M A T H E M A T I C A L   R E A S O N I N G

Mathematical reasoning questions test the students ability to sift information given in mathematical terms, use their analytical skills and solve the problem. More often there is a catch in the problem and if one identifies the catch, the rest is quite simple.

Some examples of mathematical reasoning are solved below. These, with the help of mathematical fundamentals should help to be able to solve such problems confidently. One should note, however, that there is tremendous variety in the types and one has to use one ingenuity consistently,

<u>Example 1:</u>

1. Which is the next appropriate number in the series.
   5, 17, 37, ?
   (a) 22 (b) 65 (c) 47 (d) 57

Solution:

$5 = 2^2 + 1$ $17 = 4^2 + 1$ $37 = 6^2 + 1$
Therefore the next number in the series is $8^2 + 1 = 65$
Ans: (b)

<u>Example: 2</u>

2. Which of the following does not belong to the group.
   10, 11, 18, 36, 74.
   (a) 10 (b) 11 (c) 18 (d) 36

Solution:

$10 = 10 + 0$ $11 = 10 + 1^3$ $18 = 10 + 2^3$ $36 = 10 + ?^3$ $74 = 10 + 4^3$
The number in the series at position 4 must be $10 + 3^3 = 37$
Therefore the number 36 does not belong to the group.
Ans: (d)

<u>Example: 3</u>

a # b = a - b
a ∗ b = a/b
a □ b = ab

3. What is the value of [(24 # 8)/(24 □ 8)] × (24 ∗ 8) (24 # 8)
   (a) 2 (b) 4 (c) 8 (d) 16

4. What is the expression (a # b) (a∗b)(a □ b) close to
   (a) $a^3 - b^3$ (b) a^2 - (a#b) (c) a^3 + (a∗b) (d) a^3 - a(a□b)

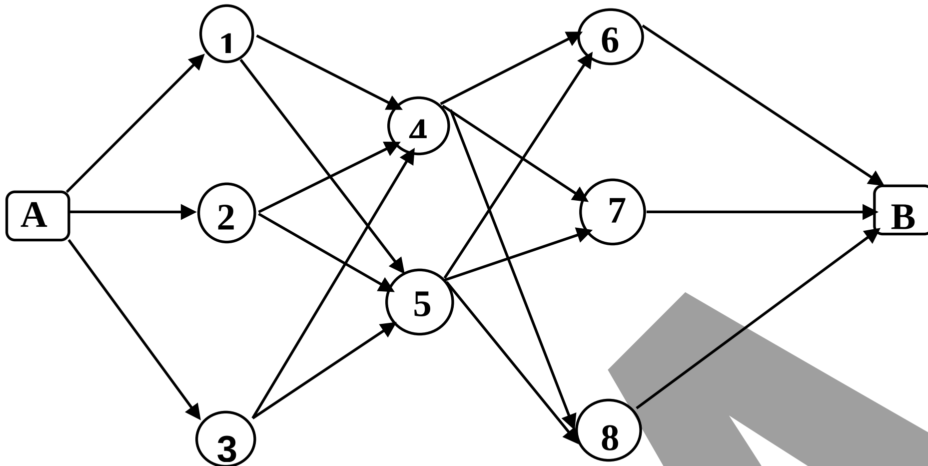
Solution:

3. *by substituting for operations,*
Ans: (b)

4. *by substituting for operations,*
(a-b) (a/b) (ab)
= $(a-b)\, a^2$
= $a^3 - a^2 b$
= a^3 - a . ab
= a3 - a (a□b)
Ans: (d)

Example: 4

Given below is a route from A to B via 8 cities.



5. What is the number of routes from A to B.
   (a) 12 (b) 18 (c) 24 (d) 36

Solutions:
There are 3 routes from A to cities 1,2 and 3. Further, there are 2 routes each from cities 1, 2, and 3 to cities 4 and 5. Therefore there are 3 x 2 = 6 routes so far. Further from cities 4 and 5 there are three routes each to cities 6,7 and 8. So there are 6 x 3 = 18 routes so far. Now from cities 6, 7, and 8 there is one route each to city B. Therefore the number of routes from city A to city B are 18 x 1= 18.
Answer (b)

Example 5

In the addition given below, each letter stands for a number from 0 to 9. None of the numbers are represented by more than one letter.

```
      S I R S
+     K I S S
    S M O K E
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6. K = ?
   (a) 4 (b) 6 (c) 8 (d) 9

7. I = ?
   (a) 2 (b) 7 (c) 3 (d) 8

8. R = ?
   (a) 9 (b) 8 (c) 7 (d) 6

9. O - S = ?
   (a) 4 (b) 5 (c) 3 (d) 2

10. M + E = ?
    (a) 2 (b) 3 (c) 4 (d) 5

Solution:
Go about the addition methodically considering addition form right hand side.

(i) *S + S = E. The maximum value of addition two similar digits is 18 (9 + 9). Therefore maximum carry over if any will be 1.*

(ii) $R + S = K$ The maximum value of addition of two different digits is 17 (9 + 8). If one has been carried to this addition, then maximum value of addition will be 18. Therefore again maximum carry over if any will be 1.

(iii) $I + I = O$. by the same logic as in 1. maximum value of addition of digits is 18. If one is carried to this addition, maximum value of addition will be 19. Therefore again maximum carry over will be 1.

(iv) $S + K$. As above, maximum total can be 17. If 1 is carried to this addition, maximum total is 18. Carry over, if any, will be 1.

Since this addition *is the last one, and the first digit of the grand total of*
S I R S + K I S S = S M O K E is S, S = 1.

$\therefore$ ***S = 1 is established.***

Since we have numbered digit additions from the right, we will refer to same numbers while analyzing the addition.

consider the addition (iv)

$S + K = SM$ \`S' is in tens position and s = 1

$\therefore (1 + K) = 10 + M$. or $(1 + K) + 1 = 10 + M$ if there is a carry over

(a) $1 + k = 10 + M$ $\therefore K - M = 9$.

only digits satisfying this conditions are $K = 9$, $M = 0$

(b) $(1 + K) + 1 = 10 + M$

$K - M = 8$ $\therefore K = 9, M = 1$

or $K = 8, M = 0$

but M cannot be 1 as $S = 1$

$\therefore K = 8, M = 0$ is the only possible condition

So in both conditions **M = 0 is established.**

and **K = 8 or K = 9**

Consider condition (i)

$S = 1 \therefore S + S = 2$

$\therefore$ **E = 2 is established.**

Consider addition (ii)

Since there is no carry over, $R + S = K$ or $10 + K$ ie. $(R + 1) = K$ or $R + 1 = 10 + K$

so,(a) $R = K - 1$ or (b) $R = 9 + K$

Analysing (b), if for a single digit R only possible value of K can be \`0'.
This is not possible as $M = 0$.

Analysing (a), **if K = 9, R = 8** and if **K = 8, R = 7.**
In any case there will be no carry over.

Consider addition (iii)

Since there is no carryover from the previous addition $I + I = O$. or $I + I = 10 + O$.

(a) $2I = O$ $\therefore I = O/2$

(b) $2I = 10 + O$ $\therefore I = 5 + O/2$

O has to be an even number to get an integral value of I .

Possible values of O are 4,6. [$E = 2$ and as either $K = 8$ or $R = 8$, $O \neq 2$, $O \neq 8$]

If O = 4, $I = 2$ or $I = 7$

but $I \neq 2$ as $E = 2$. $\therefore$ I may be 7

If O = 6, $I = 3$ or $I = 8$

$I \neq 8$,as either $K = 8$ or $R = 8$. $\therefore$ I may be 3

So $I = 3$ and $I = 7$ need to be examined with reference to addition (iv)

If $I = 3$, $I + I = 6$ gives no carry over. So $K = 9$, $R = 8$.

If $I = 7$, give a carry over, so $K = 8$, $R = 7$ this is not possible as $I = R$ is impossible.

$\therefore$ **I = 3** **O= 6** **K = 9** **R = 8** **is established**.

<u>Example: 6.</u>

11. A man distributes 70 marbles to a group of 25 children such that those below five years of age get 6 marbles each and those above five years of age get more than one marble, the share of each being equal. How many children are the below the age of five.
(a) 5 (b) 7 (c) 12 (d) None of above.

Solution:

Let X be number of children below 5years and Y be number of children above 5years.
Let z be number of marbles given to Y children

X + Y = 25 I
6X + zY = 70 II

Carrying out sbtraction (6x I) - (II)

$$Y = \frac{80}{(6-z)}$$

Now,
Z > 1...(given) and z < 6 ...(no of children, Y, has to be positive). So z may be any one of 2,3,4 or 5.

But,
Y < 25 and Y cannot be fraction . So the only value of z satisfying all conditions is 2.

Therefore Y= 20, and X= 5.

Answer (a)

<u>Example: 7.</u>

Two cubes are joined together and coloured golden on all available ten faces. Each cube is now cut into 27 pieces.

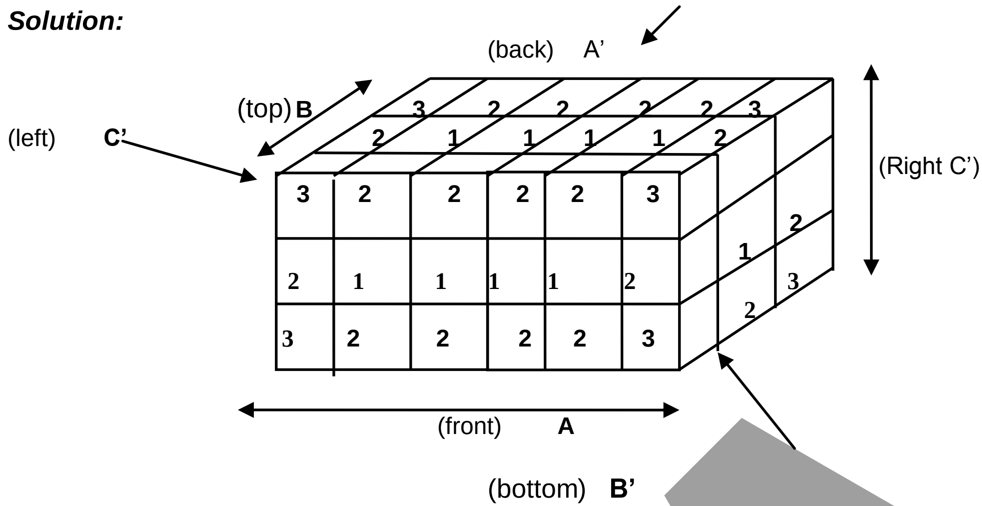
12. How many cubes will remain uncoloured?
(a) 16 (b) 8 (c) 4 (d) 2

13. How many cubes will receive colour on atleast two faces?
(a) 32 (b) 28 (c) 16 (d) 8

14. How many cubes will have only one face coloured?
(a) 24 (b) 18 (c)16 (d) 8

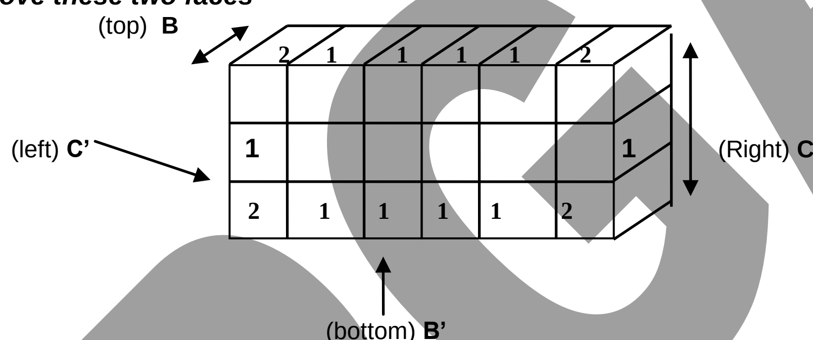
15. How many cubes will have three faces coloured?
(a) 24 (b) 16 (c) 8 (d) 4

Solution:



Face A	*4 cubes 3 sides coloured*	*10 cubes 2 sides coloured*	*4 cubes 1 side coloured*
Face A '	*4 cubes 3 sides coloured*	*10 cubes 2 sides coloured*	*4 cubes 1 side coloured*

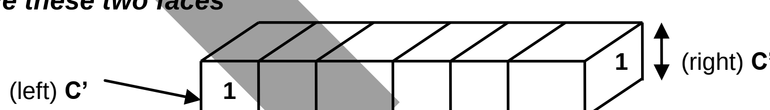
Remove these two faces



not counting cubes already counted

Face B	*2 cubes 2 sides coloured*	*4 cubes 1 side coloured*
Face B '	*2 cubes 2 sides coloured*	*4 cubes 1 side coloured*

Remove these two faces

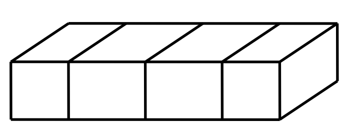


not counting cubes already counted

Face C	*1 cube 1 side coloured*
Face C '	*1 cube 1 side coloured*

Remove these two faces

4 cubes not coloured



Therefore, 8 cubes 3- sides coloured, 24 cubes 2- sides coloured, 18 cubes 1- side coloured 4 cubes No side coloured .

Answers: *12.(c) 13.(a) 14.(b) 15.(c)*

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Exercise 1(A)

Directions: In Q.1 to 5, find out the number that does not fit into the given series.

1. 2, 6, 19, 54, 162
   (a) 6 (b) 19 (c) 54 (d) 162

2. 19, 11, 16, 10, 13, 8
   (a) 19 (b) 11 (c) 16 (d) 10

3. 54, 48, 41, 34, 24
   (a) 54 (b) 48 (c) 41 (d) 34

4. 4, 8, 16, 31, 64
   (a) 4 (b) 8 (c) 16 (d) 31

5. 1, 3, 9, 27, 82
   (a) 3 (b) 9 (c) 27 (d) 82

Directions: In Q. 6 to 10, complete the following series.

6. 2, 8, 14, 20, 26, ------
   (a) 32 (b) 30 (c) 52 (d) 28

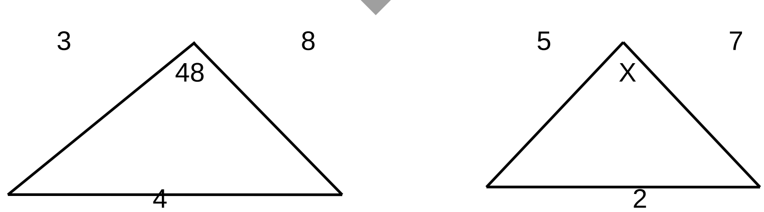
7. 0, 7, 26, 63, 124, ----
   (a) 214 (b) 215 (c) 115 (d) 224

8. A, C, E, G, I, -----
   (a) J (b) K (c) L (d) M

9. 45, 40, 35, 30, 25, ----
   (a) 15 (b) 10 (c) 20 (d) 5

10. 1/3, 1/3, 1/9, 1/27, 1/243, ----
    (a) 1/486 (b) 1/729 (c) 1/6561 (d) None of these.

Directions: For Q. 11, refer to the following figure.



11. What is the value of x
    (a) 45 (b) 70 (c) 107 (d) 35

12. Six butts of cigarette can make a new cigarette. How many cigarettes can be made from 36 such butts?
    (a) 6 (b) 7 (c) 8 (d) 9

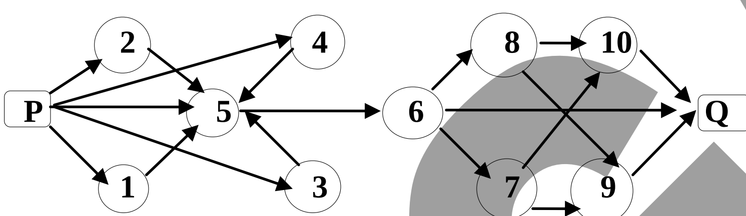
13. In a two digit number, its digits are reversed and this new number is then added to the original number. The addition is always divisible by which of the following?
(a) 3 (b) 7 (c) 9 (d) 11

14. In a certain code, a word “GROUP” is written as “GOMAN”, while another word “MOUSE” is written as “XPGTN”. Which of the following could be the possible representation in this code, for the word “HOUR”?
(a) NAME (b) HOST (c) GNAQ (d) HTGO

15. A cube is painted on all of its surfaces. Each side of this cube is then divided into 2 parts. Find out how many of the smaller cubes have no side painted.
(a) 0 (b) 1 (c) 2 (d) 3

Exercise 1(B)

Directions: Given below is a route map for reaching Q from P through 10 cities. Answer Q. 1 and 2 based on this route map.



1. What is the total number of routes from P to Q?
(a) 15 (b) 20 (c) 25 (d) 30

2. If due to storm, the route between city 6 and city 7 is closed, how many routes would be there from P to Q
(a) 15 (b) 20 (c) 22 (d) 27

Directions: Answer Q.3 to 7 based on the given information.

A,B,C,D,E,F,G are consecutive integers, not necessarily in that order, such that the lowest is greater than 50 and highest is less than 60.
i) E - D + 11 = G/4 ii) B is the highest number and is prime.
iii) C - D = B - A iv) A is an odd number and C is an even number

3. The smallest number is
(a) A (b) F (c) D (d) E

4. The number C denotes
(a) 56 (b) 57 (c) 58 (d) none of the above

5. E - A is
(a) 4 (b) 3 (c) 2 (d) 1

6. The value of D is
(a) 53 (b) 54 (c) 55 (d) 56

7. The largest even number is
(a) A (b) B (c) C (d) D

8. A person travels through 5 cities – A, B, C, D, E. City E is 2 km west of D. D is $\sqrt{13}$ km north – east of A. C is 5 km north of B and 4 km west of A. If this person visits these cities in the sequence B – C – A – E – D, what is the effective distance between cities B and D?

(a) 13 km (b) 9 km (c) 10 km (d) 11 km

Directions: Answer Q.9 and 10 based on the following information.

A monkey distributed ladoos to two cats, cheating them of some and eating these himself. At the end of the distribution, if the black cat were to give some ladoos to the white cat, the white cat would have 5 times as many whole ladoos as the black cat. If the white cat were to give the same number of ladoos to the black cat, the white cat would have 3 times the number of ladoos as the black cat.

9. What is the ratio of ladoos initially distributed the white cat and black cat respectively?
(a) 10:3 (b) 19:5 (c) 5:21 (d) cannot be determined.

10. If the total number of ladoos was thirty, what was the number of ladoos eaten by the monkey?
(a) 19 (b) 5 (c) 6 (d) cannot be determined.

Directions: Answer Q.11 to 15 based on the following information.

Two equi-dimensional cubes are joined face to face and are coloured with red on all available open faces. One cube is divided into 8 equal pieces and the other cube is divided into 27 equal pieces.

11. How many cubes have three sides coloured?
(a) 2 (b) 8 (c) 9 (d) 12

12. How many cubes have two sides coloured?
(a) 10 (b) 12 (c) 16 (d) 18

13. How many cubes have atleast one side coloured?
(a) 24 (b) 30 (c) 33 (d) 35

14. How many cubes have no sides coloured?
(a) 0 (b) 1 (c) 2 (d) 4

15. How many cubes have only one side coloured?
(a) 1 (b) 3 (c) 7 (d) 9

Exercise 2(A)

Directions: For Q.1 to 10, complete the following series.

1. 1/27, 1/9, 1/3, 1, ----
(a) 3 (b) 2 (c) 1 (d) None of these

2. 10, 6, 2, ----- , -6
(a) -2 (b) 4 (c) -4 (d) 1

3. 5, 25, 125, 625, ----
(a) 1250 (b) 3125 (c) 3150 (d) 2150

4. 1, 6, 6, 36, 216, ----
(a) 7775 (b) 7776 (c) 7777 (d) 7778

5. $3\,{}^{1}/_{2}$, $7\,{}^{3}/_{4}$, 12, $16\,{}^{1}/_{4}$, ...
(a) $20\,{}^{1}/_{2}$ (b) $18\,{}^{1}/_{2}$ (c) $22\,{}^{1}/_{2}$ (d) None of these.

6. 18, 54, 90, 126, ...
(a) 160 (b) 161 (c) 162 (d) 163

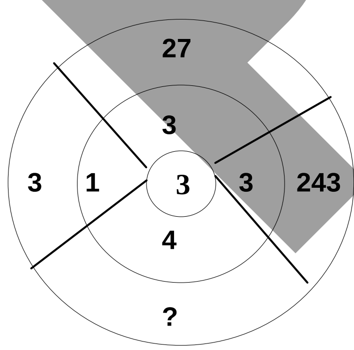
7. 48, 43, 42, 37, 36, 31, 30, ----
(a) 29 (b) 24 (c) 25 (d) 28

8. 25, 16, 9, 4, 1, 0, ----
(a) 1 (b) 2 (c) 3 (d) 4

9. 7, 8, 10, 13, 17, ---
(a) 19 (b) 20 (c) 21 (d) 22

10. 1, 1, 2, 3, 5, 8, 13, 21, ---
(a) 31 (b) 32 (c) 33 (d) 34

11. Which number belongs to the blank section?



(a) 81 (b) 16 (c) 25 (d) None of these.

Directions: Based on the sequence of figures in the given table, answer the Q.12 to 14.

7	15	22	737	5	11	16	527
8	17	25	***a***	6	13	***b***	***C***

12. What is the value of ***a***?
(a) 698 (b) 968 (c) 842 (d) 896

13. What is the value of ***b***?

(a) 17 (b) 19 (c) 25 (d) 15

14. What is the value of ***c***?
(a) 627 (b) 642 (c) 632 (d) 648

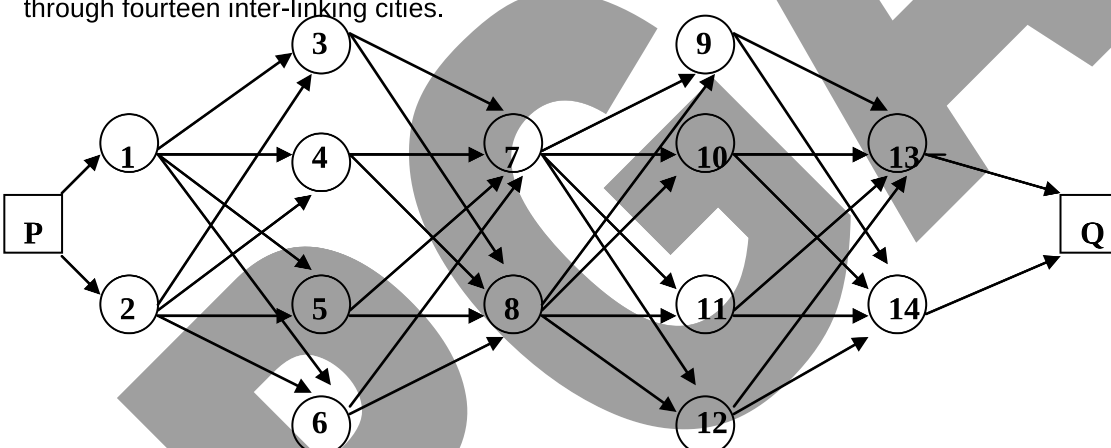
Directions: Choose the correct alternative.

15. Which one of the following rules is followed by the number set.
3 , 24 , 63, 120?
(a) Subtract twice the number from its square.
(b) Multiply the number by three and subtract one from the product.
(c) Add the number to its square.
(d) Divide the number by three and add the square of the quotient to the number.

Exercise 2(B)

1. Which of the following is a perfect square?
(a) 19210 (b) 23435 (c) 28561 (d) 17466

Directions: Answer Q.2 to 4, based on the diagram given below, which shows the way from P to Q through fourteen inter-linking cities.



2. How many routes are there from P to Q?
(a) 24 (b) 64 (c) 128 (d) 256

3. If the link between city 7 and city 8 is established both ways how many routes would there be from P to Q?
(a) 32 (b) 160 (c) 128 (d) 256

4. Due to a land-slide, the route between city 3 and city 7 is closed, how many total routes would there be from P to Q?
(a) 16 (b) 56 (c) 120 (d) 112

Directions: Answer Q.5 to 9 based on following data.
A game of cards is being played such that an Ace = 1, Jack = 11, Queen = 12 and King = 13. The rest of the cards are assigned the points printed on them. A suit is dealt such that the top card is lifted and looked at. This is then placed face down and the rest of the cards are dealt without looking at the cards to the particular player such that if the first card were say 7, then other cards are counted 8, 9, 10, 11, 12, 13. The dealing stops at the count 13. Therefore this player would get 7 cards.
Having finished the dealing to all the players if some cards are leftover, they are kept aside.

5. What is the maximum number of players that can take part in the game?
(a) 4 (b) 6 (c) 12 (d) 18

6. What is the minimum number of players that can participate in the game?

(a) 4 (b) 6 (c) 7 (d) 2

7. What is the maximum number of cards that can remain undistributed?
(a) 2 (b) 3 (c) 9 (d) 12

8. If the total number of cards dealt is equal to the square of the number of players, how many people are participating in the game at the maximum?
(a) 4 (b) 6 (c) 7 (d) 8

9. If the information in question 8 is true, what is the number of cards kept aside?
(a) 2 (b) 3 (c) 9 (d) 12

Directions: Answer Q.10 and 11 based on following data.
Munna was allowed to buy not more than 20 sweets by his parents. Had he bought them from the supermarket, he would have spent Rs.3 more for the same number of sweets than he would have spent had he bought them from the local grocer getting 2 sweets less per rupee. We bough them from the grocer, giving him exactly the whole number of rupee coins required.

10. How many sweets did he buy?
(a) 18 (b) 15 (c) 12 (d) cannot be determined

11. How much would he have spent at the super market?
(a) Rs.3 (b) Rs.6 (c) Rs.9 (d) cannot be determined

Directions : Read following information carefully and answer Q.12 to 15.
The figure shows a square divided into 36 parts (6 rows: R1, R2, - - -,R6 and 6 columns: C1 , C2 , - - - -, C6). Some of these squares contain hidden treasures, denoted by the sign : ⊗. If a square contains a "X" sign, it means that , there is no treasure hidden inside that square. A square containing a number inside, does not contain the treasure. A number inside a square denotes number of adjacent squares that contain a treasure.
Example : As the square R4C4 contains a number 4, it means that, out of 8 surrounding squares, 4 contain hidden treasures.

	C1	C2	C3	C4	C5	C6
R1						
R2						
R3	⊗	2	⊗		⊗	
R4	1			4		
R5						4
R6	X	1	1	X		

12. In the 5th row, which of the following cells contains a treasure?
(a) R5C1 (b) R5C2 (c) R5C3 (d) R5C4 (e) none of these

13. Which of the following contains a treasure?
(a) R3C4 (b) R4C3 (c) R4C5 (d) R5C5 (e) cannot be determined

14. Which of the following must contain a treasure?
(a) R6C5 (b) R6C6 (c) R4C6 (d) all of these (e) none of these

15. If the cell R3C6 contains a number 2, which of the cells in 2nd row can possibly contain a mine?
(a) R2C4 (b) R2C3 (c) R2C1 (d) R2C2 (e) R2C5

Exercise 3(A)

Directions: For Q.1 to 4, find out the missing figure.

1. When 8 x 3 = 26, 16 x 5 = 82, then 32 x 9 = ?
(a) 286 (b) 288 (c) 290 (d) None of these

2. When 3 + 2 = 33, 4 + 5 = 187, then, 1 + 10 =?
(a) 888 (b) 999 (c) 998 (d) None of these

3. When 12 + 10 = 1205, 11 + 8 = 885, 13 + 7 = 915, 14 + 15 = ?
(a) 210 (b) 2105 (c) 2100 (d) None of these

4. When 20 x 2 = 20, 25 x 4 = 50, then, 30 x 8 =?
(a) 100 (b) 110 (c) 120 (d) None of these

Directions: In Q.5 to 10 complete the following series:

5. $215\,{}^{1}/_{4}$, $209\,{}^{3}/_{4}$, $204\,{}^{1}/_{4}$, $198\,{}^{3}/_{4}$, -----
(a) $193\,{}^{1}/_{4}$ (b) $194\,{}^{3}/_{4}$ (c) $195\,{}^{1}/_{4}$ (d) None of these

6. 3/2, 1/3, 1/2, 1/6, 1/12, ----
(a) 1/72 (b) 2/72 (c) 3/72 (d) None of these

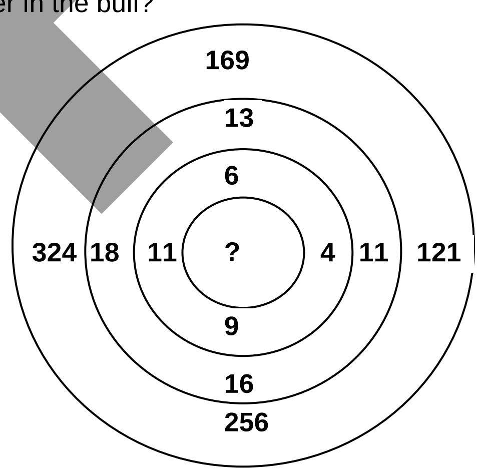
7. 876, 765, 654, 543, ----
(a) 430 (b) 431 (c) 432 (d) None of these

8. 256, 16, 4, 2, ----
(a) 1 (b) 2 (c) $2\sqrt{2}$ (d) $\sqrt{2}$

9. 17, 11, 15, 13, 13, 15, 11, ----
(a) 11 (b) 13 (c) 15 (d) 17

10. 57, 156, 255, 354, ----
(a) 450 (b) 454 (c) 453 (d) 452

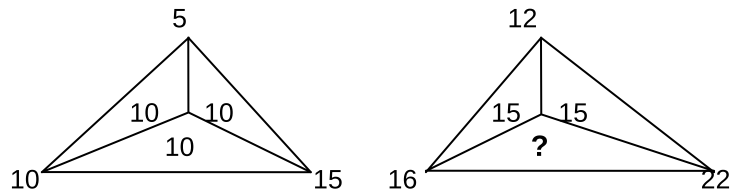
11. What is the number in the bull?



(a) 4 (b) 5 (c) 6 (d) 7

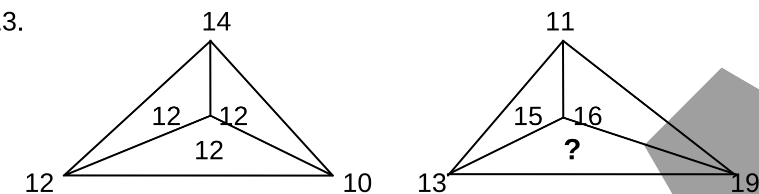
Directions: Supply the missing number, in Q.12 to 14.

12.



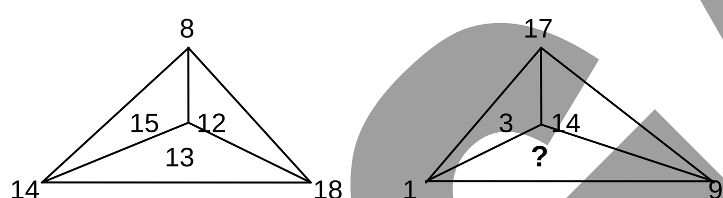
(a) 15 (b) 20 (c) 25 (d) 30

13.



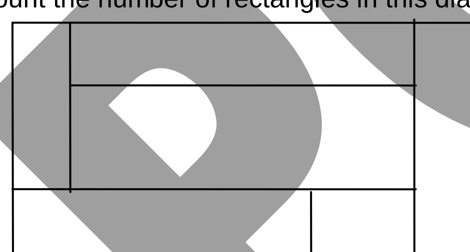
(a) 11 (b) 12 (c) 13 (d) 14

14.



(a) 5 (b) 7 (c) 10 (d) 15

15. Count the number of rectangles in this diagram.



(a) 8 (b) 9 (c) 10 (d) 11

Exercise 3(B)

Directions : Read following information carefully and answer Q. 1 to 5.

A logarithmic function (log a)/b + (log c)/d + (log e)/f + (log g)/h + - - - - is represented as (a , b , c ,d , e , f , g , h , - - -).

1. Find the value of (25 , 3 ,4 , 3 , 2 , 3 , 5 , 3)
(a) 3 (b) 25 (c) log 10 (d) 10 (e) none of these

2. The expression (4 , 2 , 9 , 2 , 64 , 12 , 343 , 9) is same as –
(a) (2 , 1 , 3 , 1 , 2 , 2 , 7 , 3) (b) (3 , 4 , 5 , 3 , 7 , 1 , 3 , 5)
(c) (4 , 2 , 5 , 6 , 3 , 1 , 2 , 4) (d) (1 , 3 , 2 , 4 , 2 , 5 , 2 , 3)

3. The expression (5 , 3 , 7 , 2 , 3 , 2 , 9 , 3) is same as –
(a) (1000 , 12) (b) (1754 , 11) (c) (2564 , 17) (d) (56 , 6) (e) none of these

4. Find the value of (4 , 2 , 64 , 3 , 512 , 3).
(a) 3log 2 (b) 4log 5 (c) 5log 3 (d) 6log 2 (e) none of these

5. Find the value of the expression (10 , 3 , 5 , 2 , -4 , 3).
(a) 2 (b) 3 (c) 5 (d) 10 (e) none of these

Directions: Answer Q.6 and 7, based on following data.

If $\boxed{m \clubsuit n} = m^2 - n^2$ $\quad \boxed{m \heartsuit n} = m/n$ $\quad \boxed{m \spadesuit n} = m \times n$

6. What is the value of
$$\boxed{4\clubsuit 3}^{2} - \boxed{4\clubsuit 3}\left[\left\{\left(\boxed{4\spadesuit 3} \div \boxed{4\heartsuit 3}\right) \heartsuit \left(\boxed{3\heartsuit 4} \div \boxed{4\spadesuit 3}\right)\right\}^{1/2} \heartsuit \boxed{4\spadesuit 3}\right]$$
(a) 252 (b) 16 (c) 42 (d) 1054

7. If m = 8, n = 7 the value of the expression
$$\left[\left\{\boxed{m\clubsuit n} \div \boxed{m\heartsuit n}\right\}\left\{\boxed{m\spadesuit n}\ \boxed{n\heartsuit m}\right\}\right] \div \left[\left\{\boxed{n\heartsuit m}\ \boxed{n\spadesuit m}\right\}\left\{(m-n) \div \boxed{m\spadesuit(m+n)}\right\}\right]$$ is closest to
(a) $(m+n)^2 / n$ (b) $m^3 - n^3$ (c) m^2 (d) $m^2 - mn$

Directions: Answer Q.8 to 11, based on the following data.

Six men A, B,C,D,E and F each placed bets on seven horses numbered H_1 to H_7 assigning them positions from 1 to 7. At the end of the race, each horse was correctly betted upon by at least one person. However, the number of bets won by every person is different from the other, yet no person won all his bets.
Following is a table of bets placed by the above six men on each of the horses

	A	B	C	D	E	F
1	H_1	H_7	H_5	H_6	H_5	H_6
2	H_2	H_3	H_6	H_2	H_6	H_7
3	H_3	H_4	H_7	H_3	H_3	H_1
4	H_4	H_6	H_1	H_1	H_1	H_3
5	H_5	H_1	H_3	H_7	H_2	H_4
6	H_6	H_2	H_4	H_4	H_4	H_5
7	H_7	H_5	H_2	H_5	H_7	H_2

8. What is the highest possible number of bets any person could have won?
(a) 2 (b) 5 (c) 4 (d) 6

9. What is the lowest number of bets that any person won?
(a) 2 (b) 0 (c) 1 (d) none of the above.

10. If one were to assume that the horses would win in accordance to the expectations of maximum number of people what is the probable sequence of positions starting from first position?
(a) H_1 H_6 H_3 H_2 H_5 H_7 H_4
(b) H_6 H_3 H_2 H_1 H_7 H_5 H_4
(c) H_7 H_6 H_1 H_2 H_3 H_4 H_5
(d) H_7 H_6 H_3 H_1 H_2 H_4 H_5

11. Referring the data of the above question and the answer got we can conclude that the highest number of bets won was by
(a) A (b) D (c) E (d) C

Directions: Answer Q.12 to 15, based on the following addition, where each of the letter below represents the same non-zero integer throughout. No integers denoted by more than one letter.

$$
\begin{array}{cccccc}
 & & A & B & C & D \\
+ & C & A & B & E & B \\
\hline
 & B & F & D & F & C
\end{array}
$$

12. What is the value of A?
(a) 1 (b) 4 (c) 6 (d) 4

13. What is the value of B?
(a) 8 (b) 1 (c) 5 (d) 4

14. What is the value of E?
(a) 9 (b) 6 (c) 8 (d) 7

15. What is the value of F?
(a) 2 (b) 8 (c) 3 (d) 6

Exercise 4(A)

Directions: For Q. 1 to 5, study each number series and fill in the missing numbers.

1. 0 6 24 60 120 210 --- ---
   (a) 336, 504 (b) 343, 512 (c) 336, 512 (d) 343, 504

2. 2 5 4 9 8 15 --- ---
   (a) 13, 22 (b) 14, 23 (c) 13, 23 (d) 14, 22

3. 8 0 15 9 22 18 29 27 --- ---
   (a) 36, 37 (b) 36, 36 (c) 37, 37 (d) 35, 36

4. 24 72 36 108 54 162 --- ---
   (a) 80, 240 (b) 81, 240 (c) 80, 243 (d) 81, 243

5. 1 3 7 15 31 --- ---
   (a) 62, 127 (b) 63, 126 (c) 63, 127 (d) 62, 126

Directions: For Q. 6 to 10, fill in plus (+) or minus (-) signs between given numbers so that they give the correct answers.

6. 1^2 3 5^2 7 $9^2 = 103$
   (a) + + + - (b) + + - + (c) + + - - (d) - + + +

7. 4 6^2 8 10^2 12 = 136
   (a) + + + - (b) + + - + (c) + + - - (d) - + + +

8.. 16^2 14 15 17 18 = 192
   (a) + + + + (b) + + - - (c) - - - - (d) - - - +

9. 1 2^3 3^3 1 $4^3 = 31$
   (a) + + - - (b) - - + + (c) + + + - (d) - - - +

10. 1 1/2 3 1/2 5 1/2 7 1/2 9 1/2 = 5 1/2
    (a) - + - + (b) + + - + (c) + + - - (d) - - + +

Directions: Answer Q.11 and 12, based on following data.

A kindergarten teacher puts 6 articles on the table in the given order:
Pencil, Eraser, Sharpener, Ruler, Crayon and Toffee.
She asks Bobby to start counting up to 100, starting with the pencil. He counts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, ... in the order Pencil, Eraser, Sharpener, Ruler, Crayon, Toffee, Crayon, Ruler, Sharpener, Eraser, Pencil, Eraser .....

11. On which article does he point when he reaches 48?
    (a) Toffee (b) Sharpener (c) Crayon (d) Ruler

12. On what number between 70 and 80 will be stop at the eraser?
    (a) 71 (b) 72 (c) 75 (d) 79

13. If there are 50 students in a class what is the least number that necessarily must be born in the month having the maximum number of children born?
    (a)1 (b) 4 (c) 5 (d) 12

14. Some apples are kept in two baskets. First basket contains x, while the second basket contains y apples. Find the number of apples that should be removed from one basket and put into another, so as the number of apples in both the baskets is equal.
    (a) x/2 (b) | x + y | / 2 (c) | y – x | (d) | x – y | / 2

Directions: Answer Q.15 is based on following data.

A multiplication sum is worked out using letters instead of numbers.

```
      H E
      E H
  ---------
      H E
    H H A
  ---------
   H N M E
```

15. What will be the numerical equivalent of N A M E?
(a) 2,905 (b) 2,906 (c) 2,907 (d) 2,908

Exercise 4(B)

Directions: Answer Q. 1 to 4, based on following data.

In Maro arithmetic code certain operations on the functions of integers P,Q,R and S are performed

i. ♣(P) - ♣(Q) = ♣(R)
ii. ♣ (Q) - (P) = 11
iii. 3 PQ = 20 R
vi. ♦(P) = Px ♣ (P)
v. [P x ♣(Q)]/♣ P = 16/5
vi. Q x ♣ (R) = 36
vii. ♣ (P) x (Q) = 100

The operations multiplication, division, addition and subtraction retain their usual meanings.

1. What is the value of ♣ (R)?
(a) 6 (b) 9 (c) 21 (d) 25

2. What is the value of ♦ (Q)?
(a) 24 (b) 72 (c) 64 (d) 128

3. The operation [2 ♦ (Q) x ♣ (R) x (P)]/♣ (Q) =
(a) 150 (b) 360 (c) 240 (d) cannot be determined

4. The operation [♣(Q) x ♦ (R) x ♣ P x ♣ P]/ [♣ (R) x Q x ♦(P)] =
(a) $(P^2 + Q^2)/R$ (b) P.R /Q (c) $R.Q^2/P$ (d) P.Q.R

Directions : Read following information carefully and answer Q. 5 to 8.

A bag contains some balls, where all but one weighs 100 gm each. The only exception is the ball that weighs 90 gm. A great mathematical wizard, Changu from Chang Pradesh is given a spring balance and asked to find this odd ball out. Changu devised a mathematical model with the help of which he can precisely predict the minimum number of times one has to use the spring balance to pinpoint this ball.
Thus, what should be the minimum number of times that the spring balance should be used, if

5. The bag contains 17 balls?
(a) 16 (b) 1 (c) 5 (d) 17

6. The bag contains 189 balls?
(a) 8 (b) 6 (c) 4 (d) 94

7. The bag contains 29 balls?
(a) 28 (b) 3 (c) 6 (d) 5

8. The bag contains 1111 balls?
(a) 1 (b) 10 (c) 8 (d) 9

Directions: For Q. 9 to 11, consider the following steps:

Step 1 - Put A = 0, B = 1, C = 1
Step 2 - Replace A by C
Step 3 - Replace B by 2A + 1
Step 4 - Replace C by A + B
Step 5 - If C $\geq$ 100 go to step 7 otherwise go to step 6.
Step 6 - Go to step 2
Step 7 - Stop.

9. What is the final value if A?
(a) 13 (b) 40 (c) 60 (d) 121

10. What is the maximum number of interactions from step 2 to step 6 such that C $\leq$100?
(a) 3 (b) 4 (c) 5 (d) 6

11. At the end of 3 steps, what is the value of B?
(a) 9 (b) 27 (c) 81 (d) 90

Directions: Answer Q.12 to 15, based on following data.

There is a certain matrix as given below:

6	2	5	1
3	1	4	7
4	1	9	5
3	1	2	4

There are two players. One can split the matrix only vertically and retain any half he chooses. The other player can split the matrix only horizontally and retain any half he chooses. The last number left is the first player's gain.

For Example :

Opening	You	Opponent	You	Opponent
7 1 5 1	5 1	5 1	5	
3 2 4 7	4 7	4 7	4	4
2 5 2 5	2 5			
1 9 9 4	9 4			

Your gain is 4

12. If you start, retain right and after your opponent's move, again right, then what should your opponent do to minimize your gain?
(a) Retain upper, retain upper
(b) Retain upper, retain lower
(c) Retain lower, retain upper
(d) Retain lower, retain lower

13. If both play intelligently, what is your gain?
(a) 4 (b) 7 (c) 1 (d) 2

14. If you do not start the game, what is your opponent's maximum gain? (Assuming the opponent starts horizontally and both play intelligently)
(a) 4 (b) 9 (c) 6 (d) 2

15. If you have to start, what is your sequence of moves if you have to maximize your gain, assuming the opponents first move is retain upper?
(a) Retain left, retain right
(b) Retain left, retain left
(c) Retain right, retain right
(d) Retain right, retain left

Exercise 5(A)

Directions: In Q.1 to 5, find out the missing number.

1. 2, 6, 4, 8, 6, ?
(a) 8 (b) 10 (c) 12 (d) 14

2. 8, 24,12, 36, 18, ?
(a) 36 (b) 52 (c) 54 (d) 56

3. 5, 3, 20. 12, 80, ?
(a) 36 (b) 48 (c) 24 (d) 160

4. 80, 40, 20, 10, 5, ?
(a) 5/2 (b) 10/2 (c) 20/2 (d) None of these

5. 1, 3, 7, 15, 31, ?
(a) 60 (b) 61 (c) 62 (d) 63

Directions: Insert the missing numbers in Q.6 to 10.

6. 2, 5, 8, 11, ---, ---
(a) 13, 15 (b) 14, 17 (c) 14, 15 (d) 13, 17

7. 7, 10, 9, 12, 11, ---, ---
(a) 13, 15 (b) 14, 15 (c) 14, 13 (d) 15, 13

8. 8, 10, 14, 18, ---, 34, 50, 66
(a) 24 (b) 23 (c) 25 (d) 26

9. 2, 7, 24, 77, ---
(a) 237 (b) 238 (c) 239 (d) 240

10. 6, 9, 18, 21, 42, 45, ---, ---
(a) 90, 93 (b) 90, 92 (c) 91, 94 (d) 91, 93

11. A bus is hired at the rate of Rs.320 per day for a picnic. Since some people did not turn up, the average contribution was Rs.48 more per person per day than before. How many people were expected, and how many turned up?
(a) 8,5 (b) 5,2 (c) 10,4 (d) 5,4

12. If P is a prime number greater than 3 (P^2-1) is always divisible by
(a) 6 but not by 12 (b) 12 but not 24
(c) 24 (d) none of the above.

13. What is the greatest power of 7 which can divide 90! Exactly?
(a) 7^{13} (b) 7^{12} (c) 7^{15} (d) 7^{17}

14. This simple subtraction sum employs all the digits from one to nine. Can you fill in the missing figures?

9 - -
<u>- 4 -</u>
<u>- - 1</u>

(a)
9 1 6
<u>2 4 5</u>
4 7 1

(b)
9 2 5
<u>1 4 6</u>
3 8 1

(c)
9 2 7
<u>3 4 6</u>
5 8 1

(d) None of the above.

15. If a coherent word can be formed out of the letters : USMOE, which is its fourth letter?
(a) E (b) M (c) U (d) S

Exercise 5(B)

Directions: Answer Q.1 and 2, based on following data.

- The cells below contain the numbers 1 to 9 arranged in random order.
- Column A contains no odd digits.
- Cell C3 minus cell C2 equals 4.
- The three digits in row 1 total 17.
- Number 7 is in column B; its left-hand neighbour is not 4.
- The digits of column C add up to 14.
- 2 is not in the same horizontal row as 8, and 9 is not immediately below 3.

	A	B	C
1			
2			
3			

1. Number 9 is in cell
(a) B1 (b) B3 (c) C2 (d) C1

2. Number 1 is in cell
(a) B1 (b) B3 (c) C2 (d) C1

Directions: Answer Q.3 to 6, based on following data.
In the given multiplication, each letter represents a different integer. Each letter stands for the same integer throughout.

```
    A B C
  x D E
  -------
  A C F B
  E A G
  -------
  F H F B
```

3. The difference between F and B is
(a) 2 (b) 3 (c) 4 (d) 5

4. D - A is
(a) E - H (b) F - C (c) B - C (d) E - B

5. G + H is
(a) 6 (b) 5 (c) 4 (d) 3

6. E/2 =
(a) 2 (b) 3 (c) 4 (d) 5

Directions : For Q.7 to 10, All the questions given below are independent of each other. Data in a question should not be used in any other question.

7. In a certain code, the word “ GOVINDA “ after coding and scrambling, becomes “ CFPKXQI. If “ OQFPCT “ is another coded and scrambled word, find out the original word.
(a) SWEATY (b) RITESH (c) COOPER (d) RANDOM (e) none of these

8. A word “ DONKEY “ when coded becomes 6171613727. Find the word represented by 20327221071716.
(a) RAYTHEON (b) RANJEET (c) MORPHINE (d) MOTHER (e) none of these

9. A word “ PIQLIC “ after coding and scrambling becomes 391291716. Find out the word, which after coding and scrambling becomes 63724124.
(a) SYFWBG (b) DXGFLC (c) ABCDEF (d) QHIKHG (e) none of these

10. Using a certain code, “ CREATIVE “ is written as “ HDWLYHFU “. Find out how “ BOOMBASTIC “ will be written in the same code.
(a) PSWJHSTEM (b) SGTEJGCJE
(C) LJDWPXJFB (d) RPEDWLFER (e) none of these

Directions: Answer Q.11 to 13, based on the following information.

In a game between two people A and B, a heap of pebbles is kept on the floor. A person can pick 1,2 or 3 pebbles. The one who picks the last pebble loses.

11. If B is to begin the game, and A to win, what is the minimum number of pebbles greater than 5 that must have been lying on the floor.
(a) 7 (b) 9 (c) 13 (d) 15

12. If A were to begin the game and win it, what is the number of pebbles on the floor that is impossible for the game to have begun with assuming that both players are playing intelligently?
(a) 13 (b) 14 (c) 15 (d) 16

13. If the number of pebbles is 17 in how many steps does the game end?
(a) 6 (b) 7 (c) 8 (d) 9

Directions: Answer Q.14 and 15.

A cube has each of its faces painted in a single colour, red, blue or green. No face is adjacent to one with the same colour. The cube is cut into 27 equal cubes

14. How many cubes would necessarily have three faces coloured with different colours on all the faces?
(a) 12 (b) 8 (c) 4 (d) 0

15. How many cubes would have same colour on at least two faces?
(a) 12 (b) 8 (c) 4 (d) 0

Exercise 6(A)

Directions: For Q.1 to 10, study each number series and find the missing numbers.

1. 7, 14, 21, 28, 35, ---, ---
   (a) 40,45 (b) 42,49 (c) 42,45 (d) 40,49

2. 2, 4, 8, 16 32, ---, ---
   (a) 60, 120 (b) 60, 128 (c) 64, 120 (d) 64, 128

3. 8, 4, 2, 1, 1/2, ---, ---
   (a) 1/4, 1/6 (b) 1/6, 1/8 (c) 1/4, 1/8 (d) None of these

4. 35, 31, 27, 23, 19, ---, ---
   (a) 16, 12 (b) 16, 11 (c) 15, 12 (d) 15, 11

5. 3, 4, 6, 9, 13, ---, ---.
   (a) 17, 25 (b) 17, 26 (c) 18, 24 (d) 18, 25

6. 1/64, 1/16, 1/4, 1, 4, ---, ---
   (a) 8, 16 (b) 16, 64 (c) 8, 64 (d) None of these

7. 2/3, $1\,{}^{1}/_{3}$, 2, $2\,{}^{2}/_{3}$, $3\,{}^{1}/_{3}$, ---, ---
   (a) 3, $3\,{}^{2}/_{3}$ (b) 4, $4\,{}^{2}/_{3}$ (c) 3, $4\,{}^{2}/_{3}$ (d) 4, $3\,{}^{2}/_{3}$

8. 2, 1/2, 5, 1/5, 8, ---, ---
   (a) 1/9, 12 (b) 1/8, 11 (c) 1/9, 11 (d) 1/8, 12

9. 6, 1, 14, 10, 22, ---
   (a) 17 (b) 18 (c) 19 (d) 20

10. 2048, 256, 1024, 128, 512, ---
    (a) 16 (b) 64 (c) 4 (d) 24

11. A woman enters a shop and buys an article worth Rs. 50. She forwards a hundred-rupee note. The shopkeeper does not have the necessary change, and dispatches his assistant to get the change from the neighbouring shop. The assistant returns with the change, and the woman gets her Rs. 50 back, and she leaves the shop. After a short while, the neighbouring shopkeeper comes in and flutters the 100 rupee note and cries out in an agitated voice," this is a counterfeit". Out of sheer embarrassment and to maintain his goodwill, the former shopkeeper gives his neighbour hundred rupees outright. Who was swindled and for what amount?
    (a) The first shopkeeper, for Rs. 100. (b) The first shopkeeper, for Rs. 50.
    (c) The first shopkeeper, for Rs. 150. (d) none of the above

12. A rapidly sinking company has a very poor funds position at the present. It can either pay the rent of its registered office for 140 days, or pay for the purchase of new material which will last 105 days, or keep the workers paid for 84 days, says the finance director. But a very promising opportunity is just round the corner, and the Director-Marketing insists that they should have all the three things going at the same time. How long can the Managing Director keep all the three things going simultaneously?
    (a) average of 140, 105, and 84 (b) 70 days
    (c) 35 days (d) none of the above

13. The second column represents the coded form of words in the first column, but not necessarily in the same order. Each letter is represented by a single digit. Find the code and answer the questions below.

MANY	5609
VERY	9102
YEAR	3249
JULY	7189
YALE	9214

The word " LAMELY " will have a code which will be divisible by
(a) 19 (b) 23 (c) both 19 and 23 (d) none of these

14. The letters A, B, C, D, E each stands for one of 1, 2, 3, 4, and 5, but not necessarily in that order. A is odd, B is neither 4 nor 5, C is 1, D is either 4 or 5 and E is neither 2, 3, nor 4. The correct order of the digits (according to the correct order of the English alphabet) is
(a) 32145 (b) 52341 (c) 11245 (d) none of these

15. There are twenty people working in an office. The first group of five works from 8.00 a.m. to 2.00 pm. The second group of ten works from 10.00 a.m. to 4.00 pm. The third group of five works from 12 noon to 6.00 pm. There are three computers in the office which all employees frequently use. During which time span are the computers likely to be used most?
(a) 1:00 pm - 3:00 pm (b) 12 noon - 2:00 pm
(c) 2:00 pm - 4:00 pm (d) 10:00 pm - 12:00 noon

Exercise 6(B)

Directions: Answer Q.1 to 4, based on following data.

In a target shooting competition a person is allowed to shoot at 4 targets successively, followed by the next competitor. When all have finished one such round, the process is repeated. If a target is hit, the shooter is awarded 2 points. If he misses the target, the others are awarded one point each. The first person to get 60 points wins. In a contest between A, B and C, the final score read A = 60, B = 53, and C = 43. If out of a total 78 shots fired 43 hit the target, answer the following questions.

1. Who was the first to shoot?
(a) A (b) B (c) C (d) Cannot be determined.

2. Who was the second to shoot?
(a) A (b) B (c) C (d) Cannot be determined

3. How many targets did A hit?
(a) 42 (b) 34 (c) 17 (d) Cannot be determined

4. How many targets did B miss?
(a) 6 (b) 10 (c) 12 (d) Cannot be determined

Directions: Answer Q.5 to 7, based on following data.

All the roads of a city are either parallel or perpendicular to each other. Azad avenue is perpendicular to Gandhi avenue. Hariprasad avenue is perpendicular to Bhabha avenue. Chavan avenue is parallel to Dadabhai avenue which is perpendicular to Jawahar avenue. Indira avenue is parallel to Hariprasad avenue which is parallel to Kishanchand avenue. Lajpatrai avenue is perpendicular to Elijah avenue which is perpendicular to Kishanchand avenue. Gandhi avenue is perpendicular to Chavan avenue which is parallel to Bhabha avenue and perpendicular to Modi avenue.

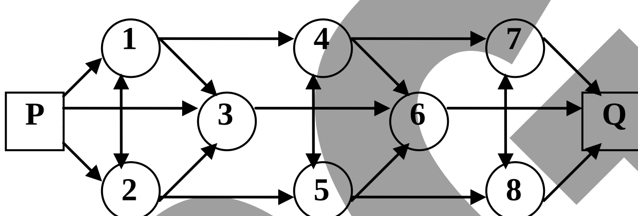
- Kishanchand avenue is 2 kms north of Lajpatrai Avenue and 4 kms. south of Modi avenue.
- Azad avenue is 4 kms east of Bhabha avenue which is two kms west of Chavan Avenue.
- Dadabhai avenue is 4 kms west of Elijah avenue.
- Gandhi avenue is 2 kms south of Hariprasad avenue.
- Indira avenue is 4 kms north of Jawahar avenue.

5. Which of the following is necessarily false?
(a) Gandhi avenue is south of Modi avenue.
(b) Jawahar avenue is north of Kishanchand avenue.
(c) Azad avenue is left of Elijah avenue
(d) Bhabha avenue is south east of Lajpatrai avenue.

6. Which of the following possibilities would make two roads coincide?
(a) Chavan avenue is 4 kms west of Dadabhai avenue.
(b) Dadabhai avenue is 2 kms east of Azad avenue.
(c) Indira avenue is 2 kms north of Kishanchand avenue.
(d) Lajpat avenue is 2 kms north of Indira avenue.

7. If Narsimha avenue is 2 kms south of Jawahar avenue and 4 kms north of and 4 kms. north of Gandhi avenue, and Indira avenue is parallel to Narsimha avenue, which two roads would be 2 kms apart?
(a) Indira avenue and Narsimha avenue
(b) Hariprasad avenue and Narsimha avenue
(c) Jawahar avenue and Gandhi avenue
(d) Jawahar avenue and Hariprasad avenue.

Directions: Answer Q.8 to 10, based on the diagram given below, which shows a network of routes from city P to Q via 8 other cities.



8. How many ways are there for reaching from P to Q.?
(a) 17 (b) 29 (c) 61 (d) 72

9. If the route between city 1 and city 2 is closed, how many routes can a person take in going from P to Q?
(a) 15 (b) 22 (c) 54 (d) 64

10. If direct routes are added from city 6 to cities 7 and 8, how many routes would there now be from P to Q?
(a) 18 (b) 28 (c) 32 (d) 81

Directions: Answer Q. 11 to 15, based on the following data.

Fun is a function which accepts two variables, a and b. Different values of this function are defined as follow

Fun (a , b)	= Fun (a – 1, b – 1)	if a = b
	= 0	if a = b = 0.
Fun (a , b)	= a + 1	if b = 0 and a ≠ 0
Fun (a , b)	= b – 1	if a = 0 and b ≠ 0
Fun (a , b)	= Fun (a – 1, b)	if a ≠ b and a ≠ 0 ; b ≠ 0

11. Fun [Fun (3,0) , Fun (4,3)] = ?
(a) 4 (b) 12 (c) 3 (d) 7 (e) none of these

12. Fun { [Fun (1,0) x Fun (0,5)] , [Fun (7,7) x Fun (2,0)] } = ?
(a) 15 (b) 2 (c) 0 (d) 9 (e) none of these

13. [Fun (3,7) ÷ Fun (78,3)] x Fun (13,1) = ?

(a) 3 (b) 5 (c) 0 (d) 4 (e) none of these

14. [Fun (3,17) x Fun (5,25)] ÷ Fun (33,193) = ?

(a) 192 (b) 384 (c) 2 (d) 5 (e) none of these

15. 2 { [Fun (3,0) x Fun (17,9)] x [Fun (5,5) + Fun (0,4)] } is same as –

(a) Fun(21,22) (b) Fun (3,6) (c) Fun (7,4) (d) Fun (0,8) (e) none of these

Exercise 7 (A)

Directions: In Q. 1 to 10, fill in plus (+) or minus (-) signs between numbers so that they give the correct answers:

1. 10 13 21 8 4 = 6
(a) + - + - (b) + + + - (c) - - + + (d) - + - +

2. 7 3 12 13 9 = 14
(a) + - + - (b) + + + - (c) - - + + (d) - + - +

3. 15 2 6 5 11 = 17
(a) + - + - (b) + + + - (c) - - + + (d) - + - +

4. 14 7 16 19 23 = 27
(a) + - + - (b) + + + - (c) - - + + (d) - + - +

5. 18 14 15 29 8 = 26
(a) + - + - (b) + + + - (c) - - + + (d) - + - +

6. 8 5 6 9 10 = 20
(a) + + - + (b) + + - - (c) - + + - (d) + - + +

7. 40 10 10 60 2 = 98
(a) + + - + (b) + + - - (c) - + + - (d) + - + +

8. 7 1 2 3 6 = 5
(a) + + - + (b) + + - - (c) - + + - (d) + - + +

9. 1 1/2 2 1/2 0 3 = 1
(a) + + - + (b) + + - - (c) - + + - (d) + - + +

10. 4 5 9 6 3 = 9
(a) + + - + (b) + + + - (c) - + + - (d) + - + +

11. If x is any integer greater than `2' $(x^3 - x)$ is divisible
(a) never by 6 (b) by 6 but never by 12
(c) 12 always (d) None of the above

Directions: Answer Q.12 and 13, based on following data.

$A \spadesuit B = A/(A-B)$, $A \clubsuit B = B/(A-B)$, $A \heartsuit B = A^2 + B^2$

12. $\dfrac{A\{[A \heartsuit B] + [A \spadesuit B] [A \clubsuit B] [(A \heartsuit B) - 2AB]\}}{\{A \spadesuit B\}} = ?$
(a) $(A^2 - B^2)/AB$ (b) $(A^2 + B^2)/A - B$ (c) $A^3 - B^3$ (d) $(A^3 - B^3) / AB$

13. $\dfrac{(3 \spadesuit 2)\ (4 \spadesuit 5)\ (8 \clubsuit 6)}{(6 \spadesuit 8)\ (6 \clubsuit 8)\ (3 \clubsuit 4)} =$
(a) -3/4 (b) 3/4 (c) 4 (d) -3

14. Which number comes next?
2 , 5 , 8.5 , 12.5 , 17 , 22 , ?
(a) 26 (b) 27 (c) 27.5 (d) 28

15. Find the odd number out.
10 , 17 , 26 , 34 , 50 , 65 , 122.
(a) 17 (b) 50 (c) 34 (d) 65

Exercise 7 (B)

Directions : Answer Q.1 to 3, based on the following data.

Ganjan, another mathematics wizard, from Chang Pradesh is entrusted with developing a coded language. He converts all words in some number series in the following manner –

All vowels (and no other consonant) are represented by prime numbers.

For all consonants, whose positions in the alphabet series are prime numbers, they are represented by a number, which is twice the number giving their positions in the alphabet series.
Ex. The letter "C" being the 3rd alphabet, will be denoted by 3 x 2 = 6.

If the position of any consonant in the alphabet series is a number, half of which is a prime number, is represented by adding a 5 at the end of that number.
Ex. The letter "Z" being the 26th alphabet, will be represented by 265.

All remaining consonants will be represented by a number giving their position in the alphabet series.

1. The word coded as "22 17 12 17 38 8 145 11 22 23 225" is –
   (a) PATAMXNEPUR (b) FEGTSHNJKID
   (c) KALASHNIKOV (d) TUTUPHENKO

2. The word coded as "38 145 11 16 7 18" is –
   (a) WEAKER (b) STRIKE (c) SNIPER (d) TAURUS

3. The word "CALCUTTA" will be coded as –
   (a) 9 29 8 9 16 18 18 29 (b) 20 17 10 20 295 4 4 12
   (c) 6 17 12 6 29 20 20 17 (d) 12 11 15 12 29 20 20 31

Directions: Answer Q.4 to 9, based on following data.

Apart from the usual racing scene at the Pune Race course where huge bets are placed and high stakes are involved, the Race course committee organizes a Race-mela every year in the month of November.

This is a unique concept basically aimed at publicity of the Race course. and popularizing racing among people.

On Sunday every week a certain fixed number of races take place. A maximum of 1650 spectators can be accommodated on a day. The ticket is worth Rs.500 of which 15% is retained by the management and 25% is retained for paying horse racers. Each spectator is allowed to speculate the winner of anyone of the scheduled races. When all the races are over, the rest of the money collected is divided equally among those who have speculated the winners correctly.

In November 1994, a spectator took home Rs.8,270 in the first week. The next week, another took home Rs.12,405, the same number of spectators being present as the first week.

4. What was the amount retained by the management in the first week?
   (a) Rs. 62,025 (b) Rs. 97,525 (c) Rs.16,250 (d) Cannot be determined.

5. How much money was divided among the spectators who speculated correctly in the first week?
   (a) Rs. 6,48,000 (b) Rs. 4,55,000
   (c) Rs. 2,48,100 (d) Cannot be determined.

6. How many spectators were present for the second weeks racing?
   (a) 1500 (b) 763 (c) 827 (d) Cannot be determined.

7. How many people won their bets in the first week?
(a) 67 (b) 30 (c) 20 (d) Cannot be determined.

8. How many people lost their bets in the second week?
(a) 673 (b) 701 (c) 807 (d) Cannot be determined.

9. How much was earned by the horse races in the given two weeks?
(a) Rs.2,06,750 (b) Rs.1,03,375 (c) Rs.1,24,050 (d) Cannot be determined.

Directions: Answer Q. 10 to 15, based on the multiplication given below, where each letter represents a single digit number and no two numbers are represented by the same letter.

$$
\begin{array}{r}
A\ B\ C \\
\times \qquad B\ D \\
\hline
F\ C\ E\ D \\
C\ G\ F\ B\ \ \\
\hline
B\ E\ D\ B\ D
\end{array}
$$

10. What is the value of D?
(a) 2 (b) 4 (c) 0 (d) 5

11. What is the value of BE?
(a) 52 (b) 71 (c) 20 (d) 10

12. What is the value of G?
(a) 6 (b) 4 (c) 8 (d) 3

13. What is the value of A?
(a) 6 (b) 8 (c) 2 (d) 4

14. What is the value of C?
(a) 1 (b) 2 (c) 3 (d) 4

15. What is the value of F?
(a) 6 (b) 8 (c) 2 (d) 4

Exercise 8(A)

Directions: Complete the following series in Q.1 to 10.

1. 2, 4, 5, 10, 11, 22, ---, ---.
(a) 22, 45 (b) 23,46 (c) 22, 46 (d) 23,45

2. 1, 3, 6, 2, -3, 3, 10, ---, ---,
(a) 1, -4 (b) 2, -4 (c) 2, -7 (d) 1, -5

3. 48, 24, 72, 36, 108, 54, ---, ---.
(a) 160, 80 (b) 162, 80 (c) 160, 81 (d) 162, 81

4. 2, 4, 7, 14, 18, ---.
(a) 35 (b) 45 (c) 48 (d) 36

5. 9, 16, 25, 36, 49, 64, ---, ---.
(a) 81, 100 (b) 81, 1000 (c) 100, 121 (d) None of these

6. 8, 3, 6, 4, 4, 5, ----, ---
(a) 2, 6 (b) 1, 5 (c) 1, 6 (d) 2, 5

7. 1, 8, 27, 64, 125, 216, ---, ---.
(a) 340, 511 (b) 343, 512 (c) 343, 511 (d) 340, 512

8. 1, 2, 3, 5, 8, 13, ---, ---.
(a) 20, 31 (b) 21, 31 (c) 20, 34 (d) 21, 34

9. 11, ---, 17, 18, 23, 24, ---
(a) 12, 29 (b) 11, 28 (c) 12, 28 (d) 11, 29

10. 3, 2, 11, 6, ---, 10, 27, ---.
(a) 18, 15 (b) 19, 14 (c) 19, 15 (d) 18, 14

Directions : Find the meanings of given symbols and get the missing number.

11. If 8 * 4 = 36 and 17 * 5 = 90, find 13 * 7 = ?
(a) 91 (b) 95 (c) 98 (d) 93

12. If 6 % 7 = 85 and 11 % 12 = 265, find 16 % 17 = ?
(a) 545 (b) 310 (c) 465 (d) 395

13. If 34 & 22 = 28 and 33 & 35 = 34, find 55 & 75 = ?
(a) 61 (b) 70 (c) 71 (d) 65

14. If 11 # 12 = 264 and 43 # 4 = 344, find 8 # 29 = ?
(a) 444 (b) 390 (c) 464 (d) 384

15. If 484 $ 121 = 33 and 144 $ 169 = 25, find 784 $ 256 = ?
(a) 44 (b) 29 (c) 31 (d) 37

Exercise 8(B)

Directions: Answer Q. 1 to 6, based on following data.

A fortune teller has a unique way of predicting his customer's prognosis. He has three parrots kept in three different cages. Each cage also has three cards with a single digit non-zero number inscribed on every card. No two cards have the same number and no cage contains two cards with digits totalling ten. Further the total of three cards in the first cage is greater by two than the second and by four than the third. When a customer asks for his prognosis, the fortune teller lets out the three parrots which randomly pick one card out of their respective cages. Before the prognosis is made, the fortune teller totals the digits on the three cards picked out and charges the customer the same number of rupees as the total of the cards. One day a customer paid seven rupees for his prognosis.

1. What is the lowest payment possible?
   (a) Rs.5 (b) Rs.7 (c) Rs.6 (d) Rs.8

2. What is the maximum possible that anyone can pay?
   (a) Rs.22 (b) Rs.23 (c) Rs.24 (d) Rs.45

3. Which is the combination of three cards randomly chosen for prognosis that is impossible?
   (a) 1,2,3 (b) 5,8,9 (c) 7,2,3 (d) 5,7,6

4. Which of the given combinations of cards picked for prognosis may be possible?
   (a) 5,7,8 (b) 7,9,4 (c) 2,6,3 (d) 1,3,8

5. Which of the following payments can never be made by any customer?
   (a) Rs.19 (b) Rs.16 (c) Rs.17 (d) Rs.23

6. Which of the following payments is possible?
   (a) Rs.8 (b) Rs.13 (c) Rs.9 (d) Rs.23

Directions: Answer Q.7 to 9, based on following steps.

Step 1: p = 0, q = 0, r = 1, s = 0

Step 2: s = q + r

Step 3: Replace q by r

Step 4: Replace r by s

Step 5: Print s.

Step 6: Increment p by 1.

Step 7: If p = 10 go to step 9 otherwise go to step 8.

Step 8: Go to step 2

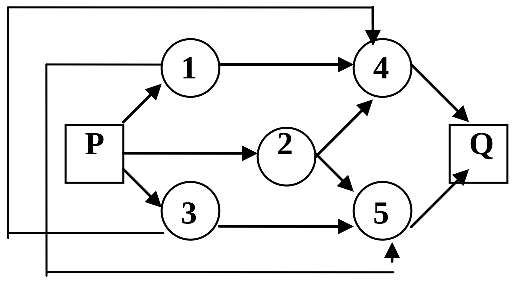
Step 9: Stop.

7. What is the last value of s that is printed?
   (a) 55 (b) 34 (c) 89 (d) 144

8. When p = 6, what value of s is printed?
   (a) 13 (b) 21 (c) 24 (d) 34

9. If step 1 starts with p = 6, q = 0, r = 3, s = 0 what would the last value of s be?
   (a) 9 (b) 10 (c) 12 (d) 15

Directions: Answer Q10 on the basis of a network of routes from P to A.



10. What is the number of routes from P to Q?
(a) 5 (b) 6 (c) 9 (d) 12

Directions: Answer Q. 11 to 15, based on the following information.

A solid cube is painted red on two adjacent sides and black on the sides opposite to the reds. The remaining sides are painted green and the cube is cut into 64 cubes of equal size.

11. How many cubes have red on one side and black on some other side?
(a) 24 (b) 16 (c) 8 (d) 0

12. How many cubes are painted on only two adjacent sides?
(a) 32 (b) 24 (c) 16 (d) 8

13. How many cubes have atleast one side black?
(a) 36 (b) 32 (c) 28 (d) 24

14. How many cubes have atleast one side green?
(a) 32 (b)28 (c) 24 (d) 16

15. How many cubes will have no sides green?
(a) 32 (b)28 (c) 24 (d) 16

Exercise 9(A)

Directions: Complete the following series in Q. 1 to 5.

1. 1, 7, 5, 2, 8, 6, 3, 9, ---
(a) 4 (b) 7 (c) 9 (d) 10

2. 3, 6, 10, 15, 21, ---
(a) 26 (b) 27 (c) 28 (d) 29

3. 4, 9, 13, 18, 22, 27, ---
(a) 30 (b) 31 (c) 32 (d) 33

4. 12, 10, 9, 7, 6, 4, ---
(a) 1 (b) 2 (c) 3 (d) 0

5. 195, $8\,{}^{1}/_{2}$, 196, $9\,{}^{1}/_{2}$, 197, $10\,{}^{1}/_{2}$, 198, ---
(a) 199 (b) $11\,{}^{1}/_{2}$ (c) 100 (d) $12\,{}^{1}/_{2}$

Directions: For Q.6 to 10, carefully observe the first two solutions; find out the rule and find the answer for the third set of figures:

6. If 4 + 3 = 28, 6 + 8 = 108, then 10 + 12 = ?
(a) 254 (b) 255 (c) 256 (d) 257

7. If 17 x 6 x 5 = 13, 11 x 7 x 8 = 45, then 13 x 9 x 9 = ?
(a) 67 (b) 68 (c) 69 (d) 70

8. If 10 x 5 x 15 = 65, 14 x 6 x 16 = 100 then 17 x 18 x 11 = ?
(a) 317 (b) 318 (c) 319 (d) 320

9. If 20 - 19 -25 = 14, 25 - 33 -18 = 40 then 33 - 12 - 24 = ?
(a) 21 (b) 22 (c) 23 (d) 24

10. If 8 - 9 = 503, 6 - 5 = 211 then 7 - 4 = ?
(a) 337 (b) 338 (c) 339 (d) 340

Directions: Answer Q. 11, based on the following data.

In a pole climbing competition of monkeys at the Kumbh mela bets are placed on which monkey will reach the top of the pole first. Monkey A and monkey B are climbing up two separate 100 feet poles. Monkey A climbs up 3 feet in one minute but slips back 1 foot for every 2 feet, climbed. Monkey B climbs up 4 feet in one minutes but slips down 1 1/2 feet for every 2 feet climbed. Monkey A stops for a minute after every 2 minutes while monkey B stops for 1 minute after 3 minutes.

11. Which monkey reaches the top first and in how many minutes?
(a) Monkey A, in 101 minutes. (b) Monkey B in 132 minutes.
(c) Monkey A in 100 minutes. (d) Monkey B in 133 minutes.

Directions: Answer Q. 12 to 14, based on the following data.

A solid cube is painted on only three sides adjacent to one another and cut into 64 cubes of equal size.

12. How many cubes have three sides coloured?
(a) 0 (b) 1 (c) 2 (d) 4

13. How many cubes have two sides coloured?
(a) 6 (b) 8 (c) 9 (d) 16

14. How many cubes have one side coloured?
(a) 36 (b) 27 (c) 16 (d) 9

15. A 45-digit number, with all its digits equal to 1, is divisible by which of the following?
(a) 3 (b) 11 (c) 8 (d) 7

Exercise 9(B)

Directions: Answer Q.1 to 5, based on following data.

$$\begin{array}{r} S\ E\ N\ D \\ \underline{+\ \ M\ O\ R\ E} \\ M\ O\ N\ E\ Y \end{array}$$

In the above addition, each letter represents a single digit number, and no digit is represented by more than one letter.

1. Which of the digits are not represented by any letter?
(a) 5 and 8 (b) 3 and 4 (c) 6 and 7 (d) 8 and 2

2. What is the value of N x R?
(a) 42 (b) 56 (c) 48 (d) 72

3. The value of R is ….
(a) 5 (b) 4 (c) 6 (d) 8

4. What is the value of MEND?
(a) 1675 (b) 1567 (c) 2897 (d) 6751

5. What is the value of SORRY?
(a) 90882 (b) 90772 (c) 91665 (d) 81665

Directions: Answer Q.6 to 9, based on following data.

In the city state of Xanada, elections are conducted in a peculiar manner. There are three rounds of elections separated by gaps of 4 months, so the candidate is voted for thrice in the election year. If the president of the current term wishes to be reelected, he can stand only for the first round. If he wins the others bow out of the race. If he does not, the election process progresses into the second round and then the third. Each candidate is awarded points in every round equal to his position in the round. Finally the grand total of points is made and the candidate with the least total is declared the president elect.

This year the president lost the elections. Of the five other candidates, the winner secured the first position only in the last round with a grand total of 7 points. Three candidates had equal total points and the highest score got 4, 5 and 2 points in the first, second and third rounds respectively. There was no tie for any position in any round. In the entire election process, the same person never got elected in the same position more than once.

6. How many points did the current President score?
(a) 3 (b) 5 (c) 6 (d) 4

7. Which of the following is an impossible score for any candidate in the first, second and third round respectively?
(a) 1,3,5 (b) 3,1,5 (c) 5,1,3 (d) 3,2,4

8. What is the score of the candidate with the lowest grand total of points in the first, second and third round respectively?
(a) 2,4,1 (b) 4,2,1 (c) 3,4,1 (d) 1,2,4

9. What is the possible total score of each candidate who scored equal to two other?
(a) 9 only (b) 10 only (c) 9 or 10 (d) None of the above

Directions : Read following information and answer Q. 10 and 11.

In the following questions, x, y and z are series of c (i.e. c, cc , ccc , cccc etc.) but not necessarily in the same order.

10. Which of the following could be possible representation of a letter series: xcbcycd?
(a) zbyd (b) caxbccd (c) ayzyd (d) bzcdx

11. Which of the following could be possible representation of a letter series: ccmncrcz?
(a) ymxnry (b) zmnxry (c) zmncrc (d) xcnrz

12. In a certain code, the word " FLOWER " is coded as " ccccvv ". Which of the following could be the coded form of the word " GARDEN "?
(a) cccvv (b) vcvvvc (c) vvvccc (d) ccvccv

13. In a code language, the word " HORSE " is written as 5 – 2/3. If 6 – 2/4 is the coded form of another word, which of the following could be that word?
(a) VISION (b) HOUSE (c) PRIEST (d) ELLORA

Directions: Answer Q. 14 and 15, based on the following information.

A solid cube is painted with silver, golden and pink, each on opposite sides and cut into 8 cubes of equal size.

14. How many cubes have atleast one side silver?
(a) 8 (b) 6 (c) 4 (d) 2

15. How many cubes will have two sides painted with two different colours?
(a) 2 (b) 4 (c) 6 (d) 8

Exercise 10(A)

Directions: Find the missing number in Q.1 to 7.

1. 1, 1/2, 1/4, 1/8, 1/16, ---
   (a) 1/18 (b) 1/20 (c) 1/36 (d) 1/32

2. 2, 5, 10, 17, 26, ---
   (a) 35 (b) 36 (c) 37 (d) 38

3. 1024, 256, 64, 16, 4, ---
   (a) 1 (b) 2 (c) 3 (d) 5

4. 2, 5, 18, 41, ---
   (a) 53 (b) 74 (c) 65 (d) 83

5. 2, 10, 26, 50, 82, ---
   (a) 96 (b) 122 (c) 145 (d) 170

6. $1\,{}^{2}/_{3}$, $2\,{}^{3}/_{4}$, $3\,{}^{4}/_{5}$, ---,
   (a) $4\,{}^{2}/_{3}$ (b) $4\,{}^{3}/_{4}$ (c) $4\,{}^{4}/_{5}$ (d) $4\,{}^{5}/_{6}$

7. 3, 7, 18, 26, 37, 53, ---- ,
   (a) 60 (b) 64 (c) 81 (d) 90

Directions: For Q.8 to 10, choose the correct alternative.

8. If 22 + 1 = 30, 43 + 4 = 75 Then 59 + 5 = ?
   (a) 64 (b) 72 (c) 86 (d) 99

9. If 2 x 2 = 8 3 x 3 = 18 Then 4 x 4 = ?
   (a) 32 (b) 64 (c) 16 (d) 8

10. Which pair of numbers is different from the rest?
    (a) (5,15) (b) (6, 24) (c) (7, 49) (d) (9, 63)

Directions : Q. 11 to 13 are based on the following multiplication, where each digit has been replaced by an alphabet.

$$\begin{array}{rcccc} & & & J & E \\ \times & & & B & B \\ \hline & & & J & E \\ + & & J & E & A \\ \hline & B & A & D & E \end{array}$$

11. What is the value of J?
    (a) 4 (b) 9 (c) 7 (d) 5

12. What is the value of A?
    (a) 6 (b) 0 (c) 7 (d) 8

13. If E = 4, what is the value of D?
    (a) 6 (b) 3 (c) 7 (d) 5

14. Ten circles of equal size are drawn inside an equilateral triangle along one of its side, with two extreme circles touching other two sides of that triangle. How many such circles can be drawn so that , maximum area inside the triangle is covered by them?
(a) 55 (b) 64 (c) 45 (d) 99

15. During my last visit to Paris, I was walking straight towards the Eiffel Tower. I walked for 3 km and then took a 90° turn, so that, the tower was now on my left hand side. I kept on walking for 2 km in this direction, before taking another 90° turn, so that, it was on my right-side. After walking for 3 km in this direction, I took a right turn and walked 1 km. The point where I stopped was on which side of the point, I started from?
(a) left (b) right (c) behind (d) ahead

Exercise 10(B)

1. A business tycoon has twice the number of shirts as the number of jackets and as many trousers as the number of shirts. If, after a year, he discarded one third the number of shirts, one fourth the number of trousers and one fifth the number of jackets, what was the minimum number of jackets in his wardrobe earlier?
(a) 15 (b) 30 (c) 45 (d) 5

2. Peter said to Paul " My wife is older by six years than your daughter who is one sixth the age my great-grandfather lived to, but your eldest son is eight years younger than your second wife." Paul said to Peter "My second wife is one-sevenths older than your only wife. My eldest son is one-sixth the age your great-grandfather would have been had he not died six years ago". What would the Peter's great-grandfather's age have been at the time of the coversation?

(a) 84 (b) 100 (c) 96 (d) 90

3. A box contains 6 red beads and 5 blue beads. What is the smallest number of beads that must be picked at a time, without looking, to be sure of getting two of the same colour?
(a) 3 (b) 7 (c) 2 (d) 11

Directions: Answer Q. 4 to 6, on the basis of the given data.

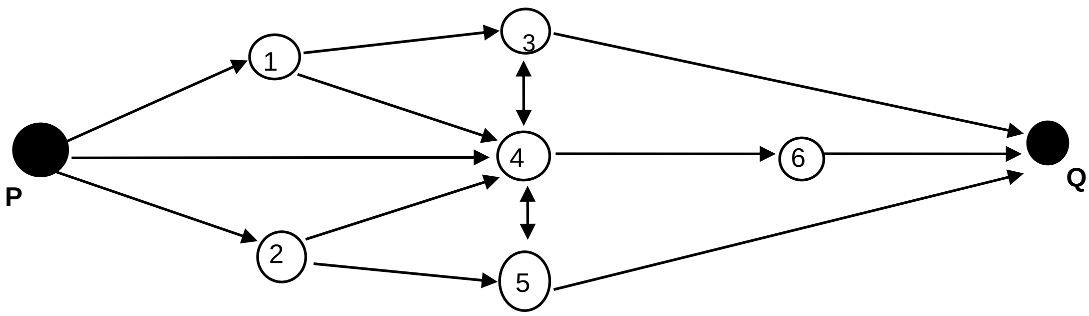
Some pebbles are divided into three heaps.If as many pebbles as there are in the second heap are taken from the first heap and added to the second heap, as many pebbles as there are in the third heap are taken from the second heap and added to the third heap, and asmany pebbles as there are left in the first heap are taken from the third heap and added to the first heap, all the heaps will be equal.

4. What is the minimum possible number of pebbles in all?
(a) 12 (b) 24 (c) 36 (d)48

5. If the total number of pebbles is 96, how many were originally there in the first heap?
(a) 36 (b) 48 (c) 44 (d)52

6. If the number of pebbles in the third heap is 18, what is the number of pebbles in the second heap?
(a) 21 (b) 24 (c) 16 (d)36

Directions: Answer Q. 7 to 9, on the basis of the following network of routes from city P to city Q via 6 cities.



7. How many routes are there from city P to city Q?

(a) 7 (b) 12 (c) 15 (d) 17

8. If the route between city 4 and 5 are blocked, how many routes are there from city P to Q?
(a) 13 (b) 11 (c) 10 (d) 9

9. If a new one-way route between city 1 and 2 is made available ,how many routes are there from city P to city Q?
(a) 21 (b) 19 (c) 18 (d) 15

Directions: Answer Q. 10 to 15, based on given data.

Five states, Maharashtra, Punjab, West Bengal, Gujrat, and Karnataka fielded three contestants each for the event Discus-Throw at the National Games. Delhi fielded only one contestant for the event, and though the contestant was allowed to contest for an individual position, Delhi was not to be considered in the ranking of team positions. The award of points was to be equal to each contestants' position in the event, the winning state being the one with the least total of points. As fate would have it, all the former five states scored the same grand total, and tied for the trophy, though no two contestants tied for the same position nor did contestants from the any state hold consecutive positions. Two contestants from Maharashtra achieved positions just above and below the contestant from Delhi. Since no state could be declared the winner, a new system was devised to decide the winner. The five states would be awarded positions on the basis of the product of positions of their contestants' positions, the state with the smallest product being the winner. Punjab, therefore, was declared the winner and West Bengal was awarded the last position. Gujrat and Maharashtra still tied for a position.

10. What were the possible positions of contestants from Gujrat?
(a) 2, 9, 14 (b) 4, 6, 15 (c) 1, 8, 16 (d) 3,10, 12

11. What was the score of Punjab in the revised scoring system?
(a) 60 (b) 128 (c) 240 (d) 80

12. What were the positions of contestants from Karnataka?
(a) 2, 9, 14 (b) 1, 8, 16 (c) 2, 9, 16 (d) 5, 7, 13

13. What was the position of the contestant from Delhi?
(a) 1 (b) 4 (c) 6 (d) 11

14. The score of West Bengal in the revised scoring system is
(a) 128 (b) 360 (c) 455 (d) 252

15. What was the total of points got by each of the five states in the previous scoring system?
(a) 25 (b) 26 (c) 26 or 25 (d) 24 or 25

Answers

Exercise 1(A)

1.(b)	2.(b)	3.(d)	4.(d)	5.(d)	6.(a)	7.(b)	8.(b)	9.(c)	10.(c)
11.(d)	12.(b)	1 3.(d)	14.(c)	15.(a)					

Exercise 1(B)

1.(c)	2.(a)	3.(b)	4.(c)	5.(c)	6.(b)	7.(c)	8.(c)	9.(b)	10.(c)
11. (b)	12. (c)	13. (c)	14. (c)	15. (d)					

Exercise 2(A)

1.(a)	2.(a)	3.(b)	4.(b)	5.(a)	6.(c)	7.(c)	8.(a)	9.(d)	10.(d)
11.(a)	12.(c)	13.(b)	14.(c)	15.(a)					

Exercise 2(B)

1.(c)	2.(c)	3.(d)	4.(d)	5.(d)	6.(a)	7.(d)	8.(c)	9.(b)	10.(c)
11.(b)	12.(c)	13.(e)	14.(d)	15.(a)					

Exercise 3(A)

1.(c)	2.(b)	3.(b)	4.(c)	5.(a)	6.(a)	7.(c)	8.(d)	9.(d)	10.(c)
11.(d)	12.(b)	13.(b)	14.(c)	15.(d)					

Exercise 3(B)

1.(c)	2.(a)	3.(e)	4.(d)	5.(e)	6.(c)	7.(a)	8.(b)	9.(b)	10.(d)
11.(c)	12.(c)	13.(d)	14.(c)	15.(a)					

Exercise 4(A)

1.(a)	2.(b)	3.(b)	4.(d)	5.(c)	6.(b)	7.(a)	8.(c)	9.(b)	10.(a)
11.(d)	12.(b)	13.(c)	14.(d)	15.(c)					

Exercise 4(B)

1.(b)	2.(c)	3.(b)	4.(d)	5.(c)	6.(a)	7.(d)	8.(b)	9.(b)	10.(a)
11.(b)	12.(a)	13.(a)	14.(d)	15.(d)					

Exercise 5(A)

1.(b)	2.(c)	3.(b)	4.(a)	5.(d)	6.(b)	7.(c)	8.(d)	9.(b)	10.(a)
11.(c)	12.(c)	13.(a)	14.(c)	15.(d)					

Exercise 5(B)

1.(b)	2.(c)	3.(b)	4.(c)	5.(d)	6.(c)	7.(d)	8.(a)	9.(b)	10.(d)
11.(b)	12.(a)	13.(d)	14.(b)	15.(d)					

Exercise 6(A)

1.(b)	2.(d)	3.(c)	4.(d)	5.(c)	6.(b)	7.(b)	8.(b)	9.(c)	10.(b)
11.(a)	12.(c)	13.(d)	14.(a)	15.(b)					

Exercise 6(B)

1.(c)	2.(a)	3.(c)	4.(b)	5.(d)	6.(c)	7.(b)	8.(b)	9.(a)	10.(d)
11. (e)	12. (d)	13. (e)	14. (c)	15.(c)					

Exercise 7(A)

1.(a)	2.(c)	3.(b)	4.(d)	5.(c)	6.(a)	7.(c)	8.(c)	9.(b)	10.(d)
11.(d)	12.(c)	13.(b)	14.(c)	15.(c)					

Exercise 7(B)

1.(c)	2.(c)	3.(c)	4.(a)	5.(c)	6.(c)	7.(b)	8.(c)	9.(a)	10.(d)
11.(c)	12.(a)	13.(b)	14.(a)	15.(d)					

Exercise 8(A)

1.(b)	2.(c)	3.(d)	4.(d)	5.(a)	6.(a)	7.(b)	8.(d)	9.(a)	10.(b)
11.(c)	12.(a)	13.(d)	14.(c)	15.(a)					

Exercise 8(B)

1.(c)	2.(c)	3.(d)	4.(b)	5.(d)	6.(b)	7.(c)	8.(a)	9.(d)	10.(b)
11.(c)	12.(b)	13.(c)	14.(a)	15.(a)					

Exercise 9(A)

1.(b)	2.(c)	3.(b)	4.(c)	5.(b)	6.(c)	7.(b)	8.(a)	9.(a)	10.(c)
11.(c)	12.(b)	13.(c)	14.(b)	15.(a)					

Exercise 9(B)

1.(b)	2.(c)	3.(d)	4.(b)	5.a)	6.(c)	7.(b)	8.(a)	9.(a)	10.(a)
11.(b)	12.(d)	13.(c)	14.(a)	15.(d)					

Exercise 10(A)

1.(d)	2.(c)	3.(a)	4.(b)	5.(b)	6.(d)	7.(b)	8.(d)	9.(a)	10.(c)
11.(b)	12.(b)	13.(b)	14.(a)	15.(b)					

Exercise 10(B)

1.(b)	2.(c)	3.(a)	4.(b)	5.(c)	6.(a)	7.(c)	8.(d)	9.(a)	10.(b)
11.(b)	12.(a)	13.(d)	14.(c)	15.(a)					

Solutions to select questions in Part (A) and Complete solutions to questions in Part (B)

1 (A)

Q. no. 11 :

$$\frac{8x3x4}{48} = 2 = \frac{5x7x2}{X} \Rightarrow X = 35$$

Q. no. 12 :

6 cigarette butts can make a new cigarette. Hence, 36 cigarette butts can make 6 new cigarettes. These 6 cigarettes can give 6 more cigarette butts, which can again make one more cigarette. Thus, 7 cigarettes .

Q. no. 13 :

For any 2-digit number, "ab" , its effective value is 10a + b. After reversing the digits, it becomes "ba" i.e. 10b + a. If these two are added, the sum is 11a + 11b = 11(a + b). Thus, this sum is definitely divisible by 11.

Q. no. 14 :

GROUP has been coded as GOMAN, while MOUSE has been coded as XPGTN. It can be observed that, GROUP and MOUSE have 2 common alphabets i.e. O and U. If you observe their coded equivalents, even they have 2 common alphabets i.e. G and N. For the word HOUR, it contains the the same alphabets O & U. Thus, its coded equivalent must contain alphabets G & N. Out of given options, GNAQ is the only word that satisfies this condition.

Q. no. 15 :

When each side is divided into 2 parts, 8 new cubes are created. As all of these are situated at the corners, they have three sides coloured. Thus, number of cubes with no sides coloured is zero.

1 (B)

Q no. 1 - 2 :

From **P**, a person can reach any one of the five following cities i.e. **1, 2, 3, 4 or 5**. Thus there are five ways to reach city **5** and then proceed to **6**. From **6**, he can reach **7** or **8**. From each of these he can then reach either **9** or **10**. Thus, he can take **5 x 2 x 2 = 20 ways**.
Also, he can reach **Q** directly from **6**. $\Rightarrow$ He has another **5 ways**.
$\therefore$ Total number of ways is = **20 + 5 = 25**.

If the route between 6 and 7 is closed, there will be (**5 x 1 x 2 = 10**) ways + **5** ways directly from **6** to **Q.**

Q no. 3 - 7 :

The numbers are consecutive integers from 51 to 59 (both included).
B is a prime number i.e. either 53 or 59. But B $\neq$ 53 as it is the highest number. $\Rightarrow$ **B = 59**
Thus all numbers fall from 53 - 59 (seven numbers).
There are 4 odd numbers $\Rightarrow$ 53, 55, 57, 59. There are 3 even numbers $\Rightarrow$ 54, 56, 58.
C is even A is odd C - D = B - A $\Rightarrow$ D is even
E - D + 11 = G / 4 $\Rightarrow$ G is even and a multiple of 4. $\Rightarrow$ **G = 56**

∴ E is odd F is odd.
E - D = (56 / 4) - 11 = 3 ⇒ D ≠ 58 ⇒ **D = 54 and E = 57** ⇒ C = 58.
B - A = C - D = 58 - 54 = 4 ⇒ **A = 55** **F = 53.**

Q no. 8 :

From given information, positions of these cities can be plotted as follow-

```
          E     D

    C     A

    B           X
```

Taking X as another imaginary point, it can be seen that, BDX is a right angle triangle, where DX = 8 and BX = 6. Thus, BD = 10.

Q no. 9 - 10 :

	black cat	white cat	
initially:	x	y	
white cat gives black cat z ladoos	x + z	y - z	⇒ (y - z) = 5 (x + z)
black cat gives white cat z ladoos	x - z	y + z	⇒ (y + z) = 3 (x - z)

Solving the two equations, we get x = 5 z and y = 19 z. Therefore, the ratio y : x = 19 : 5. 19 + 5 = 24 which means that there must be at least 24 ladoos as the cats would have integral number of ladoos. Therefore, if there are 30 ladoos, the monkey must have cheated the cats of 6 ladoos.

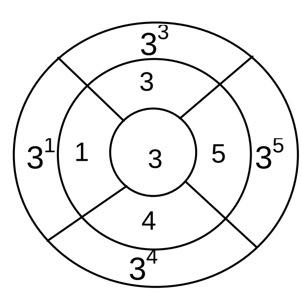
Q no. 11- 15 :

One cube is cut into 8 cubes and the other into 27 cubes. These two cubes are now joined together and painted red. The cubes at the edges would be pained on three sides and there are **8 such cubes**. The cube which has been divided into 27 cubes would have 1 cube painted red on two sides on each of its 4 edges on the extreme end. There are 4 edges which have 2 cubes painted red on 2 sides. Thus there are 4+ 8 = 12 cubes. Also the cube which is divided into 8 cubes will have 4 cubes painted red on two sides. Thus there are a total of **16 cubes** which are painted red on two sides. For the cube divided into 27 cubes, there are **2 cubes** on the inner side which are not painted red. Thus the total number of cubes which have at least one side painted red is equal to (27 + 8 - 2) = **33 cubes**. Of these 33 cubes, 16 are colored on two sides and 8 are colored on three sides which means that **9** of them are colored on just one side.

2 (A)

Q no. 11 :

The outer most number in each sector is a power three, the index being the inner number of the same sector.
Thus, The missing number is 3^4 i.e. **81**



Q no. 12 - 14 :

7	15	7 +15 = 22	**715** + 22 =**737**	5	11	5 + 11 =16	**511** + 16 = 527
8	17	8 + 17 = 25	**817** + 25 = **842**	6	13	6 + 13 =**19**	**613** + 19 = 632

Q no. 15 :

$3 = 9 - 6$ $24 = 36 - 12$ $63 = 81 - 18$ $120 = 144 - 24$
$3 = 3^2 - 2x3$ $24 = 6^2 - 2x6$ $63 = 9^2 - 2x\ 9$ $120 = 12^2 - 2x12$
Thus, all the numbers follow rule (a) i.e. subtract twice the number from its square.

2 (B)

Q no. 1 :

In a perfect square, if the unit digit is zero, the digit at the ten's place is also zero. Thus, 19210 cannot be a square. If the unit digit is 5, the next digit has to be two. Thus, 23435 cannot be a square. In a square, if the unit digit is 6, the next digit is always an odd number. So, 17466 also cannot be a square. As these three numbers are ruled out, 28561 must be a perfect square. (square of 169).

Q no. 2 - 4 :

From P, a person can reach 1 or 2. From each of these two cities, he can reach 3, 4, 5 or 6. Thus there are 2 x 4 = 8 routes so far. From these cities, he can reach 7 or 8. Thus there are 8 x 2 = 16 routes so far. Further, he can reach 9, 10, 11 or 12 and then proceed to 13 or 14. 16 x 4 x 2 = **128 ways.**
If an additional link between 7 & 8 is established, the number of routes will be twice the initial number i.e. there will be **256 ways.**
If the route between 3 and 7 is closed, the number of routes is :
The routes from the other cities are still open. Thus you would have
2 x 3 x 2 x4 x 2 = **96 ways**.
If one were to take a route passing through 3, the number of routes available would be :
2 x 1 x 1 x 4 x 2 = **16 ways**. I.e. he can first go to either 1 or 2, from where he has to proceed to 8 and then to any of the four cities (9, 10, 11, 12) and then proceed to 13 or 14.
Thus total number of ways = 96+16 =**112**

Q no. 5 - 9 :

The number of players would be maximum if the number of cards dealt per player is minimum. This is possible in the following case :
The first four cards are kings so that the total number of cards dealt is 4. The next four cards are queens so that each of these players gets 2 cards and the total number of cards dealt = 4 + 4 (2) = 12. If the next 4 players get jacks, each player would get 3 cards and the total number of cards dealt = 12 + 4 (3) = 24. If the next 4 people get 10's, each player would get 4 cards and the total number of cards dealt = 24 + 4 (4) = 40. If the next 2 players gets a 9, he would get 5 cards and the total cards dealt would be = 40 + 2 (5) = 5. Even if the next player were to get a 9 (which is the only remaining card for which you will get min. number of cards) he would need 5 cards. But this is not possible as the there are only 52 cards in a pack. Thus the max. number of players would be 4 + 4 + 4 + 4 + 2 = **18**

Try a similar approach for the min. number of cards : If each player were to get an Ace, then he or she would get 13 cards and the total number of cards dealt would be 4 x 13 = 52. Thus the min. number of players is **4**

The max. number of cards would be left in the following case : Three players get Ace each so that 3 x 13 = 39 cards are dealt. Let the fourth person get a king. He will get just one card and the total number of cards distributed would be 40. There are now 12 cards and if the fifth person gets an ace, he will have to get 13 cards and as there are only 12 cards, he will not be able to play and the **12 cards** will remain undistributed.

The number of cards dealt is a perfect square. The greatest perfect square which is ≤ 52, is 49 which implies that **7 players** participate in the game. If 49 cards are deal, **3 cards** will remain undistributed.

Q no. 10 -11 :

We know that the number of sweets is not more than 20

	local grocer	supermarket
sweets per. Rupee	X	x - 2
Amount spent	y	y + 3
No. of sweets	x y	(x - 2) (y + 3)

Equating the number of sweets, we get

$xy = xy + 3x - 2y - 6 \quad \Rightarrow x = 2y/3 + 2$. Thus y is a multiple of 3

y	**X**	**xy** (no. of sweets)
3	4	12
6	6	36
9	9	72

Thus the only value of y which can satisfy the given condition is **y = 3**
No of sweets bought = **3 x 4 = 12**
Amount he would have spent at the supermarket = y + 3 = 3 + 3 = **Rs. 6**

Q no. 12 - 15 :

There are 2 treasures around R3C2,which are indicated R3C1 and R3C3. Thus all the cells around R3C2 , i.e. R2C1, R2C2, R2C3, R4C2, R4C3 - are empty.
As there is only one cell containing a treasure around R4C1, all others – R5C1, R5C2 - are empty.
It is given that R6C1 is empty.
There is only one cell that contains a treasure around R6C2. The only cell where it can be located is R5C3. Again it can be concluded that, R5C4 is empty.
Now, there are 4 cells containing treasure around R4C4, out of which 3 have been found. The 4^{th} treasure could be located at R3C4, R4C5 or R5C5.
But, there are 4 treasures around R5C6 also. As, there are only 5 cells around R5C6, there must be at least one treasure at R4C5 and R5C5, which is the 4^{th} treasure around R4C4. Hence, the cell R3C4is empty.

12. It has been shown that, R5C3 contains a treasure.

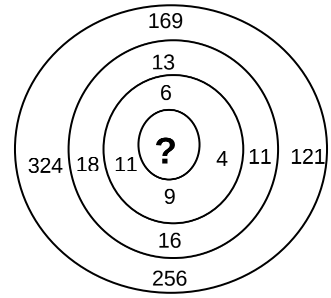
13. Out of R4C5 and R5C5, any of these can contain a treasure. Thus, its exact location cannot be determined.

14. If we assume that , there is no treasure at R6C5, and fill other 4 places around R5C6, there will be 5 treasures around R4C4, which is not possible. Same thing can be said about R6C6 and R4C6. Thus, these cells must contain a treasure.

15. R4C6 contains a treasure and R3C6contains a number 2. Two cells around R3C6, which contain treasure are R3C5 & R4C6. Then, R2C5 and R2C6 are empty. Thus, R2C4 is the only place which can possibly contain a treasure.

3 (A)

Q. NO. 11 :



? = 7.
Consider the corresponding figures of the second and third circles starting from inside.

13 - 6 = 18 - 11 = 11 - 4 = 16 - 9 = 7

Q. NO. 12 - 14 :

For the above problems, the sum of the numbers at the vertices is equal to the sum of the numbers within the triangle . Thus,

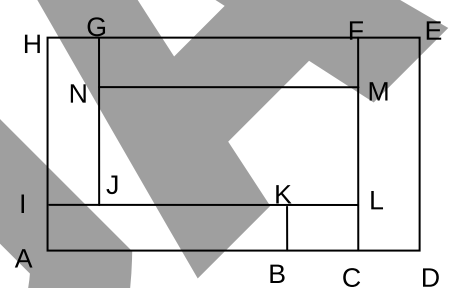
$12 + 16 + 22 = 15 + 15 + x \Rightarrow \mathbf{x = 20}$

$11 + 13 + 19 = 15 + 16 + y \Rightarrow \mathbf{y = 12}$

$17 + 1 + 9 = 3 + 14 + z \Rightarrow \mathbf{z = 10}$

Q no. 15 :

We shall have to count the number of rectangles. For our convenience, we shall label the vertices as shown in the figure. The rectangles are : ABKI, ACLI, BCLK, CDEF, FMNG, GHJI, MNJL, FGJL, ACFH, FHIL, ADEH. I.e. a total of 11 rectangles.



3 (B)

Q no. 1 - 5 :

1. Given expression is (log 25)/3 + (log 4)/3 + (log 2)/3 + (log 5)/3 = 1/3 [log 25 + log 4 + log 2 + log 5] = 1/3 [log (25 X 4 X 2 X 5)] = 1/3 log 1000 = 1/3 x 3 = 1 = log 10.

2. Given expression is (log 4)/2 + (log 9)/2 + (log 64)/12 + (log 343)/9 = 2(log 2)/2 + 2(log 3)/2 + 6(log 2)/12 + 3(log 7)/9 = (log 2)/1 + (log 3)/1 + (log 2)/2 + (log 7)/3 = (2,1,3,1,2,2,7,3).

3. Given expression is (log 5)/3 + (log 7)/2 + (log 3)/2 + (log 9)/3. After equalising the denominators, (2log 5 + 3log 7 + 3log 3 + 2log 9) / 6 = log (25 X 343 X 27 X 81) / 6 = (log 18753525) / 6.

4. Given expression is (log 4)/2 + (log 64)/3 + (log 512)/3 = 2(log 2)/2 + 3(log 4)/3 + 3(log 8)/3 = log 2 + log 4 + log 8 = log 64 = 2 log 6.

5. Given expression is (log 10)/3 + (log 5)/ 2 + (log –4)/3 . It is obvious that after simplifying this expression, we will get logarithm of a negative number, which is not defined.

Q no. 6 - 7 :

$\boxed{m \clubsuit n} = m^2 - n^2$ $\boxed{m \heartsuit n} = m/n$ $\boxed{m \spadesuit n} = m \times n$

6. $\boxed{4\clubsuit 3}^2 - \boxed{4\clubsuit 3}\ [\ \{(\boxed{4\spadesuit 3} \div \boxed{4\heartsuit 3}) \heartsuit (\boxed{3\heartsuit 4} \div \boxed{4\spadesuit 3})\}^{1/2} \heartsuit \boxed{4\spadesuit 3}\ ]$

$= \boxed{7}^2 - \boxed{7}\ [\{(\boxed{12} \div \boxed{4/3}) \div (\boxed{3/4} \div \boxed{12})\}^{1/2} \div \boxed{12}\ ]$

$= 49 - 7\ [\{(9) \div (1/16)\}^{1/2} \div 12$

$= 49 - 7\ (12/12)$

$= 42$

7. If m = 8, n = 7 the value of the expression

$$\left[\left\{\boxed{m\clubsuit n} \div \boxed{m\heartsuit n}\right\}\left\{\boxed{m\spadesuit n}\ \boxed{n\heartsuit m}\right\}\right] \div \left[\left\{\boxed{n\heartsuit m}\ \boxed{n\spadesuit m}\right\}\left\{(m-n) \div \boxed{m\spadesuit(m+n)}\right\}\right]$$

$$=\left[\left\{\boxed{15} \div \boxed{56}\right\}\left\{\boxed{56}\ \boxed{7/8}\right\}\right] \div \left[\left\{\boxed{7/8}\ \boxed{56}\right\}\left\{(1) \div \boxed{120}\right\}\right]$$

$$=\left[\left\{15/56\right\}\left\{49\right\}\right] \div \left[\left\{49\right\}\left\{1/120\right\}\right]$$

$$= 15^2 / 7$$

$$= (m+n)^2 / n$$

no. 8 -11 :

A person could have won a max. of **5 bets**. If he were to predict the positions of six of the horses correctly, he would also get the position of the seventh one. If the max. number of bets won by a person is 5, and if each person won a different number of bets, then they would have won : 5, 4, 3, 2, 1 and 0 bets. Therefore, the min. number of bets won by a person is **0**. From the given table, H_3 should have finished third as it was expected to be third by the max. number of people. Similarly H_1 finished fourth and H_4 finished sixth. Thus **option (d)** fits the requirements. If option (d) is the correct order of finish, then E must have won five bets (from the table). Thus E won the highest number of bets.

Q no. 12 - 15 :

```
     A B C D
+  C A B E B
   B F D F C
```

Let us consider the Last column. We can infer that there has to be a carry from the previous column so that C + (1) = B

From the first column,

D + B = C or D + B = C + 10

D + B = B - 1 or D + B = B + 9

i.e. D = -1 or D = 9. But D $\neq$ -1 $\Rightarrow$ **D = 9** and there is a carry to the next column i.e. C + E + (1) = F or C + E + (1) = F +10.

Further, B + B = D is not possible as B + B = 2B which is always an even number. Thus..

B + B + (1) = D = 9 or B + B + (1) = D + 10 = 19

i.e. B = 4 or B = 9 But B $\neq$ 9 as D = 9. Thus **B = 4**

C = B - 1 **C = 3**

A + A = F + 10 and C + E +(1) = F + 10

A	F	E	
6	**2**	**8**	possible
7	4		not possible B = 4
8	6	12	not possible.

4 (A)

Q no. 11 - 12 :

Pencil	1	11		21	
Eraser	2	10	12	20	22
Sharpener	3	9	13	19	23
Ruler	4	8	14	18	24
Crayon	5	7	15	17	25
Toffee	6		16		26

We can observe that the trend will continue and all numbers ending in 8 are corresponding to the ruler. Thus when he has counted 48 he points to the ruler. Every time he points to the erases, he either counts a number ending in 0 or ending in 2. Thus at 72 he will point towards the eraser.

Q no. 13 :

The first multiplication HE x H = HE would imply that **H = 1**. The addition H + A = M or M + 10. It has to be equal to M + 10 because there is a carry to the next column. Thus H + (1) = N $\Rightarrow$ **N = 2**
Also 1 + A = M + 10 and A is a single digit number. Hence **A = 9**. and **M = 0**.
E x E is ending with A. Therefore, E = 3 or E = 7. E x H is a two digit number which is possible if there is a carry from the previous column. This is not possible if E = 3, and it is only possible if **E = 7** and E x E = 49 which gives a carry of 4 to the next column.

Q no. 14 :

50 / 12 will give you a number just greater than 4. We know that the number of children born in a month should be an integer. If we want the least number that necessarily must be born in the month having maximum number of babies, we should assume that the births are well spread. Even so, if there are 10 months with 4 babies born per month, there will still be 2 months which will have **5 babies**.

Q. no. 15 :

As two baskets contain x and y apples respectively, the difference between their numbers is | x – y |. In order to nullify this difference, apples equal to the number exactly half of this difference have to be transferred from one to the other basket i.e. | x – y | / 2. This result can be verified by taking any two numbers.

4 (B)

Q no. 1 - 4 :

Such problems can be best solved by trial and error method. However we need not go on a wild goose chase. To reduce the time taken, we can take the help of certain clues and then proceed. Solving the equations can take a lot of time. From (iii), i.e. 3 PQ = 20 R, we can interpret that the product PQ has to be a multiple of 20 and R should be a multiple of 3 which means that either P or Q has to be a multiple of 5. From (v) i.e. [P x ♣ (Q)] / ♣ P = 16 / 5, we can infer that ♣P has to be a multiple of 5 and since ♣ P is an operation on P, we can infer that P has to be a multiple of 5. We shall assume the minimum values of values of P, Q and R i.e. %, 4 and 3 respectively and proceed further. From (I) i.e. ♣ P - ♣ Q = ♣ R, we know that $5^2 - 4^2 = 3^2$. We can infer that the operator ♣ stands for "SQUARE ". Based on these assumption check the other equations and see that they are satisfied. Also, ♦P = P x ♣P = 5 x 25 = 125 $\Rightarrow$ ♦ stands for " CUBE ".

Q no. 5 - 8 :

Assume that, number of balls in the bag is 2. It is obvious that, one has to use the balance only once, in order to find the odd ball. (If the ball you weigh is of 100 gm, the remaining ball is the one, that weighs 90 gm. On the other hand, if the ball you weigh is of 90 gm, well, you've got it!).
If there are 3 balls, assuming the worst case, you have to weigh twice. If there are 4 balls, again you have to weigh only twice. Let's see how –
Divide these 4 balls in 2 groups of 2 balls each. Say, these groups are G1 & G2. Use the balance once and find the weight of G1.
A) If weight of G1 is 190 gm, the odd ball is in this group. To find this ball, out of two balls in G1, you will have to weigh once more, i.e. twice.

OR

B) If weight of G1 is 200 gm, the odd ball must be in G2. To find this odd ball from two balls in G2 ,you will have to weigh once more, i.e. twice.

Thus, we can generalise these results as-

Number of balls	No. of Weighings
1 to 2 i.e. 2^{1}	1
3 to 4 i.e. 2^{2}	2
5 to 8 i.e. 2^{3}	3
9 to 16 i.e. 2^{4}	4
17 to 32 i.e. 2^{5}	5
33 to 64 i.e. 2^{6}	6
65 to 128 i.e. 2^{7}	7
129 to 256 i.e. 2^{8}	8
257 to 512 i.e. 2^{9}	9
513 to 1024 i.e. 2^{10}	10

Q no. 9 - 11 :

A (replace by C)	**0**	1	4	13	40
B =2A + 1	**1**	3	9	27	81
C = A + B	**1**	4	13	40	121

All questions can be answered with the table.
The final value of A is **40**. There are **three** interactions before the value of C exceeds 100. At the end of 3 steps, the value of B is **27**.

Q no. 12 - 15 :

The technique for this caselet is quite simple. If you are to maximize your score, you will retain the half which has the greater total of numbers and if you want to minimize your opponent's gain, you will retain the half which has least total of its constituent numbers.

After you have retained the right, your opponent will retain the top half if he has to minimize your score. This is because the total of the top half is lesser than that of the bottom half. You will now retain the right half. Since the number left is your score, your opponent will retain the upper half. Thus your opponents steps would be **retain right, retain right**.

opening	You	opponent	You	opponent
6 2 5 1	5 1	5 1	1	1
3 1 4 7	4 7	4 7	7	
4 1 9 5	9 5			
3 1 2 4	2 4			

If both of you play intelligently, you will retain the right half as it has the maximum score. Your opponent will retain the top half and then you will left half. To minimize your score the opponent will retain the bottom half and your gain will be **4**.

If both of you play intelligently, your opponent's gain will always be 2. Your opponent will start by retaining the upper half .You will then retain the left half. Your opponent will retain the upper half and your opponent will retain the right half, and your opponent will get a score of **2**.

opening	opponent	You	opponent	You
6 2 5 1	6 2 5 1	6 2	6 2	2
3 1 4 7	3 1 4 7	3 1		
4 1 9 5				
3 1 2 4				

You will first retain right as we have discussed earlier. It is mentioned that your opponent will retain upper half which means that you will retain left to maximize your gain.

5 (A)

Q. no. 11 :

The easiest way to solve such problems will be to split the number 320 into factors.

Amount per person per day	320	160	***80***	40	***32***
No. of people	1	2	***4***	8	***10***

As soon as we get two pairs such that the individual contribution increases by 48 we have found the solution. 10 people were expected and 4 turned up.

Q no. 12 :

Any prime number greater than 3 has to be an odd number. $(P^2 - 1) = (P + 1)(P - 1)$ both of which are even numbers and one of them has to be a multiple of 4. Thus $(P + 1)(P - 1)$ is a multiple of 8. Also $(P + 1)$, P, and $(P - 1)$ are three consecutive integers of which one has to be a multiple of 3. As P is not a multiple of 3 either $(P + 1)$ or $(P - 1)$ is a multiple of 3. Thus $(P + 1)(P - 1)$ is always a multiple of 24.

Q no. 13 :

There are 12 multiples of 7 from 1 to 90. One of these is 49 which is the square of 7. Thus the greatest power of 7 which will divide 90! is 12 + 1 = 13. I.e. 7^{13}.

Q no. 14 :

By trial and error Option (c) is the only possible option which satisfies all conditions.

Q. no. 15 :

The word that can be formed is MOUSE. The fourth letter is S.

5 (B)

Q no. 1 - 2 :

There are 4 even numbers and 5 odd numbers. As the column A has only even numbers, there is just 1 even number in the other two columns. As the numbers in column C add up to 14 the even number has to be in this column (the sum of three odd numbers cannot be even). Also C3 - C2 = 4. Thus

C1	0	8	4
C2	5	1	3
C3	9	5	7

The first option is not possible as the numbers are between 1 - 9. The third option is not possible as 7 is in column B. Thus option 2 is the only feasible solution. As the the numbers in the first row add up to 17, and cell B1 is an odd number, it can be 3, 7 or 9. If B1 = 3, A1 = 6, B1 = 7, A1 = 2, B1 = 9, A1 = 0. But 2 and 8 are not in the same horizontal row. Hence B1 = 3, A1 = 6. As 9 is not immediately below 3, it is in cell B3. Also 1 is in cell C2.

	A	B	C
1	6	3	8
2			1
3		9	5

Q no. 3 - 6 :

```
      A B C
  X     D E
    A C F B
    E A G
    F H F B
```

F + G ends in F, which means that **G = 0**. The multiplication D x C ends in zero which means that either of these numbers is 5 and the other is an even number.
Let us assume C = 5, E x C ends in 5 if E is odd (i.e. should end in C)
and E x C ends in 0 if E is even (i.e. should end in G). Neither case is possible which means that C $\neq$ 5 and **D = 5**. Also, ABC is a three digit number which is multiplied by 5 and the answer is a three digit number which means that **A = 1**(any number greater than 200 when multiplied by 5 will be a four digit number). Since C is an even number, B has to be an even number (B = C x E). So we now have the following result :

$$\begin{array}{r} 1\,B\,C \\ \times\quad \underline{5\,E} \\ 1\,C\,F\,B \\ \underline{E\,1\,0} \\ F\,H\,F\,B \end{array}$$

Thus, 1 + E = F and C + 1 = H. The numbers left are 2, 3, 4, 6, 7, 8 and 9. Since C is an even number and C + 1 = H, C $\rightarrow$ 2, 6 or 8. If C = 6, H = 7 and since E and F are consecutive numbers, E = 2 or 8
If E = 2, C x E = 6 x 2 = 12 $\Rightarrow$ B = 2 (not possible) and If E = 8, C x E = 6 x 8 = 48 $\Rightarrow$ B = 8 (not possible). Similarly check for C = 8. Thus we can infer that C = 2 and H = 3. E is either 4, 6, 7 or 8
and b = 4 or 6 or 8. Now the quickest method would be to substitute the values and check. We get **E = 8** and so **B = 6**. **F** = E + 1 = **9** and **H** = C + 1 = **3**.

Q no. 7 – 10 :

7. To code a given word, each alphabet has been replaced by a letter 2 places further in the alphabet series . After converting all the alphabets, they are written in reverse order.
Thus, GOVINDA > > > IQXKFPC > > > CFPKXQI. The scrambled word is OQFPCT, i.e. the coded word is TCPFQO and the original word is " RANDOM ".

8. It can be seen that each alphabet is converted into a number corresponding to its position in the alphabet series and that number is increased by 2. Thus to convert given number series into a word, 2 should be subtracted from each number group. These number groups cannot be 2 , 03 or 32. Hence, they must be 20 and 3 i.e. 18 and 1 which represent R and A resp. Out of 2 possible options (a) and (b), find out the code of third letter. It is obvious that the word is RAYTHEON.

9. In the given coded number series 391291716, if we try to form different groups, 39 or 91 seem unlikely to represent an alphabet. Thus two coded alphabets must be 3 and 9. These numbers in the alphabet series represent C and I respectively, which are present in given word PIQLIC. There is one more I i.e. 9. Thus each alphabet is represented by its position in the alphabet series and then scrambled. Now, in the number series 63724124, again 63, 37 or 72 are not possible. Hence, the numbers must be 6, 3 and 7 i.e. F, C, G. From given options, (b) is the only word which contains these letters. Find out positions of remaining letters and verify the answer.

10. The word CREATIVE > > > HDWLYHFU. It can be seen that the letter , which occurs twice in the original word is E, whereas H occurs twice in the coded form. Thus, it can be concluded that E > > > H i.e. each letter is replaced by another alphabet, 3 places further in the series. But the letter E occupied 3rd and 8th positions in the word, while its coded equivalent H occupies 1st and 6th places. Thus each coded alphabet is shifted right by 2 places. Hence, BOOMBASTIC > > > ERRPEDWLF > > > RPEDWLFER.

Q no. 11 - 13 :

The minimum number of pebbles cannot be 7 as B will start with 2 pebbles and then even if A picks one pebble, B will be in a position to leave just one pebble and pick the remainder which will be a maximum of 3. Thus the minimum number of pebbles has to be at least 9 so that A will have a chance of manipulating the remaining number of pebbles. If B picks 1 pebble, A will pick 3 pebbles which will

mean that there are 5 pebbles left. Even if B picks 1 pebble, A will be in a position to ensure that B picks the last pebble. Thus, the minimum number of pebbles is **9**.
The number of pebbles is **13**. Basically, if both play intelligently, B has to ensure that he will pick the 12^{th} pebble. For this he will also ensure that he picks the 4^{th} and 8^{th} pebble since he will be in a position to manipulate later on. If A picks 3, B will pick 1and so on. After this, if A picks 1,2 or 3 B will pick 3,2 and 1 respectively so that he will pick the 8^{th} pebble. The above step will be repeated and A will be forced to pick the last pebble. Thus he cannot win with 13 pebbles. Again, if the number of pebbles is 17 the one playing second will have to ensure that he picks the 4^{th}, 8^{th}, 12^{th} and the 16^{th} pebbles. For each cycle there will be 2 steps and hence a total of **8 steps** before the last pebble is picked.

Q no. 14 - 15 :

As no two adjacent sides are painted with the same color, the sides which are colored similarly must be on the opposite sides of the larger cube which is divided into 27 cubes, so It is not possible for a cube to have the same color on two sides. Also all cubes at the corners have three sides colored differently. There are **eight** such corners for a cube.

6 (A)

Q no. 11 :
The first shopkeeper got change for Rs. 100 of which he gave Rs. 50 to the woman and keeps the remaining Rs. 50 with himself. Thus he got the money in return for the article he sold. When the neighbor asks for a new note of Rs. 100 in return for counterfeit note, he gives him Rs. 100 and so his loss is **Rs. 100**.

Q no. 12 :

Let us assume that he had Rs. x with him. The expenses per day for all three put together are $\frac{x}{140}+\frac{x}{105}+\frac{x}{84} \Rightarrow$ x / 35. Thus, he can manage for 35 days.

Q no. 13 :

Let us make a table of the numbers and letters present and the number of times they are repeated.

0	1	2	3	4	5	6	7	8	9
2	3	3	1	2	1	1	1	1	5

M	N	A	E	U	V	J	R	L	Y
1	1	3	3	1	1	1	2	2	5

We can thus infer that : Y = 9 A or E = 1 or 2
M, N, V, U, J = 3, 5, 6, 7, 8

Let us now consider the word MANY. The letters M & N appear only once and that is with each other and A appears thrice. While comparing with the numbers, we see that 7189 fits the requirements with two numbers 7 and 8 appearing only one and 1 appearing thrice. Thus, **A = 1, M =7 N = 8**. $\Rightarrow$ **E = 2**. The only other number which has 2 numbers appearing only once is 5609 which when compared with JULY we get **L = 0**. Thus, LAMELY can be interpreted as 017209 i.e. **17209** which is neither divisible by 19 nor by 23. Thus **(d)** is the correct alternative.

Q no. 14 :

It is given that **C = 1**.

Also E $\neq$ 2, 3, 4 $\Rightarrow$ E $\neq$ 1, 2, 3, 4 $\Rightarrow$ **E = 5**.
D is either 4 or 5, but as E = 5 $\Rightarrow$ **D = 4**.
As A is an odd number and the only odd number is 3 $\Rightarrow$ **A = 3** and **B = 2**.

Q no. 15 :

Let us make a table of time and numbe of people present.

Time interval	No. of People
8 a.m - 10 a.m.	5
10 a.m. - 12 noon	5 + 10 = 15
12 noon - 2 p.m.	**5 + 10 + 5 = 20**
2 p.m. - 4 p.m.	10 + 5 = 15
4 p.m. - 6 p.m.	5

6 (B)

Q no. 1 - 4 :
There are three shooters A, B and C taking part in the competition. Each shooter will aim at 4 targets before the next gets his chance. Thus a round is completed every 12 shots. A total of 78 shots are fired of which 72 shots would complete 6 rounds, this means that the first to shoot will get (6 x4 + 4) **28 shots** and the next to shooter will get (6 x 4 + 2) **26 shots** and the third will get **24 shots**.

	Hits target	misses target	
A	a1	a2	(all numbers are integers)
B	b1	b2	
C	c1	c2	

Of the 78 shots, 43 hit the target and 35 miss the target. Thus,
a1 + b1 + c1 = 43 (1)
& a2 + b2 + c2 = 35 (2)
A scored 60 points $\Rightarrow$ 2a1 + b2 + c2 = 60 (3)
B scored 53 points $\Rightarrow$ 2b1 + a2 + c2 = 53 (4)
C scored 60 points $\Rightarrow$ 2c1 + a2 + b2 = 43 (5)

Let us assume that A was the first to shoot. Thus, a1 + a2 = 28
from (2) and (3), we have 2a1 - a2 = 25 $\Rightarrow$ 3a1 = 53 $\Rightarrow$ a1 = 17.67 (not possible)

Let us assume that B was the first to shoot. Thus, b1 + b2 = 28
from (2) and (4), we have 2b1 - b2 = 18 $\Rightarrow$ 3b1 = 46 $\Rightarrow$ b1 = 15.33 (not possible)

Let us assume that C was the first to shoot. Thus, c1 + c2 = 28
from (2) and (5), we have 2c1 - c2 = 8 $\Rightarrow$ 3c1 = 36 $\Rightarrow$ **c1 = 12** and **c2 = 16**

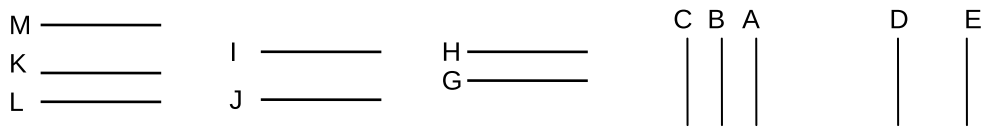
Let us assume that A was the second to shoot. Thus, a1 + a2 = 26
from (2) and (3), we have 2a1 - a2 = 25 $\Rightarrow$ 3a1 = 51 $\Rightarrow$ **a1 = 17** and **a2 = 9**
Thus, C was the first to shoot and A was the second to shoot
Also, from the above values, **b1 = 14** and **b2 = 10**

Q no. 5 - 7:

Note : We shall denote all cities by the first letter of their respective names. We shall also use the following symbols $\perp$ for perpendicular roads and = for parallel roads.
From the given data, we can deduce the following :
A $\perp$ G, H $\perp$ B, C$\parallel$D, D $\perp$ J, I $\parallel$ H $\parallel$K, L $\perp$ E, E $\perp$ K
From this, we can deduce that the roads are of two sets :

A, B, C, D, E and G, H, I, J, K, L, M.

Now let s consider the distances between these roads.



Let us now discuss the questions. If Indira avenue is 2 km. north of Kishanchand avenue, Jawahar avenue would coincide with Lajpatrai avenue. If Narsimha avenue is 2 km. south of Jawahar avenue and 4 km. north of Gandhi avenue, Hariprasad avenue and Narsimha avenue will be 2 km. apart as seen in the figure.

Q no. 8 - 10 :

Let us consider a person traveling from P to 1. He will have the following routes : P-1-4-7-Q, P-1-4-7-8-Q, P-1-4-6-Q, P-1-4-5-8-Q, P-1-4-5-8-7-Q, P-1-4-5-6-Q and P-1-3-6-Q i.e. a total of 7 ways.

If the person is to take the path P-1-2, he would have a further 7 routes. Thus any person traveling from P-1, will have a total of 14 routes.

Similarly, if the person were to take the P-2, he would have another 14 routes and if he takes the route P-3, he would have one route i.e. a total of **29 routes**.

If the route between 1 and 2 is closed, a person will have 7 + 7 +1 =**15 routes**.

If direct routes are added from 6 to 7 and 8, the number of routes will increase as follows: Let us initially discuss the path P-1. The number of options available will be P-1-4-7-Q, P-1-4-7-8-Q, P-1-4-6-Q, P-1-4-6-7-Q, P-1-4-6-8-Q, P-1-4-6-7-8-Q, P-1-4-6-8-7-Q i.e. 7 routes so far. He would have 7 similar routes if he takes the path P-1-4-5 and then proceed along the above lines. Thus, he has 14 routes so far. If were to move from P-1-3, he will have 5 more routes increasing his tally to 19. His options will be doubled if he takes the path P-1-2 and then proceeding on the above lines. Thus in all he has 38 routes from P-1 and similarly another 38 routes from P-2 and then proceed further. If directly move from P-3, he will have 5 routes. Thus he will have 38 + 38 + 5 = **81 routes**.

Q no. 11 – 15 :

From given rules, certain conclusions can be drawn –

1. When a = b,
i.e. Fun (a,a) = Fun (a – 1,a – 1) = Fun (a – 2,a – 2) = _ _ _
e.g. Fun (3,3) = Fun (2,2) = Fun (1,1) = Fun (0,0) = 0. Thus, Fun (a,b) is always zero if a = b.

2. When a ≠ b and a ≠ 0 and b ≠ 0

a) If a > b, i.e. Fun (a,b) = Fun (a – 1,b) = Fun (a – 2,b) = - - - = Fun (b,b) = 0.
b) If a < b, i.e. Fun (a,b) = Fun (a – 1,b) = Fun (a – 2,b) = - - - - = Fun (0,b) = b – 1.

Thus,

11. Fun (3,0) = 4 ; Fun (4,3) = Fun (3,3) = 0. Hence given expression is Fun (4,0) = 5.

12. Fun (1,0) = 2 ; Fun (0,5) = 4 ; Fun (7,7) = 0 ; Fun (2,0) = 3. So, given expression is Fun (8,0) =9

13. Fun (3,7) = 6 ; Fun (78,3) = 0 ; Fun (13,1) = 0. Thus given expression is [6 / 0] x 0 which is not defined.

14. Fun (3,17) = 16 ; Fun (5,25) = 24 ; Fun (33,193) = 192. The given expression is (16x24)/192 = 2.

15. Fun (3,0) = 4 ; Fun (17,9) = 0 ; Fun (5,5) = 0 ; Fun (0,4) = 3.
The given expression then becomes 2 { [4 x 0] x [0 + 3] } = 0 = Fun (7,4).

7 (A)

Q no. 11 :

(X^3 - X) = X(X-1)(X+1). Are three consecutive numbers of which atleast one is even and alleast one is a multiple of 3. Thus the product is always diviible by 6. In some cases say X = 4, X-1 =3 and X+1 = 5 and the product is divisible by 12. But in cases such as X = 6, X - 1 =5 and X + 1 = 7, the product is 210 which is not divisible by 12. Hence the answer is **(d)**

Q no. 12 - 13 :

$A \spadesuit B = A/ (A - B)$ $\qquad$ $A \clubsuit B = B/ (A - B)$ $\qquad$ $A \heartsuit B = A^2 + B^2$

$A \{ [A \heartsuit B + [A \spadesuit B] [A \clubsuit B] [(A \heartsuit B) - 2 AB]\} / \{ A \spadesuit B\}$

$= \quad A \{ A^2 + B^2 + [AB/ (A - B)^2] [A^2 + B^2 - 2 AB] / \{ A / A - B\}$

$= \quad A \{ A^2 + B^2 + [AB/ (A - B)^2] [A - B]^2 / \{ A / A - B\}$

$= \quad A \{ A^2 + B^2 + AB] / \{ A / A - B\}$

$= \quad A \{ A^2 + B^2 + AB \} [A - B] / A \quad = \quad [A^2 + B^2 + AB] [A - B] = \mathbf{A^3 - B^3}$.

$$\frac{(3 \spadesuit 2)\ (4 \spadesuit 5)\ (8 \clubsuit 6)}{(6 \spadesuit 8)\ (6 \clubsuit 8)\ (3 \clubsuit 4)} = \frac{(3)\ (-4)\ (3)}{(-3)\ (-4)\ (-4)} = \mathbf{3 / 4}$$

Q. no. 14 :

If the differences between two consecutive numbers are considered, they are 3,3.5,4,4.5,5 etc. Thus, the next difference will be 5.5 and the next number will be 27.5.

Q. no. 15 :

It can be observed that, except 34, all other numbers 10,17,26,50,65,122 can be expressed as a perfect square plus 1 i.e. 9+1,16+1,25+1 etc. Thus 34 is the odd word out.

7 (B)

Q no. 1 – 3 :

As per the given directions, only vowels can be represented by prime numbers.

For consonants, present at prime numbered positions –

Letter	B	C	G	K	M	Q	S	W
Position	2	3	7	11	13	17	19	23
Representated by	4	6	14	22	26	34	38	46

For consonants, whose position is a number, half of which is a prime number –

Letter	D	F	J	N	V	Z
Position	4	6	10	14	22	26
Represented by	45	65	105	145	225	265

All remaining consonants –

Letter	H	L	P	R	T	X	Y
Position	8	12	16	18	20	24	25
Represented by	8	12	16	18	20	24	25

Thus, even though representations for vowels are not known, we can conclude that a prime number has to denote a vowel, whereas, coded symbols for all the consonants are derived in above tables. Therefore,

1. 22 17 12 17 38 8 145 11 22 23 225 = = K_L_SHN_K_V. From given options, the word is KALASHNIKOV.

2. 38 145 11 16 7 18 = = SN_P_R. From given options, the word is SNIPER.

3. CALCUTTA = = 6_ 12_ 6_ 20 20 _. From given options, the code is 6 17 12 6 29 20 20 17.

Q no. 4 - 9 :

From the given data, we can infer that 60% of the money collected will be divided among those who have speculated the winner correctly.
Let us assume that the number of spectators is x. Let us also assume that y spectators predicted correctly during the first week and z spectators predicted correctly during the second week. If each sectator paid Rs. 500, Rs. 300 is meant for the winners.
Thus, during the first week, $300\ x / y = 8270 \Rightarrow \quad x / y = 827 / 30$
Similarly, for the second week, $300\ x / z = 12405 \Rightarrow \quad x / z = 827 / 20$
Since x, y and z are integers, the smallest value of x is 827. Also the next multiple of 827 i.e. 1654 is not possible as there is a limit to the number of spectators.
Thus **x = 827 y = 30 z = 20**
The management retains 15% of the collections i.e. 15% of 500 x 827 = **Rs. 62,025**
Each of the 30 spectators who speculated correctly got Rs. 8270, thus total amount is 8270 x 30 = **Rs. 2,48,100**
During the second week, 827 - 20 = **807** spectators lost their bets.
The horse racers earned 25% of 2 x 500 x 827 = **Rs. 2,06,750**

Q no. 10 - 15 :

$$\begin{array}{cr} & A\ B\ C \\ \times & \underline{B\ D} \\ & F\ C\ E\ D \\ & \underline{C\ G\ F\ B\ \ \ } \\ & B\ E\ D\ B\ D \end{array}$$

From the multiplication, C x D = D and C x B = B $\Rightarrow$ **C = 1**
Now let us focus our attention on the addition E + B = B
There are two cases possible : E + B = B $\Rightarrow$ E = 0 or
E + B = 10 + B (i.e. there is a carry to the next addition) $\Rightarrow$ E = 10, which is not possible.
$\therefore$ **E = 0**
To the extreme left, there is C and a carry has to be added to it to get the digit in the ten-thousands place as B $\Rightarrow$ C + (1) = B $\Rightarrow$ **B = 2**
The multiplication B x D ends in E i.e. 0. $\Rightarrow$2 x 5 = 10 $\Rightarrow$ **D = 5**
B x B = F $\Rightarrow$ F = 2 x 2 $\Rightarrow$ **F = 4**
The addition F + G is ending in E, $\Rightarrow$ F + G = 10 or F + G + (1) = 10 $\Rightarrow$ **G = 6 or 7**
The multiplication A x B = C G i.e. a two digit number $\Rightarrow$ A = 6, 7, 8 or 9

If A = 6 A x B = 12 $\Rightarrow$ G = 2 not possible

If A = 7 A x B = 14   ⇒ G = 4   not possible
If A = 8 A x B = 16   ⇒ G = 6   possible
If A = 9 A x B = 18   ⇒ G = 8   possible   ⇒ **G = 6 or 8**
Thus **G = 6**   ⇒ **A** = 8

8 (A)

Q. no. 11 :

Given function can be defined as a * b = (a x b) + b. Hence, 13 * 7 = 91 + 7 = 98.

Q. no. 12 :

Given function is a % b = a ^{2} + b ^{2}. Hence, 16 % 17 = 16 ^{2} + 17 ^{2} = 545.

Q. no. 13 :

Given function is a & b = (a + b)/2. Hence, 55 & 75 = (55 + 75)/2 = 65.

Q. no. 14 :
Given function is a # b = 2ab. Hence, 8 # 29 = 2 x 8 x 29 = 464.

Q. no. 15 :
The function is a $ b = √a + √b. Thus, 784 $ 256 = 28 + 16 = 44.

8 (B)

Q no. 1 - 6 :
The cards are numbered 1, 2, ...,9. therefore, the sum of points on all cards = {(9 x 10) / 2} = 45
The if sum of numbers of cards in the 1st cage = x
The if sum of numbers of cards in the 2nd cage = x - 2
The if sum of numbers of cards in the 3rd cage = x - 4

⇒ x + x - 2 + x - 4 = 45 ⇒ x = 17   ∴ the three cages would have cards totaling 17, 15 and 13 respectively. So each cage should have one card from each of the following three sets of cards.

<u>1, 2, 3</u>   **<u>4, 5, 6</u>**   **<u>7, 8, 9</u>**

The following combinations are possible if one has to satisfy the other requirements.

	Combination - 1		Combination - 2
Cage 1 :	17 =	9 + 6 + 2	9 + 5 + 3
Cage 2 :	15 =	8 + 4 + 3	8 + 6 + 1
Cage 3 :	13 =	7 + 5 + 1	7 + 4 + 2

But combination - 2 is not possible because : the only way a person can pay Rs. 7 is if the three cards are 4, 2, 1⇒4 + 2 + 1 = 7. But in combination - 2, 4 & 2 are in the same cage and as only one card can be drawn from a cage, this is not possible.
∴ the only combination possible is combination - 1.
The **lowest** possible payment is 3 + 2 + 1 = **Rs. 6**
The **max**. possible payment is 9 + 8 + 7 = **Rs. 24**
Option (d) is not possible as 5 & 7 are in the same cage.
Option (b) is the only one possible as all three cards mentioned are in different cages.
A customer cannot pay **Rs. 23** as 23 = 9 + +8 + 6, and 9 and 6 are in the same cage.
A customer can pay **Rs. 13** i.e. 9 + 3 + 1 = 13 as all three cards are in different cages. The other amounts are not possible due to the same reason.

Q no. 7 - 9 :

S (S = R + Q)	**0**	1	2	3	5	8	13	21	34	55	89

Q (replace by R)	**0**	1	1	2	3	5	8	13	21	34	55
R (replace by S)	**1**	1	2	3	5	8	13	21	34	55	89
P (increase by 1)	**0**	1	2	3	4	5	6	7	8	9	10

The last value to be printed is **S = 89**
When P = 6, S = 21

When we start with P = 6, Q = 0, R = 3 and S = 0

S (S = R + Q)	**0**	3	6	9	15
Q (replace by R)	**0**	3	3	6	9
R (replace by S)	**3**	3	6	9	15
P (increase by 1)	6	7	8	9	10

The value of S to be printed is **15**

Q no. 10 :
From P we can go to 1, 2 or 3. From each of these cities, we can reach 4 or 5 from where we can reach A. Thus the total number of ways is 3 x 2 = 6.

Q no. 11 - 15 :

The large cube is divided into 64 smaller cube which means that the side of the smaller cubes is 1/ 4^{th} that of the larger cube. We know that two adjacent sides are painted black and the two sides opposite to these sides are painted red. This would mean that the only sides not painted so far are the top and the bottom ones. There are painted green. Thus, there are two edges where sides painted red and black meet and each edge has 4 cubes which means that there are a total of **8 cubes** which have red on one side and black on the other side. All cubes on the edges are painted on two sides but the cubes at the corner are painted on three sides which means that there are only 2 cubes per edge which are painted on two sides and so a total of (12 x 2) **24 cubes**. There are a 4 x 4 = **16 cubes** on one side which are painted black and 4 x 3 = **12 cubes** on the adjacent side which are painted black. Thus, there are a total of **28 cubes**. The top and bottom surface s are painted green and there are 4 x 4 = 16 cubes on each side which mean that there are **32 cubes** which are painted green. The remaining 64 - 32 = **32 cubes** which are not painted green.

9 (A)

Q no. 11 :

Since nothing is said about the manner in which the monkeys slip, we will assume that the slipping occurs as the monkeys are climbing. Monkey A climbs 3 ft. per minute and slips 1.ft.per every 2 ft. Climbed, so in a minute it will effectively climb [3 - (1 x 1.5)] = 1.5ft. Monkey A rests 1 min. after every 2 min. Therefore it climbs 3 ft. every 3 min. Monkey B climbs 4 ft. per minute and slips 1.5ft.per every 2 ft. Climbed, so in a minute it will effectively climb [3 - (1.5 x 2)] = 1 ft. Monkey B rests 1 min. after every 3 min. Therefore it climbs 3 ft. every 4 min. Monkey A will take 99min. to climb 99 ft. and will take another 1min to climb 1.5 ft. Thus it will take approximately 100min.

Q no. 12 – 14 :

The cube is painted on three adjacent sides and divided into 64 cubes. Any cube at the corner would be painted on three sides. In this case, **only one such cube** is painted on three sides. The three adjacent sides will have three sides common between them. There are three cubes on each edge which are painted on two sides i.e. **9 cubes in all**. Each side which is painted has 9 cubes which are colored on just one side. Thus there are 9 x 3 = **27 cubes** which are colored on just one side.

Q. no. 15 :

The given number has 45 digits, each equal to one. If we take the sum of all the digits, it will be 45. As this sum is divisible by 3, the number itself is divisible by 3.

9 (B)

Q no. 1 - 5 :

$$\begin{array}{cccccc} & & S & E & N & D \\ + & & M & O & R & E \\ \hline & M & O & N & E & Y \\ \hline \end{array}$$

$\Rightarrow$ M is the max. carry over. $\therefore$ **M = 1**
Thus we get S + 1 = 10 + O. $\therefore$ S is either 8 or 9.
if S = 8 & there is a carry from the previous column, S + 1 + (1) = 10 $\Rightarrow$ O = 0 (possible)
if S = 8 & there is no carry from the previous column, S + 1 = 9 (not possible as S + 1 must be a two-digit number)
if S = 9 & there is a carry from the previous column, S + 1 + (1) = 11 $\Rightarrow$ O = 1 (not possible)
if S = 9 & there is no carry from the previous column, S + 1 = 10 $\Rightarrow$ O = 0 (possible)
$\therefore$ in either case, **O = 0**

Concentrate on the column "E + O = N ". As O = 0, and E and N being <u>distinct</u> single digit numbers, there has to be a carry into this column.
E + (1) = N or E +(1) = N +10 (if there is a carry to the next column. But as N$\neq$ 1, 0, this possibility cannot exist.
$\therefore$ E + (1) = N which means that there is no carry to the next column. $\Rightarrow$ **S= 9**

Consider the column " N + R = E ". This addition has to give a carry to the next column (refer to discussion about " E + O = N ").
$\therefore$ N + R= E +10 if there is no carry into this column.
$\Rightarrow$ E +1 + R = E +10 $\Rightarrow$ R = 9 (not possible)
or N + R (1) = E +10 if there is a carry from the previous column
$\Rightarrow$ E +1 + R + (1) = E +10 $\Rightarrow$ R = 8 (possible) $\therefore$ **R = 8**
Thus D + E = Y 10

We have now found the letters for - 0, 1, 8, 9. Thus max. value of N,D, E, Y, = 7 and E +1= N

Thus we have the following conditions : 7 $\geq$N, 6 $\geq$ E $\geq$ 2, 7 $\geq$ Y $\geq$ 2, 7 $\geq$ D

The addition " E + D " should be at least equal to 12 which is possible only if D = 7 & E = 5 or 6
E $\neq$ 6 as N = E+1.
N = 5+1 = 6
10 + Y = 7 +5 = 12 $\Rightarrow$ Y = 2
Thus D = 7, E = 5, N = 6, Y = 2
Using these values you can answer all five questions.

<u>But it would take ages to solve caselets in this manner</u>.
As soon as you know that M = 1, go to Q. no.5. Options (c) & (d) are ruled out (O $\neq$ 1)
$\Rightarrow$ from options (a) or (b) S = 9, O = 0, Y = 2. It is now faster to solve the problem.

Q no. 6 - 9 :

As the president lost the election, there were six candidates for the first round and five candidates for the remaining two rounds.

For the first round, the candidates are to be ranked from 1- 6, Sum of all points obtained would be [(6 x 7) / 2] = 21.

For the second and third rounds, the candidates are to be ranked from 1- 5, Sum of all points obtained would be [(5 x 6) / 2] = 15.

Total points = 15+15+21 = 51

The candidate with min. points had 7 points, while the candidate with max. points had 4+5+2 = 11 points. Three candidates had equal points (s). Let us assume that the president obtained P points.

Thus, 7 + 11 + 3 s +P = 51 $\Rightarrow$ 3 s + P = 33. i.e. P is a multiple of 3

If P = 3, then s = 10

The only possible way for a candidate to obtain 10 points without getting the same number of points twice or without a tie taking place is 5 + 3 + 2 = 10.
This means that the three candidates who have equal points will have the following points for the three rounds.

Candidate 1 : 5, 3, 2
Candidate 2 : 3, 2, 5
Candidate 3 : 2, 5, 3

This means that the fifth position is always occupied by one of these three candidates. This is not possible (the candidate who had the maximum score was fifth in the second round).

Thus P $\neq$ 3 $\Rightarrow$ **P = 6** $\Rightarrow$ **s = 9**

We shall now see all possible combinations to obtain a score of 9 taking into account the restrictions given. We shall cancel out (x) combinations which are not possible either due to restrictions given or some other candidate having finished in the position.

5	1	3	
5	2	2	x
5	3	1	x
4	3	2	x
3	4	2	x
3	2	4	
3	1	5	
2	3	4	
2	4	3	
1	3	5	

Two options connected by an arrow means that only 1 of these 2 options is possible.
e.g. either 3,1,5 or 5,1,3 (1 in second place)
also either 3,1,5 or 3,2,4 (3 in first place)
also either 3,1,5 or 1,3,5 (5 in last place)

The option 3, 1, 5 is not possible because it rules out 3 other options viz. **(5,1,3) , (3,2,4), (1,3,5)**. Thus we are left with only two options for three candidates i.e. (3, 1, 5) & either (2, 3, 4) or (2, 4, 3).

The three candidates should have finished :

5	1	3
1	3	5
3	2	4

The candidate who finished with max. points finished :

4 5 2

Therefore, the candidate who had least points finished :

2 4 1

Q no. 10 – 11 :

10. Given series can be written as xc b cyc d. According to the given data, x and y are series of c. Hence, xc will be another series of c. Similarly, cyc will be another series of c. Now, the given series becomes : a series of c(except x), b , a series of c(except y), d. Of the given options, only zbyd could be the possible option.

11. Applying the same principle, given series can be written as : cc mn c r cz, i.e. a series of c, mn , a series of c , r , a series of c(except z). From the given options, (b) and (c) seem possible. But in option (c), note that, there is only one c at the end of the series, which is not possible. The reason is that, in our format the last group of letters is cz i.e. number of ‘c’s must be greater than 1. Thus, zmnxry is the possible representation.

Q no. 12 :

Observe that, in the given word “ FLOWER “, there are 2 vowels and 4 consonants, which is represented by ccccvv. Thus, it is clear that this code is not necessarily in the same order. In the next word “ GARDEN “, again there are 2 vowels and 4 consonants. Hence, the coded form must contain 2 “v”s and 4 “c”s, which is followed by ccvccv.

Q. no. 13 :

In the coded form, the digit 5 indicates no. of letters in the given word. The numerator 2 in the fraction denotes no. of vowels, while the denominator 3 denotes no. of consonants. Thus, the word coded as 6 – 2/4 has 6 letters, of which 2 are vowels and 4 are consonants. The word is PRIEST.

Q no. 14 -15 :

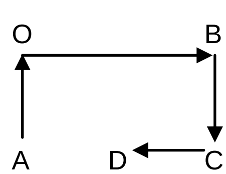
When a cube is split into 8 smaller cubes, the side of the smaller cubes would be half that of the larger cube. We also know that the opposite sides are of the same color. Thus, there are two opposite sides which are colored silver. This would mean that all **8 cubes** (4 on each side) will be colored silver. There are 8 cubes and 8 corners which means that each cube is colored on three sides. As each side has a different color, there are **8 cubes** which are colored differently on two sides.

10 (A)

Q. no. 11-13 :
The first multiplication is JE X B = JE. Thus, the digit B must be equal to 1. In the addition JE + JEA = BADE. Thus, E + A = E. Hence, A must be equal to 0. As the result of this addition is a 4-digit number, it must have resulted in a carry. We already know that B = 1. Thus, the digit J in JEA must be added to a carry to get a 2-digit number. The only digit which can satisfy this condition is 9. Hence, J = 9. One more clue we have is that, 9 + E = 10 + D. It can be observed that, for any value of E, D must be equal to E – 1. Thus, if E = 4, D = 3.

Q. no. 14 :
Number of circles drawn along one side is 10. This number will become 9 in the next row. This goes on till the number becomes 1 in the last row. Hence the total is 1+2+3+- - - -+ 10 = 55.

Q. no. 15 :
My journey can be represented in the following manner, where A is the starting point, D is the last point, while the position of Eiffel tower is represented by O. AO = 3 km. OB = 2 km. BC = 3 km. CD = 1 km. Thus, the point where I stop, is 2 km on the right hand side of my starting point.



10 (B)

Q no. 1 :
Let the business tycoon have x jackets. No of shirts = 2 x. No. of trousers = 2 x.
After a year, he discards (2 x / 3) shirts, (2 x / 4) trousers, (x / 5) shirts. Therefore, x has to be a multiple of 3, 5, & 2. Thus the min. value of x is 30.

Q no. 2 :
According to Peter....Peter's great-grandfather lived - x years
Paul's daughter's age = x / 6 Peter's wife's age = (x / 6) + 6
Paul's eldest son's age = b Paul's second wife = b + 8

According to Paul....
(b + 8) : (x / 6 + 6) = 8 : 7 $\Rightarrow$ 21 b + 24 = 4x
b = (x + 6) / 6 $\Rightarrow$ 6 b -x = 6
Solving the two equations, **x = 90**
Peter's great-grandfather would be **90 + 6 = 96** years old if he were to be alive today.

Q no. 3 :
You need to pick 3 beads. You will have either 2 red beads and one blue bead or 2 blue beads and one red bead.

Q no. 4 - 6 :

	Heap 1	Heap 2	Heap 3
Initially :	x	y	z
step 1 :	x - y	2 y	z
step 2 :	x - y	2 y - z	2 z
step 3 :	2 (x - y)	2 y - z	2 z - (x - y)

After step 3, all three heaps have equal no of pebbles. Thus we get three equations which need to be solved. We get..
x = (11 z) / 6 y = (7 z / 6) $\Rightarrow$ **x : y : z = 11 : 7 : 6**
minimum number of pebbles = 11 + 7 + 6 = 24

11 : 7 : 6 = 24 ← 4
44 : 28 : 24 = 96 ← If there are 96 pebbles in all, the first heap would have 44 pebbles.

11 : 7 : 6 ← 3
33 : 21 : ← 18 If the3 rd heap has 18 pebbles, the second heap has **21** pebbles.

Q no.7 - 9 :

If a person travels from P to 1, he will have the following options : P-1-3-Q, P-1-3-4-Q, P-1-3-5-Q, P-1-4-3-Q, P-1-4-Q, P-1-4-5-Q. i.e. 6 routes. He will have similar options from 2. Thus a man will have 12 routes. If he directly goes to 4 from P, he will have the following options : P-4-Q, P-4-3-Q, P-4-5-Q i.e. 3 routes. Thus he will have a total of 12 + 3 = **15 routes**.
There are 6 routes which involve the use of the link between 4 and 5which will be affected. Thus the number of routes available would be 15 - 6 = **9 routes**.
The number of routes from P to 2 and further are the same and the number of routes from P to 4 are also not affected. But the number of routes from P -1 and further are increased. We will have 6 new routes from P-1-2- further on (because this is the number of routes from 2). Thus, the total number of routes = 15 + 6 = **21routes**.

Q no. 10 - 15 :

Total number of participants = 16 i.e. three each from five states and one from Delhi. If they are ranked from 1, 2, ...,16, the sum of all ranks would be equal to { (16 x 17) / 2} = 136.

Let us assume that the participant from Delhi was positioned " d ".
Each state had the same total number of points (x).
$5x + d = 136 \quad \Rightarrow d = 1, 6, 11$ or 16

$d \neq 1$ or 16 as a participant from Maharashtra was before and after the one from Delhi.

If $d = 6$, $\quad \Rightarrow x = 26$
Two participants from Maharashtra have 5 & 7 as their positions. the third participant will have $\{26 - (5+7)\} = 14$. Thus the product of Maharashtra's score is $5 \times 7 \times 14 = 490$. But the product of Gujarat's score cannot be 490 as both multiples of 7 are scores of participants from Maharashtra.
$\therefore d \neq 6 \Rightarrow \quad d = 11 \quad \Rightarrow x = 25$

The two participants from Maharashtra are 10th and 12th. $\{25 - (10 + 12)\} = 3$.
The product is $10 \times 12 \times 3 = 360$. The only option valid for Gujarat is (b) i.e. **15, 4, 6**
The three teams from Punjab, West Bengal and Karnataka must have a participant in each of the following three groups

<u>1, 2, 5</u> **<u>7, 8, 9</u>** **<u>13, 14, 16</u>**

The sum of the scores is equal but the product of the scores is least for Punjab which means that Punjab has participants spread apart. As the product of scores is largest for West Bengal, its participants must have finished in positions which are close to one another.

$\therefore$ **Punjab** $\Rightarrow$ **1, 8, 16**
West Bengal $\Rightarrow$ **5, 7, 13**
Karnataka $\Rightarrow$ **2, 9, 14**