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Candidates must write the Code on the title page of the answer-book.

- Please check that this question paper contains **9** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **40** questions.
- Please write down the Serial Number of the question before attempting it.
- 15 minutes time has been allotted to read this question paper.

MATHEMATICS

*Time Allowed : 3 Hours**Maximum Marks : 80*

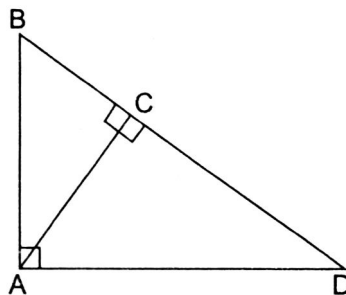
General Instructions :

- All the questions are compulsory.*
- The question paper consists of 40 questions divided into four sections–A, B, C and D.*
- Section–A comprises 20 questions of 1 mark each. Section–B comprises 6 questions of 2 marks each. Section–C comprises 8 questions of 3 marks each. Section–D comprises 6 questions of 4 marks each.*
- There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.*
- Use of **calculators** is not permitted.*

SECTION A

Q.1 – Q.10 are multiple choice questions. Select the most appropriate answer from the given options.

1. The perimeter of two similar triangles ABC and LMN are 60 cm and 48 cm respectively. If $ML = 8$ cm, then $AB =$
 - (a) 10 cm
 - (b) 8 cm
 - (c) 48 cm
 - (d) 60 cm
2. In figure, $PQ \parallel BC$ and $AP : PB = 1 : 2$, then $\frac{\text{ar}(\Delta APQ)}{\text{ar}(\Delta ABC)}$
 - (a) 1 : 3
 - (b) 1 : 2
 - (c) 1 : 9
 - (d) 1 : 4
3. If $173a + 197b = 149$ and $197a + 173b = 221$, then (a, b) is
 - (a) (3, - 2)
 - (b) (2, 1)
 - (c) (1, - 2)
 - (d) (2, - 1)
4. If α, β are the zeroes of the polynomial $f(x) = x^2 - x - 4$, then the value of $\alpha + \beta - \alpha\beta =$
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 5
5. A rectangular block $6 \text{ cm} \times 12 \text{ cm} \times 5 \text{ cm}$ is cut into exact number of equal cubes. The least possible number of cubes will be
 - (a) 1
 - (b) 4
 - (c) 3
 - (d) 2
6. In figure, ΔABD is a right-angled triangle, $\angle A = 90^\circ$ and $AC \perp BD$, then $AB^2 =$

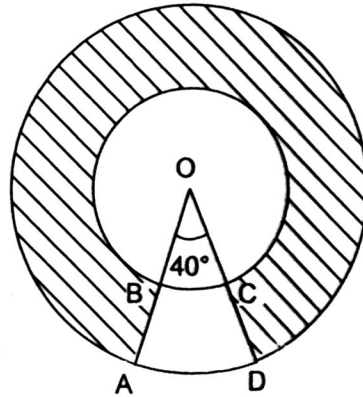


- (a) $BD \cdot BC$
- (b) $BC \cdot BD$
- (c) $AC \cdot BC$
- (d) $AC \cdot CD$

7. If $\sin(A + B) = 1$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, then $\tan A + \cot B =$

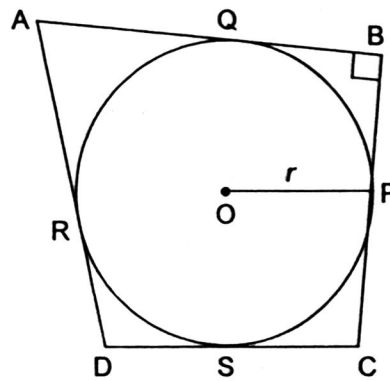
- (a) 60° (b) 30°
 (c) $2\sqrt{3}$ (d) $\sqrt{3}$

8. In figure, find area of shaded region, where $OB = 7$ cm and $OA = 14$ cm, and $\angle AOC = 40^\circ$



- (a) 410 cm^2 (b) 411 cm^2
 (c) 410.67 cm^2 (d) 400 cm^2

9. In the given figure, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^\circ$, if $AD = 23$ cm, $AB = 29$ cm and $DS = 5$ cm. The radius r of the circle is



- (a) 5 cm (b) 23 cm
 (c) 11 cm (d) 18 cm

10. A chord of a circle of radius 20 cm subtends an angle of 90° at the centre. The area of the corresponding major segment of the circle is (use $\pi = 3.14$).

- (a) 11.42 cm^2 (b) 11.42 m^2
 (c) 1142 cm^2 (d) 1140 cm^2

(Q.11 – Q.15) Fill in the blanks

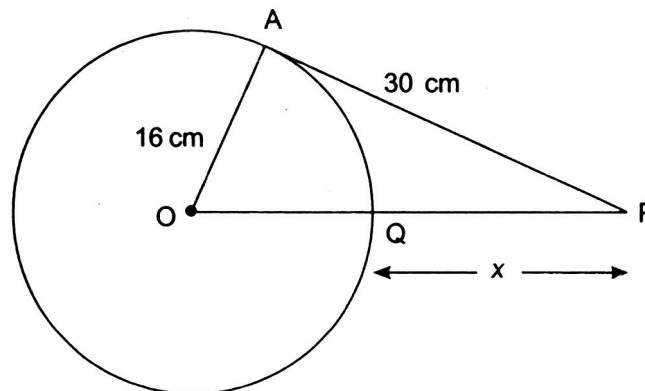
11. If $\sin^4\theta - \cos^4\theta = k^4$, then $\sin^2\theta - \cos^2\theta =$ _____
12. The equation $(x^2 + 1)^2 - x^2 = 0$ has _____ real root/roots.
13. A sequence $\{a_n\}$ is given by the formula $a_n = 10 - 3n$, is an AP, its common difference is _____.
14. $\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta) =$ _____.
15. The distance between the points $A(at_1^2, 2at_1)$ and $B(at_2^2, 2at_2)$ is _____.

OR

If $P(2, p)$ is the mid-point of the line segment joining the points $A(6, -5)$ and $B(-2, 11)$, then the value of p is _____.

(Q.16 – Q.20) Answer the following

16. In the given figure, AP is tangent to the circle with centre O. $OA = 16$, $AP = 30$, $QP = x$, find x .



17. If m and n are zeroes of the polynomial $ax^2 - 5x + c$, find the values of a and c , if $m + n = 10 = mn$.

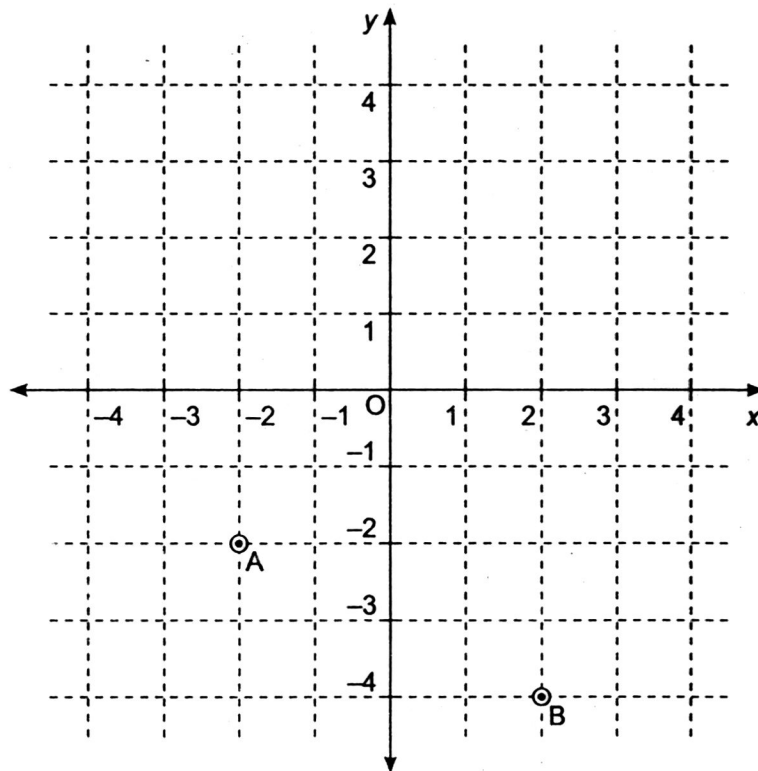
OR

If α, β are the zeroes of a polynomial, such that $\alpha + \beta = 6$ and $\alpha\beta = 4$, then write the polynomial.

18. Mean and mode of a given data is 21 each respectively. Find the median of the data.
19. An integer is chosen between 40 and 80. What is the probability that it is not divisible by 7?
20. Find the area of a circle circumscribing a square of side 6 cm.

SECTION B

21. Can the number 6^n , n being a natural number, end with the digit 5? Give reasons.
22. Is the term 344 belongs to the AP – 5, 2, 9 ...
23. Two friends start their journey from same place at same time. After some time their location is represented by points A and B on the coordinate axes as shown. If third friend start his journey from the same place and after sometime, its location point P, with respect to the points A and B is represented by the relation $AP = \frac{3}{7}AB$, then determine the coordinates of point P. (Assume that point A, P and B are on same straight line.)



24. A teacher writes two cubic identities on board

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

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

Which identities will be used to prove $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta = 1$? Explain.

25. For the following distribution, write the median class:

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

OR

Ramesh is a cricket player. He played 50 matches in a year. His data regarding runs scored is given below. Calculate his average score.

Score (runs)	0–20	20–40	40–60	60–80	80–100	100–120
Number of matches	5	11	13	7	8	6

26. Find the volume of the largest right circular cone that can be cut out of a cube whose edge is 18 cm.

OR

Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of the resulting cuboid.

SECTION C

27. What must be added to the polynomial $p(x) = 2x^3 + 9x^2 - 5x - 15$, so that the resulting polynomial is exactly divisible by $2x + 3$.

OR

Find all the zeroes of the polynomial $x^4 - 3x^3 + 6x - 4$, if two of its zeros are $\sqrt{2}$ and $-\sqrt{2}$.

28. If the roots of the equation $(a - b)x^2 + (b - c)x + (c - a) = 0$ are equal, show that c , a and b are in AP.

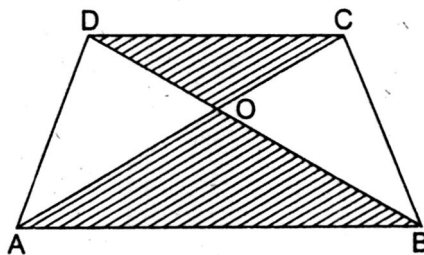
29. The first and the last terms of an AP are 4 and 81 respectively. If the common difference is 7, how many terms are there in the AP and what is their sum ?

OR

200 logs are placed in the following manner:

20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on. In how many rows 200 logs are placed and how many logs are in the second row from the top?

30. A farmer has a land in form of trapezium ABCD as shown. He cultivate the area shown by $\triangle AOB$ and $\triangle COD$. Here $AB \parallel DC$ and $2AB = 3DC$, find the ratio of areas of $\triangle AOB$ and $\triangle COD$.



31. Draw a line segment AB of length 8 cm. Draw circles of radii 4 cm and 3 cm with A and B as centres respectively. Construct tangents to each circle from the centre of the other circle.

32. The centre of a circle is $(2\alpha - 1, 7)$ and it passes through the point $(-3, -1)$. If the diameter of the circle is 20 units. Then find the value(s) of α .

OR

If point $(x + 2, 2y - 3)$ lies on the line joining the points $(1, -3)$ and $(-4, 2)$, write a linear relation between x and y .

33. Prove that $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{\cos \theta}{1 - \sin \theta}$

34. The accountant of a factory analysed the daily income of 50 workers of factory. He then represented the analysed data in the form of table as shown.

Daily income (in ₹)	100–120	120–140	140–160	160–180	180–200
Number of workers	12	14	8	6	10

Find the mode of the above data.

SECTION D

35. Show that $\sqrt{5} + \sqrt{3}$ is an irrational number, given that positive square root of 15 is an irrational number.

36. Solve for x and y .

$$\frac{xy}{x+y} = \frac{1}{5}, x+y \neq 0$$

$$\frac{xy}{x-y} = \frac{1}{7}, x-y \neq 0$$

OR

A fraction is such that if the numerator is multiplied by 3 and denominator is reduced by 3, we get $\frac{18}{11}$, but if the numerator is increased by 8 and denominator is doubled, we get $\frac{2}{5}$. Find the fraction.

37. Prove that if two triangles are similar, then their areas are proportional to the squares of the corresponding sides.

OR

If a line is drawn parallel to one side of a triangle intersecting the other two sides in different points, then it divides the two sides in the same ratio. Prove.

- 38.** A man is standing on the deck of a ship 8 m above the water level. He observes that the angle of elevation of the top of a hill is 60° and the angle of depression of the base of the hill is 30° . Calculate the distance of the hill from the ship and the height of the hill.
- 39.** A box has cards numbered 14 to 99. Cards are mixed thoroughly and a card is drawn from the bag at random. Find the probability that the number on the card, drawn from the box is
- (i) an odd number (ii) a perfect square (iii) a number divisible by 7.
- 40.** Water flows at the rate of 10 m per minute from a cylindrical pipe 5 mm in diameter. How long would it take to fill a conical vessel whose diameter at the surface is 40 cm and depth 24 cm?

OR

A spherical copper shell, external diameter of 18 cm is melted and recast into a solid cone of base radius 14 cm and height $4\frac{3}{7}$ cm. Find the inner diameter of the shell.