

PART - A
SECTION - I

16 marks

Section - I has 16 questions of 1 mark each, internal choice is provided in 5 questions.

1. Using factorisation, find the HCF of 36 and 54. **18**

OR

Write a rational number and an irrational number between 1 and 2. **0.5, $\sqrt{2}$** 1

2. Find the zeros of the polynomial $p(x) = x^2 - 7x + 6$ **1, 6** 1

3. Determine the discriminant of the quadratic equation $x^2 - 4x + 1 = 0$ **12** 1

4. Which term of the AP: 4, 9, 14, ... is 254? **51**

OR

Find the sum of the first 20 natural numbers. **210** 1

5. Find the centroid of ΔABC , where $A(-4, 6)$, $B(2, -2)$ and $C(2, 5)$ **0, 3** 1

6. A man goes 15 m due west and then 8 m due north. How far is he from the starting point? 1

7. Prove that $4 \tan^2 A - 4 \sec^2 A = -4$ **$\pm 17m$**

OR

If $\tan A = \frac{3}{4}$, find the value of $\sin A$. **$\frac{2}{3}$** 1

8. If the perimeter of a semi-circular protractor is 36 cm, find its diameter. **14 cm**

OR

The chord of a circle of radius 10 cm subtends a right angle at its centre. Find the length of the chord. 1

$10\sqrt{2}$

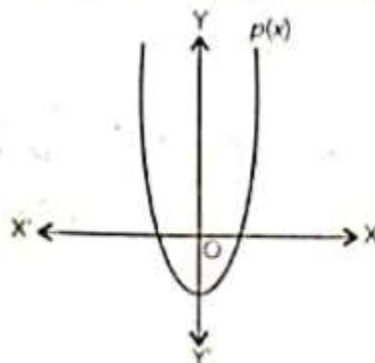
9. A box contains 20 balls bearing numbers 1, 2, 3, 4, ..., 20. A ball is drawn at random from the box. What is the probability that the number on the ball is divisible by 7? **$\frac{2}{20}$**

10. The mean of twenty observations is 15. If two observations 3 and 14 are replaced by 8 and 9 respectively, then what will be the new mean. **(9)**

OR

If the mean and mode of a discrete data is 6 and 9, find the median of the data. **7**

11. Write the number of zeros for a polynomial $p(x)$ whose graph is given in the figure.



2

12. Write a pair of lines which has the unique solution $x = -1, y = 3$ **$2 - y = -4$**

13. The quadratic equation $2x^2 + px + 3 = 0$ has two equal roots. Find the value of p . **$\pm 2\sqrt{6}$**

14. Construct a pair of tangents to a circle of radius 4 cm and from a point which is at a distance of 6 cm from its centre.
15. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle. **6 cm**
16. In a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, find the length OP. **25 cm**

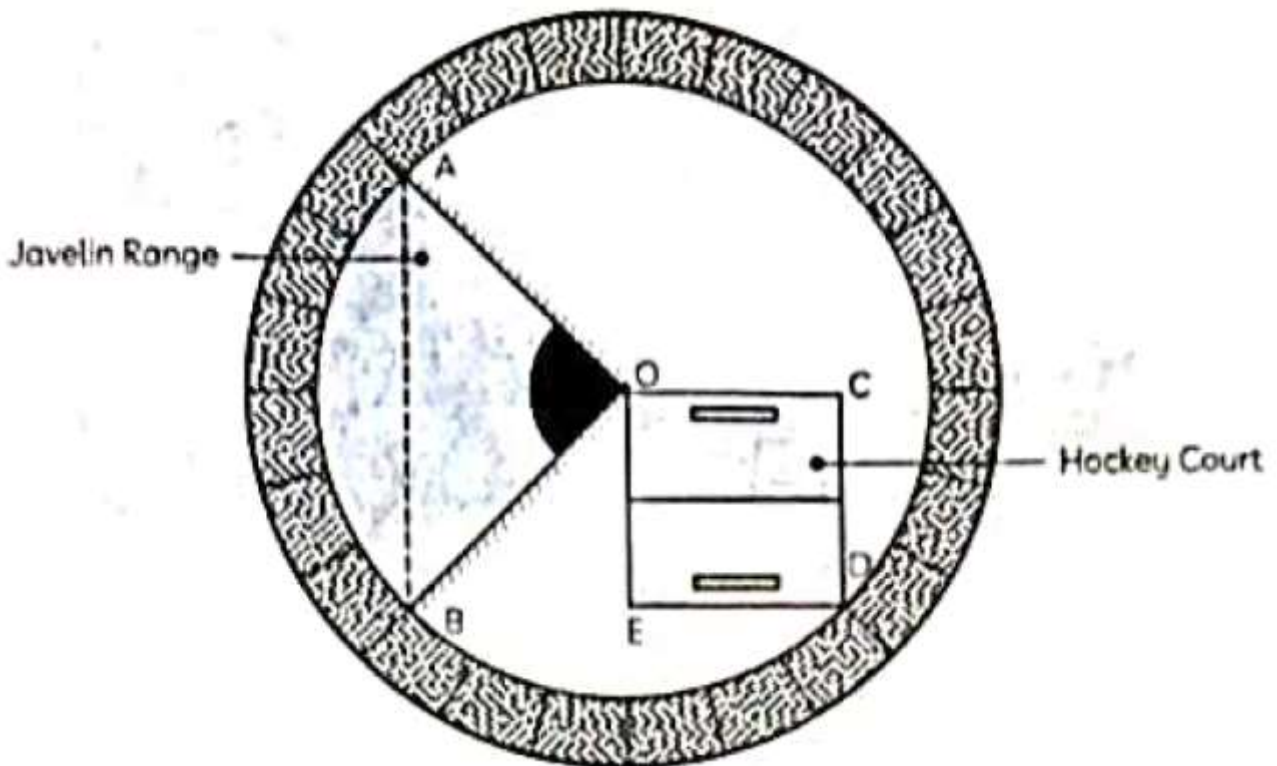
SECTION - II

16 marks

Section - II has case study based questions. All are compulsory. Attempt any four sub-parts of each question. Each subpart carries 1 mark.

17. Jawaharlal Nehru Stadium in New Delhi is conducting the annual sports competition soon. The curator of the stadium is tasked with preparing the grounds for various sports as per the technical requirements of sports invigilator.

The engineer assigned to assist the curator is tasked with figuring out the dimensions for carving out some areas allotted for a 'hockey court' and a 'javelin range', as shown in the figure below.



The shapes of the 'hockey court' and the 'javelin range' are square and triangle respectively. Both of the courts have a common edge that touches the centre of stadium. The construction of the javelin range is such that the angle to centre is 90° . The radius of the stadium is 200 metres.

On the basis of the above information, answer any four of the following questions:

- (A) The area (in sq m) allotted to 'javelin range' is
- | | | |
|------------|--------------|---|
| (a) 11,400 | (b) 20,000 ✓ | |
| (c) 31,400 | (d) 40,000 | 1 |
- (B) The area (in sq m) allotted to 'Hockey court' is
- | | | |
|------------|--------------|---|
| (a) 11,400 | (b) 20,000 ✓ | |
| (c) 31,400 | (d) 40,000 | 1 |

- (C) If the team of the curators managing the stadium, likes to allot space for some more sports, how much area (in sq m) is available to them?
 (a) 1,25,600 (b) 1,05,600
 (c) 85,600 (d) 58,600 1
- (D) If the boundaries of the hockey court and javelin range are to be fenced, then the total length (in m) of the fence required is
 (a) $100(2+3\sqrt{2})$ (b) $100(2+5\sqrt{2})$
 (d) $200(2+3\sqrt{2})$ 1
- (E) If the cost of fencing is ₹ 12 per metre, then the total cost of fencing is
 (a) ₹ 1200 $(2+3\sqrt{2})$ (b) ₹ 1200 $(2+5\sqrt{2})$
 (d) ₹ 2400 $(2+3\sqrt{2})$ 1

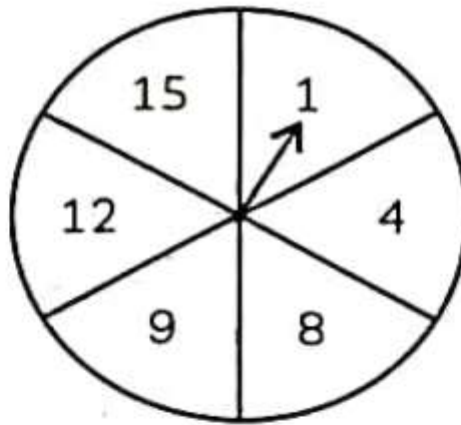
18. Due to ongoing COVID-19 crises, Surbhi Medical store has started stocking up and sell masks of decent quality as sourced from a disposable medical device manufacturer. The owner of Surbhi Medical store is selling two types of masks currently - A and B. The cost of one type A mask is ₹ 10 and of one type B mask is ₹ 12. In the month of April, 2020, the store sold 100 masks for total sales of ₹ 1082.

Due to great demand and short supply, the store has increased the price of each type by ₹ 1 from May 1, 2020. In the month of May, 2020, the store sold 250 masks for total sales of ₹ 2920.

On the basis of the above information, answer any four of the following questions:

- (A) How many masks of each type were sold in the month of April?
 (a) 46 masks of type A, and 54 masks of type B
 (b) 54 masks of type A, and 46 masks of type B
 (c) 41 masks of type A, and 59 masks of type B
 (d) 59 masks of type A, and 41 masks of type B
- (B) If the store had sold 50 masks of each type, what would be its sales in month of April?
 (a) ₹ 550 (b) ₹ 560
 (d) ₹ 1100
- (C) How many masks of each type were sold in the month of May?
 (a) 120 masks of type A, and 130 masks of type B
 (b) 130 masks of type A, and 120 masks of type B
 (c) 155 masks of type A, and 95 masks of type B
 (d) 165 masks of type A, and 85 masks of type B
- (D) If the store had sold 125 masks of each type, what would be its sale in month of May?
 (a) ₹ 3000 (b) ₹ 3052
 (c) ₹ 2941 (d) ₹ 2938
- (E) What percent of masks of each type sale was increased in the month of May, compared with the sale of month April?
 (b) 180% in type A and 110% in type B
 (a) 200% in type A ; and 100% in type B
 (c) 150% in type A and 120% in type B
 (d) 110% in type A and 180% in type B

19. A game at a stall in Diwali fare involves using a spinner first as a pre-cursor to complete the game with certain rules. If the spinner stops at a particular number, then the player is allowed to roll a 6- faced unbiased die.



Rules:

- (1) If the spinner stops at a particular number, then the player is allowed to roll a 6- faced unbiased dice.
- (2) If the spinner stops at any other number, you get to try again and only two tries allowed maximum.
- (3) If you reach the next stage and roll a dice, the shopkeeper will open a chit to disclose the number if it matches, the player gets a prize.

On the basis of the above information, answer any four of the following questions:

(A) What is the probability of getting an odd number on the spinner?

(a) $\frac{1}{4}$

(b) $\frac{1}{2}$ ✓

(1, 9, 15)

(c) $\frac{1}{8}$

(d) $\frac{1}{16}$

1

(B) If getting an even number on the spinner allows a player to roll the die, then the probability of his rolling the die is

(a) $\frac{1}{4}$

(b) $\frac{1}{2}$ ✓

(c) $\frac{1}{8}$

(d) $\frac{1}{16}$

1

(C) If the player is allowed to roll the die and getting a prime number entitles him to get prize, then the probability of his winning the prize is

(a) $\frac{1}{4}$

(b) $\frac{1}{2}$ ✓

2, 3, 5

(c) $\frac{1}{3}$

(d) $\frac{1}{6}$

1

(D) If getting a square number on the spinner allows a player to roll the die, then the probability of his rolling the die is

(a) $\frac{3}{4}$

(b) $\frac{1}{2}$ ✓

1, 4, 9

(c) $\frac{1}{3}$

(d) $\frac{2}{3}$

1

(E) If the player is allowed to roll the die and getting a number greater than 5 entitles him to get prize, then the probability of his winning the prize is

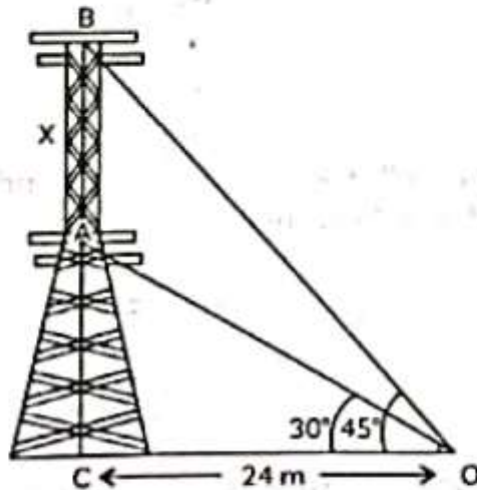
- (a) $\frac{3}{4}$ (b) $\frac{1}{6}$ ✓
 (c) $\frac{1}{3}$ (d) $\frac{2}{3}$

6

20. Radio towers are typically tall structures designed to support antennas for tele-communications and broadcasting, including television. There are 2 main types: guyed and self-supporting structures.

They are among the tallest human-made structures. Masts are often named after the broadcasting organizations that originally built them or currently use them.

On a similar concept, a radio - station tower was built in two sections A and B. From a point 24 m from the base of the tower, the angle of elevation of the top of section A is 30° and the angle of elevation of the top of section B is 45° .



On the basis of the above information, answer any four of the following questions:

- (A) The height of the section A is
 (a) 13.84 m ✓ (b) 14.6 m
 (c) 16.7 m (d) 34.6 m
- (B) The height of the section B is
 (a) 5.4 m (b) 3.3 m
 (c) 6.16 m (d) 10.16 m ✓
- (C) The height of the tower is
 (a) 17.9 m (b) 24 m ✓
 (c) 31.6 m (d) 20 m
- (D) The length of the wire structure from the point O to the top of section A is
 (a) 11.8 m (b) 14.6 m
 ✓(c) 27.7 m ✓ (d) 33.84 m
- (E) The length of the wire structure from the point O to the top of section B is
 (a) 11.8 m (b) 14.6 m
 (c) 27.7 m ✓(d) 33.84 m ✓

PART - B
SECTION - III

12 marks

Section - III, all questions are compulsory. In case of internal choice, attempt any one.

21. Two unbiased coins are tossed. Find the probability of getting: (A) two heads and (B) at least one head. 2

$\frac{1}{4}, \frac{3}{4}$

22. If α and β be the zeroes of the quadratic polynomial $p(x) = 2x^2 - kx + 7$ since that $\alpha^2 + \beta^2 = \frac{1}{2}$, $\alpha\beta = \frac{23}{2}$, find the value of k . 2

± 9

23. Usman asked her classmate Mamta to calculate the value of $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$.

Mamta calculated the value as shown below:

$$\begin{aligned} &\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ \\ &= \sin (60^\circ + 30^\circ) + \cos (60^\circ + 30^\circ) \\ &= \sin 90^\circ + \cos 90^\circ \\ &= 1 + 0 \text{ or } 1 \end{aligned}$$

(A) Examine if Mamta's calculation is correct or not. F

(B) If not, point out the inaccuracy and give the correct calculation. If yes, calculate if the answer will still be "1" if angles 60° and 30° given in the equation are replaced each with 45° . 2

24. Find a relationship between x and y such that the point (x, y) is equidistant from the points $(3, 6)$ and $(-3, 4)$.

$3x + y - 5 = 0$

OR

Show that the points $(4, 2)$, $(7, 5)$ and $(9, 7)$ are collinear. 2

25. If the circumference of a circle increases from 4π to 8π , then find the percentage increase in the area of the circle. 2

300%

26. If 0.3528 is expressed in the form $\frac{p}{2^m 5^n}$, find the smallest values of m , n and p . (1, 4, 44)

OR

Using prime factorisation, find the LCM of 150 and 210 . 2

1050

$\frac{441}{2^1 \times 5^4}$

SECTION - IV

21 marks

Section - IV, all questions are compulsory. In case of internal choice, attempt any one.

27. Prove that $\sqrt{2}$ is an irrational number. 3

28. Solve for x and y :

$3x + 2y = 11, 2x + 3y = 4$

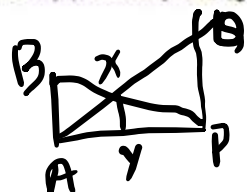
$5, -2$

29. Two poles of heights ' a ' metres and ' b ' metres are ' p ' metres apart. Prove that the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{ab}{(a+b)}$ metres. 3

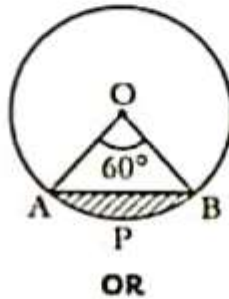
$\triangle PAB, \triangle PAQ$

OR

Draw a line segment of length 8 cm. Divide it into three equal parts. 3



30. If two adjacent vertices of a parallelogram are (3, 2) and (-1, 0) and the diagonals intersect at (2, -5), then find the coordinates of the other two vertices. **(1, -2), (5, -10)** 3
31. In a circle of radius 7 cm, a chord makes an angle of 60° at the centre of the circle. Find: (a) area of the circle (b) area of sector AOB (c) area of minor segment APB
(Take $\sqrt{3} = 1.73$)



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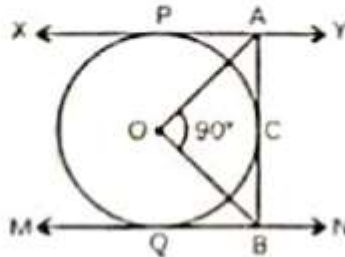
A solid wooden toy is in the shape of a right circular cone mounted on a hemi-sphere of radius 4.2 cm. The total height of the toy is 10.2 cm. Find the volume of the toy. 3

32. Find the mean and the mode from the following data:

30.375, 31 ⁹/₁₁

Age (in years)	0-10	10-20	20-30	30-40	40-50	50-60
Number of persons	6	11	21	23	14	5

33. In the figure, XY and MN are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and MN at B. Prove that $\angle AOB = 90^\circ$



SECTION - V

15 marks

Section - V, all questions are compulsory. In case of internal choice, attempt any one.

34. Find the zeroes of the polynomial $p(x) = 4x^2 - 7x + 3$ by factorising it and verify the relationship between the zeroes and coefficients of $p(x)$. 5
35. State and prove the Pythagoras Theorem. OR 5
- In a ΔABC , $\angle B$ is an acute-angle and $AD \perp BC$. Prove that:
(A) $AC^2 = AB^2 + BC^2 - 2 BC \times BD$ (B) $AB^2 + CD^2 = AC^2 + BD^2$ 5
36. Two pillars of equal height, stand on either side of a roadway which is 150 m wide. From a point on the roadway between the pillars, the elevations of the top of the pillars are 60° and 30° . Find the height of the pillars and the position of the point. [Use $\sqrt{3} = 1.73$] 5

$h = \frac{150\sqrt{3}}{4}$, 112.5