

596. F = Total production of R2 type of rice by all the states. K = Average of the total production of R1 type of rice by all the states. What is the value of K/F?

(A) .875

(B) 0.802

(C) 0.08

(D) .702

Solution

1. **Answer: (C)**
    Go through options
    In 2012,
    Required percentage $= \frac{325-250}{250} \times 100$
    $= \frac{75}{250} \times 100$
    $= 30\%$

2. **Answer: (B)**
    Total number of Arts students in 2011, 2013 and 2015 = 275 + 350 + 325 = 950
    Total number of Science students in five years = 225 + 250 + 300 + 280 + 375 = 1430
    Required percentage
    = (1430–950/1430)×100
    = (480/1430)×100
    = 33.6%

3. **Answer: (C)**
    The average number of science students in 2011, 2013 and 2015
    = (225+300+375)/3=300
    Number of arts students in 2011 = 275
    Required percentage
    = (300–275)/275×100
    = 25/275×100
    = $9\frac{1}{11}\%$

4. **Answer: (C)**
    Total number of students of Science in 2011 and 2015 = 225 + 375 = 600
    Total number of students of Arts in 2012 and 2015 = 325 + 325 = 650
    Required ratio = 600 : 650 = 12 : 13

5. **Answer: (A)**
    Average production of motorcycle of compline's B, C and E = 90+135+120 / 3=115 lakhs
    Demand of company D = 125 lakhs
    Required percentage
    = (125–115/125)×100
    = (10/125)×100=8%

6. **Answer: (B)**
    For company C,
    Required percentage
    = (135–110/110)×100
    = 22.7% = 23% (approx)

7. **Answer: (A)**
    The total production of motorcycles of companies B and D = 90 + 140 = 230 lakhs

    Demand of all companies taken together = 100 + 70 + 110 + 125 + 95 = 500 lakhs
    Required percentage = 230/500×100
    = 46%

8. **Answer: (C)**
    Total demand of motorcycles of companies A and D
    = 100 + 125 = 225 lakhs
    The production of motorcycles of company C = 135 lakhs
    Required Ratio = 225 : 135 = 5 : 3

9. **Answer: (A)**
    In year 2015
    Required percentage
    = (360 – 280/280)×100
    = (80 /280)×100=28.5%

10. **Answer: (A)**
    Total average number of students enrolled in B during 2015, 2016, and 2018
    = 360+375+225 / 3 = 320
    The number of students enrolled in A during 2017 = 250
    Required percentage = (320 – 250 / 250)×100 = 28%

11. **Answer: (B)**
    Total number of students enrolled in A during 2014, 2016, and 2018 = 160 + 300 + 260 = 720
    Total number of students enrolled in B during the five years = 225 + 360 + 375 + 325 + 225 = 1510
    Required percentage
    = (720 / 1510)×100
    = 47.7%

12. **Answer: (A)**
    Total number of students enrolled in A during 2015 and 2018 = 280 + 260 = 540
    Total number of students enrolled in B during 2014 and 2016 = 225 + 375 = 600
    Required Ratio
    540 : 600
    9 : 10

13. **Answer: (D)**
    Average Income of the company in five year = (225+280+325+350+350)/5
    =1530/5 = 306
    Required percentage
    = (306–250)/250×100
    = 22.4%

14. **Answer: (A)**

Total income of the company in 2015, 2017 and 2018 = 280 + 350 + 350 = 980

Total expenditure in the five year = 175 + 250 + 275 + 300 + 325 = 1325

Required percentage
= (1325–980)/1325 ×100 = 26%

15. **Answer: (B)**

In 2015

= (250–175)/175)×100

= 42.8%

16. **Answer: (D)**

Total expenditure in 2014, 2016 and 2017
= 175 + 275 + 300 = 750

Total income in 2014, 2016 and 2017 =
225 + 325 + 350 = 900

Required ratio = 750 : 900 = 5 : 6

17. **Answer: (C)**

From the bar graph total exports and imports is highest in 2014-2015

Total exports and imports in year 2014-2015 = 2270

Total exports and imports in year 2013-2014 = 1452

Percentage increase =
$\frac{818}{1452} \times 100 = 56\%$

18. **Answer: (C)**

Total imports in 2013-14, 2015-16 and 2017–18 = 824 + 1137 + 1658 = 3619

Total exports in 2013-14, 2015-16 and 2017–18 = 638 + 1661 + 1305 = 3604

Required ratio
3619 : 3604

19. **Answer: (B)**

Total import and export during the five financial years = 638 + 824 + 1256 + 1014 + 1661 + 1137 + 1538 + 1513 + 1305 + 1658 = 12544

Average = $\frac{12544}{5}$ = 2508.8

20. **Answer: (B)**

From the given bar graph in 2013-14 year total exports and imports is lowest

Exports and imports in year 2013-14 = 638 + 824 = 1462

21. **Answer: (A)**

Clearly in 2016-2017

(Exp) - (Imp) = 1538 – 1513 = 25

Which is the lowest

So, Ans – (i) 2016-2017

22. **Answer: (B)**

Total Export during 2014-15, 2015-16, 2016-17 = 1256 + 1661 + 1538 = 4455

Total Import during 2014-15, 2015-16, 2016-17 = 1014 + 1137 + 1513 = 3,664

So, Required Ratio = 3664 : 4455

23. **Answer: (A)**

Required Average = $\frac{6398-6146}{5}$

= $\frac{252}{5}$ = 50.4

24. **Answer: (D)**

Clearly in the year 2017 – 18 there is a decrease in total imports and exports compared to the previous year i.e. 2016 – 17

as,

(Imp + Exp) 2016-17 = 1538 + 1513
= 3051 tonnes

(Imp + Exp) 2017-18 = 1305 + 1658
= 2963 tonnes

Increase = 88 tonnes

So, Ans is 'd' 2017 – 18.

25. **Answer: (C)**

Total imports during the five financial years = 824 + 1014 + 1137 + 1513 + 1658 = 6146

Total exports during the five financial years = 638 + 1256 + 1661 + 1538 + 1305 = 6398

Required ratio
6146 : 6398
3073 : 3199

26. **Answer: (C)**

From the given bar graph in 2016-2017 total of imports and exports is highest = 1538 + 1513 = 3051

27. **Answer: (B)**

From the given bar graph in year 2016-2017 is highest increase in import

Percentage increase
= $\frac{1513-1137}{1137} \times 100$
= $\frac{376}{1137} \times 100 = 33\%$

28. **Answer: (A)**

Total export during the financial years = 638 + 1256 + 1661 + 1538 + 1305 = 6398

Average = 6398/5 = 1279.6

29. **Answer: (C)**

Total number of students from school A = 640 + 800 + 500 + 700 + 900 + 750 = 4290

Average = $\frac{4290}{6}$ = 715

30. **Answer: (C)**

From the given bar graph the absolute difference of the students in two school is lowest in 2009 = 820 – 800 = 20

31. Answer: (C)
From the given bar graph
Highest percentage increase of students in school A in 2011
$= \frac{700-500}{500} \times 100 = 40\%$

32. Answer: (C)
Total number of students in A = 640 + 800 + 500 + 700 + 900 + 750 = 4290
Total number of students in B = 550 + 820 + 600 + 750 + 500 + 480 = 3700
Required ratio
4290 : 3700
429 : 370

33. Answer: (C)
Total students in School A = 640 + 800 + 500 + 700 + 900 + 750 = 4290
Total students in School B = 550 + 820 + 600 + 750 + 500 + 480 = 3700
Average students in school A and B
$= \frac{4290+3700}{6} = 1331.67$

34. Answer: (A)
Total number of students for the years 2008, 2012 and 2013 in A = 640 + 900 + 750 = 2290
Total number of students for the years 2008, 2012 and 2013 in B = 550 + 500 + 480 = 1530
Required ratio
2290 : 1530
229 : 153

35. Answer: (D)
From the given bar graph the highest percentage increase in student is in 2009
=
$\frac{1620-1190}{1190} \times 100 = 36.13\%$

36. Answer: (A)
From the given bar graph the highest sum of students is in 2009
= 800 + 820 = 1620

37. Answer: (C)
From the gives bar graph the highest absolute difference b/w the number of students in two school is 2012
= 900 – 500 = 400

38. Answer: (A)
The number of students in school A = 640 + 800 + 500 + 700 + 900 + 750 = 4290
The number of students in school B = 550 + 820 + 600 + 750 + 500 + 480 = 3700

Required ratio
School B : school A
3700 : 4290
370 : 429

39. Answer: (B)
Total number of students from school B = 550 + 820 + 600 + 750 + 500 + 480 = 3700
Average $= \frac{3700}{6}$
= 616.67

40. Answer: (C)
From the given bar graph in 2009 highest increase in students is B
$= \frac{820-550}{550} \times 100$
= 49.9%

41. Answer: (C)
Total sales by all branch for the year 2000 = 80 + 75 + 95 + 85 + 75 + 70 = 480
Total sales by all branch for the year 2001 = 105 + 65 + 110 + 95 + 95 + 80 = 550
Required ratio
550 : 480
55 : 48

42. Answer: (D)
Total sale by all branch for the year 2000 and 2001 = 1030
Average = 1030/6 =171.67

43. Answer: (B)
Total sales by branches B1, B3 and B5 = 80 + 105 + 95 + 110 + 75 + 95 = 560
Total sales by branches B2, B4 and B6 = 75 + 65 + 85 + 95 + 70 + 80 = 470
Required ratio
560 : 470
56 : 47

44. Answer: (D)
Total sales by B1 branch for 2000 and 2001 = 80 + 105 = 185
Total sales by B2 branch for 2000 and 2001 = 75 + 65 = 140
Total sales by B3 branch for 2000 and 2001 = 95 + 110 = 205
Total sales by B4 branch for 2000 and 2001 = 85 + 95 = 180
Total sales by B5 branch for 2000 and 2001 = 75 + 95 = 170
Total sales by B6 branch for 2000 and 2001 = 70 + 80 = 150
Total sales by all branch for both the years = 185 + 140 + 205 + 180 + 170 + 150 = 1030

45. Answer: (B)
For January $\left(\frac{B}{A+C}\right) = \frac{9}{18} = \frac{1}{2} = 0.5|$

For February $\left(\frac{B}{A+C}\right) = \frac{7}{11} = 0.63$

For March $\left(\frac{B}{A+C}\right) = \frac{9}{16} = 0.56$

For April $\left(\frac{B}{A+C}\right) = \frac{11}{18} = 0.61$

Arranging the values in Ascending order we get.

0.5, 0.56, 0.61, 0.63 that is January, March, April, February

46. **Answer: (D)**

Clearly,

Required ratio $= \frac{2 \times 5}{7 \times 3} = \frac{10}{21}$

47. **Answer: (A)**

Average sale per month by A during January February March, 2018

$= \frac{8+6+8}{3} \times 1000 kg$

$= \frac{22000}{3}$

$= 7333.33$ kg

48. **Answer: (D)**

B average $= \frac{9+9+7+11}{4} \times 1000 kg$

$= 9000 kg$

C average $= \frac{10+5+8+9}{4} \times 1000 kg$

$= 32/4 \times 1000$

$= 8000 kg$

So, B average – C average = 1000 kg

So B average is more than C average by 1000kg

49. **Answer: (B)**

Total number of student during five year = 250 + 300 + 350 + 350 + 400 = 1650

Number of student who failed during five year = 100 + 100 + 50 + 100 + 100 = 450

Failed percentage = (450/1650)×100 = 27.27%

= 27% (approx)

50. **Answer: (D)**

Total number of students who passed in five years = 150 + 200 + 300 + 250 + 300

Average = 1200/5 = 240

51. **Answer: (A)**

From the given bar graph the difference between the number of students passed and that of these failed is lowest in = 2013-14

= 150 –100 = 50

52. **Answer: (A)**

From the given bar graph in 2016-17 year the total number of student in lowest = (350–350/350)×100 = 0%

53. **Answer: (A)**

From the chart

Profit percentage in Y2 = 25%

Expenditure = Rs. 40000

Profit percentage

=[(Revenue – Expenditure)/Expenditure] × 100

25 = [(Revenue – 40000)/40000] × 100

⇒ Revenue – 40000 = 25 × 400

⇒ Revenue = 10000 + 40000

⇒ Revenue = 50000

54. **Answer: (B)**

From the chart

Profit percentage in Y5 = 20%

Revenue = Rs. 96000

Profit percentage

=[(Revenue – Expenditure)/Expenditure] × 100

20= [(96000 - Expenditure)/Expenditure] × 100

0.20 × Expenditure = 96000 – Expenditure

⇒ 1.20 × Expenditure = 96000

⇒ Expenditure = 96000/1.20 = 80000

55. **Answer: (C)**

From the chart

In the year Y1

Profit percentage = 20%

Expenditure = Rs. 40000

Profit percentage = [(Profit)/Expenditure] × 100

20 = [(Profit)/40000] × 100

⇒ Profit = 20 × 400

⇒ Profit = 8000

From the chart

In the year Y4

Profit percentage = 12%

Expenditure = Rs. 60000

Profit percentage = [(Profit)/Expenditure] × 100

12 = [(Profit)/60000] × 100

⇒ Profit = 12 × 600

⇒ Profit = 7200

∴ Total profit (in Rs) of Y1 and Y4 = Rs. 8000 + Rs. 7200 = Rs. 15200

56. **Answer: (D)**

From the chart

In the year Y3

Profit percentage = 10%

Expenditure = Rs. 100000

Profit percentage = [(Revenue – Expenditure)/Expenditure] × 100

10 = [(Revenue – 100000)/100000] × 100

⇒ Revenue – 100000 = 10 × 1000

⇒ Revenue = 10000 + 100000

⇒ Revenue = 110000

From the chart

In the year Y6

Profit percentage = 18%

Expenditure = Rs. 200000

Profit percentage = [(Revenue – Expenditure)/Expenditure] × 100

18 = [(Revenue – 200000)/200000] × 100

⇒ Revenue – 200000 = 18 × 2000

⇒ Revenue = 36000 + 200000

⇒ Revenue = 236000

∴ Average revenue

= (110000 + 236000)/2

= 346000/2

= 173000

57. **Answer: (B)**

In 2000, college in Delhi = 150

College in Mumbai = 50

Percent = $\frac{Delhi - Mumbai}{Mumbai} \times 100$

= $\frac{150-50}{50} \times 100 = \frac{100}{50} \times 100 = 200\%$

58. **Answer: (D)**

Total colleges in Mumbai

= 50 + 60 + 62 + 65 + 70 = 307

59. **Answer: (C)**

Average Number of colleges in Delhi in 5 years = $\frac{150+170+182+192+193}{5}$

= $\frac{885}{5} = 177$

60. **Answer: (A)**

In Delhi,

Number of colleges in 2002 = 180

Number of colleges in 2000 = 150

Percent = $\frac{180}{150} \times 100 = 120\%$

61. **Answer: (A)**

Average of 10 innings

= $\frac{108+65+13+113+78+109+72+57+104+106}{10}$

= $\frac{825}{10} = 82.5$

So, we can see in 1st, 4th, 6th, 9th & 10th innings he has stored more than has average.

62. **Answer: (B)**

Runs scored in innings 1 = 108

Runs scored in inning s 5 = 78

Required percentage

= $\frac{108}{78} \times 100\% = 138.46\%$

63. **Answer: (B)**

Average runs per innings, as calculated in solution of question 22 is 82.5

64. **Answer: (D)**

S1 = 108 + 65 + 13 + 113 + 78 = 377

S2 = 109 + 72 + 57 + 104 + 106 = 448

S2 - S1 = 448 - 377 = 71

65. **Answer: (A)**

Selling price of 2kg of item A from shop 2 = 12 × 2 = Rs. 24

Selling price of 2kg of item B from shop 2 = 10 × 2 = Rs. 20

Selling price of 2kg of item C from shop 2 = 12 × 2 = Rs. 24

Selling price of 2kg of item D from shop 2 = 20 × 2 = Rs. 40

Total selling price = 12 + 10 + 12 + 20 = Rs. 108

66. **Answer: (C)**

Selling price of 3kg of item A from shop 1 = 10 × 3 = Rs. 30

Selling price of 3kg of item A from shop 2 = 12 × 3 = Rs. 36

Selling price of 3kg of item A from shop 3 = 14 × 3 = Rs. 42

Selling price of 3kg of item A from shop 4 = 11 × 3 = Rs. 33

Selling price of 3kg of item A from shop 5 = 13 × 3 = Rs. 39

Total selling price = 30 + 36 + 42 + 33 + 39 = Rs. 180

67. **Answer: (B)**

Average selling price = Sum of price of item from all shops/ Total number of shops

Total number of shops = 5

Average selling price of item C = (18 + 12 + 14 + 15 + 17)/5 = Rs. 15.20

68. **Answer: (C)**

Selling price of all items from shop 1 = 10 + 21 + 18 + 20 = Rs. 69

Selling price of all items from shop 2 = 12 + 20 + 12 + 20 = Rs. 64

Selling price of all items from shop 3 = 14 + 22 + 14 + 19 = Rs. 69

Selling price of all items from shop 4 = 11 + 21 + 15 + 19 = Rs. 66

Selling price of all items from shop 5 = 13 + 21 + 17 + 20 = Rs. 71

The least selling price is from shop 2

69. **Answer: (B)**

The sum of number of flights in 6 years = 8200 + 11900 + 13200 + 15500 + 16200 + 18400 = 83400

Average = 83400/6 = 13900

70. **Answer: (B)**

From Bar graph,

Increase from Y_1 to Y_2 = 11900 - 8200 = 3700

Increase from Y_2 to Y_3 = 13200 - 11900 = 1300

Increase from Y_3 to Y_4 = 15500 - 13200 = 2300

Increase from Y_4 to Y_5 = 16200 - 15500 = 700

Increase from Y_5 to Y_6 = 18400 - 16200 = 2200

Hence, the maximum increase in number of flights in year Y_2 = 3700

71. **Answer: (A)**

Number of flights in Y_6 = 18400

Number of flights in Y_1 = 8200

Difference = 18400 - 8200 = 10200

% Increase = (10200 × 100)/8200 = 124.4%

72. **Answer: (D)**

Number of flights in Y_2 = 11900

Number of flights in Y_5 = 16200

⇒ Number of flights of Y_2 = x% of Number of flights of Y_5

⇒ 11900 = 16200x/100

⇒ x = (11900 × 100)/16200

⇒ x = 73.45%

73. **Answer: (B)**

Average cost of journey to time A = (cost of train 1 + cost of train 2 + cost of train 3 + cost of train 4)/4

Average cost of journey to time A = (4300 + 3100 + 4000 + 6000)/4 = Rs. 4350

74. **Answer: (C)**

We can observe from the table that cost is least in train 2 when going to C

75. **Answer: (A)**

Least cost of journey from Delhi to town A = 3100 when traveling by train 2

Least cost of journey from Delhi to town D = 3200 when traveling by train 2

Total least cost of journey from Delhi to town A and Delhi to town D = 3100 + 3200 = Rs. 6300

76. **Answer: (A)**

Maximum cost of traveling from Delhi to town A = 6000 when traveling by train 4

Maximum cost of traveling from Delhi to town B = 6300 when traveling by train 4

Maximum cost of traveling from Delhi to town C = 5600 when traveling by train 4

Maximum cost of traveling from Delhi to town D = 5700 when traveling by train 4

Maximum cost of traveling from Delhi to all cities = 6000 + 6300 + 5600 + 5700 = Rs. 23600

77. **Answer: (C)**

The sum of import of soybean for all the years = 120 + 340 + 708 + 225 + 390 + 720 = 2503

Average = 2503/6 = 417.16

78. **Answer: (B)**

The import of soybean in the year 2011 = 120 quintals

The import of soybean in the year 2012 = 340 quintals

Percentage increase = (340 - 120) × 100/120 = 183.33%

79. **Answer: (D)**

The average import of soybean for all the years = 417.16

The import of soybean for 2011 = 120 quintals

The import of soybean for 2012 = 340 quintals

The import of soybean for 2013 = 708 quintals

The import of soybean for 2014 = 225 quintals

The import of soybean for 2015 = 390 quintals

The import of soybean for 2016 = 720 quintals

In 2013 and 2016, the import of soybean is more than the average import.

80.   **Answer: (C)**

The import of soybean for 2015 = 390 quintals

The import of soybean for 2012 = 340 quintals

Required % = $\frac{390}{340} \times 100 = 114.7\%$

81.   **Answer: (A)**

Given,

Sales of company A in November = 105 crores

Sales of company B in November = 100 crores

Let sales of company A in November be m% more than sales of company B in November.

Sales of company A = sales of company B + sales of company B × (m/100)

⇒ 105 = 100 + 100 × (m/100)

⇒ 105 = 100 + m

⇒ m = 105 - 100

⇒ m = 5

∴ The sales of company A in November be 5% more than sales of company B in November

82.   **Answer: (A)**

From above chart

Sales of company B in September = 170 crores

Sales of company B in October = 170 crores

∴ From above sales of company B is same for September and October.

83.   **Answer: (A)**

Sales of company B in July, August, September, October, November and December is 110, 103, 170, 170, 100 and 205 crores respectively.

Total sales of company in given six months =

= 110 + 103 + 170 + 170 + 100 + 205

= 858

Average sale of company B in the given six months = 858/6

= 143

∴ Average sale of company B in the given six months = Rs.143 crores.

84.   **Answer: (B)**

Given,

Sales of company A in July, August, September, October, November and December is 112, 125, 130, 145, 105 and 175 crores respectively.

Sales of company B in July, August, September, October, November and December is 110, 103, 170, 170, 100 and 205 crores respectively.

From above data,

∴ For September, October and December months sales of company B is more than the sales of company A.

85.   **Answer: (B)**

Average number of students from year 2000 to 2002 = (number of student in 2000 + number of students in 2001 + number of students in 2002)/3

⇒ Average number of students from year 2000 to 2002 = (1000+1200+1400)/3= 1200

86.   **Answer: (A)**

Total number of students in year 2002 and 2003 = number of students in 2002 + number of students in 2003

Total number of students in year 2002 and 2003 = 1400 + 1500 = 2900

87.   **Answer: (D)**

Difference between the total number of students in year 2004 and 2000 = (number of students in year 2004) - (number of students in year 2000)

Difference between the total number of students in year 2004 and 2000 = 1600 - 1000 = 600

88.   **Answer: (C)**

Difference between the total number of students in year 2003 and 2000 = 1500 - 1000 = 500

Percentage difference in number of students = (500 × 100)/1000 = 50%

89. **Answer: (D)**

Total sale of company A from 2010 to 2015
= 150+120+360+400+450+400 = 1880

∴ Average sale = 1880/6 crores
= 313.33 crores

90. **Answer: (B)**

From the bar graph,

Only in the years 2010 and 2014 sale of company A is greater than that of B.

∴ In 2 years sale of company A is greater than that of company B.

91. **Answer: (C)**

Sale of company B in 2011 = 150 crores

Sale of company B in 2012 = 375 crores

Change in sale of company B from year 2011 to 2012

= (375 - 150) crores = 225 crores

∴ Required percentage
= (225/150) × 100 = 150%

92. **Answer: (D)**

Sale of company A in 2012 = 360 crores

Sale of company B in 2015 = 500 crores

∴ Required difference = 500 crores - 360 crores = 140 crores

93. **Answer:(C)**

Total no. of bikes by D company
$= \frac{2}{3} \times 300000 = 200000$

Total no. of car of C_1 type by G company
$= \frac{2}{6} \times \frac{3}{4} \times 400000 = 100000$

% of bike to C_1 type car $= \frac{200000}{100000} \times 100 = 200\%$

94. **Answer: (D)**

Average of C_1 car by all company =

$$= \frac{\overset{D}{\frac{2}{10} \times \frac{1}{3} \times 300000} + \overset{E}{\frac{1}{3} \times \frac{3}{4} \times 280000} + \overset{F}{\frac{2}{4} \times \frac{1}{2} \times 320000} + \overset{G}{\frac{2}{6} \times \frac{3}{4} \times 400000} + \overset{D}{\frac{1}{4} \times \frac{1}{3} \times 480000}}{5}$$

$$\Rightarrow \frac{20000+70000+80000+100000+40000}{5}$$

$\Rightarrow 62000$

95. **Answer: (B)**

Total no. of C_3 type car by E & G company
$= \frac{1}{3} \times \frac{3}{4} \times 280000 + \frac{1}{6} \times \frac{3}{4} \times 400000 = 120000 \ldots(i)$

Total no. of bike of B_1 type by H company
$= \frac{2}{8} \times \frac{2}{3} \times 480000$
$= 80000 \ldots(ii)$

Subtract (i) from eqn. (ii)

Difference = 120000 – 80000 = 40000

96. **Answer: (C)**

H = total no. of B_2 bike by all company

$= \overset{D}{\frac{2}{5} \times \frac{2}{3} \times 300000} + \overset{E}{\frac{3}{7} \times \frac{1}{4} \times 280000}$

$+ \overset{F}{\frac{1}{4} \times \frac{1}{2} \times 32000} + \overset{G}{\frac{2}{5} \times \frac{1}{4} \times 40000} + \overset{H}{\frac{1}{8} \times \frac{2}{3} \times 480000}$

H ⇒ 80000 + 30000 + 40000 + 40000 + 40000

H = 230000

R = Total no. of C_1 car by F, G & D company

$= \frac{2}{4} \times \frac{1}{2} \times 320000 + \frac{2}{6} \times \frac{3}{4} \times 400000 + \frac{2}{10} \times \frac{1}{3} \times 300000$

= 80000 + 100000 + 20000

= 200000

$\frac{H}{R} = \frac{230000}{200000} = 1.15$

97. **Answer: (B)**

Number of customers in complex B in March = 20 Thousand

Number of customers in complex B in April = 28 Thousand

∴ Increase percentage = [(28 - 20)/20] × 100% = 40%

98. **Answer: (B)**

In January, difference between number of customers in 2 complexes
= (22 - 20) Thousands = 2 Thousand

In February, difference between no of customers in 2 complexes
= (25 - 24) Thousands = 1 Thousand

In March, difference between no of customers in 2 complexes
= (20 - 15) Thousands = 5 Thousand

In April, difference between no of customers in 2 complexes
= (28 - 25) Thousands = 2 Thousand

In May, difference between no of customers in 2 complexes
= (20 - 14) Thousands = 6 Thousand

In June, difference between no of customers in 2 complexes
= (20 - 15) Thousands = 5 Thousand

Difference between number of customers in 2 complexes is maximum in May and this difference is 6 thousand

99.   Answer: (B)

Customers in complex A in April = 25 Thousand

Customers in complex B in April = 28 Thousand

∴ Total number of customers in 2 complexes

= (25 + 28) thousand

= 53 thousand

100. Answer: (C)

Customers in complex B in February = 24 Thousand

Customers in complex B in March = 20 Thousand

Customers in complex B in April = 28 Thousand

Customers in complex B in May = 20 Thousand

∴ Total number of customers in B from February to May

= (24 + 20 + 28 + 20) Thousand = 92 Thousand

∴ Average number of customers

= (92/4) Thousand per year

= 23 thousand per year

101. Answer: (C)

⇒ Sale of company P in 2010 = 300 crore

⇒ Sale of company P in 2014 = 350 crore

⇒ Difference in sale from 2010 to 2014 = 350 - 300 = 50

⇒ Percentage Changes = (50 / 300) × 100

∴ Percentage Changes = 16.67%

102. Answer: (B)

⇒ Sale of company P in 2009 = 200 crore

⇒ Sale of company P in 2010 = 300 crore

⇒ Sale of company P in 2011 = 400 crore

⇒ Sale of company P in 2012 = 330 crore

⇒ Sale of company P in 2013 = 450 crore

⇒ Total sale of P from year 2009 to 2013 = 200 + 300 + 400 + 330 + 450 = 1680

⇒ Average sale from year 2009 to 2013 = 1680/5

∴ Average sale from year 2009 to 2013 = 336 crore

103. Answer: (C)

⇒ from graph it is clear that in 2011, 2013, 2014, 2015 company P has more sales than that in 2012

∴ For 4 years, sales is more than that in year 2012

104. SAnswer: (D)

⇒ Sale of company P in 2009 = 200 crore

⇒ Sale of company P in 2013 = 450 crore

⇒ Difference in sales from 2009 to 2013 = 450 - 200 = 250

⇒ Percentage Changes = (250/200) × 100

∴ Percentage Changes = 125%

105. Answer: (A)

The average difference of the number of students in school A and B in the given period =

[(428 − 392) + (442 − 410) + (480 − 423) + (436 − 428) + (465 − 456) + (452 − 450)]/6 = 144/6 = 24

106. Answer: (B)

The difference between the numbers of students in both schools in the year 2010 = 428 − 392 = 36

The difference between the numbers of students in both schools in the year 2011 = 442 − 410 = 32

The difference between the numbers of students in both schools in the year 2012 = 480 − 423 = 57

The difference between the numbers of students in both schools in the year 2013 = 436 − 428 = 8

The difference between the numbers of students in both schools in the year 2014 = 465 − 456 = 9

The difference between the numbers of students in both schools in the year 2015 = 452 − 450 = 2

∴ The difference between the numbers of students in both schools is maximum in the year 2012

107. Answer: (C)

Given,

Total student intake capacity for School B = 500

Percentage of seats remained vacant in school B in 2015 = [(500 − 450)/500] × 100 = 10%

108. **Answer: (A)**

Average number of students in school B = (392 + 410 + 423 + 428 + 456 + 450)/6 = 426.5

In all the years the number of students in school A is greater than the average number of students in school B.

∴ Number of years for which the number of students in school A was less than the average number of students in school B = 0

109. **Answer: (A)**

Sum of student in college B = 784 + 820 + 846 + 856 + 912 + 900 = 5118

Average of student in college B = 5118/6 = 853

Number of students in college A in 2010 = 856 > 853

Number of students in college A in 2011 = 884 > 853

Number of students in college A in 2012 = 960 > 853

Number of students in college A in 2013 = 872 > 853

Number of students in college A in 2014 = 930 > 853

Number of students in college A in 2015 = 904 > 853

Hence, the number of students in college A is less than the average number of students in college B across all the years = 0

110. **Answer: (B)**

Total capacity = 1000

Seats vacant = 1000 - 900 = 100

%vacant = (100 × 100)/1000 = 10%

111. **Answer: (B)**

Difference in 2010 = 856 - 784 = 72

Difference in 2011 = 884 - 820 = 64

Difference in 2012 = 960 - 846 = 114

Difference in 2013 = 872 - 856 = 16

Difference in 2014 = 930 - 912 = 18

Difference in 2015 = 904 - 900 = 4

Hence, the difference between the number of students in both colleges is maximum in 2012.

112. **Answer: (B)**

Sum of student in college A = 856 + 884 + 960 + 872 + 930 + 904 = 5406

Average of student in college A = 5406/6 = 901

Sum of student in college B = 784 + 820 + 846 + 856 + 912 + 900 = 5118

Average of student in college B = 5118/6 = 853

Difference of average = 901 - 853 = 48

113. **Answer: (B)**

⇒ Total cultivation area = 3000 acres

⇒ Cultivation area for Maize = 17% of total cultivation area

⇒ Cultivation area for Maize = 17% of 3000

⇒ Cultivation area for Maize = 510 Acre

114. **Answer: (A)**

⇒ Total cultivation area = 3000 acres

⇒ Cultivation area for Rice = 40% of total cultivation area

⇒ Cultivation area for Barley = 15% of total cultivation area

⇒ Cultivation area for Rice and Barley = (40 + 15)% of total cultivation area

⇒ Cultivation area for Rice and Barley = 55% of 3000

∴ Cultivation area for Rice and Barley = 1650 Acre

115. **Answer: (D)**

⇒ Total cultivation area = 3000 acres

⇒ Cultivation area for Jowar = 5% of total cultivation area

⇒ Cultivation area for Maize = 17% of total cultivation area

⇒ Cultivation area for Wheat = 10% of total cultivation area

⇒ Cultivation area for Jowar, Maize and Wheat = (5 + 17 + 10) % of total cultivation area

⇒ Cultivation area for Jowar, Maize and Wheat = 32% of 3000

∴ Cultivation area for Jowar, Maize and Wheat = 960 Acre

116. **Answer: (C)**

⇒ Total cultivation area = 3000 acres

⇒ Cultivation area for Bajra = 10% of total cultivation area

⇒ Cultivation area for Maize = 17% of total cultivation area

⇒ Cultivation area for Bajra and Maize = (10 + 17) % of total cultivation area

⇒ Cultivation area for Bajra and Maize = 27% of 3000

∴ Cultivation area for Bajra and Maize = 810 Acre

117. **Answer: (A)**

Export in year 2013 = 125 Lacs

∴ Required percentage of change

$= \frac{Export\ in\ 2012 - Export\ in\ 2013}{Export\ in\ 2012} \times 100\%$

$= \frac{150 - 125}{150} \times 100\%$

$= \frac{25}{150} \times 100\%$

$= \frac{1}{6} \times 100\%$

$= 16.66\%$

118. **Answer: (B)**

It is seen that in the years 2012, 2013, 2014 and 2015 the exports are 150 Lacs, 125 Lacs, 160 Lacs and 150 Lacs respectively.

∴ The export was more than 110 Lacs in 4 years

119. **Answer: (C)**

From the bar graph,

Export in year 2011 = 110 lacs

Export in year 2014 = 160 lacs

∴ Difference is

= (160 - 110) Lacs

= 50 Lacs

120. **Answer: (B)**

From the bar graph,

Exports in 2015 = 150 lacs

∴ Exports in 2015 is more than export in the years 2008, 2009, 2010, 2011 and 2013

∴ From the given options, Exports in 2015 is more than the export in the year 2014

121. **Answer: (C)**

Number of students admitted in section X in 2011 = 50

Number of students admitted in section X in 2013 = 72

Percentage change = [(72 - 50) / 50] × 100

Percentage change = (22 / 50) × 100

∴ Percentage change = 44%

122. **Answer: (D)**

Difference in number of students admitted in two sections in 2011 = 52 - 50

Difference in number of students admitted in two sections in 2011 = 2

Difference in number of students admitted in two sections in 2012 = 65 - 60

Difference in number of students admitted in two sections in 2012 = 5

Difference in number of students admitted in two sections in 2013 = 72 - 50

Difference in number of students admitted in two sections in 2013 = 22

Difference in number of students admitted in two sections in 2014 = 80 - 58

Difference in number of students admitted in two sections in 2014 = 22

Difference in number of students admitted in two sections in 2015 = 64 - 62

Difference in number of students admitted in two sections in 2015 = 2

∴ Difference is same in the years 2011 and 2015 also the difference is same in the years 2013 and 2014.

123. **Answer: (A)**

In year 2012,

Number of students admitted in section Y = 65

Number of students admitted in section X = 60

Required percentage

Required percentage = (65 / 60) × 100

Required percentage = (13 / 12) × 100

∴ required percentage = 108.33%

124. **Answer: (B)**

Number of students admitted in section Y in 2011 = 52

Number of students admitted in section Y in 2014 = 58

Percentage change = $[(58 - 52) / 52] \times 100$

Percentage change = $(6 / 52) \times 100$

∴ Percentage change = 11.54%

125.   Answer: (C)

Total funds collected = Rs. 200 crore

∴ Fund collected through consultancy project = Rs. $(200 \times 2/100)$ crore = Rs. 4 crore

∴ Funds collected through research activities = Rs. $(200 \times 10/100)$ = Rs. 20 crore

∴ the amount of fund collected through Consultancy Projects and Research Activities together,

⇒ Rs. $(4 + 20)$ crore

⇒ Rs. 24 crore

126.   Answer: (A)

Total amount collected = Rs. 200 crore

∴ Amount collected from endowments,

⇒ $200 \times 18/100$

⇒ Rs. 36 crore

127.   Answer: (D)

Total amount collected = Rs. 200 crore

∴ Amount collected from Government aids,

⇒ $200 \times 40/100$

⇒ Rs. 80 crore

∴ Amount collected from tuition fees,

⇒ $200 \times 30/100$

⇒ Rs. 60 crore

∴ Require difference = Rs. $(80 - 60)$ crore = Rs. 20 crore

128.   Answer: (B)

Total funds collected = Rs. 200 crore

∴ Funds collected through research activities = Rs. $(200 \times 10/100)$ = Rs.20 crore

∴ total amount invested in research development facilities,

⇒ $20 \times 1/5$

⇒ Rs. 4 crore

129.   Answer: (D)

Average = sum of elements / number of elements

Number of thefts in Jaipur for February, March, April, May and June is 510, 640, 576, 504 and 500 respectively.

Average number of mobile phones thefts in Jaipur from February 2015 to June 2015 =

= $(510 + 640 + 576 + 504 + 500)/5$

= 2730/5

= 546

∴ Average number of mobile phones thefts in Jaipur from February 2015 to June 2015 is 546.

130.   Answer: (C)

Number of thefts in Delhi for April = 510

Number of thefts in Delhi for May = 408

Percentage change =

= $[(510 - 408)/510] \times 100$

= 20%

131.   Answer: (C)

Number of thefts in Jaipur for February = 510

Number of thefts in Jaipur for April = 576

Percentage change =

= $[(576 - 510)/510] \times 100$

= 12.94%

132.   Answer: (B)

Number of thefts in Delhi for February, March, April, May and June is 500, 600, 510, 408 and 510 respectively.

Number of thefts in Jaipur for February, March, April, May and June is 510, 640, 576, 504 and 500 respectively.

From above data,

∴ There are four months where number of mobile phones thefts in Jaipur higher than that in Delhi.

133.   Answer: (B)

As shown in the pie chart, the value of Marketing is 450 lakhs which is greater than any other expenditure.

So answer = Marketing

134.   Answer: (A)

Total Expenditure = Expenditure of (Faculty + Staff + Marketing + Rent + Assessments + Placements + Taxes)

∴ Total Expenditure = 300 + 150 + 450 + 250 + 200 + 300 + 150 = 1800

135. **Answer: (D)**
∴ The central angle of the sector representing Faculty = 300/1800 × 360° = 60°

136. **Answer: (D)**
Total expenditure on Assessments and Placements = 200 + 300 = 500
∴ Required Percentage = 500/1800 × 100 = 500/18 = 27.77%

137. **Answer: (B)**
120 is the least no. of people who consumed the drink C.
∴ the answer is C.

138. **Answer: (B)**
∴ Ratio of consumers of energy drink C to consumers of energy drink G = 120 : 280 = 3 : 7

139. **Answer: (B)**
Consumers of drink B are greater than that of drink E by = (280 - 140)/140 × 100 = 140/140 × 100 = 100%

140. **Answer: (A)**
Consumers of drink F = 240
New Consumers of drink F = 240 + 40% of 120 = 240 + 48 = 288
∴ % increase = (288 - 240)/240 × 100 = 4800/240 = 20%

141. **Answer: (D)**
According to the graph, the highest number of people (500) says that their favorite travel destination is Goa.

142. **Answer: (C)**
Number of people whose favourite travel destination is
Goa = 500
Hong kong = 400
Dubai = 150
Singapore = 350
London = 350
Hawai = 50
Mauritius = 450
∴ Total number of people who responded to the survey = 2250

143. **Answer: (D)**

Total number of people who responded to the survey = 2250
Number of people whose favourite travel destination is Hawai = 50
∴ Measure of central angle = (50/2250) × 360° = 8°

144. **Answer: (D)**
Total number of people who responded to the survey = 2250
Number of people whose favourite travel destination is Goa = 500
Number of people whose favourite travel destination is Hong kong = 400
Number of people whose favourite travel destination is Goa + Hong kong = 500 + 400 = 900
∴ Required percentage = (900/2250) × 100 = 40%

145. **Answer: (B)**
Because author B is followed by maximum (500) people.

146. **Answer: (D)**
Total respondents = 2250
Respondents who say their favourite author is A = 300
& respondents who say their favourite author is B = 500
(A + B) = 800
∴ Required Percentage = 800/2250 × 100 = 35.55%

147. **Answer: (B)**
2250 people represent = 360°
⇒ 1 people represent = 360°/2250
∴ 400 people represent = 400/2250 × 360°= 64°

148. **Answer: (A)**
∴ Total number of people who have responded to the survey = A + B + C + D + E + F + G = 2250

149. **Answer: (D)**
It is clear from the bar graph that the second lowest sales of Television were for brand F.

150. **Answer: (B)**
From the bar graph
Sales of A = 170000

Sales of E = 340000

∴ Ratio of the sales of E to A is 340000 : 170000 = 2 : 1

151.   Answer: (B)

Sales of brand B = 280000

Sales of brand G = 300000

⇒ Difference = 300000 – 280000 = 20000

∴ Sales of brand B was lesser than that of brand G by = (20000/300000) × 100 = 6.67%

152.   Answer: (A)

Total sales of all seven brands = 170 + 280 + 380 + 340 + 340 + 190 + 300 = 2000000

∴ Total tax to be paid = (12/100) × 2000000 = 240000

153.   Answer: (D)

∴ As shown in the , the value of A is 180 which is highest. So answer = A.

154.   Answer: (B)

Total No. of employees = Employees in (A + B + C + D + E + F + G)

Total expenditure = 180 + 20 + 20 + 160 + 20 + 80 + 120

∴ Total expenditure = 600

155.   Answer: (A)

∴ The central angle of the sector representing F is = (80/600) × 360 = 48°

156.   Answer: (C)

Average salary of employees = 6000 $

Total no. of employees = 600

∴ Total of the salary paid (million $) = 600 × 6000/1000000 = 36/10 = 3.6 million $

157.   Answer: (C)

From the graph, it is clear that in year 2016, the number of vacancies are lesser than that of the previous year.

158.   Answer: (D)

Number of vacancies in 2012 = 55

Number of vacancies in 2015 = 100

Therefore, difference = 100 - 55 = 45

159.   Answer: (D)

Number of vacancies in 2014 = 60

Number of vacancies in 2017 = 30

∴ required percentage = (60 - 30)/30 × 100 = 100%

160.   Answer: (C)

Salary of sales officer = Rs. 20000

Number of vacancies in 2015 = 100

∴ Total expense of salaries = 20,000 × 100 = 20 lakhs

161.   Answer: (A)

As shown in the pie chart, the value of C is 20 lakhs which is least.

So answer = C

162.   Answer: (A)

Total wealth = Wealth of (A + B + C + D + E + F + G)

∴ Total wealth = 60 + 30 + 20 + 60 + 40 + 40 + 50 = 300

163.   Answer: (A)

∴ The central angle of the sector representing the share of wealth that D gets = 60/300 × 360 = 72°

164.   Answer: (A)

Wealth tax of C = 40% of 20 = 8 lakh

165.   Answer: (A)

From the options

As we can see in the diagram in 2013 the production was 30 and in its previous year i.e in 2012 it is 90 hence the answer will be 2013.

Rest in all options the production was maximum or not as per the question

166.   Answer: (A)

Production of steel in 2011 = 35

Production of steel in 2015 = 25

∴ Difference = 35 – 25 = 10

167.   Answer: (D)

Production of steel in 2012 = 90

Production of steel in 2015 = 25

∴ Required % = (90 – 25)/25 × 100 = 260%

168.   Answer: (C)

Given that cost of 1 tonne of stell = Rs. 30,000

∴ in 2017 the cost of steel (in billions) = 80 × 30000 = 2400

169.   Answer: (A)

∴ The most number of employees belong to E department = 150

170.   Answer: (D)

∴ Total number of employees of the company = 60 + 60 + 30 + 90 + 150 + 30 +

120 = 540

171. **Answer: (B)**
Total employees of the company = 540 and department B = 60 employees
∴ Measure of the central angle = (360°/540)× 60 = 40°

172. **Answer: (D)**
We know, total employees of the company = 540
Average monthly salary of the employees of the company = 20,000
We know sum of the salary = average salary × total number of employees
So, sum of the monthly salary of the employees of the company = 20,000 × 540 = 108,00,000
∴ Total of the salaries 108 lakhs paid to all the employees of the company.

173. **Answer: (A)**
∴ According to graph, Country A has 50 soldiers which the least

174. **Answer: (D)**
⇒ Number of soldiers of country B = 200
⇒ Number of soldiers of country D = 750
∴ Required ratio = 200 : 750 = 4 : 15

175. **Answer: (D)**
⇒ Number of soldiers of country F = 150
⇒ Number of soldiers of country A = 50
∴ Required % = {(150 − 50)/50} × 100 = 200%

176. **Answer: (C)**
⇒ Number of soldiers = 750
∴ Total expenditure = 20000 × 750 = $ 150000 million

177. **Answer: (B)**
Football game is the favourite of most people surveyed (600).

178. **Answer: (C)**
Total number of people who have responded to the survey = 300 + 600 + 100 + 500 + 300 + 400 + 200 = 2400

179. **Answer: (D)**
Total number of people who have responded to the survey = 2400
We know, total sector 2400 represents = 360°

So, Baseball sector 300 represents = (360°/2400) × 300 = 45°

180. **Answer: (B)**
We know total respondent = 2400
Respondents who say their favourite game is cricket and Hockey = 300 + 500 = 800
∴ Required percentage = 800/2400 × 100 = 33.33%

181. **Answer: (B)**
From the graph it is clearly visible that the lowest number of employees is in Department 'D' which is 100
∴ Department D has the lowest number of Employees

182. **Answer: (D)**
Number of employees in department A = 200
Number of employees in department F = 350
Ratio of number of employees of department A to that of department F = 200 : 350 = 4 : 7
∴ Required Ratio = 4 : 7

183. **Answer: (B)**
Number of employees of department G = 350
Number of employees in department C = 200
The difference between the number of employees of department G and department C = (350 - 200) = 150
Required Percentage = (Difference in number of employees in Department G and C)/(Number of employees in Department C) × 100%
⇒ (150/200) × 100% = (3/4) × 100% = 75%
∴ Required Percentage = 75%

184. **Answer: (C)**
Total compensation of all the employees of Department A = (Average compensation of an employee of Department A) × Total number of employees of Department A
⇒ Rs. 40000 × 200 = Rs. 8000000 = Rs. 80 Lakhs

185. **Answer: (C)**
As shown in the pie chart, the value of

Prunes is 950 lakhs which is more than all other dry fruits. So answer = Prunes

186. Answer: (B)
Total value = Value of (Raisins + Almonds + Cashews + Pistachios + Dates + Prunes + Walnuts)
Total value = 600 + 800 + 550 + 300 + 400 + 950 + 900
So, Total value = 4500

187. Answer: (C)
∴ The central angle of the sector representing the annual production of dates = (400/4500) × 360 = 32°

188. Answer: (C)
The average value of almonds = 800 Rs/kg
∴ Total production of almonds = (Total value of almonds)/(Average value of almonds) = (800 × 100000)/800 = 100000

189. Answer: (A)
From the graph the highest average hours per day spent is 4 which is corresponsing to the teenager whose age is 15 ('4' lies between the teenagers of age 14 and 16)

190. Answer: (B)
⇒ Hours per day spent by 13 year old in playing outdoor games = 2.5
⇒ Hours per day spent by 18 year old in playing outdoor games = 1
⇒ Ratio = 2.5 : 1 = 25 : 10 = 5 : 2
∴ Required Ratio = 5 : 2

191. Answer: (B)
⇒ Hours per day spent by 17 year old in playing outdoor games = 3.5
⇒ Hours per day spent by 14 year old in playing outdoor games = 3
⇒ Percentage change = [(3.5 - 3)/3] × 100% = (0.5/3) × 100% = (50/3) % = 16.67%
∴ Required Percentage = 16.67%

192. Answer: (A)
⇒ Hours per day spent by 16 year old in playing outdoor games = 3.5
⇒ Hours spent in a week = 3.5 × 7 = 24.5
∴ Number of hours spent in the week = 24.5

193. Answer: (C)
Male Count: 35

Total Count: 60 Female Count: 60 - 35 = 25
Ratio: 35 : 25 = 7 : 5

194. Answer: (A)
Male Population: 40
Female Population: 72 - 40 = 32
Female less by : 8.
Difference % = 100 × 8/32 = 25%

195. Answer: (B)
Total population: 54
Female population: 54 - 34 = 20
Percentage = 100 × (20/54) ~ 37.03%

196. Answer: (D)
In 2015,
Total population: 60
Female population: 60 - 35 = 25
In 2014,
Total population: 54
Female population: 54 - 34 = 20
2015 female % wrt 2014: 100 × 25/20 = 125%

197. Answer: (A)
Spent of rent = 8% of 26000 = 8 × 26000/100 = Rs. 2080

198. Answer: (C)
Spent of saving and fuel: 22 + 20 = 42% Spent on transport = 15%
Difference = 42 - 15 = 27% = 27 × 26000/100 = Rs. 7020

199. Answer: (B)
Spent on Miscellaneous: 26000 × 17/100
If salary is 22000, spent: 22000 × 17/100
Difference = 4000 × 17/100 = Rs. 680

200. Answer: (D)
Spent on gold: 65% of savings.
Savings: 22% of 26000 = 22 × 26000/100 = 22 × 260
Spent of gold = 65 × 22 × 260/100 = 65 × 22 × 26/10 = Rs. 3718

201. Answer: (A)
Average spent on saving, rent and fuel = (22% + 8% + 20%)of 26000/3
Average spent on food, transport and savings = (18% + 15% + 22%)of 26000/3
Difference = 5% of 26000/3 = 5 × 26000/100 × 1/3 = 1300/3 = 433.33 ~ 433.

202. Answer: (C)
Revenue of company in year 2011 = 500

Revenue of company in year 2012 = 280
Revenue of company in year 2013 = 470
Revenue of company in year 2014 = 650
Revenue of company in year 2015 = 400
Revenue of company in year 2016 = 510
Total revenue in these 6 years = 500 + 280 + 470 + 650 + 400 + 510 = 2810
Average revenue for 6 years = 2810 / 6
∴ Average revenue for 6 years = 468.33

203.   Answer: (B)
Revenue of company in year 2011 = 500
Revenue of company in year 2012 = 280
Percentage decrease = [(500 - 280) / 500] × 100
Percentage decrease = (220 / 500) × 100
∴ Percentage decrease = 44%

204.   Answer: (A)
Revenue of company in year 2014 = 650
Revenue of company in year 2015 = 400
Revenue percent of 2015 in terms of 2014 = (400 / 650) × 100
∴ Revenue percent of 2015 in terms of 2014 = 61.53%

205.   Answer: (D)
Revenue of company in year 2011 = 500
Revenue of company in year 2012 = 280
Revenue of company in year 2013 = 470
Revenue of company in year 2014 = 650
Revenue of company in year 2015 = 400
Revenue of company in year 2016 = 510
Total revenue in these 6 years = 500 + 280 + 470 + 650 + 400 + 510 = 2810
Total revenue in 2013, 2014 and 2015 = 470 + 650 + 400 = 1520
Revenue percent of 2013, 2014 and 2015 in terms of total revenue = (1520 / 2810) × 100
∴ Revenue percent of 2015 in terms of 2014 = 54.09%

206.   Answer: (D)
Total expenditure = 60000
Expenditure share on seat = (10.8° / 360°) of total expenditure
Expenditure share on seat = (10.8° / 360°) × 60000

Expenditure share on seat = (10.8° / 360°) × 60000
∴ Expenditure share on seat = 1800

207.   Answer: (C)
Expenditure incurred on tyre = (72/360°) of total expenditure
Total expenditure = 75000
Expenditure share on painting = (36/360°) × 75000 = 7500
∴ Expenditure share on seat = 7500

208.   Answer: (C)
Total expenditure = 60000
Expenditure share on paint = (36/360) of total expenditure
Expenditure share on paint = (36/360) × 60000
Expenditure share on other = (61.2/360) of total expenditure
Expenditure share on other = (61.2/360) × 60000
Expenditure percent of other is greater than seat = (61.2 - 36)/36 × 100
∴ Expenditure percent of other is greater than seat = 70%

209.   Answer: (A)
Total expenditure = 60000
Expenditure share on seat = (10.8/360) of total expenditure
Expenditure share on seat = (10.8/360) × 60000
Expenditure share on tyres = (72/360) of total expenditure
Expenditure share on tyres = (72/360) × 60000
Expenditure percent of seat is less than tyre = (72 - 10.8)/72 × 100
∴ Expenditure percent of seat is less than tyre = 85%

210.   Answer: (B)
Total expenditure on tyre = 10000
The expenditure on making a motorcycle = 10000 × 100/20 = 50000
Expenditure of paint is greater than seat = (10 - 3)/100 × 50000 = 3500
∴ Expenditure of paint is greater than seat = 3500

211. Answer: (B)

The revenue of the firm for year 2010 = 260 Rs. rores

The revenue of the firm for year 2011 = 350 Rs. rores

The revenue of the firm for year 2012 = 320 Rs.crores

Hence total value of revenue of firm in years 2010, 2011 and 2012 = 260 + 350 + 320 = 930 crores.

212. Answer: (D)

Revenue in 2010 = 260

Revenue in 2009 = 300

Percentage decrease = (300 - 260)/300 × 100 = 13.33%

213. Answer: (B)

Average revenue of the firm = 292.50

For 2010, 2013, 2015 and 2016 the revenue of the firm is less than the average revenue for these 8 years

214. Answer: (B)

Percentage increase in its revenue in 2011 = (350 - 260)/260 × 100 = 34.6%

Percentage increase in its revenue in 2014 = (340 - 250)/250 × 100 = 37.5%

Percentage increase in its revenue in 2016 = (280 - 240)/240 × 100 = 16.67%

The firm has shown the maximum percentage increase in its revenue with respect to the previous year in 2014

215. Answer: (D)

Total number of cars sold = 40500 × (360/90) = 162000

Difference in numbers of cars of E and A sold = (75 - 45)/360 × 162000 = 13500

216. Answer: (B)

Total number of cars sold = 40500 × (360/90) = 162000

Ratio between the number of cars sold of model D and E = 90/75 = 6 : 5

217. Answer: (A)

Total number of cars sold = 72900 × (360/90) = 291600

218. Answer: (C)

Total number of cars sold = 22000 × (360/110) = 72000

Difference in numbers of cars of E and A sold = (45 - 40)/360 × 72000 = 1000

219. Answer: (B)

Total number of model E cars sold = (750) × (100/5) = 15000

Total number of cars sold = 15000 × (360/75) = 72000

Average number of cars sold = (72000/5) = 14400

220. Answer: (B)

No. of boys using Whatsapp in March = 680

No. of boys using Facebook in February = 500

∴ Required % = 680/500×100=136%

221. Answer: (D)

No. of boys using Facebook in January = 600

No. of boys using Facebook in February = 500

∴ % decrease = 600−500600×100=16.66%

222. Answer: (A)

No. of boys using Whatsapp in February = 750

No. of boys using Facebook in February = 500

∴ Required % = (750−500)/500×100=50%

223. Answer: (C)

Total number of boys using apps in March = 680 + 470 + 300 = 1450

∴ Total no. of boys using apps in March = 1450

224. Answer: (B)

Total amount spent on interest = 20% = 0.2 × 72 = 14.4 crores

⇒ Money spent on Raw material = 50% of 14.4 crores = 7.2 crores

From the given ratio it is clear that money spent on rent is 50% of money spent on raw material.

⇒ Money spent on Rent annually = 7.2/2 = 3.6 crores = 36000000

225. Answer: (D)

Total expenditure on interest and miscellaneous = 44% = 0.44 × 72 = 31.68

Total expenditure on tax and salary = 40%
= 0.4 × 72 = 28.8

∴ Required % = 31.68−28.828.8×100=10%

226. **Answer: (A)**

Total miscellaneous expenditure = 0.24 × 72 = 17.28 crores

⇒ Expenditure on nanotubes = 5% of 17.28 = 0.864 crores

∴ Money spent on nanotube research = 0.864 crores

227. **Answer: (B)**

Miscellaneous % = 24

∴ Expenditure on miscellaneous = 0.24 × 72 crores = 17.28 crores in a year

⇒ Monthly expenditure = 17.28/12 = 1.44 crores.

228. **Answer: (C)**

Operations % = 16

∴ Expenditure on operations = 0.16 × 72 crores = 11.52 crores

229. **Answer: (B)**

Total runs scored by A = 70 + 105 + 55 + 135

Total runs scored by A = 365

Total runs scored by B = 40 + 35 + 95 + 72

Total runs scored by B = 242

Difference between runs scored by A and B = 365 - 242

∴ Difference between runs scored by A and B = 123

230. **Answer: (D)**

Runs scored by C in match II = 68

Runs scored by C in match I = 60

Percentage of runs scored more in terms of match I for C = (68 - 60/60) × 100

∴ Percentage = 13.33%

231. **Answer: (C)**

Runs scored by A in match II = 105

Runs scored by all five player in match II = 105 + 35 + 68 + 45 + 110

Runs scored by all five player in match II = 363

Percentage of runs scored By A in terms of all runs scored by all player in match II = (105/363) × 100

∴ Percentage = 28.92 %

232. **Answer: (A)**

Total runs scored by A = 70 + 105 + 55 + 135

Total runs scored by A = 365

Average = 365/4 = 91.25

Total runs scored by B = 40 + 35 + 95 + 72

Total runs scored by B = 242

Average = 242/4 = 60.5

Total runs scored by C = 60 + 68 + 75 + 85

Total runs scored by C = 288

Average = 288/4 = 72

Total runs scored by D = 95 + 45 + 55 + 60

Total runs scored by D = 255

Average = 255/4 = 63.75

Total runs scored by E = 105 + 110 + 125 + 122

Total runs scored by E = 462

Average = 462/4 = 115.5

From above we can see that Average is in the order E, A, C, D, B

∴ Option 1 is the correct order

233. **Answer: (B)**

Total expenditure = 48 crores

Expenditure of company Q, R and T together = (22 + 18 + 20)% of total expenditure

Expenditure of company Q, R and T together = 60% of 48

∴ Expenditure of company Q, R and T together = 28.8 crores

234. **Answer: (C)**

Total expenditure = 48 crores

Expenditure of company Q and R = (22 + 18)% of total expenditure

Expenditure of company Q and R = 40% of 48 = 19.2

Expenditure of company P = 24% of 48 = 11.52

Percentage of expenditure of Q and R greater in terms of P = (19.2 - 11.52/11.52) × 100

∴ Percentage = 66.67 %

235. **Answer: (D)**

Total expenditure = 48 crores

Expenditure of company P, Q and S = (24 + 22 + 16)% of total expenditure

Expenditure of company P, Q and S = 62% of 48 = 29.76

Required Ratio = 29.76/48 = 31/50

∴ Required Ratio = 31 : 50

236. **Answer: (A)**

Total expenditure = 48 crores

Amount spent by company S = (16)% of total expenditure

Amount spent by company S = 16% of 48 = 7.68

Amount spent by company T and R = (20 + 18)% of total expenditure

Amount spent by company T and R = 38% of 48 = 18.24

Required Percentage = (7.68/18.24) × 100

∴ Percentage = 42.1%

237. **Answer: (C)**

Let the profit earned by company R be x

According to question

x = (1/4) of expenditure of company Q

Expenditure of company Q = 22% of 48

Expenditure of company Q = 10.56

Putting the value of expenditure in above we will have

⇒ x = (1/4) x 10.56

⇒ x = 2.64

∴ Profit earned by R = 2.64

238. **Answer: (C)**

Total sale of shirts = 70 + 75 + 30 + 55 + 65 = 295

Total sale of trouser = 40 + 50 + 55 + 25 + 34 = 204

Extra % of shirt sale = [(295 - 204) /204] × 100 = (91/204) × 100 = 44.61

239. **Answer: (A)**

Sale of trousers in March = 55

Sale of shirt in March = 30

% sale of trouser = (55/30) × 100 = 83.33

240. **Answer: (A)**

Sale of trouser in in January = 4000

Sale of trouser in February = 5000

% increase in sale = (1000/4000) × 100 = 25%

241. **Answer: (B)**

Sale of shirts in January = 7000

Sale of shirts in April = 5500

Difference = 7000 - 5500 = 1500

242. **Answer: (D)**

Expenditure on printing = 60000 × (27/100) = Rs. 16200

243. **Answer: (C)**

Angle made by the expenditure on paper = 360 × (25/100) = 90

244. **Answer: (A)**

Let total expenditure is x.

Expenditure on paper = x × 25% = x/4

Expenditure on binding = x × 33% = 33x/100

∴ % expenditure more on binding = [(33x/100 - x/4) /(x/4)] × 100

= (8x/100) × (4/x) × 100 = 32%

245. **Answer: (B)**

Let total expenditure is x.

Given expenditure on paper is: 20000

∴ x × 25% = 20000

∴ x = 20000 × 4 = Rs. 80000

So expenditure on binding = 80000 × 33% = Rs. 26400

246. **Answer: (B)**

Let angle made by marketing and distribution is 3x and 2x respectively.

As expenditure make 15%,

∴ 3x + 2x = 360 × 15% = 54

∴ 5x = 54,

∴ x = 54/5

Central angle made by the sector of the expenditure = 3x = 3 × 54/5 = 32.4

247. **Answer: (C)**

Total production of company R from year 2012 - 2016 = 250 + 268 + 302 + 298 + 276 = 1394

248. **Answer: (B)**

Total production in 2013 = 386 + 402 + 268 + 360 + 450 = 1866

Avg. of total production of all companies = 1866/5 = 373.2

249. **Answer: (A)**

Production of company R in 2014 = 302

Production of company R in 2013 = 268

Percent more than 2013 = (302 - 268) × 100/268 = 12.68%

250. **Answer: (D)**
Production of all the companies in 2014 = 412 + 444 + 302 + 372 + 504 = 2034
Production of all the companies in 2015 = 503 + 529 + 298 + 398 + 597 = 2325
Percent less than 2015 = (2325 - 2034) × 100/2325 = 12.5%

251. **Answer: (D)**
Kohli scored 102 runs
Sharma scored 68 runs.
Percent run scored more than Sharma = (102 - 68) × 100/68 = 50%

252. **Answer: (A)**
Let run scored by kohli is X% of runs scored by yuvraj.
X = 27 × 100/21 = 128.57%

253. **Answer: (C)**
Run scored by Pujara = 76
Total run scored by 5 players = 76 + 82 + 102 + 52 + 68 = 380
%of run scored by Pujara = 76×100/380 = 20%

254. **Answer: (A)**
Total run scored by 5 playes = 380
Central angle made by the sector of runs scored by Yuvraj = 79.8 × 360/380 = 75.6°

255. **Answer: (B)**
Taking approximate values,
Runs scored by Rahane = 82/2 = 41 runs
Runs scored by Kohli, Pujara and Dhoni = 102 + 76 + 52 = 230
%of run scored by Rahane = 41 × 100/230 = 17.82%

256. **Answer (B)**
Total marks obtained by D = 55 + 69 + 74 + 81 + 76 = 355

257. **Answer (A)**
Marks scored by 6 students in subject R = 80 + 78 + 55 + 74 + 83 + 95 = 465
Average marks scored by six student = 465/6 = 77.5

258. **Answer (D)**
Total marks = 500
Marks obtained by C = 68 + 79 + 55 + 91 + 72 = 365
Percentage = 365 × 100/500 = 73%

259. **Answer (C)**
Total marks = 500
Marks obtained by B = 87 + 94 + 78 + 87 + 95 = 441
Percentage of marks obtained by B = 441 × 100/500 = 88.2%
Marks obtained by A = 72 + 75 + 80 + 82 + 93 = 402
Percentage of marks obtained by A = 402 × 100/500 = 80.4%
B scored (88.2 - 80.4) = 7.8% more than A.

260. **Answer (C)** Total marks obtained = 432
Central angle obtained by Hindi and maths = 145°
Marks obtained by hindi and maths = 145 × 432/360 = 174

261. **Answer (D)** Marks obtained in science = 70 432/360 = 84
%of marks obtained in science = 84 100/432 = 19.44%

262. **Answer (B)** Marks obtained in maths = 80 × 432/360 = 96
Marks obtained in social science = 70 × 432/360 = 84
Extra marks obtained in maths = 96 - 84 = 12
= 12 × 100/84 = 100/7 = 14.28%

263. **Answer (C)** Total marks obtained = 432
Average marks per subject = 432/5 = 86.4
86.4 marks will form (86.4 × 360/432 = 72°) at the center.
Central angle greater than 72° have marks more than average marks per subject.
⇒ English and maths marks is more than average marks per subject.

264. **Answer (D)** Angle obtained by English and Hindi = 65° + 75° = 140°
Marks obtained by English and Hindi together = 140° × 432/360° = 168
Marks in percentage = 168 × 100/200 = 84%

265. **Answer: (A)**
Runs scored by Rohit against all 5 teams = 800 + 700 + 1000 + 1200 + 1300 = 5000

Runs scored by Kohli against all 5 teams = 1000 + 1100 + 1400 + 500 + 800 = 4800

∴Required percentage = (5000/4800) × 100% = 104.16%

266. **Answer: (C)**

Runs scored by Kohli against S = 500

Runs scored by Rohit against = 1200

∴Required percentage =[(1200 – 500)/1200] × 100% = (7/12) × 100% = 58.33%

267. **Answer: (D)**

Runs scored by Kohli against Q = 1100

Runs scored by Kohli against R = 1400

Runs scored by Rohit against Q = 700

Runs scored by Rohit against R = 1000

∴Required difference = (1100 + 1400) – (700 + 1000) = 2500 – 1700 = 800

268. **Answer: (B)**

∴ Runs scored by Kohli against all 5 teams = 1000 + 1100 + 1400 + 500 + 800 = 4800

269. **Answer: (A)**

Expenditure on clothes = 15%

Let, central angle made by the sector of expenditure on clothes = x°

Total angle = 360°

According to problem,

⇒ 15/100 = x/360

⇒ x = 360° × (15/100)

⇒ x = 54°

∴ Central angle made by the sector of expenditure on clothes = 54°

Let, central angle made by the sector of expenditure on fuel = y°

According to problem,

⇒ y/54° = 4/3

⇒ y = 54° × (4/3)

⇒ y = 72°

∴ Central angle made by the sector of expenditure on fuel = 72°

270. **Answer: (C)**

Let, expenditure incurred on education = Rs.   x

In the chart,

Expenditure incurred on clothes = 15%

Expenditure incurred on education = 26%

According to problem,

⇒ 15/26 = 3000/x

⇒ x = 3000 × (26/15)

⇒ x = 5200

∴ Expenditure incurred on education = Rs. 5200

271. **Answer: (B)**

Expenditure on food = 23%

Expenditure on savings = 20%

∴ Required percentage,

⇒ [(23 - 20)/20] × 100%

⇒ (3/20) × 100%

⇒ 15%

272. **Answer: (A)**

Expenditure on education = 26%

Let, central angle made by the sector of expenditure on education = x°

Total angle = 360°

According to problem,

⇒ 26/100 = x/360°

⇒ x = 360° × 26/100

⇒ x = 93.6°

∴ Central angle made by the sector of expenditure on education = 93.6°

273. **Answer: (D)**

Let, expenditure on rent be x.

In the chart expenditure on rent = 16%

According to problem,

⇒ 16/100 = x/50000

⇒ x = 50000 × (16/100)

⇒ x = 8000

∴ Expenditure on rent = Rs.   8000

274. **Answer: (D)**

No. of players playing cricket in 2015 = 400

No.of players playing football in 2015 = 350

No. of players playing hockey in 2015 = 250

∴ total number of players playing all three games in 2015,

⇒ 400 + 350 + 250

⇒ 1000

No.of players playing cricket in 2016 = 350

No. of players playing football in 2016 = 250

No. of players playing hockey in 2016 = 150

∴ total number of players playing all three games in 2015,

⇒ 350 + 250 + 150

⇒ 750

∴ Required percentage,

⇒ 1000/750 × 100%

⇒ 133.33%

275.   Answer: (A)

No. of players playing cricket in 2015 = 400

No. of players playing football in 2015 = 350

No.of players playing hockey in 2015 = 250

∴ total number of players playing all three games in 2015,

⇒ 400 + 350 + 250

⇒ 1000

∴ Required percentage,

⇒ (250/1000) × 100%

⇒ 25%

276.   Answer: (B)

Number of players playing football in 2016 = 250

Number of players playing football in 2014 = 300

∴ Required percentage,

⇒ (300 − 250)/300 × 100%

⇒ (50/300)× 100%

⇒ 16.66%

277.   Answer: (C)

No. of players playing cricket in 2015 = 400

No.of players playing football in 2015 = 350

No. of players playing hockey in 2015 = 250

∴ total number of players playing all three games in 2015,

⇒ 400 + 350 + 250

⇒ 1000

278.   Answer: (A)

Total expense = 360°

Expense on clothes = 50°

Let, expense on cloth = Rs.   x

According to problem,

⇒ 50/360 = x/1080000

⇒ x = 1080000 × 5/36

⇒ x = 150,000

∴ They spent on cloths = Rs.   150000

279.   Answer: (C)

Expenditure on rent = 90°

Expenditure on Education = 90°

∴ Required percentage,

⇒ 90/90 × 100%

⇒ 100%

280.   Answer: (C)

Expenditure on rent = 90°

Expenditure on Food = 60°

Expenditure on transport = 40°

∴ total expenditure on Rent, Food and Transport together,

⇒ 90° + 60° + 40°

⇒ 190°

Total expenditure = 360°

Let, total expenditure on Rent, Food and Transport together = Rs.   x

⇒ 190/360 = x/1080000

⇒ x = 1080000 × 19/36

⇒ x = 570000

∴ total expenditure on Rent, Food and Transport together = Rs. 570000

281.   Answer: (D)

Spent on education = 90°

Spent on savings = 30°

Spent on rent = 90°

∴ Average spending = (90 + 30 + 90)/3 = 70°

Let, average spending = Rs.   x

According to problem,

⇒ 70/360 = x/1080000

⇒ x = 1080000 × 7/36

⇒ x = 210000

∴ Average spending on education savings and rent = Rs. 210000

282.   Answer: (B)

Income in 2016 = Rs.   1080000

Savings = 30°

∴ savings = 1080000 × 30/360 = Rs. 90000

∴ Income in 2015

= 1080000 × (1 - 20/100) = Rs. 864000

∴ Savings in 2015 = 90000 × 2/5

= Rs. 36000

∴ Required percentage,

⇒ 36000/864000 × 100%

⇒ 4.16%

283. **Answer (C)**

Passed = 50% of appeared = 50% of 80% of total = 40% of total = 40% of 390 = 156

284. **Answer (B)** Total number of students in N in all years: 330 + 380 + 390 + 360 + 340 = 1800

Total number of students in 2011: 430 + 390 + 440 + 440 + 440 = 2140

Ratio: 1800 : 2140 = 90 : 107

285. **Answer (D)**

Total number of students in M: 450 + 480 + 430 + 480 + 490 = 2330

Average = 2330/5 = 466.

286. **Answer (D)**

Year	Total Students	Average
2009	2180	436
2010	2270	454
2011	2140	428
2012	2260	452
2013	2290	458

Clearly, maximum average is in 2013.

287. **Answer (B)**

Total cost = 100% = Rs. 68000

⇒ 1% = Rs. 680

⇒ Advertising: 18% = 680 × 18 = Rs. 12240.

288. **Answer (D)**

Binding: 12% = 14400

⇒ 1% = 1200

⇒ Paper: 14% = 1200 × 14 = Rs. 16800

289. **Answer (A)**

Paper and binding: 12 + 14 = 26%

Printing: 33%

Difference % = 100 × (33 − 26)/33 = 700/33

= 21.21%

290. **Answer (A)**

Total amount spent: 100% = 150000

⇒ 1% = 1500

average spent on printing, paper and royalty: 64/3%

average spent on advertising and binding: 30/2%

Difference = 64/3 − 15 = (64 − 45)/3 = 19/3% = 19/3 × 1500 = Rs. 9500

291. **Answer (C)**

Expense incurred on others on 1 book: 6% = 36960/11000 = Rs. 3.36

⇒ total expense = 100% = 3.36 × 100/6 = Rs. 56

MP = CP + Profit% = 56 + 56×25% = 56 + 14 = Rs. 70.

292. **Answer: (A)**

Revenue in 2009 = 17 lac

Let revenue in 2007 was x.

According to question,

$x \times \dfrac{80}{100} \times \dfrac{80}{100} = 17$

x = 26.56 lac

∴ Revenue in 2007 was 26.56 lac.

293. **Answer: (C)**

Average revenue of company from 2013 to 2016

$= \dfrac{72+79+102+112}{4} = 91.25 \, lac$

Average revenue of company from 2009 to 2012

$= \dfrac{17+35+55+58}{4} = 41.25 \, lac$

% more than average revenue from 2009 to 2012

$= \dfrac{91.25-41.25}{41.25} \times 100 = \dfrac{50}{41.25} \times 100 = 121.21\%$

294. **Answer: (B)**

% increase in revenue in 2010

$= \dfrac{35-17}{17} \times 100 = \dfrac{18}{17} \times 100 = 105.8\%$

% increase in revenue in 2011

$= \dfrac{55-35}{35} \times 100 = 57.14\%$

% increase in revenue in 2012

$= \dfrac{58-55}{55} \times 100 = 5.45\%$

% increase in revenue in 2013

$$= \frac{72 - 58}{58} \times 100 = 24.13\%$$

% increase in revenue in 2014 is less than 20%

% increase in revenue in 2015

$$= \frac{102 - 79}{79} \times 100 = 29.11\%$$

% increase in revenue in 2016 is less than 20%.

∴ Increase in the revenue is more than 20% of the previous year value is occurring 4 times.

295. Answer: (C)

Revenue in 2013 = 72 lac

Revenue in 2011 = 55 lac

Let, Revenue in 2013 = x% of (Revenue in 2011)

⇒ 72 = x% of 55

$$x = 72 \times \frac{100}{55} = 130.9\%$$

296. Answer: (D)

Total candidates from medical and non-medical = (72/360)×720000=144000

Candidates qualified from medical and non-medical = 1.3% of 144000 = 1872

Candidates qualified from Commerce and Arts = 5400 – 1872 = 3528

297. Answer: (D)

Total candidates from Arts, Commerce, and Non-medical

= 342/360×720000 = 684000

Average = 684000/3=228000

298. Answer: (C)

% of candidates belong to non-medical = (54/360)×100=15%

299. Answer: (C)

Ratio of the arts and commerce candidate =

$$\frac{\frac{180}{360} \times 720000}{\frac{108}{360} \times 720000} = \frac{180}{108} = \frac{5}{3}$$

300. Answer: (B)

The total number of candidates who applied = 720000

Number of candidates who have qualified the exam = 5400

% of candidates qualified the exam

= 5400/720000×100=0.75%

301. Answer: (B)

Total people for newspaper E = 20000 × 22% = 4400

From given ratio of male : female = 4 : 7

Let the no. of Male = 4e and No. of Female = 7e

4e + 7e = 4400

e = 400

No. of Female reading newspaper E = 7e = 7 × 400 = 2800

Total people reading newspaper C = 20000 × 16% = 3200

From given ratio of male : female = 3 : 5

Let the no. of Male = 3c and No. of Female = 5c

3c + 5c = 3200

c = 400

No. of Males for newspaper C = 3c = 3 × 400 = 1200

Difference of no. of Females for both newspaper E and C = 2800 - 1200 = 1600

Required percent = (1600/1200) × 100 = 133.33

302. Answer: (C)

According to solutions of above questions, No. of Female reading newspaper A and B are 2a = 2400 and 3b = 2400 which means both are equal (a = 1200 and b = 800)

∴ Option C is correct answer.

303. Answer: (D)

Total people reading newspaper B = 20000 × 20% = 4000

From given ratio of male : female = 2 : 3

Let the number of male = 2b and Number of Female = 3b

2b + 3b = 4000

b = 800

No. of Male for newspaper B = 2b = 2 × 800 = 1600

Total people reading newspaper D = 20000 × 12% = 2400

From given ratio of male : female = 1 : 2

Let the no. of Male = d and No. of Female = 2d

d + 2d = 2400

d = 800

No. of Male for newspaper D = d = 800

Now, required difference = 1600 - 800 = 800

304. Answer: (C)

Total people reading newspaper A = 20000 × 30% = 6000

From given ratio of male : female = 3 : 2

Let the no. of Male = 3a and No. of Female = 2a

3a + 2a = 6000

a = 1200

∴ Number of Female reading newspaper A = 2a = 2 × 1200 = 2400

∴ Option C is correct answer.

305. Answer: (C)

Let monthly salary (in Rs.) = t

According to given information monthly spends (in %) on Clothing = 20% of income = 20t/100

Monthly spends (in %) on Education = 14% of income = 14t/100

Since the difference in monthly expenditure on Clothing and Education is Rs 9000 = (20t/100) - (14t/100)

t = 150000 = monthly salary (in Rs).

Now, saving = 10% of income = 15000

And expenditure on Bills = 8% of income = 12000

Difference (in Rs.) in monthly saving and monthly expenditure on Bills = 15000 - 12000 = 3000

Difference (in Rs.) in yearly saving and yearly expenditure on Bills = 12 × 3000 = 36000

306. Answer: (D)

Let monthly salary (in Rs.) = y

According to given information monthly spends (in %) on Fuel = 20% of income = 20y/100

Monthly spends (in %) on Bills = 8% of income = 8y/100

Since the difference in monthly expenditure on Fuel and Bills is Rs. 4800 = (20y/100) - (8y/100)

y = 400000 = monthly salary (in Rs).

Annual salary = Rs. 480000

307. Answer: (A)

Let monthly salary (in Rs) = x

According to given information monthly spends (in %) on saving = 10% of income

Also, monthly spends (in Rs.) on saving = 2400 = 10% of x

x = 24000

308. Answer: (A)

Expenditure on Household items = 28% of 65000= 18200

And Clothing = 20% of 65000 = 13000

Now the difference (in Rs) between expenditure on Household items and Clothing

18200 - 13000 = 5200

∴ Option A is correct answer.

309. Answer: (B)

Given monthly spends on Fuel = 20% of monthly income = 20×50000/100=10000

∴ Option B is correct answer.

310. Answer: (B)

Profit of A in year 2013 = 3,20,000 - 3,00,000 = Rs. 20,000

Profit of B in year 2016 = 4,50,000 - 4,00,000 = Rs. 50,000

Ratio = 20000/50000 = 2 : 5

311. Answer: (A)

Average income of A = (250000 + 320000 + 425000 + 490000 + 600000)/5 = Rs. 4,17,000

Average expenditure of A = (200000 + 300000 + 400000 + 450000 + 525000)/5 = Rs. 3,75,000

Average profit of A = 417000 - 375000 = Rs. 42,000

312. Answer: (D)

Profit percentage of B for 2012 = (180000 - 150000)/150000 × 100 = 20%

Profit percentage of B for 2013 = (250000 - 220000)/220000 × 100 = 13.64%

Profit percentage of B for 2014 = (320000 - 300000)/300000 × 100 = 6.67%

Profit percentage of B for 2015 = (375000 - 350000)/350000 × 100 = 7.14%

Profit percentage of B for 2016 = (450000 - 400000)/400000 × 100 = 12.5%

The profit percentage of B for 2012 is the highest

313. **Answer: (C)**

Income of A in 2017 = 600000 × (600000/490000) = Rs. 7,34,693.88

Expenditure of A in 2017 = 525000 × (525000/450000) = Rs. 6,12,500

Profit percent
= [(734693.88 - 612500)/612500]× 100
= 20%

314. **Answer: (B)**

Expenditure on Raw material = 17% of 136000 = Rs. 23120

Expenditure on Rent = 9% of 136000 = Rs. 12240

Difference in expenditure = 23120 - 12240 = Rs. 10880

315. **Answer: (C)**

Total expenditure incurred on Furniture and Others = 20 + 14 = 34% of 136000 = Rs. 46240

316. **Answer: (C)**

Expenditure incurred on Salary = 40% of 136000 = Rs. 54400

Expenditure incurred on Rent = 9% of 136000 = Rs. 12240

Ratio = 54400/12240 = 40/9 = 40 : 9

317. **Answer: (A)**

Percentage difference = 23 - 20 = 3%

Difference in the central angles = (3/100) × 360 = 10.8°

318. **Answer: (C)**

Amount in all other expenses reduced = Amount spent on transportation

Amount spent on transportation = (72/360) × 100 = 20% = Rs. 27200

319. **Answer: (A)**

⇒ Production of cars of type A in 2014 and type C in 2013 = 48 + 36 = 84

⇒ Production of cars of type B in 2016 and type E in 2015 = 56 + 35 = 91

∴ Required ratio = 84 : 91 = 12 : 13

320. **Answer: (B)**

Production of type B cars in 2012, 2014 and 2015 = 42 + 40 + 38 = 120 thousands

Production of type A cars in 2013 and 2016 = 35 + 56 = 91 thousands

⇒ Required percentage = [(120 – 91)/91] × 100 = 31.9% (Approx)

321. **Answer: (C)**

Production of cars type D over the years = 51 + 24 + 30 + 46 + 54 = 205

Average production of type D cars over the years = 205/5 = 41

Production of type B cars in 2014 and 2015 are 40 and 38 thousands respectively.

Now, we can say there are 2 years in which the production of cars of type B is less than the average production of type D cars over the years.

322. **Answer: (A)**

Total production of type E cars over the year = 20 + 42 + 40 + 35 + 43 = 180

Production of type E cars in 2013 = 42 thousands

180 thousands represents = 360°

∴ 42 thousands will represent = [360°/180] × 42 = 84°

323. **Answer: (A)**

Total production of cars of type C and E in 2013 taken together = 52 + 36 = 88

Total production of cars of type D in 2014 and 2016 and type E in 2017 = 42 + 46 + 55 = 143

⇒ Required ratio = 88 : 143 = 8 : 13

324. **Answer: (A)**

Production of cars of type a is 2015 and of type C in 2013 = 48 + 52 = 100

Production of cars of type D in over five years = 50 + 42 + 45 + 46 + 47 = 230

⇒ Required percentage = [100/230] × 100 = 43.5% approx

325. **Answer: (A)**

Production of cars of type B in 2013, 2014, 2015 and 2017 = 39 + 45 + 54 + 72 = 210

Production of all type of cars in 2017 = 36 + 72 + 45 + 47 + 55 = 255

⇒ Required percentage = [(255 − 210)/255] × 100 = 17.6% approx

326. **Answer: (D)**
Production of cars of type B over five years
= 39 + 45 + 54 + 60 + 72 = 270
Production of cars type B in 2016 = 60
⇒ 270 thousands represents = 360°
⇒ 60 thousands will represent = [360°/270] × 60 = 80°

327. **Answer: (B)**
Production of type A cars in 2015 and type B cars in 2014 taken together = 56 + 48 = 104
Production of type C cars in 2017 and type E cars in 2018 taken together = 57 + 60 = 117
∴ Required ratio = 104 : 117 = 8 : 9

328. **Answer: (A)**
Total production of type C cars in 2015 and type E cars in 2018 = 42 + 60 = 102 thousand
Total production of cars in 2104 = 64 + 48 + 33 + 25 + 40 = 210
Total production of cars in 2017 = 63 + 64 + 57 + 55 + 61 = 300
Total production of cars in 2014 and 2017 = 210 + 300 = 510
∴ Required percentage = [102/510] × 100 = 20%

329. **Answer: (C)**
Total production of type D cars during 2015 to 2017 = 45 + 40 + 55 = 140
Total production of type E cars during 2014, 2015, 2016 and 2018 = 40 + 48 + 52 + 60 = 200
∴ Required percentage = [(200 − 140)/200] × 100 = 30%

330. **Answer: (B)**
Production of type D cars in 2015 = 45
Total production of type D cars = 25 + 45 + 40 + 55 + 35 = 200 thousands
⇒ 200 thousand represent = 360°
⇒ 45 thousand will represent = [360°/200] × 45 = 81°

331. **Answer: (D)**

Total production of type D cars in five years = 46 + 50 + 54 + 68 + 67 = 285
⇒ Average production of type D cars in five years = 285/5 = 57
Production of type E cars in 2018 = 70
∴ Required percentage = [(70 − 57)/70] × 100 = 18.6 (Approx)

332. **Answer: (B)**
Total production of cars in 2018 = 38 + 40 + 54 + 68 + 70 = 270 thousand
Production of cars C in 2018 = 54 thousand
⇒ 270 thousand represents = 360°
∴ 54 thousand will represent = [360°/270] × 54 = 72°

333. **Answer: (A)**
Production of type B cars of 5 years = 54 + 45 + 47 + 50 + 40 = 236
Production of cars type A, B and D in 2017 = 43 + 50 + 67 = 160
∴ Required percentage = [(236 − 160)/160] × 100 = 47.5%

334. **Answer: (B)**
Production of type C cars in 2015 and type D in 2017 = 53 + 67 = 120 thousands
Production of type B cars in 2016 and type A in 2017 = 47 + 43 = 90 thousands
∴ Required ratio = 120 : 90 = 4 : 3

335. **Answer: (D)**
Total production of type D cars = 33 + 35 + 48 + 45 + 49 = 210 thousands
Production of type D cars in 2013 = 35 thousands
⇒ 210 thousands represents = 360°
⇒ 35 thousands will represent = [360°/210] × 35 = 60°

336. **Answer: (A)**
Total production of all type of cars, except type B, in 2012 = 54 + 46 + 33 + 47 = 180
Total production of all type of cars in 2016 = 55 + 67 + 77 + 49 + 52 = 300
Required percentage = [(300 − 180)/300] × 100 = 40%

337. **Answer: (B)**
Total production of type E cars in 2014 and type C cars in 2016 = 53 + 77 = 130

Total production of type B cars in 2014 and type D cars in 2013 = 56 + 35 = 91

∴ Required ratio = 130 : 91 = 10 : 7

338. **Answer: (D)**

Total production of type E cars in 2012 and 2013 = 47 + 43 = 90

total production of type A cars during the years 2012 to 2016 = 54 + 58 + 60 + 63 + 55 = 290

Average production of type A cars during the years 2012 to 2016 = 290/5 = 58

∴ Required percentage = [(90 - 58)/58] × 100 = 55.2% (Approx)

339. **Answer: (A)**

Total production of type B cars in 2015 and type C cars in 2013 = 58 + 52 = 110

Total production of type E cars in 2013 and 2014 = 43 + 47 = 90

∴ Required percentage = [(110 − 90)/90] × 100 = 22.2%

340. **Answer: (C)**

Total Production of type D cars = 60 + 53 + 56 + 65 + 66 = 300 thousands

Production of type D cars in 2016 = 65 thousands

⇒ 300 thousands represents = 360°

⇒ 65 thousands will represents = 360°/300 × 65 = 78°

341. **Answer: (A)**

Total production of type B cars during 2013 to 2016 = 47 + 55 + 58 + 54 = 214

Total production of cars in 2017 = 64 + 66 + 72 + 66 + 62 = 330

∴ Required percentage = [(330 − 214)/330] × 100 = 35% (approx)

342. **Answer: (A)**

Total production of type A cars in 2017 and type D cars in 2015 = 64 + 56 = 120

Total production of type B and type E cars in 2013 = 47 + 43 = 90

∴ Required ratio = 120 : 90 = 4 : 3

343. **Answer: (D)**

Average production of type C cars during 2012 to 2016 = (44 + 45 + 67 + 63 + 76)/5 = 295/5 = 59 thousands

Production of type D cars in 2012 and type E cars in 2014 = 44 + 64 = 110 thousands

⇒ Required percentage = [(110 − 59)/110] × 100 = 46.36%

344. **Answer: (B)**

Total production of type A cars in 2014 and 2016 and type C cars in 2013 = 56 + 64 + 45 = 165 thousands

Total production of type B cars and type D cars in 2014 = 63 + 57 = 120 thousands

∴ Required ratio = 165 : 120 = 11 : 8

345. **Answer: (D)**

Total production of type E cars in 2015 and type C cars in 2013 taken together = 65 + 45 = 110

Total production of type A cars and type D cars = 46 + 48 + 56 + 57 + 64 + 46 + 49 + 57 + 55 + 72 = 550

∴ Required percentage = [110/550] × 100 = 20%

346. **Answer: (D)**

Total production of type E cars = 48 + 55 + 64 + 65 + 68 = 300 thousands

Production of type E cars in 2013 = 55

300 thousands represents = 360°

∴ 55 thousand will represent = [360°/300] × 55 = 66°

347. **Answer: (D)**

Total production of type C cars = 54 + 55 + 45 + 60 + 56 = 270 thousands

Production of type C cars in 2012 = 45 thousands

270 thousands represents = 360°

45 thousands will represent = [360°/270] × 45 = 60°

348. **Answer: (C)**

Total production of cars in 2014 = 63 + 64 + 56 + 65 + 72 = 320 thousands

Average production of cars in 2014 = 320/5 = 64 thousands

Total production of type B cars in 2013 and type D cars in 2010 = 68 + 42 = 110

∴ Required percentage = [(110 − 64)/110] × 100 = 41.81%

349. **Answer: (D)**

Total production of type A cars in 2011 and type C cars and type E cars in 2012 = 69 + 45 + 61 = 175 thousands

Total production of type B cars during 2010 to 2014 = 40 + 56 + 52 + 68 + 64 = 280 thousands

∴ Required percentage = [175/280] × 100 = 62.5%

350. **Answer: (C)**

Total production of type B cars in 2011 and type E cars in 2013 = 56 + 64 = 120 thousands

Total production of type C cars in 2014 and type D cars in 2012 = 56 + 44 = 100 thousands

∴ Required ratio = 120 : 100 = 6 : 5

351. **Answer: (A)**

Total production of type D cars in 2015 and type B cars in 2017 = 56 + 64 = 120 thousands

total production of cars in 2018 = 65 + 72 + 56 + 68 + 64 = 325 thousands

Average production of cars in 2018 = 325/5 = 65 thousands

∴ Required percentage = [(120 − 65)/120] × 100 = 45.83%

352. **Answer: (D)**

Total production of type A cars in 2017 and type C cars in 2014 = 66 + 54 = 120 thousands

Total production of type B cars in 2014, type C cars in 2017 and type E cars in 2018 = 46 + 50 + 64 = 160 thousands

∴ Required ratio = 120 : 160 = 3 : 4

353. **Answer: (D)**

Total production of type A cars in 2016 and type E cars in 2014 = 44 + 46 = 90 thousands

total production of type C cars during 2014 to 2018 = 54 + 45 + 45 + 50 + 56 = 250 thousands

Required percentage = [90/250] × 100 = 36%

354. **Answer: (D)**

Total production of type D cars = 48 + 56 + 63 + 65 + 68 = 300 thousands

Total production of type D cars in 2017 = 65 thousands

⇒ 300 thousand represents = 360°

⇒ 65 thousand will represents = [360°/300] × 65 = 78°

355. **Answer: (C)**

Total production of type B cars in 2015 and type D cars in 2016 = 66 + 74 = 140

Total production of type E cars in five years = 48 + 58 + 63 + 64 + 67 = 300

Required percentage = [(300 − 140)/300] × 100 = 160/3

356. **Answer: (A)**

Average of type A cars during five years = (46 + 53 + 56 + 58 + 67)/2 = 280/5 = 56

Total production of type C cars in during five years = 43 + 54 + 55 + 47 + 51 = 250

Required percentage = [56/250] × 100 = 22.4%

357. **Answer: (C)**

Average of type C cars and D cars in 2012 = 43 + 47 = 90

Production of type A cars in 2014 and type E cars in 2015 = 56 + 64 = 120

Required ratio = 90 : 120 = 3 : 4

358. **Answer: (C)**

Total production of type B cars = 50 + 65 + 67 + 66 + 72 = 320 thousand

Production of type B cars in 2016 = 72 thousand

320 thousand represent = 360°

72 will represent = [360°/320] × 72 = 81°

359. **Answer: (D)**

Enrolled students in college A and B in year 2012 = 370 + 250 = 620

Enrolled students in college D and E in 2013 = 420 + 430 = 850

∴ Required ratio = 620 : 850 = 62 : 85

360. **Answer: (D)**

Total number of students in college D = 430 + 450 + 470 + 420 + 480 = 2250

Average of students studying in college D = 2250/5 = 450

361. **Answer: (A)**

Total enrolled students in 2014 = 420 + 290 + 340 + 480 + 480 = 2010

Enrolled students of college C in 2014 = 340

∴ Required percentage = (340/2010) × 100 = 16.9%

362. Answer: (B)

Number of students studying in college E in 2013 = 430

Total number of students studying in college B, C and D in 2013 = 310 + 370 + 420 = 1100

∴ Required percentage = [430/1100] × 100 = 39.09%

363. Answer: (C)

Percentage difference between the number of boys and girls in college A = [(5 − 4)/9] × 100 = 11.11%

Percentage difference between the number of boys and girls in college C = [(4 − 3)/7] × 100 = 14.28%

Percentage difference between the number of boys and girls in college D = [(6 − 5)/11] × 100 = 9.09%

Percentage difference between the number of boys and girls in college E = [(3 − 2)/5] × 100 = 20%

In college D the percentage difference between the number of boys and girls is minimum

364. Answer: (A)

Given, Total number of students are = 1800

Number of girls in college D = 1800 × [22/100] × [5/11] = 180

Number of girls in college E = 1800 × [10/100] × [3/5] = 108

Number of girls in college F = 1800 × [16/100] × [7/16] = 126

Total number of students in colleges D, E and F = 1800 × (22 + 10 + 16)% = 864

Required percentage = [(180 + 108 + 126)/864] × 100 = 47.91%

365. Answer: (B)

Number of girls in college A = 1800 × [20/100] × [5/9] = 200

10% of girls of college A = 200 × [10/100] = 20

Number of girls in college E = 1800 × [10/100] × [3/5] = 108

Required percentage = [20/108] × 100 = 18.51%

366. Answer: (A)

Number of boys in college A = 1800 × [20/100] × [4/9] = 160

Number of girls in college A = 1800 × [20/100] × [5/9] = 200

Number of boys in college B = 1800 × [18/100] × [1/3] = 108

Number of girls in college B = 1800 × [18/100] × [2/3] = 216

Total number of boys in college A and B = 160 + 108 = 268

Total number of girls in college A and B = 200 + 216 = 416

Required ratio = 268 : 416 = 67 : 104

367. Answer: (B)

Total number of students in college A = 300 + 250 + 400 = 950

Total number of students in college B = 350 + 400 + 450 = 1200

Total number of students in college C = 275 + 325 + 250 = 850

Total number of students in college D = 400 + 275 + 300 = 975

Total number of students in college E = 275 + 250 + 500 = 1025

Total number of students in all five college = 950 + 1200 + 850 + 975 + 1025 = 5000

5000 students represents = 360°

1200 students will represent = [360°/5000] × 1200 = 86.4° ≈ 86°

368. Answer: (A)

Total number of students studying in the science stream = 300 + 350 + 275 + 400 + 275 = 1600

Total number of students studying in the commerce stream = 250 + 400 + 325 + 275 + 250 = 1500

∴ Required ratio = 1600 : 1500 = 16 : 15

369. Answer: (A)

Total number of students in college B = 350 + 400 + 450 = 1200

Number of students of college B who studying in science = 350

∴ Required percentage = [350/1200] × 100 = 29.16% ≈ 29.2%

370. Answer: (D)

Total number of students in college A = 300 + 250 + 400 = 950

Total number of students in college B = 350 + 400 + 450 = 1200

Total number of students in college C = 275 + 325 + 250 = 850

Total number of students in college D = 400 + 275 + 300 = 975

Total number of students in college E = 275 + 250 + 500 = 1025

Total number of students in all five college = 950 + 1200 + 850 + 975 + 1025 = 5000

Total number of students studying in the commerce stream = 250 + 400 + 325 + 275 + 250 = 1500

∴ Required percentage = [1500/5000] × 100 = 30%

371. Answer: (B)

Number of girls in CE = 2600 × 20/100 × 2/5 = 208

Number of girls in CS = 2600 × 18/100 × 5/9 = 260

Number of girls in IT = 2600 × 21/100 × 4/7 = 312

Number of girls in ME = 2600 × 22/100 × 5/11 = 260

Number of girls in EC = 2600 × 19/100 × 10/19 = 260

Total girl in all five streams = 208 + 260 + 312 + 260 + 260 = 1300

Total number of girls = 1300

Total number of boys = 2600 - 1300 = 1300

Required ratio = 1300 : 1300 = 1 : 1

372. Answer: (D)

Number of students who studying in CS = 2600 × 18/100 = 468

Number of students who studying in IT = 2600 × 21/100 = 546

Required ratio = 468 : 546 = 6 : 7

373. Answer: (C)

Difference in the percentage of boys and girls in CE = [(3 - 2)/5] × 100 = 20%

Difference in the percentage of boys and girls in CS = [(5 - 4)/9] × 100 = 11.11%

Difference in the percentage of boys and girls in IT = [(4 - 3)/7] × 100 = 14.28%

Difference in the percentage of boys and girls in ME = [(6 - 5)/11] × 100 = 9.09%

Difference in the percentage of boys and girls in EC = [(10 - 9)/19] × 100 = 5.26%

In EC stream the difference in the percentage of boys and girls is minimum

374. Answer: (B)

Number of girls in CE = 2600 × 20/100 × 2/5 = 208

Number of girls in CS = 2600 × 18/100 × 5/9 = 260

Number of girls in IT = 2600 × 21/100 × 4/7 = 312

Number of girls in ME = 2600 × 22/100 × 5/11 = 260

Number of girls in EC = 2600 × 19/100 × 10/19 = 260

Total girl in all five streams = 208 + 260 + 312 + 260 + 260 = 1300

1300 girls represents = 360°

Number of girls in ME (260) will represent = (360°/1300) × 260 = 72° (approx)

375. Answer: (C)

Total number of students in the arts stream = 580 + 460 + 320 + 470 + 370 = 2200

Required average = 2200/5 = 440

376. Answer: (C)

Total number of students of college C = 320 + 540 + 350 = 1210

Number of students in science stream of college C = 540

Required percentage = [540/1210] × 100 = 44.66% = 45% (approx)

377. Answer: (B)

Total number of students studying science in collages A and B together = 620 + 680 = 1300

Total number of students studying commerce in colleges D and E together = 520 + 330 = 850

Required ratio = 1300 : 850 = 26 : 17

378. Answer: (A)
Number of students of the commerce stream in all colleges = 480 + 520 + 350 + 520 + 330 = 2200
Number of students of college D in commerce stream = 520
2200 students represents = 360°
520 students will represent = [360°/2200] × 520 = 85° (approx)

379. Answer: (B)
Total students of all five college = 8,000 + 10,000 + 15,000 + 9,000 + 11,000 = 53,000
Number of students of college E = 11,000
53,000 students represents = 360°
11,000 students will represent = [360°/53,000] × 11,000 = 74.7 ≈ 75°

380. Answer: (D)
Total students from the Economics discipline of college B = 10,000 × 40/100 = 4,000
Total students from the science discipline of college C = 15,000 × 45/100 = 6,750
Required percentage = [4,000/6,750] × 100 = 59.25% = 59% (approx)

381. Answer: (D)
Total students from the science discipline of college A = 8,000 × 25/100 = 2,000
Total students from the science discipline of college B = 10,000 × 35/100 = 3,500
Total students from the science discipline of college C = 15,000 × 45/100 = 6,750
Total students from the science discipline of college D = 9,000 × 28/100 = 2,520
Total students from the science discipline of college E = 11,000 × 35/100 = 3,850
Total students from the science discipline of all the colleges = 2,000 + 3,500 + 6,750 + 2,520 + 3,850 = 18,620
Required average = 18,620/5 = 3724

382. Answer: (B)
Total students from the discipline of Mathematics for college A = 8,000 × 40/100 = 3,200

Total students from the discipline of Mathematics for college C = 15,000 × 35/100 = 5,250
Total students from Mathematics discipline of college A and C = 3,200 + 5,250 = 8,450
Total students of college A and C = 8,000 + 15,000 = 23,000
Required percentage = [8,450/23,000] × 100 = 36.7%

383. Answer: (A)
Total production of rice of all three states in 2014 = 6.2 + 4.8 + 6.4 = 17.4
Total production of rice of all three states in 2016 = 6.9 + 5.7 + 7.4 = 20
Required ratio = 17.4 : 20 = 87 : 100

384. Answer: (B)
Production of rice of state B in 2014 = 4.8
Production of rice of state B in 2016 = 5.7
Required percentage = [(5.7 - 4.8)/4.8] × 100 = 18.75%

385. Answer: (C)
Total production of rice of state A over the years = 5.2 + 5.4 + 5.8 + 6.2 + 6.5 + 6.9 = 36 million tonnes
Required average = 36/6 = 6 million tonnes

386. Answer: (C)
Total production of rice of state A over the years = 5.2 + 5.4 + 5.8 + 6.2 + 6.5 + 6.9 = 36 million tonnes
Total production of rice of state B over the years = 3.8 + 4.1 + 4.4 + 4.8 + 5.2 + 5.7 = 28 million tonnes
Total production of rice of state C over the years = 4.5 + 5.2 + 5.8 + 6.4 + 6.7 + 7.4 = 36 million tonnes
Total production of rice of three states in all six years = 36 + 28 + 36 = 100 million tonnes
Total production of rice of three states in 2014 = 6.2 + 4.8 + 6.4 = 17.4 million tonnes
100 million tonnes represents = 360°
17.4 million tonnes will represents = [360/100] × 17.4 = 62.64° ≈ 63°

387. **Answer: (C)**

Total appeared students in college E in 2015 = 200

Number of passing students in college E in 2015 = 200 × 72/100 = 144

Number of fail students in college E in 2015 = 200 − 144 = 56

Required ratio = 144 : 56 = 18 : 7

388. **Answer: (B)**

Total passing students of college A = 200 × 68/100 + 200 × 72/100 + 200 × 74/100 = 136 + 144 + 148 = 428

Average passing percentage of college A = 428/600 × 100 = 71.33%

Total passing students of college B = 200 × 65/100 + 200 × 68/100 + 200 × 77/100 = 130 + 136 + 154 = 420

Total passing percentage of college B = 420/600 × 100 = 70%

Total passing students of college C = 200 × 80/100 + 200 × 88/100 + 200 × 92/100 = 160 + 176 + 184 = 520

Total passing percentage of college C = 520/600 × 100 = 86.66%

Total passing students of college D = 200 × 92/100 + 200 × 95/100 + 200 × 98/100 = 184 + 190 + 196 = 570

Total passing percentage of college D = 570/600 × 100 = 95%

Total passing students of college E = 200 × 72/100 + 200 × 75/100 + 200 × 73/100 = 144 + 150 + 146 = 440

Total passing percentage of college E = 440/600 × 100 = 73.33%

Average passing percentage of college B is the least.

389. **Answer: (B)**

Total passing students of college A = 200 × 68/100 + 200 × 72/100 + 200 × 74/100 = 136 + 144 + 148 = 428

Total passing students of college B = 200 × 65/100 + 200 × 68/100 + 200 × 77/100 = 130 + 136 + 154 = 420

Total passing students of college C = 200 × 80/100 + 200 × 88/100 + 200 × 92/100 = 160 + 176 + 184 = 520

Total passing students of college D = 200 × 92/100 + 200 × 95/100 + 200 × 98/100 = 184 + 190 + 196 = 570

Total passing students of college E = 200 × 72/100 + 200 × 75/100 + 200 × 73/100 = 144 + 150 + 146 = 440

Total passing students of all five college over the years = 428 + 420 + 520 + 570 + 440 = 2378

2378 students represents = 360°

520 students will represent = [360°/2378] × 520 = 78.72° = 79° (approx)

390. **Answer: (B)**

Number of passing students of college B in 2016 = 200 × 68/100 = 136

Number of passing students of college B in 2017 = 200 × 77/100 = 154

Required percentage = (154 − 136)/136 × 100 = 13.2%

391. **Answer: (D)**

Total students who play cricket in schools A and B together = 125 + 250 = 375

Total students who play hockey in schools C and D together = 200 + 150 = 350

Required ratio = 375 : 350 = 15 : 14

392. **Answer: (C)**

Total students who play hockey of all four schools = 75 + 125 + 200 + 150 = 550

Total students who play hockey of school C = 200

550 students represent = 360°

200 students will represent = 360/550 × 200 = 131° (approx)

393. **Answer: (B)**

Total students who play cricket of all four schools = 125 + 250 + 150 + 175 = 700

Required average = 700/4 = 175

394. **Answer: (A)**

Number of students who play football in school A = 175

Total number of students who play football of all four schools = 175 + 200 + 250 + 125 = 750

Required percentage = [175/750] × 100 = 23.3% (approx)

395. **Answer: (A)**

Total cars sold by showroom A = 500 + 480 + 520 + 620 + 650 + 630 = 3400

Total cars sold by showroom B = 450 + 420 + 530 + 480 + 520 + 400 = 2800

Total cars sold by showroom C = 400 + 450 + 460 + 520 + 540 + 430 = 2800

Total cars sold by all three showrooms = 3400 + 2800 + 2800 = 9000

Cars sold in the year 2013 = 520 + 530 + 460 = 1510

9000 represents = 360°

1510 will represent = 360/9000 × 1510 = 60° (approx)

396. **Answer: (B)**

Total cars sold in the year 2015 = 650 + 520 + 540 = 1710

Total cars sold in the year 2016 = 630 + 400 + 430 = 1460

Required percentage
= (1710–1460)/1710×100=14.6% (approx)

397. **Answer: (A)**

Total cars sold by showroom A = 500 + 480 + 520 + 620 + 650 + 630 = 3400

Required average = 3400/6 = 566.7 (approx)

398. **Answer: (A)**

Total cars sold by showroom B during the years 2014 and 2016 = 480 + 400 = 880

Total cars sold by showroom C during the years 2015 and 2016 = 540 + 430 = 970

Required ratio = 880 : 970 = 88 : 97

399. **Answer: (C)**

Total number obtained by A in Physics = 120 × 90/100 = 108

Total number obtained by B in Physics = 120 × 80/100 = 96

Total number obtained by C in Physics = 120 × 70/100 = 84

Total number obtained by D in Physics = 120 × 80/100 = 96

Total number obtained by E in Physics = 120 × 85/100 = 102

Total number obtained by F in Physics = 120 × 65/100 = 78

Total number obtained by G in Physics = 120 × 50/100 = 60

Total number obtained by all seven students in Physics = 108 + 96 + 84 + 96 + 102 + 78 + 60 = 624

Required average = 624/7 = 89.14

400. **Answer: (C)**

Short trick:

Total sum of percentage = 90 + 100 + 90 + 80 + 80 + 70 + 65 = 575%

⇒ Average = 575/7 %

∴ Required percentage = 575/7 × 150/100 = 123.21

Detailed solution:

Total sum of marks = (90% of 150) + (100% of 150) + (90% of 150) + (80% of 150) + (80% of 150) + (70% of 150) + (65% of 150)

⇒ 135 + 150 + 135 + 120 + 120 + 105 + 97.5

⇒ 862.5

∴ Required average marks = 862.5/7 = 123.21

401. **Answer: (B)**

Total expenditure on interest over the years = 23.4 + 32.5 + 41.6 + 36.4 + 49.4 = 183.3 lakhs

Required average = 183.3/5 = 36.66 lakhs

402. **Answer: (B)**

Average amount of tax = (83 + 108 + 74 + 88 + 98)/5 = 451/5 = 90.2

403. **Answer: (B)**

Total expenditure on Royalty = 15%

Total expenditure on Printing = 20%

Required percentage = [(20 − 15)/20] × 100 = 25%

404. **Answer: (C)**

Percentage of expenditure on paper = 25

Percentage of expenditure on promotion = 10

Expenditure on promotion Is less than that on paper = (25 - 10)/25 × 100 = 60%

405. **Answer: (B)**

Total sales of books from branch B1 in 2000 and 2001 = 80 + 105 = 185

Total sales of books from branch B3 in 2000 and 2001 = 95 + 110 = 205

Total sales of books from branch B6 in 2000 and 2001 = 70 + 80 = 150

Total sales of books from branches B1, B3 and B6 for both years = 185 + 205 + 150 = 540

406. **Answer: (C)**
From the given table,
In the year 2000: B1 = 80, B2 = 75, B5 = 75
In the year 2001: B1 = 105, B2 = 65, B5 = 95
∴ Required number = 80 + 105 + 75 + 65 + 75 + 95 = 495

407. **Answer: (C)**
Req. percentage increase
$$= \frac{(168 - 148)}{148} \times 100 = 13.51$$

408. **Answer: (B)**
Req. annual growth rate = (16/32) × 100/4 = 12.5

409. **Answer: (A)**
Required ratio = $\frac{(48+56+64+78+92)}{(105+123+125+148+161)}$
= 169/331

410. **Answer: (C)**
Total student in 2012 = 333
Total student in 2013 = 345
Total student in 2014 = 369
Total student in 2015 = 418
Total student in 2016 = 469
So, max. increase in the percentage of total number of student = 2015

411. **Answer: (B)**
Total marks of all students in Mathematics is maximum
Highest marks in Mathematics = 475
English = 407
Science = 471
Hindi = 439

412. **Answer: (C)** Student 3 has scored the highest marks including all 4 subjects
Max marks in all the 4 subjects
Student 1 = 354
Student 2 = 356
Student 3 = 379
Student 4 = 338
Student 5 = 365

413. **Answer: (B)** A new subject has been included, in which all students scored 100 marks. If the subjects with 4 highest marks have been used to calculate their total marks, then the student in second place will be 2 based on the total marks.
According to the given condition
the marks ⇒ Student 1 = 373
Student 2 = 382
Student 3 = 390
Student 4 = 376
Student 5 = 379

414. **Answer: (C)** The average marks per student in English is 92.71 percent of the average marks per student in Hindi.
Average score
$\frac{407 \times 5}{439 \times 5} \times 100 = 92.71\%$

415. **Answer: (B)** Reebok brand has 276 shoes

416. **Answer: (A)** There is a difference of 96 in the number of shoes of Puma and Vans.

417. **Answer: (C)** The difference in the number of shoes between the Reebok and Nike brands is the same as the difference between the number of Vans and Nike brand shoes.

418. **Answer: (B)** Puma shoes are 16.66 percent more than Nike shoes

419. **Answer: (D)**
Required difference = (24-6)%×200=36 corers

420. **Answer: (B)**
Total GDP = 0.07 × 200 × 2260
= 31640

421. **Answer: (D)**
Total GDP = 0.17 × 200 × 4840
= 164560

422. **Answer: (C)**
Highest GDP
Country 3 = 0.15 × 200 × 9900
= 297000

423. **Answer: (C)** XYZ Ltd. paid 118.8 in Y7

424. **Answer: (B)** Y8> Y6> Y2 facts about profit after tax for Y2, Y6 and Y8 are correct

425. **Answer: (C)** There are 5 different values of the amount of annual benefit

426. **Answer: (C)** The total amount of after-tax profit from Y1 to Y8 is 1820.2

427. **Answer: (C)**
Difference in hour of algebra and modern maths = (9 - 4) = 5%

So, 100% of hour = 500

5% of hour $= \dfrac{500}{100} \times 5 = 25$

428. **Answer: (C)**

Given that

6% of geometry = 36 hour

1% hour = 6 hour

So,

Remaining $\dfrac{1}{4}$ hour arithmetic

Time taken to teach topic of ratio

$= \dfrac{1}{4} \times 46 \times 6 = 69$

429. **Answer: (D)**

Given that

DI & modern maths = 8 + 4 = 12%

12% hour = 96

1% hour = 8 hour

So, no. system & Geometry = 23 + 6 = 29%

Req. hour = 29 × 8 = 232

430. **Answer: (C)**

Except arithmetic 10% =10% of 54 = 5.4

So, $\Rightarrow$ 5.4%

So, required angle $= \dfrac{360}{100} \times 5.4 = 19.44$

431. **Answer: (B)**

Given then,

Literate people in city 4

$= \dfrac{600000}{100} \times 63$

$= 378000$

432. **Answer: (C)**

Req. ratio $= \dfrac{\dfrac{220000}{100} \times \dfrac{85}{11} \times 7}{\dfrac{200000}{100} \times \dfrac{58}{5} \times 3}$

$= \dfrac{1190}{696} = \dfrac{595}{348}$

433. **Answer: (A)**

Total population of city 5

$= \dfrac{\left[\dfrac{259210}{7} \times 16\right]}{92} \times 100$

$= 644000$

434. **Answer: (D)**

City 1 = 80% of 250000 = 200000

City 2 = 85% of 200000 = 170000

City 3 = 78% of 220000 = 171600

City 4 = 63% of 300000 = 189000

City 5 = 92% of 150000 = 138000

City 6 = 58% of 400000 = 232000

So, city 6 > city 1 > city 4 > city 3 > city 2 > city 5

435. **Answer: (B)**

Audience in screen 1 . 2nd show = 300

Audience in screen 1, 3rd show = 600

Increases% $= \dfrac{600 - 300}{300} \times 100 = 100\%$

436. **Answer: (C)**

Audience in screen 3, 2nd show = 700

Audience in screen 1, 2nd show = 300

Required No. of Audience = 700 – 300 = 400

437. **Answer: (A)**

Total audience of 2nd show = 300 + 450 + 700 = 1450

Total audience of 3rd show = 600 + 400 + 750 = 1750

Required increase % =

$\dfrac{1750 - 1450}{1450} \times 100 = 20.69\%$

438. **Answer: (D)**

Revenue of screen 1 = (500 + 300 + 600) × 350 = Rs. 4,90,000

Revenue of screen 2 = (600 + 450 + 400) × 300 = Rs. 4,35,000

Revenue of screen 3 = (650 + 700 + 750) × 250 = Rs. 5,25,000

:: Revenue of screen 3 is maximum

439. **Answer: (A)**

Total trade in year 3 = 1183 crore dollars

Total export in year 3

$= \dfrac{1183}{7} \times 4 = 676$

Total import in year 3

$= \dfrac{1183}{7} \times 3 = 507$

Required difference = 676 – 507 = 169

Or

$= \dfrac{1183}{7} (4 - 3)$

$= \dfrac{1183}{7} = 169$ crore dollars

440. **Answer: (D)**

Let total trade in year 2 and year 4 = x

Export in year 4 $= \dfrac{5}{13} \times x$

$\dfrac{5x}{13} = 315$

$x = 13 \times 63 = 819$

Import in year 2 $= \dfrac{819}{18} \times 7$

= 318.5 crore dollars

441. **Answer: (B)**

Export of year 1 $= \dfrac{5700}{19} \times 10$

= 3000

Export of year 5 $= \dfrac{5700}{2 \times 25} \times 12$

= 1368

Required difference = 3000 – 1368

= 1632 crore dollars

442. **Answer: (A)**

Export in year 1 $= \frac{3800}{19} \times 10$
$= 2000$

Export in year 2 $= \frac{3600}{18} \times 11$
$= 2200$

Export in year 3 $= \frac{2800}{7} \times 4$
$= 1600$

Export in year 4 $= \frac{3900}{13} \times 5$
$= 1500$

Export in year 5 $= \frac{5000}{25} \times 12$
$= 2400$

Import in year 1 = 3800 – 2000 = 180
Import in year 2 = 3600 – 2200 = 140
Import in year 3 = 2800 – 1600 = 120
Import in year 4 = 3900 – 1500 = 240
Import in year 5 = 5000 – 2400 = 260

Average export $= \frac{1}{5} \times 9700 = 1940$

Average import $= \frac{1}{5} \times 9400 = 1880$

Required difference = 1940 - 1880 = 60 crore dollars

443. **Answer: (B)**

Surplus of country A of year 2013 and 2014 taken together
$= (1671 - 1641) + (1103 - 1002)$
$= 30 + 101 = 131$ thousand quintal

444. **Answer: (C)**

Stock of country C at end of 4 year period.
$= [7835 + 2035 + 1821 + 1937 + 3014] - [2247 + 2018 + 2563 + 2988]$
$= 6826$ thousand quintal

445. **Answer: (A)**

Required difference
$= \left| \frac{(2035+1821+1937+3014)}{4} - \frac{(2247+2018+2563+2988)}{4} \right|$
$= \left| \frac{8807}{4} - \frac{9816}{4} \right|$
$= |2201.75 - 2454| = 252.25$ thousand quintal

446. **Answer: (B)**

Surplus of country B over the 4 years
$= (1881 - 1798) + (2067 - 2389) + (1328 - 2063) + (1578 - 1239)$
$= 83 - 322 - 735 + 339 = -635$

Surplus of country D over the 4 years.
$= (3126 - 2417) + (2987 - 2917) + (2143 - 3188) + (4126 - 3563)$
$= 709 + 70 - 1045 + 563$
$= 297$

∴ surplus of D > surplus of B.

447. **Answer: (C)**

Time taken in point and frame
$= \frac{35}{100} \times 300$
$= 105$ hours

448. **Answer: (A)**

Time taken in glasss
$= \frac{192}{6} \times 8$
$= 32 \times 8$
$= 256$ hours

449. **Answer: (D)**

Difference in time taken by frame and glass
$= \frac{127.5}{40+11} \times (22 - 8)$
$= \frac{127.5}{51} \times 14 = 35$ hours

450. **Answer: (B)**

Total time for quality check = 15%

There are 6 processes

So,

Time taken for any one process in quality check
$= \frac{15\%}{6}$
$= 2.5\%$

New angle for seats and glass
$= \frac{(6+8-2.5-2.5)\%}{x°} = \frac{100}{360}$

$x = 32.4°$

451. **Answer: (C)** Increase in sale from 2009 to 2012 in Hatchback
$= 800 - 500 = 300$

Increase in sale from 2009 to 2012 in Sedan
$= 625 - 450 = 175$

Increase in sale from 2009 to 2012 in SUV
$= 750 - 150 = 600$

So, SUV has highest increase.

452. **Answer: (C)**

Growth from 2009 to 2012 $= 750 - 150 = 600$

Annual growth rate for SUV
$= \frac{600}{150 \times 3} \times 100 = 133.33\%$

453. **Answer: (C)**

Total sale of sedan = 450 + 500 + 575 + 625 = 2150

Total sale of SUV = 150 + 250 + 400 + 750 = 1550

Required ratio = $\frac{2150}{1550}$ = $\frac{43}{31}$

454. **Answer: (C) 3069**

Growth Rate for hatchback in 2012 over 2011

= $\frac{800-650}{650}$ × 100

= $\frac{150}{650}$ × 100

= 23%

Growth Rate for Sedan in 2012 over 2011

= $\frac{625-575}{575}$ × 100

= 9%

Growth Rate for SUV in 2012 over 2011

= $\frac{750-400}{400}$ × 100

= $\frac{350}{400}$ × 100

= 87.5%

Total sale in 2013

= $\frac{123}{100}$ × 800 + $\frac{109}{100}$ × 625 + $\frac{187.5}{100}$ × 750

= 984 + 681.25 + 1406.25

= 3069

455. **Answer: (B)**

Required average

= $\frac{152+35+14+138+34+40+35+150+63+68+112+73+196}{13}$

= $\frac{1110}{13}$

= 85.39 ≃ 85

456. **Answer: (C)**

It is clear from the graph that the percentage change in number of parked cars is maximum from 8 am to 9 am.

457. **Answer: (B)**

Since the approximate average is 85 Therefore, number of parked cars less than average is for 8 hours.

458. **Answer: (A)**

Since total number of cars = 1110

∴ total = 1110 × 50 = Rs. 55500

459. **Answer: (B)**

Required% = $\frac{122-65}{65}$ × 100

≃ 87.69%

460. **Answer: (C) Bank 1, Bank 4 and Bank 5**

461. **Answer: (A)**

I → $\frac{295}{122}$

II → $\frac{211}{123}$

I > II

462. **Answer: (C)**

% increase for Bank 1 = $\frac{352-265}{265}$ × 100

= 32.83%

% increase for Bank 2 = $\frac{122-65}{65}$ × 100

= 87.69%

% increase for Bank 3 = $\frac{211-138}{138}$ × 100

= 52.89%

% increase for Bank 4 = $\frac{157-109}{109}$ × 100

= 44.03%

% increase for Bank 5 = $\frac{158-80}{80}$ × 100

= 97.5%

463. **Answer: (B)**

MBBS, who have filled the form from XYZ university

= $\frac{18}{100}$ × $\frac{17}{100}$ × 40000000

= 1224000

464. **Answer: (C)**

Required difference

= $\frac{18}{100}$ × 40000000 − $\frac{9}{100}$ × 35000000

= 4050000

465. **Answer: (A)**

B. Arch. candidates who did not gave exam

$\frac{50}{100}$ × $\frac{16}{100}$ × 40000000 − $\frac{45}{100}$ × $\frac{14}{100}$ × 35000000

= 995000

466. **Answer: (D)**

Number of absentees for

B. Tech = 18 × 400000 − 19 × 350000

= 550000

B. com = 21 × 400000 − 22 × 350000

= 700000

M.B.B.S. = 17 × 400000 − 14 × 350000 = 1900000

B.A. = 20 × 400000 − 22 × 350000

= 300000

M.B.A. = 8 × 400000 − 9 × 350000

= 50000

Others = 16 × 400000 − 14 × 350000

= 1500000

Therefore, highest number of absentees is for M.B.B.S.

467. Answer: (B)

Required average

$$= \frac{300 + 250 + 272 + 162 + 82 + 104 + 120}{7}$$

$$= 184.28$$

468. Answer: (D)

Required Ratio

$$= \frac{\frac{300 + 250 + 272}{8}}{\frac{82 + 104 + 120}{8}}$$

$$= \frac{822}{306}$$

$$= \frac{137}{51}$$

469. Answer: (D)

Required percent $= \frac{300 + 272}{718} \times 100$

$$= 79.66$$

470. Answer: (A)

Bottom two countries after arranging in ascending order = Nepal and Thailand

New per acre yield of all countries

$$= (82 + 104)\frac{120}{100} + \frac{110}{100}(1104)$$

$$= 186 \times 1.2 + 1.1 \times 1104$$

$$= 223.2 + 1214.4$$

$$= 1437.6$$

Required average $= \frac{1437.5}{7}$

$$= 205.37$$

471. Answer: (D)

Required percentage increase

$$= \frac{5 - 4.5}{4.5} \times 100$$

$$= \frac{5}{45} \times 100$$

$$= 11\frac{1}{9}\%$$

$$= 11.11\%$$

472. Answer: (B)

Total sale in 2014 =

$4 + 4.5 + 6 + 7.5 = 22$

Total sale in 2016 =

$7.5 + 6 + 7.5 + 9.5 = 30.5$

$$\frac{30.5 - 22}{22} \times 100$$

$$= \frac{8.5}{22} \times 100$$

$$= 38.63\%$$

473. Answer: (A)

Percentage increase of sale in 2016 of Brand 1

$$= \frac{7.5 - 5.5}{5.5} \times 100$$

$$= \frac{20}{55} \times 100$$

Percentage increase of sale in 2016 of Brand 2

$$= \frac{6 - 5}{5} \times 100$$

$$= 20\%$$

Percentage increase of sale in 2016 of Brand 3

$$= \frac{7.5 - 6.5}{6.5} \times 100$$

$$= 15.38\%$$

Percentage increase of sale in 2016 of Brand 4

$$= \frac{9.5 - 8.5}{8.5} \times 100$$

$$= 11.76\%$$

$$= \left(\frac{136.36}{100} \times 7.5 + \frac{120}{100} \times 6 + \frac{115.38}{100}\right) \times 100$$

$$\times 7.5 + \frac{111.76}{100} \times 9.5$$

$$= 10227 + 7200 + 8653.5 + 10617.2$$

$$= 36698$$

Average sales $= \frac{36698}{4}$

$$= 9175$$

474. Answer: (C)

Average sale in 2014 = 22/4 = 5.5

Average sale in 2015 = 25.5/4 = 6.375

Average sale in 2016 = 30.5/4 = 7.625

Brand 4 will have maximum stars.

475. Answer: (B) Answer: :

Required runs = 12% of 1600

$$= \frac{12}{100} \times 1600$$

$$= 192$$

476. Answer: (D)

Difference of % runs against England & Pakistan = 9%

Which is same as in case against Australia & New Zealand

477. Answer: (A) Answer: :

Difference of % = 25% – 9%

$$= 16\%$$

∴ Required runs $= \frac{16}{100} \times 1600$

$$= 256$$

478. Answer: (D)

Total % runs against Australia & New Zealand = 41%

And,

Total % runs against Sri Lanka & Pakistan = 21%

Difference 20%

Which is $= \frac{20}{100} \times 360° = 72°$

479. **Answer: (C)**

Required percent $= \frac{24-8}{8} \times 100$

$= \frac{16}{8} \times 100$

$= 200\%$

480. **Answer: (A)**

Required difference $= \frac{1875}{100}(24 - 16)$

$= 150$

481. **Answer: (D)**

Let sectorial angel for runs made against Australia be x

$\frac{x}{32} = \frac{360}{100}$

$\frac{x}{32} = \frac{18}{5}$

$= \frac{18 \times 32}{5}$

x = 115.2

482. **Answer: (A)**

Taking option (a) Runs scored against each team is in integral value when total runs scored is 25.

483. **Answer: : (B) C**

484. **Answer: (A)** Amount (in billion USD) = 50 -30 = 20

485. **Answer: (A)**

Required ratio $= \frac{90}{30+70+50} = \frac{3}{5}$

486. **Answer: (C)**

Let GDP 10 years before be x

$: x \times \frac{150}{100} = (30 + 100 + 70 + 20 + 90 + 50)$

$= x = 240$

487. **Answer: (A)** E

488. **Answer: (C)**

Required no. of tickets = (6-5) = 1

: Required percentage $= \frac{1}{5} \times 100 = 20\%$

489. **Answer: (B)**

Required ratio $= \frac{5+3}{6} = \frac{8}{6} = \frac{4}{3}$

490. **Answer: (C)**

Required revenue = 7000 × (11 – 6) × 1000

= 350,00,000

= 35 millions

491. **Answer: (A)** 2013

492. **Answer: (B)** Cumulative profit = 20 + 30 – 10 +5 + 15 +10

= 70

493. **Answer: (C)**

Required % value $= \frac{30-20}{20} \times 100 = 50$

494. **Answer: (C)** Profits added till the end of 2015

20 + 30 – 10 + 5 + 15

= 60

∴ Profit at the start of 2011

= (150 – 60) lakh

= 90 lakh

∴ profit at the start of 2012

= (90 + 20) lakhs

= 110 lakhs

495. **Answer: (A)**

For country C, inflation in 2016 is lower than that in 2015.

496. **Answer: (C)**

Required % $= \frac{5-2}{2} \times 100 = 150\%$

497. **Answer: (D)**

Required ratio $= \frac{8}{4} = 2 : 1$

498. **Answer: (D)**

Price index of country D in the end of 2016 = $200 \times \frac{102}{100} \times \frac{105}{100}$

= 214.2

499. **Answer: (B)**

2012, 2014, 2015 had admissions greater than that of the previous year.

500. **Answer: (A)**

Required no. of students = 100 + 150 + 150 + 250 + 350+300

= 1300

501. **Answer: (D)**

Required % = $\frac{250-150}{150} \times 100$

= 66.67%

502. **Answer: (A)**

Total fees = (100 + 150 + 150) × 10000 + (250 + 350 + 300) × 12000

= 40,00,000 + 1,08,00,000

= 1.48 crore

503. Answer: (B) F
504. Answer: (B)
Required % = $\frac{0.9-0.8}{0.8} \times 100$
= 12.5%
505. Answer: (A)
Total no. of cars (in millions) = 2.7
Now, % of petrol cars = 65%
∴ Required numbers = $\frac{65}{100} \times 2.7$
= 1.755
506. Answer: (B)
Tax on 1 car = 2.5% × 30,000
= 750 millions
Tax on 2.7 million car = 750 × 2.7
= 2.03 billion (approx)
507. Answer: (D)
Two times in year 2012 & 2015
508. Answer: (D)
Net exports = Exports + imports
−10 = 90 + imports
Imports = −100
509. Answer: (D)
Required ratio = $\frac{30}{20} = \frac{3}{2}$
510. Answer: (C)
Circulative net exports
= 20 − 10 − 20 + 30
= 20 million USD
511. Answer: (A) D
512. Answer: (B)
Required % = $\frac{525-500}{500} \times 100$
= 5%
513. Answer: (D)
Required amount = (330 + 525 + 120 + 100) − (300 + 500 + 100 + 50)
= 125 lakh = 1.25 crores
514. Answer: (B)
Cumulative cost of production in **2015** and **2016** = 10 + 10 = 20 Cr = 2000 lac
Cumulative revenue in **2015** and **2016** = 300 + 330 + 500 + 525 + 100 + 120 + 50 + 100
= 2025 lac
= Cumulative Profit = (2025 − 2000) lacs
= 25 lacs
515. Answer: (C)
As seen from pie-chart = B = 30%
516. Answer: (A)

A country = 25%
⇒ 90% _____ 360°
$\frac{360°}{90} \times 25 = 4 \times 25 = 100°$
517. Answer: (B)
Req. percent
$= \frac{30-10}{10} \times 100 = \frac{20}{10} \times 100 = 200$
518. Answer: (B)
Required ratio =
$\frac{(total\ no.\ of\ students \times 15000)}{9,00,000}$
$= \frac{1350,000}{900000} = \frac{3}{2}$
519. Answer: (A)
Required ratio = 150: 200 = 3: 4
520. Answer: (D)
Required difference
$= \frac{400}{100} \times 1000 - \frac{150}{100} \times 1000 = 2500$
521. Answer: (B)
Required % $= \frac{200}{200} \times 100 = 100\%$
522. Answer: (D)
Required population
$= \frac{50}{100} \times 2000000 = 10,00,000$
523. Answer: (C)
From the graph → A & D
524. Answer: (A)
If double of memory model C = 2 × 4 = 8
The Required are = 16 − 8 = 8
525. Answer: (A)
If D model memory halved $= \frac{16}{2} = 8\ then$
Required % $= \frac{(8-2)}{2} \times 100 = 300$
526. Answer: (B)
If model E increased by 12000 & mm. Double the sales. Unchanged
$= \frac{12000}{8} = 1500$
527. Answer: (D)
Second biggest expense of the company = 25% electricity
528. Answer: (D)
Req. ratio $= \frac{30+15}{15} = \frac{3}{1}$
529. Answer: (A)
Required percent $= \frac{(10-5)}{5} \times 100$

= 100%

530. Answer: (C)
Total expenses on transport and electricity
= 40% of 50 crores
= 20 crores

531. Answer: (C)
from pie-chart, F is winner if A dedared disqualified,

532. Answer: (A)
From the pie-chart,
Winning candidate = $(27 - 21) = 6\%$
So, 1% = 1000
The value of 6% = 6000

533. Answer: (B)
According to condition,
F gets - 21 + 8 = 29%
So, A gets → 27%
So, F would have won by 2% = 2000 votes

534. Answer: (D)
Attendence = 60%
That is equal to = (27 + 11 + 6 + 9 + 16 + 21)
Total votes lis candidates $= \frac{90}{60} \times 100 = 150\%$
= 150000

535. Answer: (D)
No. of tigers in WLS D = 10
No. of tigers in WLS F = 13
∴ No. of tigers in WLS B is more than that in D but less than F.

536. Answer: (B)
Required No. of Tigers =
(29 + 9) + 11 + 5 + 10 + (22-3) +13 = 96

537. Answer: (B)
$Required\ Ratio = \frac{(22+13)}{(10+5)} = \frac{35}{15} = 7:3$

538. Answer: (C)
Total No. of Tigers in all sanctuaries
= 29 + 11 + 5 + 10 + 22 + 13 = 90
Total of Tigers in all sanctuaries before 20 years
$= 90 \times \frac{100}{120} \times \frac{100}{125}$
= 60

539. Answer: (B)
No. of taxi in company A = 25
No. of taxi in company D = 75
No. of taxi in company C = 35
:: No. of taxi in company C is more than A but less than that of D

540. Answer: (D)
Final no. of taxi in company D = 75 + 30
= 105
No. of taxi in company C = 35
:: Required difference = $105 - 35 = 70$

541. Answer: (D)
$Required\ \% = \frac{75 - (25 + 35)}{(25 + 35)} \times 100 = 25\%$

542. Answer: (B)
Required amount = (25 + 120 + 35 + 75 + 95 + 10)$\times 100 \times 3$
= Rs 1,08,000

543. Answer: (A)
C has the lowest share i.e. 5%

544. Answer: (A)
Share of E = 40%
Share of (F + A + B) = 10 + 20 + 10 = 40%
:: Share of E = Share of (F + A + B)

545. Answer: (C)
$Required\ Ratio$
$= \frac{Share\ (E+B)}{share\ (A+C+D+F)} = \frac{40+10}{20+5+15+10}$
= 1:1

546. Answer: (D)
D's share = 15% of 10 lakh
= Rs. 1,50,000

547. Answer: (A)
Required difference = 200 – 100 = 100

548. Answer: (A)
No. of policies sold by agent = 250 + 100 + 400 = 750

549. Answer: (B)
$Required\ \% = \frac{250 - 50}{250} \times 100 = 80\%$

550. Answer: (B)
Final no. of employees in Company F
$= 400 + \frac{20}{100} \times 250$
= 400 + 50
= 450

551. Answer: (A)
Descending order of departments according to no. of employees
A > E > C > B > D > F
: Departments E has the second highest no. of employees

552. Answer: (A) Net employees in Department F

= 3 + 5 = 8

& Net employees in Department A

= 25 − 5 = 20

∴ B < F < C (According to no. of employees)

553. **Answer: (D)**

No. of Employees in Department G = 5 + 3 = 8

Now, order will become

$$\frac{A > E > C > G > B}{\text{No. of Employees}}$$

∴ Department B has the least no. of employees

554. **Answer: (B)**

Company's total expense towards salaries

= (25+6+10+5+15+3)×8000

= Rs 512000

= 5.12 lakh

555. **Answer: (D)** 2012 and 2015 has more issued visas than previous year.

556. **Answer: (D)**

$$Required \% = \frac{4000 - 3000}{4000} \times 100 = 25\%$$

557. **Answer: (A)** No of visas issued from 2012 to 2015 = 6000 + 2000 + 1000 + 4000 = 13000

558. **Answer: (D)**

Required no. of peoples

$$= \frac{90}{100} (5000 + 6000 + 2000 + 1000 + 4000 + 3000) = 18900$$

559. **Answer: (A)** Fiction and Historical were the two genres of movies liked the least.

560. **Answer: (C)**

$$Historical\ Movies = \frac{1200}{(35 + 25 + 6 + 5 + 11 + 8)} \times 6 = 80$$

561. **Answer: (C)**

Required no. of people

$$= \frac{1200}{(35 + 25 + 6 + 5 + 11 + 8)} \times (11 - 8) = 40$$

562. **Answer: (A)**

Required no. of people = $\frac{1200}{24} \times 100$

=5000

563. **Answer: (B)** order according to box office collection E > C >A > F > B > D

So, Movie C gain second highest box office collection.

564. **Answer: (B)**

$$Required \% = \frac{50 - 30}{50} \times 100 = 40\%$$

565. **Answer: (B)** Collection of movie C = 150

Collection of movie (B+D+F)

= 50 + 30 + 70 =150

So, collection of movie C = collection of movie (B + D + F)

566. **Answer: (C)**

Amount the producer gets

$$= \frac{60}{100} (100 + 200) = 180 \text{ crore}$$

567. **Answer: (B)**

Let x be Total number of applicants.

$$x \times \frac{15}{100} \times \frac{64}{100} \times \frac{15}{100} : x \times \frac{16}{100} \times \frac{80}{100}$$

A : B ⇒ A: B

45:400 9:80

$$\frac{9}{80} \times 100 = 11.25\%$$

568. **Answer: (B)**

Let x be Total number of applicants

$$\left(x \times \frac{25}{100} \times \frac{75}{100} + x \times \frac{(24)}{100} \times \frac{82}{100}\right) - \left(x \times \frac{20}{100} \times \frac{48}{100} + x \times \frac{16}{100} \times \frac{62}{100} + x \times \frac{15}{100} \times \frac{70}{100}\right)$$

$$= x \left[\frac{(1875 + 1968) - (960 + 992 + 1050)}{10000}\right]$$

$$= x \left[\frac{3843 - 3002}{10000}\right] \Rightarrow 1200000 \times \frac{841}{10000} = 100920$$

569. **Answer: (C)**

$$x \times \frac{15}{100} \times \frac{70}{100} + x \times \frac{20}{100} \times \frac{48}{100} + x \times \frac{24}{100} \times \frac{54}{100} + x \times \frac{25}{100} \times \frac{56}{100}$$

$$\Rightarrow \frac{x(1050 + 1400 + 960 + 1296)}{10000} = \frac{1200000 \times 4706}{10000}$$

Total number of applicants = 564720

570. **Answer: (B)**

$$x \times \frac{16}{100} \times \frac{80}{100} : x \times \frac{24}{100} \times \frac{54}{100}$$

80 : 81

571. **Answer: (C)**

$$1200000 \times \frac{20}{100} \times \frac{68}{100} + 1200000 \times \frac{25}{100} \times \frac{75}{100}$$

⇒ 163200 + 225000

⇒ 388200

572. **Answer: (A)**

given total sales of milk in all states is x=200000

Total sales by A salesman in all states

$$= x \left[\frac{24}{100} \times \frac{65}{100} + \frac{10}{100} \times \frac{80}{100} + \frac{17}{100} \times \frac{50}{100} + \frac{13}{100} \times \frac{70}{100} + \frac{22}{100} \times \frac{60}{100} + \frac{14}{100} \times \frac{80}{100}\right]$$

Total sales by A salesman in all states = $\frac{x[1560+800+850+910+1320+1120]}{100 \times 100}$

Hence Average sales by A salesman in all states = $\frac{200000 \times 6560}{100 \times 100 \times 6}$ ⇒21866.67 lit

573. **Answer: (B)**

ratio of sales of milk in P & Q states by B salesman and R &T states by A salesman is

(P + Q) by B salesman : (R + T) by A salesman

$$\left[\frac{24}{100} \times \frac{35}{100} + \frac{10}{100} \times \frac{20}{100}\right] : \left[\frac{17}{100} \times \frac{50}{100} + \frac{22}{100} \times \frac{60}{100}\right]$$

(840 + 200) : (850 + 1320)

1040 : 2170

⇒ 104 : 217

574. **Answer: (D)**

To find central angle by average sales in Q,T & S states together , we first have to find percentage of sales by
(Q + T + S) states = (10 + 22 + 13) = 45%
average sales= 15%
If 100% represent complete → 360°
15% is equal to → $\frac{360}{100} \times 15 = 54°$

575. **Answer: (B)**

Difference of sales in T states by salesman B and sales of milk in R&S states is

Difference=[T by salesman B – (R + S)] × 200000

Difference=$\left[\frac{30}{100} - \frac{22}{100} \times \frac{40}{100}\right] \times 200000$

difference⇒ $\frac{2120}{100 \times 100} \times 200000$

⇒ 42400

576. **Answer: (B)**

The sales of milk in R state by salesman A & B is equal
both A & B salesman selling 50% milk
So,
Difference=0

577. **Answer: (C)**

No. of employees of A & C together living in city Z=$(\frac{10}{100} \times \frac{1}{10} \times 80000 + \frac{12}{100} \times \frac{5}{6} \times 80000)$
No. of employees of A & C together living in city Z =8800

578. **Answer: (C)**

Male employees of department E
$= \left(\frac{36}{100} \times \frac{8}{9} \times 80000\right) = 25600$
Employees living in city Z from A department
$= \left(\frac{10}{100} \times \frac{1}{10} \times 80000\right) = 800$
Employees in z city is what percent of male in E department $= \left(\frac{25600}{800} \times 100\right) = 3200$

579. **Answer: (B)**

Male employees in B& D department
$= (\frac{22}{100} \times \frac{13}{22} \times 80000 + \frac{20}{100} \times \frac{3}{5} \times 80000) = 20000$
female employees working in A & E department
$= \left(\frac{10}{100} \times \frac{3}{10} + \frac{36}{100} \times \frac{1}{9}\right) \times 80000 = 5600$
ratio of both is 20000:5600=25:7

580. **Answer: (A)**

residents of city Y living togethe
$= \left(\frac{10}{100} \times \frac{9}{10} + \frac{22}{100} \times \frac{19}{22} + \frac{12}{100} \times \frac{1}{6} + \frac{20}{100} \times \frac{3}{4} + \frac{36}{100} \times \frac{13}{18}\right) \times 80000$
average residents of city Y living together = $\frac{71 \times 800}{5} = 11360$

581. **Answer: (D)**

total no. of employee in department A& E together
$= \left(\frac{10}{100} + \frac{36}{100}\right) \times 80000 = 46 \times 800 = 36800$

582. **Answer: (D)**

Study the DI with question paper
No of wooden bats by T Company
$= \frac{6}{25} \times \frac{55}{100} \times 55000$
Wooden bats by T company = 72600

583. **Answer: (B)**

Wooden bats by N company $= \frac{14}{55} \times \frac{25}{100} \times 550000$
Wooden bats by M company $= \frac{105}{100} \times 550000$
$\frac{N}{M} = \frac{14 \times 25}{105 \times 55} = 0.061$

584. **Answer: (C)**

Brand b by S   P   brand a by W
↓
$P = \left(\frac{7}{15} \times \frac{30}{100} + \frac{5}{11} \times \frac{60}{100}\right) \times 550000$

Q
↓
Difference of wooden bats of brand b and a by U $= \left(\frac{27}{55} \times \frac{25}{100}\right)$
P–Q = 159500

585. **Answer: (A)**

R   S   T   U   V   W
Wooden bats of brand A
$= \left(\frac{21}{25} \times \frac{45}{100} + \frac{8}{15} \times \frac{30}{160} + \frac{6}{25} \times \frac{55}{100} + \frac{41}{55} \times \frac{25}{100} + \frac{7}{22} \times \frac{40}{100} + \frac{5}{11} \times \frac{60}{100}\right) \times 550000$
= 691000

586. **Answer: (C)**

X = 60% $Y = \frac{7}{22} \times \frac{40}{100}\%$
X-Y = 260000

587. **Answer: (C)**

Diff. = No. of Physics – No. of Biology
See from graph as it is already solved.
D = [65523– 47447] = 18076

588. **Answer: (A)**

Ratio= $\frac{student\ present\ in\ Phy.\ from\ M}{student\ absent\ (M + L + O)}$
$= \frac{52976}{[101520 + 113520 + 24003]} \times 100$
= 22.16%

589. **Answer: (A)**

$$\text{Average} = \frac{\text{Present in Phy } [N+K+L]}{3}$$

$$= \frac{[65523+105196+108119]}{3}$$

$$= 92946$$

590.   Answer: (A)

Total = No. of student present in Bio.

Total =
[49504+44162+22704+47448+7335]
    = 171153

591.   Answer: (B)

No. of student in Physics from A =
2.5×[present in Phycis –present Bio]

IN K school

= 2.5 × 55692
= 139230

$$\text{RATIO} \Rightarrow \frac{\text{No.of student present from L}}{\text{No.of student in Physics from A}}$$

$$= \frac{152280}{139230} = 1692 : 1547$$

592.   Answer: (B)

$$\Rightarrow \left[\overset{R_1 \text{By } X}{\underset{\Downarrow}{\frac{60}{100} \times \frac{48}{100}}} - \frac{6}{17} \times \frac{40}{100} \times \overset{R_2 \text{ by } H}{\underset{\Downarrow}{\frac{68}{100}}}\right] \times 625000$$

$$\Rightarrow [0.288 - 0.096] \times 625000$$

$$\Rightarrow 0.192 \times 625000 \Rightarrow 120000$$

593.   Answer: (D)

$$\overset{\text{Maize by}X\&T}{\downarrow} + \overset{R_2 \text{ by } S}{\downarrow} + \overset{R_2 \text{ by } R}{\downarrow}$$

$$\text{sum} \Rightarrow \left[\frac{52}{100} + \frac{74}{100} + \frac{4}{9} \times \frac{45}{100} \times \frac{48}{100} + \frac{9}{19} \times \frac{40}{100} \times \frac{38}{100}\right]$$

$$\Rightarrow [1.26 + 0.096 + 0.072] \times 625000$$

$$\Rightarrow 892500$$

594.   Answer: (A)

$$\frac{R_3 \text{ by } X}{R_1 \text{ by } S} \Rightarrow \frac{\frac{5}{8} \times \frac{40}{100} \times \frac{48}{100}}{\frac{55}{100} \times \frac{48}{100}} \times 100$$

$$\Rightarrow \frac{0.12}{0.264} \times 100 \Rightarrow 45.45\%$$

595.   Answer: (C)

$$R_3 \text{ of } (\overset{H}{\downarrow} \quad + \quad \overset{R}{\downarrow} \quad + \quad \overset{X}{\downarrow} \quad + \quad \overset{S}{\downarrow})$$

$$\text{Average (A)} = \frac{\left[\frac{11}{17} \times \frac{40}{100} \times \frac{48}{100} + \frac{10}{19} \times \frac{40}{100} \times \frac{38}{100} + \frac{5}{8} \times \frac{40}{100} \times \frac{48}{100} + \frac{5}{9} \times \frac{45}{100} \times \frac{48}{100}\right]}{4}$$

$$\Rightarrow \frac{(0.176 + 0.08 + 0.12 + 0.12)}{4} \Rightarrow \frac{0.496}{4} \times 625000 \Rightarrow 77500$$

$$B = (R_2 \text{ by } T \sim R_1 \text{ by } R)$$

$$= \left[\frac{3}{13} \times \frac{20}{100} \times \frac{26}{100} \sim \frac{60}{100} \times \frac{38}{100}\right]$$

$$\Rightarrow 0.216 \times 625000 \Rightarrow 135000$$

$$B - A = 57500$$

596.   Answer: (B)

Sum (F) =

$$\left[\frac{6}{17} \times \frac{40}{100} \times \frac{68}{100} + \frac{9}{19} \times \frac{40}{100} \times \frac{38}{100} + \frac{3}{8} \times \frac{40}{100} \times \frac{48}{100} + \frac{4}{9} \times \frac{45}{100} \times \frac{48}{100} + \frac{3}{13} \times \frac{20}{100} \times \frac{26}{100}\right]$$

$$= [0.096 + 0.072 + 0.072 + 0.096 + 0.012] \times 625000$$

$$= 0.348 \times 625000$$

$$R_1 \text{ by } \rightarrow \quad H \quad\quad R \quad\quad X \quad\quad S \quad\quad T$$

$$\text{Sum (K)} = \frac{\left[\frac{60}{100} \times \frac{68}{100} + \frac{60}{100} \times \frac{38}{100} + \frac{60}{100} \times \frac{48}{100} + \frac{55}{100} \times \frac{48}{100} + \frac{80}{100} \times \frac{26}{100}\right]}{5}$$

$$= \frac{(0.408 + 0.228 + 0.288 + 0.264 + 0.208)}{5} \times 625000$$

$$\frac{K}{F} = \frac{0.2792}{0.348} \Rightarrow 0.802$$

Elementary Statistics

1. The mean of the figures 2, x, 7, 3, y, 9, 6 is 6, where x and y are constant. If x is replaced by $3x + 1$ and y is replaced by $y + 3$, the mean 2 increases. Find the value of x –
   (A) 7   (B) 8
   (C) 10   (D) 5

2. The mean of the 8 smallest numbers in a group is 17 while when taken together, the mean of all the numbers in the group is 20. If the mean of the remaining numbers after leaving the smallest eight numbers is 22, then how many numbers are there in the group?
   (A) 20   (B) 22
   (C) 18   (D) 19

3. The mean of 21 observations (all different) is 40. If the value of the median is increased to 21, then the value of the observations increases, the mean of the observations will be:
   (A) 50   (B) 50.5
   (C) 30   (D) 45

4. The mean of the 8 smallest numbers in a group is 12.5, while the mean of all 14 numbers in the group is 14. What is the mean of the largest 6 numbers?
   (A) 16.50   (B) 16.00
   (C) 17.00   (D) 15.50

5. The arithmetic mean of a set of numbers is 12. The mean of another set of numbers is 15. If the combined mean of both sets is 12.5, what will be the ratio of frequency of the two groups?
   (A) 3: 1   (B) 5: 1
   (C) 3: 2   (D) 5: 2

6. Find the median of 67, 34, 57, 32, 12, 92, 51, 62, 62, 57, 93 and 5.
   (A) 56.5   (B) 32
   (C) 57   (D) 62

7. Mean of an observation set $x_1, x_2 \ldots \ldots x_{10}$ is 20. Find out mean of $x_1 + 4, x_2 + 8 \ldots \ldots x_{10} + 40$.
   (A) 34   (B) 32
   (C) 42   (D) 52

8. In one examination, the mean of 36 students in mathematics was 72.50. On revising the digits, it was found that if a student's marks were mistakenly written 65 instead of 56, what would be the correct mean?
   (A) 71.50   (B) 72.25
   (C) 72   (D) 73

9. One group with 17 members had a mean score of 15, while another group with n members had a mean score of 12. If their combined mean was 13.7, find the value of n.
   (A) 12   (B) 13
   (C) 14   (D) 11

10. The mean weight of six children is 17.5 kg. If the individual weights of five of these children are 14, 19, 23, 21 and 13 kg respectively, find the weight of the sixth child.
    (A) 17 kg   (B) 15kg
    (C) 16kg   (D) 18kg

11. The mean of the digits will be based on the data given below:

अंक	0	1	2	3	4	8
छात्रों की संख्या	6	5	4	3	2	5

   (A) 3.3   (B) 2.8
   (C) 2.5   (D) 3.2

12. The four numbers a, b, c and d are such that their overall average is 23. The average of c and d will be-
    (A) 26.5   (B) 25.5
    (C) 24.5   (D) 27.5

13. Mean of numbers $27+x$, $31+x$, $89+x$, $107+x$ and $156+ x$ is 82, then find out mean of $130+x$, $126+x$, $68+x$, $50+x$ and $1+x$?
    (A) 30   (B) 75
    (C) 50   (D) 70

14. Arithmetical mean of series $x_1, x_2, x_3, \ldots \ldots \ldots x_n$ is 1, then find the arithmetical mean of $\frac{x_1}{k}, \frac{x_2}{k}, \frac{x_3}{k}, \ldots \ldots \ldots \frac{x_n}{k}$ $(k > 0)$.
    (A) $\frac{1}{k}$ (B) k
    (C) $\frac{2}{k}$ (D) $2k$

15. Find the median of the numbers 5, 17, 68, 17, 32, 45, 64, 37, 93, 45, 78, 32, 35 and 45.
    (A) 41   (B) 44
    (C) 42   (D) 43

16. Find the median of the prime numbers from 1 to 55?

(A) 22 (B) 20
(C) 21 (D) 19

17. Points scored by 12 persons - 6, 17, 89, 16, 10, 15, 21, 9, 11, 12 and 16. Find their median.
(A) 11.5 (B) 11.6
(C) 10.4 (D) 12

18. Following are the points obtained by a Kabaddi team in a series of matches.
17, 2, 7, 27, 15, 5, 14, 8, 10, 24, 48, 10, 8, 7, 18, 28
Find the median of the marks obtained by the team.
(A) 11 (B) 12
(C) 16 (D) 15

19. In a school, the statistics (in cm) of height survey of 50 girls of class X are as follows:

Length (in cm)	Number of girls
Less than 140 cm	4
Less than 145 cm	11
Less than 150 cm	29
Less than 155 cm	40
Less than 160 cm	46
Less than 165 cm	50

Find the median of their height.
(A) 144.03 cm (B) 148.89 cm
(C) 145.03 cm (D) 149.03 cm

20. The following graph shows the 12 months price of cabbage. What is the median of their values?
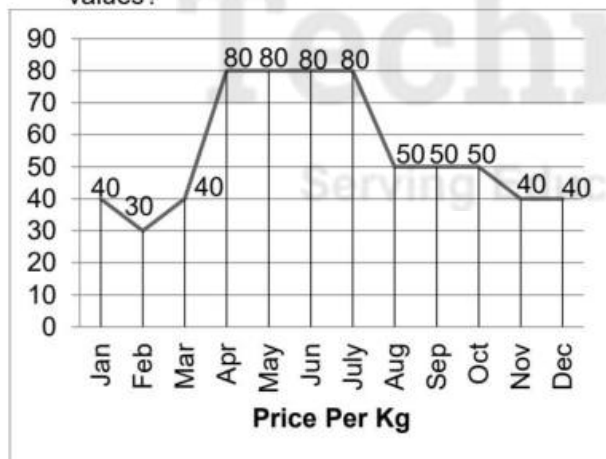
(A) 55 (B) 40
(C) 50 (D) 60

21. The mean of 12, 13, 15, 18, x, 28, 18, 12, 6, 8 is 15. What is the median of the data?

22. Find the mean of the first 10 numbers in the Fibonacci series:
A Fibonacci number is the sum of the last two numbers in that series. The first two Fibonacci numbers are 0 and 1 respectively.
(A) 4 (B) 3
(C) 5 (D) 4.5

23. In a survey conducted by a group of students on 20 households in a local area, the results of the following frequency table related to the number of household family members have been found.

household size	Number of families
1-3	7
3-5	9
5-7	2
7-9	1
9-11	1

Find the mode of these data.
(A) 3.571 (B) 3.444
(C) 3.628 (D) 3.286

24. The wickets taken by a bowler in 12 cricket matches are as follows:
2, 6, 4, 3, 5, 0, 3, 2, 1, 3, 2, 3
Find the mode of this distribution.
(A) 4 (B) 2
(C) 3 (D) 1

25. Find the mode of this distribution.
25, 45, 58, 87, 45, 54, 65, 12, 25, 59, 42, 60
(A) 25 (B) 45
(C) 45, 54 (D) 45, 25

26. The details of the number of persons taking loans from the bank are given below, based on the interval of their age group.

age group	20-30	30-40	40-50	50-60	60-70
number of persons	37	38	70	42	13

Find the mode.
(A) 45.33 (B) 44.89
(C) 45.67 (D) 45.12

(A) 14.5 (B) 13.5
(C) 14 (D) 13

27. Below, the details of the 100 students present in the class are given based on their attendance (day).

Number of days of attendance	6 - 10	10 - 14	14 - 18	18 - 22	22 - 26
Number of students	9	28	34	18	11

Find the mode.
(A) 15.09 (B) 15.01
(C) 14.71 (D) 15.04

28. If the mean of 3, 4, a, b, 10 is 6 and the median is 5 and a <b, then the values of a and b are _____ and _____ respectively.
(A) 7, 6 (B) 5, 8
(C) 6, 7 (D) 8, 5

29. Sachin Tendulkar scored 38, 70, 48, 34, 42, 55, 63, 46, 54, and 44 against Australia in ten innings. Find the average deviation in terms of mean.
(A) $\frac{44}{5}$ (B) $\frac{43}{5}$
(C) $\frac{41}{5}$ (D) $\frac{42}{5}$

30. If the mean deviation of the numbers 1, 1 + d, 1 + 2d …… 1 + 100d is 255, then d is equal to.
(A) 20.2 (B) 10.1
(C) 20.0 (D) 10.5

31. What would be the possibility of taking out a face card from a pack of cards?
(A) $\frac{6}{13}$ (B) $\frac{12}{13}$
(C) $\frac{3}{13}$ (D) $\frac{3}{26}$

32. From a pack of cards, what is the probability of extracting an ace?
(A) $\frac{12}{13}$ (B) $\frac{15}{26}$
(C) $\frac{9}{13}$ (D) $\frac{1}{13}$

33. There are 100 pens in a box of which 8 are defective. A pen is taken out of the box. Find the probability that it is not defective?
(A) 23/25 (B) 8/100
(C) 100 8 (D) 25/23

34. If 75% of the data represents upper quartile and 25% of the data represents lower quartile, then the median will be:
(A) 20% (B) 100%
(C) 50% (D) 80%

35. Out of a set of four numbers, the mean of the three smallest numbers is 19 and the mean of the three largest numbers is 23. What will be the range of this set?
(A) 18 (B) 12

36. The mean of three numbers is 20. The range of this data set is 12 while the difference of two smaller numbers is 3, the larger number is:
(C) 14 (D) 15
(A) 28 (B) 25
(C) 27 (D) 24

37. The mean of the three numbers is 33 and the range of data is 29. The middle number is 27 less than the sum of the other two numbers. What is the largest number among these three numbers?
(A) 46 (B) 45
(C) 48 (D) 47

38. The mean of the three numbers was 35 and the range of the figures was 24. The difference between the largest and the middle number was three times the difference between the smallest and the middle number. Which is the largest of these three numbers?
(A) 51 (B) 50
(C) 49 (D) 52

39. The ratio of the number of blue and red balls in a bag is fixed. When the number of red balls was 68, the number of blue balls was 36. If the number of blue balls is 63, what should be the number of red balls in the bag?
(A) 119 (B) 98
(C) 110 (D) 102

40. Find the least common multiple of the mode, median and mean of the data given below.
7, 2, 10, 4, 3, 12, 8, 4, 6, 4
(A) 30 (B) 20
(C) 12 (D) 60

41. For the following data, find (Mode × Median + Mean).
9, 1, 11, 3, 2, 12, 8, 4, 6, 4
(A) 34 (B) 31
(C) 26 (D) 29

42. The mean of the three numbers was 15 and the range of figures was 9. The difference between the largest number and the middle number was twice the difference between the middle number and the smallest number. Which is the largest of the three numbers?
(A) 20 (B) 21
(C) 19 (D) 22

43. The range of the set of four integers a, b, c and d arranged in ascending order is 20. The difference between c and a is equal to the difference between d and b. The arithmetical mean of these numbers is 25. Which of the following number is the value of a?
(A) 13 (B) 15
(C) 14 (D) 16

44. The arithmetic mean of the marks obtained by the students of a class is 58. Among them, the

mean of the marks obtained by 20% was 60 and the mean of the marks obtained by 30% was 40. What was the mean of the marks obtained by the remaining students?

(A) 65   (B) 66

(C) 68   (D) 70

45. Mean of observations $x, x + 3, x + 5, x + 8, x + 9$ is 9. Find the mean of last three observations.

(A) $\frac{32}{3}$ (B) $\frac{31}{3}$

(C) $\frac{35}{3}$ (D) $\frac{34}{3}$

46. Since a student's marks were mistakenly typed 86 instead of 68, the mean of the class increased by 1/2. What is the total number of students?

(A) 34   (B) 36

(C) 38   (D) 40

47. If the mean of five observations x, x + 3, x + 4, x + 6 and x + 7 is 11, then the mean of the last three observations will be:

(A) 12   (B) 12.67

(C) 19   (D) 13

48. The average of the marks obtained by 40 students in an examination is 72.5. Later it was discovered that a student's marks were mistakenly written 48 instead of 84. Find the correct mean.

(A) 71.3   (B) 72.4

(C) 77.5   (D) 73.4

49. Find the median of all positive factors of 48.

(A) 16   (B) 12

(C) 8   (D) 7

50. Find the median of $1, \frac{1}{2}, \frac{1}{2}, \frac{3}{4}, \frac{1}{4}, 2, \frac{1}{2}, \frac{1}{4}, \frac{3}{4}$.

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{6}$ (D) $\frac{3}{4}$

51. Find the median of 5, 2, 2, 7, 3 and 8.

(A) 3.5   (B) 4.5

(C) 4   (D) 3

52. Find the mode of 3, 12, 4, 6, 8, 5, 4.

(A) 5   (B) 8

(C) 4   (D) 3

53. The mean of a distribution is 24 and the standard deviation is 6. What is the value of variance coefficient?

(A) 50%   (B) 25%

(C) 100%   (D) 75%

54. If the standard deviation of the population is 10, what will be its variance coefficient?

(A) 100   (B) 30

(C) 5   (D) 20

55. Find the Standard deviation of {11, 7, 10, 13, 9}.

(A) 1   (B) 2

(C) 4   (D) 5

56. Satish kept 5 yellow and 3 blue balls in a closed box. His brother Manish picks up two balls at random.

Find the probability of picking balls of the same color.

(A) $\frac{15}{28}$ (B) $\frac{15}{23}$

(C) $\frac{13}{28}$ (D) $\frac{11}{23}$

57. Find the probability that the sum of the digits coming when a dice is thrown twice is 10.

(A) 3   (B) 1/36

(C) 1/12   (D) 5/36

58. Find the range of the figures 9, 5, 9, 3, 4, 7, 8, 4, 8, 9, 5, 9.

(A) 3   (B) 5

(C) 6   (D) 4

59. Find the range of data 11, 13, 9, 17, 13, 19, 10, 11.

(A) 6   (B) 10

(C) 11   (D) 13

60. If the arithmetic mean of 10 numbers is 35, then 2 is added to each, then what will be the mean of the new range of numbers?

(A) 28   (B) 34

(C) 40   (D) 37

61. The mean of the marks obtained by 12 students of a class is 67.4. If the mean of the marks obtained by 15 students of another class is 72.3, what will be the combined mean of the two classes?

(A) 70.12   (B) 69.85

(C) 71.23   (D) 68.94

62. The mean of the four different observations is 17.5, when a new observation whose value is 20 is added to it, then what will be its new mean?

(A) 18   (B) 17.5

(C) 19   (D) 18.5

63. The arithmetic mean of 20 observations is 15.5. It was later found that one observation accidentally read 42 instead of 24. So find the correct mean?

(A) 14   (B) 14.4

(C) 14.6   (D) 15

64. The mean of 22 observations is 10. Including two more observations, the new mean becomes 11. The mean of two new observations is-

(A) 19   (B) 20

(C) 21   (D) 22

65. The mean of 8 observations is 10. Three more observations are added to these and the new mean becomes 12. The mean of three new observations is:

(A) 16   (B) 18

(C) 17.33   (D) 15

66. The mean of the data $1, \frac{1}{2}, \frac{1}{2}, \frac{3}{4}, \frac{1}{4}, 2, \frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ is-

(A) $\frac{15}{18}$ (B) $\frac{13}{18}$

(C) $\frac{7}{9}$ (D) $\frac{8}{9}$

67. If mean of data $18, 16, 22, 13$ and $?$ is 16, then find the value of $?$.

(A) 9   (B) 11

(C) 10   (D) 12

68. The mean of 9 observations is 18. Four more observations are included and the new mean becomes 19. The mean of four new observations is-

(A) 21.25   (B) 20.25

(C) 19   (D) 22

69. Find the mean of the first 6 prime numbers.

(A) 14/3   (B) 3

(C) 41/6   (D) 13/2

70. The median of the following numbers (figures) is

7, 21, 2, 17, 3, 13, 7, 4, 9, 7, 9

(A) 4   (B) 17

(C) 7   (D) 9

71. Find the median of 9, 0, 2, 8, 5, 3, 5, 4, 1, 5, 2, 7.

(A) 5   (B) 6.5

(C) 4.5   (D) 4

72. The median of the following numbers arranged in ascending order is 2.5. Find x.

0, 0, 1, 1, 2, 2, x, 3, 3, 4, 5, 7

(A) 2   (B) 3

(C) 4   (D) 0

73. Find the median of 25, 23, 26, 29, 31, 39 and 11.

(A) 25   (B) 26

(C) 29   (D) 31

74. Find the median of the numbers 55, 53, 59, 56, 61, 69, and 31.

(A) 55   (B) 56

(C) 59   (D) 61

75. Find the median of the following set of numbers.

2, 3, 4, 3, 0, 5, 1, 1, 3, 2

(A) 0   (B) 3

(C) 2.5   (D) 2.4

76. If the numbers 3, 6, 7, 11, x, 15, 19, 20, 25, 28 are in ascending order and their median is 13, then find x?

(A) 11   (B) 12

(C) 13   (D) 14

77. Find the median of the data -3, 4, 0, 4, -2, -5, 1, 7, 10, 5.

(A) 2   (B) 2.5

(C) 2.75   (D) 3

78. What is the median of the numbers?

3, 3, 5, 7, 8, 8, 8, 9, 11, 12, 12

(A) 9   (B) 7

(C) 8   (D) 12

79. What is the median of the numbers?

87, 21, 53, 12, 86, 98, 23, 64, 87, 23, 23, 87, 56, 12, 53

(A) 53.5   (B) 54

(C) 53   (D) 56.5

80. The median of the following terms 32, 12, 23, 17, 28, 25, 431 was determined:

Later it was found that 17 was written by mistake instead of 29, now what will be the changed median?

(A) 29   (B) 17

(C) 23   (D) 28

81. Find the mode of 12, 1, 10, 1, 9, 3, 4, 9, 7, 9.

(A) 9   (B) 12

(C) 1   (D) 7

82. Find the mode of 32, 34, 35, 36, 35, 34, 33, 35, 33, 31 and 37.

(A) 33   (B) 34

(C) 35   (D) 32

83. Find the mode of 12, 14, 15, 16, 15, 14, 13, 15, 13, 11 and 17.

(A) 13   (B) 14

(C) 15   (D) 12

84. Find the mode of 2, 4, 5, 6, 5, 4, 3, 5, 3, 1 and 7.

(A) 3   (B) 4

(C) 5   (D) 2

85. If the mode of the following figures is 52, find the value of x.

52, 45, 49, 54, 56, x-3, 56

(A) 52   (B) 55

(C) 54   (D) 56

86. Find the mode of $1, \frac{1}{2}, \frac{1}{2}, \frac{3}{4}, \frac{1}{4}, 2, \frac{1}{2}, \frac{1}{4}, \frac{2}{4}$.

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) 1

87. If the standard deviation of a population is 9.5, what will be its variance?

(A) 19   (B) 90.25

(C) 81.25   (D) 93.25

88. If the standard deviation of a population is 4.5, what will be its variance?

(A) 20.25   (B) 20

(C) 9   (D) 18

89. If the standard deviation of the population is 11, what will be the variance of the population?

(A) 44   (B) 121

(C) 22   (D) 33

90. If the standard deviation of a distribution is 4, what is the value of variance?

(A) 8   (B) 9

(C) 16   (D) 12

91. 4 out of 5 cricketers have played 13, 9, 5, 11 innings respectively. If the mean of the data set is 9, then the number of innings played by that 5th player is
(A) 9   (B) 8
(C) 7   (D) 6

92. The mean of the 8 observations is 10.5. If seven observations out of observations are 3, 15, 7, 19, 12, 17 and 8, then find the eighth observation –
(A) 10   (B) 11
(C) 3   (D) 12

93. The mean of distributions is 14 and the standard deviation is 5. Find the variance coefficient.
(A) 60.4%   (B) 27.9%
(C) 35.7%   (D) 48.3%

94. The mean deviation of the figures 3, 10, 10, 4, 7, 10, 5 is-
(A) $\frac{49}{7}$ (B) $\frac{19}{7}$
(C) $\frac{50}{7}$ (D) $\frac{18}{7}$

95. The standard deviation of a set of 10, 11, 12, 9, and 8 is........
(A) 1   (B) $\sqrt{2}$
(C) 2   (D) $2\sqrt{2}$

96. If the standard deviation of a distribution is 6, what is the value of its variance?
(A) 8   (B) 24
(C) 36   (D) 12

97. Find the standard deviation if the variance of a data set is 196.
(A) ±14   (B) 14
(C) 96   (D) 98

98. Variance of a data set is 121; find the standard deviation of the data.
(A) ±11   (B) 11
(C) 21   (D) 60.5

99. If the variance of a set of data is 81, find the standard deviation of the data.
(A) ±9   (B) 9
(C) 81   (D) 40.5

100. The multiplier of a set of data is 64 then find the standard deviation.
(A) ±8   (B) 8
(C) 14   (D) 64

101. Find the standard deviation if the variance of a data set is 361.
(A) ±19   (B) 19
(C) 361   (D) 180.5

102. The variance of a data set is 169, then find the standard deviation.
(A) ±13   (B) 13
(C) 69   (D) 845

103. What will be standard deviation of n observation of $x_1, x_2, x_3, \ldots \ldots x_n$, whose mean is $\bar{x}$ and frequency is $f_1, f_2, f_3 \ldots \ldots f_x$ respectively?
(A) $\sqrt{\frac{\sum_{i=1}^{n} f_i(x_i-\bar{x})}{\sum_{i=1}^{n} f_i}}$ (B) $\sqrt{\frac{\sum_{i=1}^{n} f_i(x_i-\bar{x})^2}{\sum_{i=1}^{n} f_i}}$
(C) $\sqrt{\frac{\sum_{i=1}^{n} f_i(x_i^2-\bar{x})}{\sum_{i=1}^{n} f_i}}$ (D) $\sqrt{\sum_{i=1}^{n} f_i(x_i - \bar{x})}$

104. What will be standard deviation of n observation of $x_1, x_2, x_3, \ldots \ldots x_n$, whose mean is $\bar{x}$.
(A) $\sqrt{\frac{\sum_{1}^{n}(x_i-\bar{x})}{n}}$ (B) $\sqrt{\frac{\sum_{1}^{n}(x_i-\bar{x})^2}{n}}$
(C) $\sqrt{\frac{\sum_{1}^{n}(x_i^2-\bar{x})}{n}}$ (D) $\sqrt{\frac{\sum_{1}^{n}(x_i-\bar{x})^2}{n}}$

105. If a box has 3 white cushions, 4 red cushions and 5 blue cushions, what is the probability of choosing a white or blue cushion?
(A) 2/3   (B) 3/4
(C) ¼   (D) 1/9

106. When a coin is tossed once, what is the probability of getting head?
(A) 1   (B) 1/2
(C) 2   (D) 0

107. 6, 7, 8, 9, 5, 6, 7, 4, 8, 9, 5, 9
Find the range of these figures.
6, 7, 8, 9, 5, 6, 7, 4, 8, 9, 5, 9
(A) 2   (B) 3
(C) 4   (D) 5

108. 2, 1, 2, 3, 4, 5, 7, 3, 5, 2, 4 Find the range of data of 2, 1, 2, 3, 4, 5, 7, 3, 5, 2, 4.
(A) 5   (B) 4
(C) 3   (D) 6

109. 12, 11, 18, 28, 19, 13, 19, 18
Find the range of these digits.
(A) 11   (B) 17
(C) 18   (D) 19

110. If the variance of 2, 4, 5, 6, 8, 18 figures is 23.33, then the variance of 4, 8, 10, 12, 16, 36 figures will be-
(A) 11.66   (B) 46.66
(C) 93.3333   (D) 483

111. Find the range of 10, 21, 5, 1, 3, 17, 19, 2.
(A) 19   (B) 10
(C) 20   (D) 17

112. If the following information 60 $\sum x^2 = 18000$ is related to a specimen of $\sum x = 960$, then variation is:
(A) 55   (B) 44
(C) 22   (D) 16

113. Find the range of data of 3, 1, 4, 6, 5, 7, 3, 8, 1, 4.
(A) 3   (B) 8
(C) 7   (D) 6

114. Find the mean, mode and median of 3, 4, 5, 3, 6, 3, 4, 5, 3 –

(A) 4, 4, 4   (B) 4, 4, 3
(C) 3, 4, 4   (D) 4, 3, 4

115. Find the median, mode and mean of 9, 5, 8, 9, 9, 7, 8, 9, 8.
(A) 9, 9, 9   (B) 9, 8, 9
(C) 8, 9, 8   (D) 8, 9, 9

116. Find the mode and median of 8, 6, 8, 7, 8, 6, 8, 7, 6.
(A) 7 and 8   (B) 6 and 7
(C) 8 and 7   (D) 6 and 8

117. What is the mean and mode of these figures 1, 9, 5, 4, 2, 1, 9, 9, 2, 1, 9, 1, 2?
(A) 4 and 9   (B) 5 and 1
(C) 4 and 1   (D) 5 and 9

118. The mean of a distribution is 13 and the standard deviation is 7. What is the value of variance coefficient?
(A) 50%   (B) 76.77%
(C) 53.85%   (D) 38.88%

119. The mean of 20 observations is 19. Another observation is included and the new mean becomes 20. The 21st observation is-
(A) 20   (B) 30
(C) 40   (D) 42

120. The mean of a distribution is 18 and the standard deviation is 4.5. What is the value of the coefficient of variation?
(A) 50%   (B) 25%
(C) 100%   (D) 75%

121. The mean of a distribution is 11 and the standard deviation is 5. What is the value of variance coefficient?
(A) 45.45%   (B) 35.35%
(C) 25.25%   (D) 55.55%

122. The mean of a distribution is 11 and the standard deviation is 5. What is the value of variance coefficient?
(A) 50%   (B) 100%
(C) 150%   (D) 200%

123. If the standard deviation of a population is 8, what will be its variance?
(A) 64   (B) 16
(C) 32   (D) 24

124. The mean of a distribution is 24 and the standard deviation is 8. What is the value of variance coefficient?
(A) 16.66%   (B) 66.66%
(C) 33.33%   (D) 100%

125. The mean of a distribution is 20 and the standard deviation is 4, so what will be the value of its coefficient variation?
(A) 10   (B) 20
(C) 40   (D) 60

126. The mean of a distribution is 18 and the standard deviation is 7. What is the value of variance coefficient?

(A) 50%   (B) 76.77%
(C) 54.44%   (D) 38.88%

127. The mean of a distribution is 21 and the standard deviation is 7. What is the value of variance coefficient?
(A) 16.66%   (B) 66.66%
(C) 33.33%   (D) 100%

128. The average of the results of 35 test is 21. The average of the first 17 results is 19 and the average of the last 17 is 22. What is the value of the result of the 18th test?
(A) 42   (B) 36
(C) 38   (D) 34

129. The mean of a distribution is 15 and the standard deviation is 5. What is the value of variance coefficient?
(A) 16.66%   (B) 66.66%
(C) 33.33%   (D) 100%

130. If the value of the mode is 14 and the arithmetic mean is 5, then the value of the median is:
(A) 8   (B) 18
(C) 12   (D) 14

131. Find the mode and median of 3, 4, 5, 5, 3, 5, 5, 6.
(A) 5 and 5   (B) 3 and 5
(C) 5 and 4   (D) 3 and 4

132. If a data set variance is 324, find the standard deviation.
(A) ±18   (B) 18
(C) 324   (D) 162

133. If the mean value of the height of 12 men is 1.70 meters and the mean height of 8 women is 1.60 meters. Then what is the sum (in meters) of the total length of 8 women?
(A) 12.9   (B) 12.8
(C) 12.4   (D) 13

134. The mean of a distribution is 80 and the standard deviation is 16. What is the value of the variance coefficient?
(A) 10%   (B) 20%
(C) 40%   (D) 6%

135. If the standard deviation of the population is 13, what will be the variance of the population?
(A) 78   (B) 39
(C) 26   (D) 169

136. Find the median, mode and mean of 9, 8, 3, 5, 1, 9, 8, 2, 9.
(A) 9, 9, 6   (B) 9, 6, 9
(C) 8, 9, 6   (D) 8, 5, 6

137. If the standard deviation of a distribution is 9, what is the value of the variance?
(A) 18   (B) 27
(C) 81   (D) 36

138. The mean of the lengths of 6 bars is 44.2 cm. is. The mean of the lengths of 5 bars is 46 cm,

then what will be the length (in cm) of the sixth bar?

(A) 35   (B) 35.2
(C) 35.1   (D) 35.5

139. The frequency distribution of diameter (D) of 101 steel balls is given in the following list –

D (mm)	43	44	45	46	47	48
No.	13	15	22	21	16	14

Find the mean of diameter in mm.

(A) 45.4   (B) 45.5
(C) 45.7   (D) 45.6

140. Find the median of 1.9, 8.4, 3.6, 5.8.

(A) 5.1   (B) 4.7
(C) 5.2   (D) 5.6

141. Find the range, mode and median of 13, 14, 13, 12, 15, 21, 16, 18, and 13.

(A) 9, 13, 14   (B) 6, 13, 14
(C) 8, 13, 14   (D) 5, 13, 14

142. Find the frequency 'x' absent in this figure, given that the arithmetic mean is 28.

profit %	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of stores	12	18	27	X	17	6

(A) 20   (B) 15
(C) 12   (D) 24

143. If the mean of K, 2K + 1, 2K + 5, 2K + 9 is 30, find the value of 'K'.

(A) 15   (B) 5
(C) 12   (D) 20

144. Find the median.

$(a + 4), (a – 3.5), (a – 2.5), (a – 3), (a – 2), (a+, (a + 5)$ and $(a – 0.5)$

(A) $a – 1.25$ (B) $a – 2.5$
(C) $a – 1.5$ (D) $a – 0.75$

145. Calculate the median for these data.

Daily income in rs.	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39
Number of	5	10	15	20	10	5

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(A) 20   (B) 12.33
(C) 26.4   (D) 25.13

146. Find the mode of this distribution.

Class interval	1 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequency	3	16	26	31	16	8

(A) 34.5   (B) 35
(C) 42   (D) 32.5

147. The standard deviation of a group of values is 4.5. If each value increases by K, find the variance of the new set of values.

(A) 10.5   (B) 20.25
(C) 100.25   (D) 4.5

148. The variance of 5 values is 16. If each value is doubled, find the standard deviation of the new value.

(A) 16   (B) 4
(C) 10   (D) 8

149. The variance of 5 values is 36. If each value is doubled, find the standard deviation.

(A) 12   (B) 6
(C) 18   (D) 10

150. Find the standard deviation of the given sample data.

6, 12, 9, 7, 8, 4, 3, 12, 15, 4

(A) 3.80   (B) 2
(C) 3.48   (D) 4

151. Find the standard deviation of the first 'n' natural numbers.

(A) $\sqrt{\frac{n^2-1}{12}}$ (B) $\frac{n(2n+1)}{3}$
(C) $\sqrt{\frac{n^2+1}{6}}$ (D) $\frac{n(n+1)}{12}$

152. If a number is chosen at random, what is the probability that a two-digit number is not a prime number?

(A) 7/30   (B) 23/30
(C) 21/90   (D) 67 /90

153. When a pair of dice is thrown, what is the probability that the sum of the numbers is odd?

(A) 1   (B) 0.25
(C) 0.4   (D) 0.5

154. In a shooting competition, the probability of penetrating a target is 1/2 for A, 2/3 for B and 3/4 for C. If they shoot to hit the target together, what is the probability of one of them hitting the target?

(A) 1 6   (B) 3/8

(C) 2/3   (D) 1/4

155. One black, one red and one green dice are thrown together. What is the probability that the sum of three numbers is ≥17?

(A) 7/216   (B) 5/216

(C) 1/54   (D) 1/36

156. The variance of a set of values $X_1 X_2, ... X_n$, is given by which of the following formulas?

(A) $\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2$ (B) $\left(\frac{\Sigma x}{n}\right)^2 - \frac{\Sigma x^2}{n}$

(C) $\left(\frac{\Sigma x}{n}\right)^2$ (D) $\frac{\Sigma x^2}{n} - \frac{\Sigma x}{n}$

157. Find the range of the first 7 prime numbers.

(A) 15   (B) 8.3

(C) 9   (D) 17

Solution

1. Ans.(D)

$$\text{Mean} = \frac{\text{sum of digits}}{\text{number of digits}}$$

$$6 = \frac{2 + x + 7 + 3 + y + 9 + 6}{7}$$

$x + y + 27 = 42$

$x + y = 42 - 27$

$x + y = 15 \dots\dots\dots\dots (i)$

According to Question,

$$\frac{27 + 3x + 1 + y + 3}{7} = 8$$

$31 + 3x + y = 56$

$3x + y = 56 - 31$

$3x + y = 25 \dots\dots\dots\dots(ii)$

From equation (i) and equation (ii) –

$x = 5$

2. Ans.(A)

Let the total number in the group = x

According to Question –

$8 \times 17 + (x - 8)22 = x \times 20$

$136 + 22x - 176 = 20x$

$-40 + 22x = 20x$

$2x = 40$

$x = 20$

Total number in group = 20

3. Ans.(A)

Total of 21 observations = 21 × 40 = 840

If the value of the median is increased to 21, the value of observations increases.

Increased value of observations

= (21 – 11) × 21 = 210

Mean of observations

$$= \frac{\text{Total mean + Increased value}}{21}$$

$$= \frac{840 + 210}{21} = 50$$

4. Ans.(B)

Mean of the eight smallest numbers in the group = 12.5

Sum of the smallest eights = 8 × 12.5 = 100

Mean of all 14 numbers = 14

Sum of 14 numbers = 14 × 14 = 196

Sum of 6 largest numbers = 196 – 100 = 96

Mean of 6 largest numbers = $\frac{96}{6}$ = 16

$$\boxed{Thus, the\ required\ mean\ = 16}$$

5. Ans.(B)

Let the number of terms in the first set of numbers (frequency) = n_1

And the number of terms in the second set of numbers (frequency) = n_2

According to Question –

$\Rightarrow 12 \times n_1 + 15 \times n_2 = (n_1 + n_2) \times 12.5$

$\Rightarrow 12n_1 + 15n_2 = 12.5n_1 + 12.5n_2$

$\Rightarrow 15n_2 - 12.5n_2 = 12.5n_1 - 12n_1$

$\Rightarrow 2.5n_2 = .5n_1 \Rightarrow \frac{n_1}{n_2} = \frac{5}{1}$

Hence ratio of frequency of both groups

= 5: 1

6. Ans.(C)

Write the given numbers in ascending order

5, 12, 32, 34, 51, $\boxed{57}$, $\boxed{57}$, 62, 62, 67, 92, 93

Total numbers (n) = 12 even

$$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2} + 1\right)^{th} term}{2}$$

$$= \left[\frac{6^{th}\ term + 7^{th}\ term}{2}\right]$$

$$= \left[\frac{57 + 57}{2}\right] = \frac{114}{2} = 57$$

7. Ans.(C)

$$\frac{x_1 + x_2 + x_3 + ---- x_{10}}{10} = 20$$

$x_1 + x_2 + x_3 + \dots - x_{10} = 200 \dots\dots(i)$

Then, mean

$$= \frac{(x_1 + 4) + (x_2 + 8) + (x_3 + 12) + ----(x_{10} + 40)}{10}$$

$$= \frac{x_1 + x_2 + x_3 + --- x_{10} + 4 + 8 + 12 + --- 40}{10}$$

$$= \frac{200 + 5(4 + 40)}{10} \qquad \text{(From equation (i))}$$

$$= \frac{200 + 220}{10} = \frac{420}{10} = 42$$

8. Ans.(B)

$$\text{Correct mean} = \frac{36 \times 72.50 + (56 - 65)}{36}$$

$$= \frac{2610 - 9}{36} = \frac{2601}{36} = 72.25$$

9. Ans.(B)

Total score of 17 members = 17 × 15 = 255

Total score of n member = 12n

According to Question,

$$\frac{255 + 12n}{17 + n} = 13.7$$

$13.7n + 232.9 = 255 + 12n$

$13.7n - 12n = 255 - 232.9$

$1.7n = 22.1$

$n = 13$

10. Ans.(B)

Let the weight of the sixth child be x kg

$$\therefore 17.5 = \frac{14 + 19 + 23 + 21 + 13 + x}{6}$$

$105.0 = 90 + x$

$x = 15$

Thus, weight of sixth child = 15 kg

11. Ans.(B)

Number (x)	0	1	2	3	4	7		

No. of students	6	5	4	3	2	5	$\sum f = 25$
fx	0	5	8	9	8	40	$\sum fx = 70$

Mean $= \frac{\sum fx}{\sum f}$

$= \frac{70}{25} = 2.8$

12. **Ans.(A)**

There are four numbers a, b, c, d whose average is 23.

Sum of all numbers = 4 × 23 = 92

Sum of a and b = 2 × 19.5 = 39.0

Sum of c and d = Sum of 4 numbers – Sum of 2 numbers = 92 – 39

Sum of c and d = 53

Average of c and d $= \frac{53}{2}$

$\boxed{Average\ of\ c\ and\ d\ =\ 26.5}$

13. **Ans.(B)**

$Mean = \dfrac{Sum\ of\ terms}{Number\ of\ terms}$

$\Rightarrow \frac{27 + x + 31 + x + 89 + x + 107 + x + 156 + x}{5} = 82$

$\Rightarrow 410 + 5x = 410$

$\Rightarrow 5x = 410 - 410$

$\Rightarrow 5x = 0$

$x = 0$

Again mean

$= \frac{130 + x + 126 + x + 68 + x + 50 + x + 1 + x}{5}$

$= \frac{130 + 126 + 68 + 50 + 1}{5}$

$= \frac{375}{5} = 75$

Required mean = 75

14. **Ans.(A)**

$Mean = \dfrac{Sum\ of\ terms}{Number\ of\ terms}$

$1 = \frac{x_1 + x_2 + x_3 + \cdots x_n}{n} ----- (I)$

Therefore, mean $= \frac{\left(\frac{x_1}{k} + \frac{x_2}{k} + ---- \frac{x_n}{k}\right)}{n}$

$Mean = \frac{1}{k}\frac{(x_1 + x_2 + x_3 + ---x_n)}{n}$

$Mean = \frac{1}{k}$

15. **Ans.(A)**

Write numbers in ascending order –

5, 17, 17, 32, 32, 35, 37, 45, 45, 45, 64, 68, 78, 93

Number of terms = 14 (even)

$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$

$= \frac{1}{2}(7^{th}\ term + 8^{th}\ term$

$= \frac{1}{2}[37 + 45]$

$= \frac{82}{2} = 41$

16. **Ans.(C)**

According to Question,

All prime numbers from 1 to 55 = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53

n = 16 even

$\therefore Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$

$= \frac{\left(\frac{16}{2}\right)^{th} term + \left(\frac{16}{2}+1\right)^{th} term}{2}$

$= \frac{8^{th}}{2}\ term + 9^{th}\ term$

$= \frac{19 + 23}{2}$

$= \frac{42}{2}$

$= 21$

Thus, the median of the total prime numbers from 1 to 55 = 21

17. **Ans.(A)**

Placing the series in ascending order,

6, 8, 9, 9, 10, 11, 12, 15, 16, 16, 17, 21

$\because n = 12$ (even)

$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2} =$

$\frac{\left(\frac{12}{2}\right)^{th} term + \left(\frac{12}{2}+1\right)^{th} term}{2}$

$= \frac{6^{th}\ term + 7^{th}\ term}{2} = \frac{11 + 12}{2}$

$= \frac{23}{2} = 11.5$

18. **Ans.(B)**

Write the digits in ascending order – 2, 5, 7, 7, 8, 8, 10, 10, 14, 15, 17, 18, 24, 27, 28, 48

The total number of terms is (n) = 16 even.

$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$

$= \frac{8^{th} term + 9^{th}\ term}{2} = \frac{10 + 14}{2} = \frac{24}{2} = 12$

19. **Ans.(B)**

Length (cm)	Frequency	Cumulative frequency
135–140	4	4
140–145	7	11
145–150	18=f	29
150–155	11=f_b	40
155–160	6	46
160–165	4	50

$\sum f = N = 50$

$Median = L + \left(\frac{\frac{N}{2} - f_b}{f}\right) \times i$

where $\frac{N}{2} = \frac{50}{2} = 25$

$= 145 + \frac{(25-11)}{18} \times 5$

$= 145 + \frac{70}{18}$

$= 145 + 3.88 = 148.88 \approx 148.89$

20. **Ans.(C)**
Write the given numbers in ascending order,
30, 40, 40, 40, 40, 50, 50, 50, 80, 80, 80, 80
Total number (n) = 12 (even)

$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$

$= \frac{\left(\frac{12}{2}\right)^{th} 4\epsilon + \left(\frac{12}{2}+1\right)^{th} term}{2}$

$= \frac{6^{th} term + 7^{th} term}{2} = \frac{50+50}{2} = 50$

21. **Ans.(C)**
Given 12, 13, 15, 18, x, 28, 18, 12, 6, 8
Mean = 15

$\frac{6+8+12+12+13+15+18+18+28+x}{10} = 15$

$= 130 + x = 150$

$x = 150 - 130 = 20$

Write data in ascending order

$\therefore 6, 8, 12, 12, \boxed{13, 15}, 18, 18, 20, 28$

Number of terms = 10 (even)

$Median = \frac{1}{2}\left[\frac{n}{2}\vec{q}\text{* term} + \left(\frac{n}{2}+1\right)^{th} term\right]$

$= \frac{1}{2}\left[\left(\frac{10}{2}\right)^{th} term + \left(\frac{10}{2}+1\right)^{th} term\right]$

$= \frac{1}{2}[5^{th} term + 6^{th} term]$

$Median = \frac{13+15}{2} = \frac{28}{2} = 14$

22. **Ans.(A)**
Fibonacci series = $a_0, a_1, a_2, a_3, a_4 \ldots$
Where,
$a_0 = 0$
$a_1 = 1$
$a_n = a_{(n-2)} + a_{(n-1)}$
In this, the next number is the sum of the first two numbers.
Hence Fibonacci numbers = 0, 1, 1, 2, 3, 5, 8, 13, 21, 34
Number of terms (n) = 10 (even)

$Median = \frac{(5^{th} term + 6^{th} term)}{2} = \frac{3+5}{2} = 4$

23. **Ans.(B)**

Family size	Number of family
1 – 3	7 = f_0
3 – 5	9 = f_1
5 – 7	2 = f_2
7 – 9	1
9 – 11	1

The frequency of classes 3 – 5 is the highest so the mode is class 3 – 5.
$L = 3, f_0 = 7, f_1 = 9, f_2 = 2$ and $h = 2$

$Mode = L + \left(\frac{f_1-f_0}{2f_1-f_0-f_2}\right) \times h$

$= 3 + \frac{9-7}{18-7-2} \times 2$

$= 3 + \frac{2}{9} \times 2 = \frac{31}{9} = 3.444$

24. **Ans.(C)**
Mode means that the number has come more often or has a higher frequency. Therefore, the given mode has a high frequency of 3.
$\therefore$ mode of data = 3

25. **Ans.(D)**
Given data – 25, 45, 58, 87, 45, 54, 65, 12, 25, 59, 42, 60
It has 25 is maximum 2 times and 45 is 2 times.
Hence the required mode is 25, 45.

26. **Ans.(A)**

Age group	Number of persons
20 – 30	37
30 – 40	38
40 – 50	70 Mode class
50 – 60	42
60 – 70	13

Here – L = low limit of Mode class = 40
F_1 = number of Mode classes = 70
F_0 = number of class above Mode class = 38
i = higher limit – lower limit (class difference)
= 10

$Mode (z) = L + \frac{f_1-f_0}{2f_1-f_0-f_2} \times I$

$= 40 + \frac{70-38}{70\times2-38-42} \times 10$

$= 40 + \frac{32}{140-80} \times 10$

$= 40 + \frac{320}{60} = 40 + 5.33$

$= 45.33$

27. **Ans.(A)**

Number	Frequency
6-10	9
10-14	28 = f_0
14-28	34-f_1
18-22	18 =f_2
22-26	11

$z(Mode) = L + \frac{f_1-f_0}{2f_1-f_0-f_2} \times I$

$L = 14 \ f_1 = 34 \ f_0 = 28$
$f_2 = 18 \ i = 4$

$z = 14 + \frac{34-28}{68-28-18} \times 4$

$= 14 + \frac{24}{22}$

$z = 15.09$

28. Ans.(B)

The mean of 3, 4, a, b, 10 is 6 and the median is 5 a < b

Mean $= \frac{\text{Sum of total numbers}}{\text{Total number}}$

$6 = \frac{3+4+a+b+10}{5}$

$30 = 17 + a + b$

$a + b = 13$

Median is 5 –

Median when the number of terms is odd $\left(\frac{n+1}{2}\right)$

Number of terms (n) = 5

Median $= \left(\frac{5+1}{2}\right)^{th}$ term $= 3^{rd}$ term

$5 = a$

$a + b = 13$

$5 + b = 13$

$b = 8$

$a = 5, b = 8$

29. Ans.(B)

Average $=$

$\frac{34+38+42+44+46+48+54+55+63+70}{10}$

$= \frac{494}{10} = \frac{247}{5}$

Mean $= \underbrace{34+38+42+44+46}_{\frac{204}{5}} \quad \underbrace{48+54+55+63+70}_{\frac{290}{5}}$

Mean deviation $= \frac{247}{5} - \frac{204}{5} = \frac{43}{5}$

30. Ans.(B)

$1, 1+d, 1+2d \ldots \ldots 1$

$+ 100d$ is in airthmetic progression.

$\because$ Total number of terms = 101

Arithmetic mean$(x) = \frac{1+(1+d)+\ldots(1+100d)}{101}$

$= \frac{101(1+50d)}{101}$

$\bar{x} = 1 + 50d$

Mean deviation $= \frac{1}{101}\sum_{i=0}^{100}|x_i - \bar{x}|$

$= \frac{1}{101}(|-50d| + |-49d| + \ldots|-d| +$

$0 + |d| + |2d| + \ldots + |50d|)$

$255 = \frac{2d}{101} \frac{(50\times51)}{2}$

$255 = \frac{d}{101} \times 50 \times 51$

$d = \frac{255\times101}{50\times51} = \frac{25755}{2550} = 10.1$

31. Ans.(C)

Total number of cards = 52

Number of face cards = 12

Hence the possibility of having a face card

$= \frac{12}{52} = \frac{3}{13}$

32. Ans.(D)

The number of cards is 52.

The number of ace in the cards is 4.

Probability of taking out from pack of cards $=$

$\frac{4}{52} = \frac{1}{13}$

33. Ans.(A)

Total number of pens = 100

Number of damage pens = 8

Probability of removing a damage pen $= \frac{8}{100}$

Probability of not having a damage pen $= 1 - \frac{8}{100} = \frac{92}{100} = \frac{23}{25}$

34. Ans.(C)

Mean $= \frac{75\% + 25\%}{2} = \frac{100\%}{2} = 50\%$

35. Ans.(B)

Sum of 3 smallest numbers in four numbers

$= 19 \times 3 = 57$

Sum of the three largest numbers

$= 23 \times 3 = 69$

Range of set = 69 – 57 = 12

36. Ans.(C)

Considered numbers = x, y, z where $x < y < z$

According to Question –

$x + y + z = 60 - (i)$

$z - x = 12 \Rightarrow z = 12 + x \ldots\ldots$ (ii)

$y - x = 3 \Rightarrow y = 3 + x$

Solving equation (i), (ii) and (iii),

$x = 15$

$y = 18$

$\boxed{z = 27}$

Maximum number (z) = 27

37. Ans.(A)

Let the three numbers be x > y > z.

According to Question –

$\frac{x+y+z}{2} = 33$

$x + y + z = 99$ ....(i)

$x - z = 29$ ....(ii)

and $y = x + z - 27$

$y + 27 = x + z$ ....(iii)

From equation (I) and (III) –

$y + y + 27 = 99$

$2y = 72$

$y = 36$

Putting the value of y in equation (III),

$y + 27 = x + z$

$36 + 27 = x + z$

$x + z = 63$ ....(iv)

Equation (II) + (IV)

$2x = 92$

$x = 46$

Putting the value of x in equation (IV) –

$z = 63 - 46$

$z = 17$

Hence the numbers x, y and z are 46, 36, 17 respectively.

Hence the largest number = 46

38. **Ans.(C)**
Let the numbers be a, b, c where a> b> c
Mean $= \frac{a+b+c}{3} = 35$
$a + b + c = 105$...........(1)
$a - c = 24$.........(2)
And $a - b = 3(b - c)$........(3)
$a - b = 3b - 3c$
$a + 3c = 4b$
$a + c = 4b - 2c$...............(4)
Putting the value of a + c from equation (4) into equation (1)
$b + 4b - 2c = 105$
$5b - 2c = 105$.....(5)
Putting a = 24 + c in equation (1)
$24 + c + b + c = 105$
$b + 2c = 81$.........(6)
On solving equation (5) and (6)
$b = 31, c = 25$
From equation (I)
$a + 31 + 25 = 105$
$a + 56 = 105$
$\boxed{a = 49}$

39. **Ans.(A)**
Blue : Red = 36: 68
= 9: 17
When the number of blue balls is 63, then the number of red balls is n.
Then –
$\frac{63}{n} = \frac{9}{17}$
$9n = 63 \times 17$
$n = \frac{63 \times 17}{9}$
$n = 7 \times 17$
$n = 119$
Thus, number of red balls = 119

40. **Ans.(D)**
7, 2, 10, 4, 3, 12, 8, 4, 6, 4
Write in ascending order
2, 3, 4, 4, 4, 6, 7, 8, 10, 12
Median $= \frac{1}{2}\left(\frac{n^{th}}{2} + \left(\frac{n}{2} + 1\right)^{th}\right)$
Median $= \frac{1}{2}(5^{th} + 6^{th})$ term
$= \frac{1}{2} \times 10 = 5$
Mean $= \frac{\text{Total sum}}{\text{Total number}}$

$= \frac{2+3+4+4+4+6+7+8+10+12}{10}$
Mean $= \frac{60}{10} = 6$
$L.C.M$ of $4, 5, 6, = 2 \times 2 \times 3 \times 5 = 60$

41. **Ans.(C)**
Mode = 4 (maximum)
Arranging in ascending order –
$1, 2, 3, 4, 4, 6, 8, 9, 11, 12$
Mean $= \frac{1+2+3+4+4+6+8+9+11+12}{10}$

$= \frac{60}{10} = 6$
Total number (n) = 10 (even)
Median $= \frac{\frac{n^{th}}{2}\text{ value of term} + \left(\frac{n}{2}+1\right)^{th}\text{ value of term}}{2}$
$= \frac{5^{th}\text{ value of term} + 6^{th}\text{value of term}}{2}$
$= \frac{4+6}{2} = \frac{10}{2} = 5$
= Mode × Median + Mean
$= (4 \times 5) + 6 = 26$

42. **Ans.(A)**
Let there be three numbers a, b and c. Where
a <b <c
According to Question –
$\frac{a+b+c}{3} = 15$
$\Rightarrow a + b + c = 45$..........(I)
and $c - a = 9$..........(II)
and $c - b = 2(b - a)$
$\Rightarrow c - b = 2b - 2a$
$\Rightarrow 3b = 2a + c \Rightarrow b = \frac{2a+c}{3}$.........(III)
Putting the value of 'b' from equation (III) in equation (I) –
$a + \left(\frac{2a+c}{3}\right) + c = 45$
$\Rightarrow 5a + 4c = 135$..........(IV)
Now, equation (IV) + equation (II) × 5
$9c = 180 \Rightarrow c = 20$
From equation (II)
$20 - a = 9 \Rightarrow a = 11$
From equation (III)
$b = \frac{2 \times 11 + 20}{3} = 14$
Hence the largest number = 20

43. **Ans.(B)**
According to Question,
$c - a = k ... (i)$
$d - b = k ... (ii)$
Subtracting,
$c - a - d + b = 0$
$b + c = a + d$........(iii)
∵ Arithmetic mean = 25
$\frac{a+b+c+d}{4} = 25$
$a + (b + c) + d = 100$
$a + d + a + d = 100$
$a + d = 50$.........(iv)
But, $d - a = 20$
$d = 20 + a$
∴ $a + 20 + a = 50$
$2a = 30$
$a = 15$
Hence the coefficient of variance = (standard deviation) $^2 = (10)^2 = 100$

44. **Ans.(C)**
Let the number of students in the class = 100 and the mean of the marks obtained by the remaining 50% students = x

According to Question –
$$20 \times 60 + 30 \times 40 + 50 \times x = 100 \times 58$$
$$1200 + 1200 + 50 \times x = 5800$$
$$2400 + 50x = 5800$$
$$50x = 5800 - 2400 = 3400$$
$$x = \frac{3400}{50} = 68$$
Hence the mean of the marks obtained by the remaining students is 68.

45.   Ans.(D)
$$\because \text{Mean} = \frac{\text{Sum of total terms}}{\text{numbers of terms}}$$
$$9 = \frac{x + x + 3 + x + 5 + x + 8 + x + 9}{5}$$
$$45 = 5x + 25$$
$$5x = 45 - 25$$
$$5x = 20$$
$$x = 4$$
Value of last three terms
$$x + 5 = 4 + 5 = 9$$
$$x + 8 = 12$$
$$x + 9 = 13$$
$$\text{Mean} = \frac{9 + 12 + 13}{3}$$
$$= \frac{34}{3}$$

46.   Ans.(B)
Let the number of students be x and the mean of the entire class is y, so the total marks obtained by the students = xy
According to Question –
$$xy + (86 - 68) = x\left(y + \frac{1}{2}\right)$$
$$\Rightarrow xy + 18 = xy + \frac{x}{2}$$
$$\Rightarrow \frac{x}{2} = 18$$
$$\Rightarrow x = 18 \times 2$$
$$\Rightarrow x = 36$$
Thus, number of students = 36

47.   Ans.(B)
$$\text{Mean} = \frac{\text{Sum of total terms}}{\text{numbers of terms}} = \frac{\sum x}{N}$$
$$11 = \frac{x + (x + 3) + (x + 4) + (x + 6) + (x + 7)}{5}$$
$$55 = 5x + 20$$
$$35 = 5x$$
$$x = \frac{35}{5} = 7$$
Mean of last three observations
$$= \frac{(x + 4) + (x + 6) + (x + 7)}{3}$$
$$= \frac{(7 + 4) + (7 + 6) + (7 + 7)}{3} = \frac{38}{3} = 12.67$$

48.   Ans.(D)
Sum of marks obtained by 40 students = 40 × 72.5 = 2900
According to Question,
$$\text{True mean} = \frac{2900 + (84 - 48)}{40}$$
$$= \frac{2936}{40} = 73.4$$

49.   Ans.(D)
All positive factors of 48 are –

$$1, 2, 3, 4, \boxed{6}, \boxed{8}, 12, 16, 24, 48$$
$$n = 10(\text{even})$$

$$\therefore \text{Median} = \frac{\frac{10}{2}\text{th term} + \left(\frac{10}{2} + 1\right)\text{th term}}{2}$$
$$= \frac{5\text{th term} + 6\text{th term}}{2}$$
$$= \frac{6 + 8}{2} = \frac{14}{2} = 7$$

50.   Ans.(B)
On keeping the data in ascending order –
$$\frac{1}{4}, \frac{1}{4}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{3}{4}, \frac{3}{4}, 1, 2$$
$$n = 9 \text{ (Odd)}$$
$$\text{Meadian} = \left(\frac{n + 1}{2}\right)\text{th term} = \left(\frac{9 + 1}{2}\right)\text{th term}$$
$$= 5\text{th term} = \frac{1}{2}$$

51.   Ans.(C)
5, 2, 2, 7, 3, 8
Arranging in ascending order
2, 2, 3, 5, 7, 8
n = 6
$$\text{Median} = \frac{\frac{n}{2}\text{th term} + \left(\frac{n}{2} + 1\right)\text{th term}}{2}$$
$$= \frac{3 + 5}{2}$$
$$= \frac{8}{2} = 4$$

52.   Ans.(C)
Mode = Highest frequency number
Mode = 4

53.   Ans.(B)
$$\text{Variance Coefficient} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$
$$= \frac{6}{24} \times 100 = 25\%$$

54.   Ans.(A)
Standard deviation of population = 10

55.   Ans.(B)
$$\text{Standard deviation} = \sqrt{\frac{\sum(x - x)^2}{n}}$$
where x → personal term
$$x \to \text{Mean}$$
$$n \to \text{number of terms}$$
$$\bar{x} = \frac{11 + 7 + 10 + 13 + 9}{5} = \frac{50}{5} = 10$$
$$\sum(x - m)^2 = (11 - 10)^2 + (7 - 10)^2 + (10 - 10)^2 + (13 - 10)^2 + (9 - 10)^2 = 1 + 9 + 0 + 9 + 1 = 20$$
$$\text{Standard deviation} = \sqrt{\frac{20}{5}} = 2$$

56.   Ans.(C)
Total number of balls = 8
Probability of two balls of the same color.

$$= \frac{{}^5C_2 + {}^3C_2}{{}^8C_2} \left[{}^nC_r = \frac{n!}{r!(n-r)!} \right]$$

$$= \frac{\frac{5!}{3! \times 2!} + \frac{3!}{1! \times 2!}}{\frac{8!}{2! \times 6!}}$$

$$= \frac{\frac{5 \times 4 \times 3!}{2 \times 1 \times 3!} + \frac{3 \times 2!}{2! \times 1}}{\frac{8 \times 7 \times 6!}{2 \times 1 \times 6!}} = \frac{\frac{5 \times 4}{2 \times 1} + 3}{\frac{8 \times 7}{2 \times 1}}$$

$$= \frac{5 \times 4}{8 \times 7/2} = \frac{\frac{26}{2}}{\frac{3}{2}} = \frac{13}{28}$$

57. **Ans.(C)**
When a dice is thrown 2 times –
Total possibilities N (E) = 6^2 = 36
The probability that the sum of digits is 10 N (S)
= (4, 6) (6, 4) (5, 5) = 3
Hence the required probability P (E) = $\frac{N(S)}{N(E)}$

$$= \frac{3}{36} = \frac{1}{12}$$

58. **Ans.(C)**
Data Range = Highest Value – Lowest Value =
9 – 3 = 6

59. **Ans.(B)**
Range of data = ceiling – lowest range
= 19 – 9 = 10

60. **Ans.(D)**
Since, 2 is added to each number.
∴ 2 will be added to the arithmetic mean. Thus,
the mean of the new range
= 35 + 2 = 37

61. **Ans.(A)**
Total sum of marks obtained by 12 students
= 12 × 67.4 = 808.8
Total sum of marks obtained by 15 students
= 15 x 72.3 = 1084.5
Joint mean of both classes = $\frac{808.8 + 1084.5}{12 + 15}$

$$= \frac{1893.3}{27} = 70.12$$

62. **Ans.(A)**
Mean of four observations = 17.5
Sum of four observations = 17.5 × 4 = 70.0
Adding a new observation = 70 + 20 = 90
New mean = $\frac{90}{5}$ = 18

63. **Ans.(C)**
Total of 20 observations = 20 × 15.5 = 310
But 42 was read instead of 24 by mistake.
∴ Correct sum = 310 + 24 – 42 = 292
Hence the correct mean = $\frac{292}{20}$ = 14.6

64. **Ans.(D)**
Mean of two new observations = $\frac{24 \times 11 - 22 \times 10}{2}$

$$= \frac{264 - 220}{2} = \frac{44}{2} = 22$$

65. **Ans.(C)**
Total of 8 observations = 8 × 10 = 80

Sum of observations when three other observations are included = 11 × 12 = 132
∴ Sum of three new observations = 132 – 80 = 52
Hence the mean of three new observations = $\frac{52}{3}$ = 17.33

66. **Ans.(B)**
Mean = $\frac{\text{sum of numbers}}{\text{number of numbers}}$

$$= \frac{1 + \frac{1}{2} + \frac{1}{2} + \frac{3}{4} + \frac{1}{4} + 2 + \frac{1}{2} + \frac{1}{4} + \frac{3}{4}}{9}$$

$$= \frac{\frac{4+2+2+3+1+8+2+1+3}{4}}{9}$$

$$= \frac{26}{36}$$

$$= \frac{13}{18}$$

67. **Ans.(B)**
Mean = $\frac{18 + 16 + 22 + 13 + ?}{5}$

$16 = \frac{69 + ?}{5}$

⇒ 69 + ? = 16 × 5
? = 80 – 69 = 11

68. **Ans.(A)**
Sum of 9 observations = 18 × 9 = 162
Sum of 13 observations = 19 × 13 = 247
Hence the mean of four new observations =
$\frac{247 - 162}{4}$

$$= \frac{85}{4} = 21.25$$

69. **Ans.(C)**
First 6 prime numbers = 2, 3, 5, 7, 11, 13
∴ Mean = $\frac{2 + 3 + 5 + 7 + 11 + 13}{6}$

$$= \frac{41}{6}$$

70. **Ans.(C)**
Ascending order of given data –
2, 3, 4, 7, 7, 7, 9, 9, 13, 17, 21
n = 11 (Odd)
Median = $\frac{11+1}{2}$ th term = 6 th term = 7

71. **Ans.(C)**
Arranging given data in ascending order –
0, 1, 2, 2, 3, 4, 5, 5, 5, 7, 8, 9
n = 12 Even
Median = $\frac{1}{2}\left[\frac{12^{th}}{2} \text{ term} + \left(\frac{12}{2} + 1\right)^{th} \text{ term}\right]$

$$= \frac{1}{2}[6^{th} \text{ term} + 7^{th} \text{ term}]$$

$$= \frac{1}{2}(4 + 5) = \frac{9}{2} = 4.5$$

72. **Ans.(B)**
0, 0, 1, 1, 2, 2, x, 3, 3, 4, 5, 7
n = 12 (Even)

Median $= \frac{1}{2}\left[\frac{n}{2}^{th} \text{ term} + \left(\frac{n}{2} + 1\right)^{th} \text{ term}\right]$

$2.5 = \frac{1}{2}\left[\frac{12}{2}^{th} \text{ term} + \left(\frac{12}{2} + 1\right)^{th} \text{ term}\right]$

$= \frac{1}{2}[6^{th} \text{ term} + 7^{th} \text{ term}]$

$2.5 = \frac{1}{2}[2 + x]$

$\Rightarrow 2 + x = 5$

$\Rightarrow x = 3$

73.   Ans.(B)

Arrange in ascending order,

11, 23, 25, 26, 29, 31, 39

Number of terms = 7 (Odd)

$\therefore$ Median $= \left(\frac{7+1}{2}\right)^{th}$ term

$= 4^{th}$ term $= 26$

74.   Ans.(B)

Arranging numbers in ascending order –

31, 53, 55, 56, 59, 61, 69

n = 7(Odd)

Median $= \frac{n+1}{2}^{th}$ term $= \left(\frac{7+1}{2}\right)^{th}$ term

$= 4^{th}$ term

$= 56$

75.   Ans.(C)

2, 3, 4, 3, 0, 5, 1, 1, 3, 2

In ascending order

0, 1, 1, 2, 2, 3, 3, 4, 5

n = 10 (Even)

Median $= \frac{1}{2}\left[\frac{n}{2}^{th} \text{ term} + \left(\frac{n}{2} + 1\right)^{th} \text{ term}\right]$

$= \frac{1}{2}\left[\frac{10}{2}^{th} \text{ term} + \left(\frac{10}{2} + 1\right)^{th} \text{ term}\right]$

$= \frac{1}{2}[5^{th} \text{ term} + 6^{th} \text{ term}]$

$= \frac{1}{2}(3 + 2) = \frac{5}{2} = 2.5$

76.   Ans.(A)

Given number

3, 6, 7, 11, x, 15, 19, 20, 25, 28

Number of terms here = 10 (even)

$\therefore$ Median $= \dfrac{\frac{n}{2}^{th} \text{ term} + \left(\frac{n}{2} + 1\right)^{th} \text{ term}}{2}$

$13 = \dfrac{\frac{10}{2}^{th} \text{ term} + \left(\frac{10}{2} + 1\right)^{th} \text{ term}}{2}$

$13 = \dfrac{5^{th} \text{ term} + 6^{th} \text{ term}}{2}$

$26 = x + 15$

$x = 11$

77.   Ans.(B)

In ascending order –

$-5, -3, -2, 0, 1, 4, 4, 5, 7, 10$

n = 10 (Even)

$\therefore$ Median $= \frac{1}{2}\left[\frac{n}{2}^{th} \text{ term} + \left(\frac{n}{2} + 1\right)^{th} \text{ term}\right]$

$= \frac{1}{2}[5^{th}\text{term} + 6^{th} \text{ term}]$

$= \frac{1}{2} \times [1 + 4]$

$= 2.5$

78.   Ans.(C)

Numbers in ascending order –

3, 3, 5, 7, 8, 8, 8, 9, 11, 12, 12

$\Rightarrow$ number of terms (n) = 11

If the number of terms is odd –

Median $= \dfrac{n+1}{2}^{th}$ term

$= \dfrac{11+1}{2}^{th}$ term $= 6^{th}$ term $= 8$

79.   Ans.(C)

Numbers in ascending order

12, 12, 21, 23, 23, 23, 53, 53, 56, 64, 86, 87, 87, 87, 98

Total number of digits n = 15 (odd)

Median $= \left(\frac{n+1}{2}\right)^{th}$ the value of the term

Hence, median = the value of $\left(\frac{15+1}{2}\right)^{th}$ term

= Value of 8th term

Hence median = 53

80.   Ans.(D)

32, 12, 23, 17, 28, 25, 43

When arranged in ascending order,

12, 23, 25, 28, 29, 32, 43

n = 7(odd)

Median $= \left(\frac{n+1}{2}\right)^{th}$ term

$= \left(\frac{7+1}{2}\right)^{th}$ term

$= 4^{th}$ term

$= 28$

81.   Ans.(A)

Figures 12, 1, 10, 1, 9, 3, 4, 9, 7, 9 have the highest frequencies of 9 (3 times). Hence the mode of the given figure is 9.

82.   Ans.(C)

32, 34, 35, 36, 35, 34, 33, 35, 33, 31, 37

The frequency of 35 is the highest 3 in numbers.

Hence Mode = 35

83.   Ans.(C)

(MODE) – If the frequency of a number is the most frequent in the data, then that number is the mode of the given data.

Hence, mode = 15

84.   Ans.(C)

2, 4, 5, 6, 5, 4, 3, 5, 3, 1, 7

Frequency of 5 is the highest in the given data.

$\therefore$ Mode = 5

85.   Ans.(B)

$\because$ Data mode = 52

$\therefore x - 3 = 52$

$\Rightarrow \boxed{x = 55}$

86. Ans.(B)

$\therefore$ The frequency of $\frac{1}{2}$ is the highest (3) in the figures.

$\therefore$ Mode $= \frac{1}{2}$

87. Ans.(B)

Variance = (standard deviation)^2

$= (9.5)^2$

$= 90.25$

88. Ans.(A)

Variance = (standard deviation)^2

$= (4.5)^2 = 20.25$

89. Ans.(B)

Standard deviation of population

= 11 Variance of population = (standard deviation)^2 = $(11)^2$ = 121

90. Ans.(C)

Standard Deviation = 4

$\therefore$ Variance (standard deviation)^2 = $(4)^2$ = 16

91. Ans.(C)

Total number of innings played by all five players = 5 × 9 = 45

Total number of innings of four players

= 13 + 9 + 5 + 11 = 38

$\therefore$ Fifth player's total number of innings

= 45 − 38 = 7

92. Ans.(C)

Sum of seven observations

= 3 + 15 + 7 + 19 + 12 + 17 + 8 = 81

$\therefore$ Eighth observation = 8 ×10.5 − 81

= 84.0 − 81 = 3

93. Ans.(C)

Variance Coefficient $= \frac{\text{Standard Deviation}}{\text{Airthmetic mean}} \times 100$

$= \frac{5}{14} \times 100$

$= \frac{500}{14} = 35.7\%$

94. Ans.(D)

The figures 3, 10, 10, 4, 7, 10, 5

$(\text{Mean}) = \frac{3 + 10 + 10 + 4 + 7 + 10 + 5}{7} = \frac{49}{7}$

$(\text{Mean}) = 7$

$(\text{Mean deviation}) = \sum_{i=1}^{N} \frac{|M - X_i|}{N}$

$= \frac{|7-3| + |7-10| + |7-10| + |7-4| + |7-7| + |7-10| + |7-5|}{7}$

$= \frac{4 + 3 + 3 + 3 + 0 + 3 + 2}{7}$

$\boxed{\text{Mean deviation} = \frac{18}{7}}$

95. Ans.(B)

$\bar{x} = \frac{10 + 11 + 12 + 9 + 8}{5} = \frac{50}{5} = 10$

$\sum_{i=1}^{5}(x_i - \bar{x})^2 = (10 - 10)^2 + (11 - 10)^2 + (12 - 10)^2 + (9 - 10)^2 + (8 - 10)^2$

$= 0 + 1 + 4 + 1 + 4 = 10$

Standard deviation $= \sqrt{\frac{\sum_{i=1}^{5}(x_i - \bar{x})^2}{N}} = \sqrt{\frac{10}{5}} = \sqrt{2}$

96. Ans.(C)

Variance = (standard deviation)

$= (6)^2 = 36$

97. Ans.(B)

Standard deviation $= \sqrt{\text{Variance}}$

$= \sqrt{196} = 14$

98. Ans.(B)

Standard deviation of data $= \sqrt{121} = 11$

99. Ans.(B)

Standard deviation of data $= \sqrt{81}$

$= \pm 9 = 9$

100. Ans.(B)

Standard deviation $= \sqrt{64} = \pm 8 = 8$

101. Ans.(B)

Standard deviation $= \sqrt{\text{Variance}}$

$= \sqrt{361}$

$= \pm 19$

Since the standard deviation is not negative.
Thus, standard deviation = 19

102. Ans.(B)

Standard deviation $= \sqrt{\text{Variance}}$

$= \sqrt{169}$

$= 13$

103. Ans.(B)

Standard deviation $= \sqrt{\frac{\sum_{i=1}^{n} f_i(x_i - \bar{x})^2}{\sum_{i=1}^{n} f_i}}$

where $\bar{x} = $ Mean

104. Ans.(B)

Standard deviation (S.D.) $= \sqrt{\frac{\sum_{1}^{n}(x_i - \bar{x})^2}{n}}$

Where $\sum_{1}^{n}(x_1 - \bar{x})^2 = $ Variable

105. Ans.(A)

White cushion = 3

Red cushion = 4

Blue cushion = 5

$\boxed{\text{Probability} = \frac{\text{favorable probabilities}}{\text{total probabilities}}}$

Total probabilities= $^{12}C_1$

Favorable chances to choose 1 white or 1 blue cushion= $^3C_1 + ^5C_1$

Probability $= \frac{^3C_1 + ^5C_1}{^{12}C_1}$

$$= \frac{\frac{13}{113-1} + \frac{15}{115-1}}{\frac{112}{1112-1}}$$

$$= \frac{\frac{13}{2} + \frac{15}{4}}{\frac{12}{11}} = \frac{\frac{3 \times 2}{12} + \frac{5 \times 14}{4}}{\frac{12 \times 11}{111}}$$

$$= \frac{3+5}{12} = \frac{8}{12} = \frac{2}{3}$$

106.   Ans.(B)
When a coin is tossed, the probability of a head
$$= \frac{\text{Favorable probability}}{\text{total probability}} = \frac{1}{2}$$
So, probability of tail $= \frac{1}{2}$

107.   Ans.(D)
Lowest limit = 4
Highest limit = 9
∴ Range (Diffusion) = Highest – Lowest Limit
   = 9 – 4 = 5

108.   Ans.(D)
Lowest limit = 1
Highest limit = 7
Range = Highest – Lowest limit
∴ Range = 7 – 1 = 6

109.   Ans.(B)
Difference of the highest and lowest values of the given data is called range.
(Range) = 28 – 11 = 17

110.   Ans.(B)
The numbers of figures have doubled, so their variance will also double.
∴ Variation = 2 × 23.33 = 46.66

111.   Ans.(C)
Range of Numbers = High Range – Low Range
   = 21 – 1 = 20

112.   Ans.(B)
$60\sum x^2 = 18000$
$\sum x^2 = \frac{18000}{60}$
$\Rightarrow \boxed{\sum x^2 = 300}$
$\sum x = 960$
Average of 60 terms $= \frac{960}{60} = 16$
$\sum x^2 = (16)^2 \Rightarrow \boxed{\sum x^2 = 256}$
∴ Variation = 300 – 256 = 44

113.   Ans.(C)
Write the given number in ascending order
1, 1, 3, 3, 4, 4, 5, 6, 7, 8
Range of data = large number – small number
   = 8 – 1 = 7

114.   Ans.(D)
Write data in ascending order,
3, 3, 3, 3, 4, 4, 5, 5, 6
Mean $= \frac{3+3+3+3+4+4+5+5+6}{9} = \frac{36}{9} = 4$
Mode = 3 (is the highest frequency)
∵ Number of terms (n) = 9 (odd)
∴ Median $= \left(\frac{n+1}{2}\right)^{th}$ term $= \left(\frac{9+1}{2}\right)^{th}$ term
   = 5th term = 4

115.   Ans.(C)
Write the data in ascending order,
5, 7, 8, 8, 8, 9, 9, 9, 9
∵ Number of terms = 9 (odd)
∴ Median $= \left(\frac{n+1}{2}\right)^{th}$ term
   $= \frac{9+1}{2} = 5^{th}$ term $= 8$
Mode = 9 (most frequently included.)
Mean $= \frac{5+7+8+8+8+9+9+9+9}{9}$
   $= \frac{72}{9} = 8$

116.   Ans.(C)
Numbers in ascending order,
6, 6, 6, 7, 7, 8, 8, 8, 8
Mode = 8 (maximum frequency)
Number of terms = 9 (odd)
Median $= \left(\frac{9+1}{2}\right) = 5^{th}$ term $= 7$

117.   Ans.(C)
Mean of data
$= \frac{1+9+5+4+2+1+9+9+2+1+9+1+2+1}{14}$
$= \frac{56}{14} = 4$
Mode of data = 1 (term with highest frequency)

118.   Ans.(C)
Variance Coefficient $= \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$
$= \frac{7}{13} \times 100 = 53.85\%$

119.   Ans.(C)
Total of 20 observations = 20 × 19 = 380
Sum of inclusion of new observation
   = 21 × 20 = 420
∴ Value of 21st observation = 420 – 380 = 40

120.   Ans.(B)
Mean of distribution = 18
Standard deviation = 4.5
∴ $Variance\ coefficient = \frac{4.5}{18} \times 100$
$= \frac{450}{18} = 25\%$

121.   Ans.(A)
Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$
$= \frac{\sigma}{x} \times 100$
$= \frac{5}{11} \times 100$
$= 45.45\%$

122.   Ans.(A)
Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$
$= \frac{5}{10} \times 100 = 50\%$

123.   Ans.(A)
Standard deviation of population = 8
Variance = (standard deviation)²
   $= (8)^2 = 64$

124.   Ans.(C)
Mean of distribution = 24
Standard Deviation = 8

Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$

$= \frac{8}{24} \times 100$

$= \frac{100}{3}$

$= 33.33\%$

125. Ans.(B)

Mean = 20

Standard deviation = 4

Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$

$= \frac{4}{20} \times 100 = 20$

126. Ans:

Mean = 18

Standard Deviation = 7

Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$

$= \frac{7}{18} \times 100$

$= 700/18 = 38.88\%$

127. Ans.(C)

Variance coefficient $= \frac{7}{21} \times 100 = 33.33\%$

128. Ans.(C)

Average of 35 results = 21

Sum of 35 results = 35 × 21 = 735

Average of 17 results = 19

Total of 17 results = 17 × 19 = 323

Average of last 17 results = 22

Total sum = 17 × 22 = 374

Value of 18th results = 735 – 374 – 323 = 38

129. Ans.(C)

Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean}} \times 100$

$= \frac{5}{15} \times 100$

$= \frac{100}{3} = 33.33\%$

130. Ans.(A)

Mode = 3 × Median – 2 × Arithmetic mean

14 = 3 × Median – 2 × 5

3 × Median = 14 + 10

Median $= \frac{24}{3} = 8$

131. Ans.(A)

3, 4, 5, 5, 3, 6, 7, 3, 5, 5, 6

In ascending order

3, 3, 3, 4, 5, 5, 5, 5, 6, 6, 7

Mode = 5 (highest frequency)

∴ where $n = 11$ (odd)

Median $= \left(\frac{n+1}{2}\right) = \frac{11+1}{2} = 6^{th}$ term = 5

132. Ans.(B)

Standard deviation $= \sqrt{\text{variance}}$

∴ Variance = 324

∴ Standard deviation $= \sqrt{324}$

$= \pm 18$

$= 18$

133. Ans.(B)

Total sum = number × mean

Sum of length of 8 women = 8 × 1.60

= 12.8 m.

134. Ans.(B)

Mean of distribution = 80 standard deviation

= 16

Variance coefficient $= \frac{\text{Variance coefficient}}{\text{Mean of distribution}} \times 100$

$= \left(\frac{16}{80}\right) \times 100$

$= \frac{1}{5} \times 100$

$= 20\%$

135. Ans.(D)

Required variance = (standard deviation)^2

$= 13 \times 13 = 169$

136. Ans.(C)

Ascending order of numbers

1, 2, 3, 5, 8, 8, 9, 9, 9

= 9 (odd)

$Median = \left(\frac{n+1}{2}\right)^{th}$ term $= \frac{9+1}{2}^{th}$ term

$= 5^{th}$ term

Mean $= \frac{\text{Sum of all numbers}}{\text{Total number}}$

$= \frac{9+8+3+5+1+9+8+2+9}{9} = \frac{54}{9} = 6$

Mode = 9 (Most frequent frequency) Hence the median, mode and mean are 8, 9, 6 respectively.

137. Ans.(C)

Variance = (standard deviation)^2

$= (9)^2 = 81$

138. Ans.(B)

The mean of the length of 6 rods = 44.2 cm.

Total length of 6 rods = 44.2 × 6 = 265.2

Mean length of 5 rods = 46cm

Total length of 5 rods = 46 × 5 = 230

Length of 6th rod = 265.2 – 230 = 35.2cm

139. Ans.(B)

D (mm) (x)	43	44	45	46	47	48
सं. (f)	13	15	22	21	16	14
fx	559	660	990	966	752	672

Mean $= \frac{\Sigma f x}{\Sigma f}$

$= \frac{559+660+990+966+752+672}{13+15+22+21+16+14}$

$= \frac{4599}{101} = 45.53$

140. Ans.(B)

Ascending order – 1.9, 3.6, 5.8, 8.4

n = 4

Median $= \frac{1}{2}\left[\frac{n}{2}^{th} \text{ term} + \left(\frac{n}{2}+1\right)^{th} \text{ term}\right]$

Median $= \frac{1}{2}[2^{th} \text{ term} + 3^{th} \text{ term}]$

$= \frac{1}{2}[3.6 + 5.8] = \frac{1}{2} \times 9.4 = 4.7$

141. Ans.(A)

Range = 21 – 12 = 9
Mode = 13 (highest frequency)
By placing data in ascending order,
12, 13, 13, 13, 14, 15, 16, 18, 21
$\because n = 9$ (odd)
$\therefore$ Median = $\left(\frac{9+1}{2}\right)^{th}$ term = 5th term = 14

142. Ans.(A)

Profit %	x	Number of shops	f. x
0 – 10	5	12	60
10 – 20	15	18	270
20 – 30	25	27	675
30 – 40	35	x	35x
40 – 50	45	17	765
50 – 60	55	6	330

$\sum f = 80 + x \quad \sum fx = 2100 + 35x$
Arithmetic mean $= \frac{\sum fx}{\sum f}$

$28 = \frac{2100 + 35x}{80 + x}$
$2240 + 28x = 2100 + 35x$
$7x = 140$
$x = 20$

143. Ans.(A)
Mean $= \frac{\text{Sum of terms}}{\text{Number of terms}}$

$30 = \frac{K + 2K + 1 + 2K + 5 + 2K + 9}{4}$
$120 = 7K + 15$
$7K = 105$
$K = 15$

144. Ans.(A)
Numbers in ascending order –
$(a - 3.5), (a - 3), (a - 2.5), (a - 2), (a - 0.5), (a + 0.5), (a + 4),$
Number of term (n) = 8 (even)
$Median = \frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2} + 1\right)^{th} term}{2}$
$= \frac{4th\ term + 5th\ term}{2}$
$= \frac{a - 2 + a - 0.5}{2}$
$= \frac{2a - 2.5}{2}$
$= \boxed{a - 1.25}$

145. Ans.(D)

Daily income (Rs.)	Number of employees	Cumulative frequency
9.5 – 14.5	5	5
14.5 – 19.5	10	15
19.5 – 24.5	15	30 =cf
24.5 – 29.5	20	50
29.5 – 34.5	10	60
34.5 – 39.5	5	65

$n = 65$
$\therefore \frac{n}{2} = \frac{65}{2} = 32.5$
It is included in the cumulative frequency 50. Hence, the median class interval will be (24.5 – 29.5).
Low limit (L) = 24.5
High limit = 5
Frequency (f) = 20
Cumulative frequency (cf) of the class before the mean class = 30
$\therefore$ Median $= L + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$
$= 24.5 + \left(\frac{32.5 - 30}{20}\right) \times 5$
$= 24.5 + \frac{2.5}{4}$
$= 24.5 + 0.625$
$= 25.125 \approx 25.13$

146. Ans.(D)

Class Difference	1–10	10–20	20–30	30–40	40–50	50–60
Frequency	3	16	(26) F_0	(31) F_1	(16) F_2	8

The highest frequency is in the class (30 – 40)
Hence, Mode class (30 – 40)
$L_1 = 30, L_2 = 40$
$F_1 = 31, F_2 = 16, F_0 = 26$
$M_0 = L_1 + \frac{(L_2 - L_1)(F_1 - F_0)}{2F_1 - F_0 - F_2}$
$M_0 = 30 + \frac{(40 - 30)(31 - 26)}{2 \times 31 - 26 - 16}$
$M_0 = 30 + \frac{50}{20}$
$M_0 = 30 + 2.5$
$M_0 = 32.5$

147. Ans.(B)
If each value is increased by k, there will be no effect on the standard deviation.
Variance = (standard deviation)^2
$= (4.5)^2 = 20.25$

148. Ans.(D)
We know that –
Standard Deviation = $\sqrt{Variance}$
Standard Deviation = 4
Note – If the figures are added, subtracted, multiplied or divided by a given number, then the same process happens in standard deviation.
Thus, new standard deviation = 4 × 2 = 8

149. **Ans.(A)**

Variation = σ^2

Standard deviation = $\sqrt{\sigma^2} = \sqrt{36}$

Standard deviation = $\sigma = 6$

New standard deviation = $\lambda\sigma$

(where λ = n times of each value)

= 2×6

= 12

150. **Ans.(A)**

x	6	12	9	7	8	4	3	12	15	4
d = $(x-\bar{x})$	-2	+4	1	-1	0	-4	-5	+4	+7	-4
d²	4	16	1	1	0	16	25	16	49	16

$\Sigma d^2 = 144$

Arithmetic mean ($\bar{x}$) =

$\frac{6+12+9+7+8+4+3+12+15+4}{10} = 8$

Standard deviation = $\sqrt{\frac{\Sigma d^2}{n}} = \sqrt{\frac{144}{10}}$

= $\sqrt{14.4} = 3.8$

151. **Ans.(A)**

$\sigma(S.D) = \sqrt{\frac{(\Sigma x_i^2)}{n} - (\frac{\Sigma x_i}{n})^2}$

First 'n' natural number

$\Sigma x_i = 1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$

$(\Sigma x_i)^2 = \frac{n(n+1)(2n+1)}{6}$

$= 1^2 + 2^2 + 3^2 + ... + n^2$

$\sigma = \sqrt{\frac{n(n+1)(2n+1)}{6 \times n} - (\frac{n(n+1)}{2n})^2}$

$\sigma = \sqrt{\frac{(n+1)(2n+1)}{6} - \frac{(n+1)^2}{4}}$

$\sigma = \sqrt{(n+1)\frac{(4n+2-3n-3)}{12}}$

$\sigma = \sqrt{\frac{(n+1)(n-1)}{12}} = \sqrt{\frac{n^2-1}{12}}$

152. **Ans.(B)**

Total number of two digits = 90

Total two digit prime numbers = 21

Total two digit composite numbers = 69

$\therefore$ Probability = $\frac{\text{Number of favorable results}}{\text{Number of total results}}$

= $\frac{69}{90} = \frac{23}{30}$

153. **Ans.(D)**

When two dice are thrown, the probability of total occurrence is n (s) = 36

Possibility of odd addition of numbers = n (E) = 18

$\therefore$ Probability of sum being odd = $\frac{n\epsilon}{n(S)}$

= $\frac{18}{36} = \frac{1}{2} = 0.5$

154. **Ans.(D)**

Probability of piercing $(A) = \frac{1}{2}$

And the probability of A not piercing (A')

$= 1 - \frac{1}{2} = \frac{1}{2}$

Probability of piercing of B $(B) = \frac{2}{3}$

And the probability of B to not piercing $(B') = 1 - \frac{2}{3} = \frac{1}{3}$

Probability of piercing of C $(C) = \frac{3}{4}$

And the probability of not piercing of C $(C') = 1 - \frac{3}{4} = \frac{1}{4}$

Penetrating probability

$= (A \times B \times C') + (A' \times B \times C') + (A' \times B' \times C)$

$= \frac{1}{2} \times \frac{1}{3} \times \frac{1}{4} + \frac{1}{2} \times \frac{2}{3} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{3} \times \frac{3}{4}$

$= \frac{1}{24} + \frac{2}{24} + \frac{3}{24} = \frac{6}{24} = \frac{1}{4}$

155. **Ans.(C)**

The probability of the sum of numbers exceeding 17 or 17 when throwing all three dice together –

$(5,6,6), (6,5,6), (6,6,5), (6,6,6)$

Total possibilities = $6 \times 6 \times 6 = 216$

$\therefore$ Required probability = $\frac{4}{216}$

$= \frac{1}{54}$

156. **Ans.(A)**

(Variance) $(\sigma^2) = \frac{\Sigma x^2}{n} - (\frac{\Sigma x}{n})^2$

157. **Ans.(A)**

First 7 prime number = 2, 3, 5, 7, 11, 13, 17

Range = Maximum Number – Minimum Number

Range = 17 – 2 = 15

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