

MATHEMATICS

Set-I

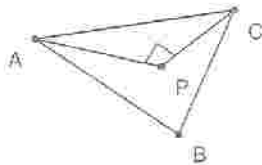
Time allowed: 3 Hours**Max marks:** 80**General Instructions:**

1. All questions are compulsory
2. The question paper consists of 30 questions divided in four sections
3. A,B,C,D. Section A comprises of 10 questions of 1 mark each, Section B comprises of 5 questions of 2 marks each, Section C comprises of 10 questions of 3 marks each, Section D comprises of 5 questions of 6 marks each
4. All questions of Section A are to be answered in one word, one sentence or as per exact requirement of the question.
5. There is no overall choice. However, internal choice has been provided in one question of 2 marks each, three questions of 3 marks each and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
6. In question on Construction, the drawing should be neat and exactly as per the given measurements.
7. Use of calculators not allowed.

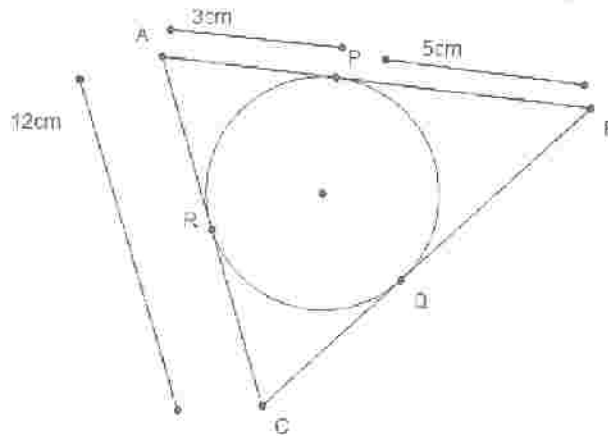
SECTION A

1. What can you say about the prime factorisation of the denominator of the rational number 52.3728 ? **1**
2. If α and β are zeros of the quadratic polynomial $x^2 - px + q$ then find the value of $\alpha^2 + \beta^2$. **1**
3. If $(x+a)$ is a factor of $2x^2 + 4x + 2ax + 10$ find a . **1**
4. Simplify $(1 + \tan^2 \theta) (1 - \sin \theta) (1 + \sin \theta)$ **1**
5. Find the 6th term from the end of the A.P. 17, 14, 11, ..., (-40) **1**
6. A cone and a sphere have equal radii and equal volume. What is the ratio of the diameter of the sphere to the height of the cone? **1**

7. In the given figure $AB = 12\text{cm}$, $BC = 13\text{cm}$, $AP = 3\text{cm}$, $\angle APC = 90^\circ$, $PC = 4\text{cm}$. Find $\angle BAC$. **1**



8. In the fig ΔABC is circumscribing a circle. Find the length of BC . **1**



9. Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on the dice is greater than 12. **1**
10. Which measure of central tendency is given by the x-coordinate of the point of intersection of the more than ogive and less than ogive? **1**

SECTION B

11. For what value of k will the system of linear equations have infinite number of solutions? $kx + 4y = k - 4$, $16x + ky = k$? **2**
12. If $(-1, 3)$, $(1, -1)$ and $(5, 1)$ are the vertices of a triangle, find the length of the median through the first vertex. **2**
13. Evaluate:
 $\cot 12^\circ \cot 60^\circ \cot 78^\circ + \sec(55^\circ - \theta) - \operatorname{cosec}(35^\circ + \theta) + \cos(40^\circ + \theta) - \sin(50^\circ - \theta)$. **2**

14. If the diagonals of a quadrilateral divide each other proportionally, prove that it is a trapezium. **2**

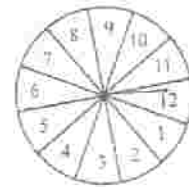
15. Five cards, ten, jack, queen, ace and king of hearts are taken out from a pack of 52 playing cards. One card is drawn from the remaining at random. What is the probability of getting (i) a face card (ii) jack or queen **2**

Or

A game of chance consists of spinning an arrow which is likely to come to rest pointing to one of the numbers, 1, 2, 3..., 12 as shown in the figure.

Find the probability that it will point to

- I. An odd number?
- II. A number which is multiple of 3?



SECTION C

16. Use Euclid's division Algorithm to show that the square of any positive integer is either of the form $3m$ or $3m+1$ for some integer m . **3**

Or

Prove that $5-\sqrt{2}$ is irrational

17. Find all the zeros of $2x^4 - 9x^3 + 5x^2 + 3x - 1$ if two of its zeros are $2+\sqrt{3}$ and $2-\sqrt{3}$. **3**

18. Solve graphically for x and y : $2x + 3y = 12$, $x - y = 1$. Shade the region between the two lines and x -axis. **3**

19. The sum of n terms of an A.P. is $5n^2 - 3n$, Find the A.P. Also find its tenth term. **3**

20. Find the value of $\sin 60^\circ$ geometrically. **3**

Or

Prove that $(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$

21. If $P(x, y)$ is any point on the line joining the points $A(a, 0)$ and $B(0, b)$

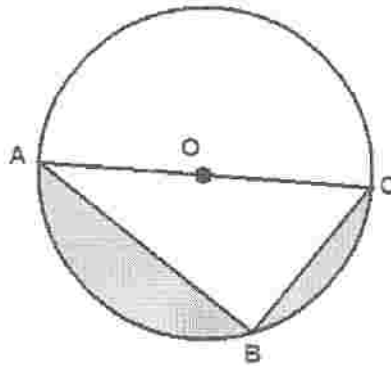
the show that: $\frac{x}{a} + \frac{y}{b} = 1$ **3**

22. Show that the points $A(1, 0)$, $B(5, 3)$, $C(2, 7)$ & $D(-2, 4)$ are vertices of a parallelogram. Also verify whether it is a rectangle. **3**

23. Construct a triangle ABC with $BC=7\text{cm}$, $\angle B=45^\circ$, $\angle A=105^\circ$. Also construct a triangle whose sides are $\frac{4}{3}$ times the corresponding sides of $\triangle ABC$. **3**

24. A parallelogram is drawn to circumscribe a circle. Prove that it is a rhombus. **3**

25. Find the area of shaded region, if $AB = 24\text{cm}$, $BC=7\text{cm}$ and O is the centre of the circle. **3**



Or

Water flows at the rate of $10\text{m}^3/\text{min}$ through a cylindrical pipe 5mm in diameter. How long would it take to fill a conical vessel whose diameter at the base is 40cm and depth 24cm .

SECTION D

26. A peacock is sitting on the top of a pillar which is 12m high. From a point 36m away from the bottom of the pillar a snake is coming to its hole which is at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught? **6**

Or

$$\text{Solve for } x \text{ and } y: \frac{148}{x} + \frac{231}{y} = \frac{527}{xy}, \therefore \frac{231}{x} + \frac{148}{y} = \frac{610}{xy}, x \neq 0, y \neq 0$$

27. A man is standing on the deck of a ship which is 8m above the water level observes the angle of elevation of the top of the hill as 60° and the angle of depression of the base of the hill as 30° . Calculate the distance of the hill from the ship and the height of the hill. **6**

Or

The angle of elevation of an aero plane from a point on the ground is 45° . After a flight of 15 seconds, the elevation changes to 30° . If the aero plane is flying at a height of 3000m, find the speed of the aero plane.

28. Prove that the ratio of areas of two similar triangles is equal to the ratio of square of their corresponding sides. Using the above theorem, find $\frac{AD}{PS}$, if $\triangle ABC$ and $\triangle PQR$ are isosceles triangles in which $\angle A = \angle P$,

$$AD \text{ and } PS \text{ are altitudes and } \frac{ar(\triangle ABC)}{ar(\triangle PQR)} = \frac{9}{16}. \quad \mathbf{6}$$

29. A tent consists of a frustum of a cone, surmounted by a cone. If the diameter of the upper and lower circular ends of the frustum is 14cm and 26cm respectively, the height of the frustum is 8 cm and the slant height of the surmounted conical portion is 12cm. Find the area of canvas required to make the tent. Assume that the radii of the upper circular end and the base of surmounted conical portion are equal. **6**

30. The following table gives daily income of 50 workers of a factory.

| | | | | | |
|--------------------|---------|---------|---------|---------|---------|
| Daily Income (Rs.) | 100-120 | 120-140 | 140-160 | 160-180 | 180-200 |
| Number of workers | 12 | 14 | 8 | 6 | 10 |

Find mean, mode and median for the above data.

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