

SET~2

Q.P. Code 30/3/2

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

NOTE

- (I) Please check that this question paper contains **23** printed pages.
- (II) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- (III) Please check that this question paper contains **38** questions.
- (IV) **Please write down the Serial Number of the question in the answer-book at the given place before attempting it.**
- (V) 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

MATHEMATICS (STANDARD)

Time allowed : 3 hours

Maximum Marks : 80

General Instructions :

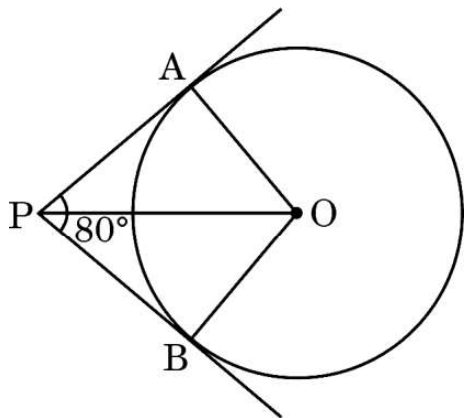
Read the following instructions very carefully and strictly follow them :

- (i) This question paper contains **38** questions. **All** questions are **compulsory**.
- (ii) This question paper is divided into **five** Sections – **A, B, C, D** and **E**.
- (iii) In **Section A**, Questions no. **1** to **18** are Multiple Choice Questions (MCQs) and questions number **19** and **20** are Assertion-Reason based questions of **1** mark each.
- (iv) In **Section B**, Questions no. **21** to **25** are Very Short Answer (VSA) type questions, carrying **2** marks each.
- (v) In **Section C**, Questions no. **26** to **31** are Short Answer (SA) type questions, carrying **3** marks each.
- (vi) In **Section D**, Questions no. **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.
- (vii) In **Section E**, Questions no. **36** to **38** are Case Study based questions carrying **4** marks each. Internal choice is provided in **2** marks questions in each case study.
- (viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
- (ix) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.
- (x) Use of calculator is **not** allowed.

SECTION A

This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each. $20 \times 1 = 20$

1. If tangents PA and PB drawn from an external point P to the circle with centre O are inclined to each other at an angle of 80° as shown in the given figure, then the measure of $\angle POA$ is :

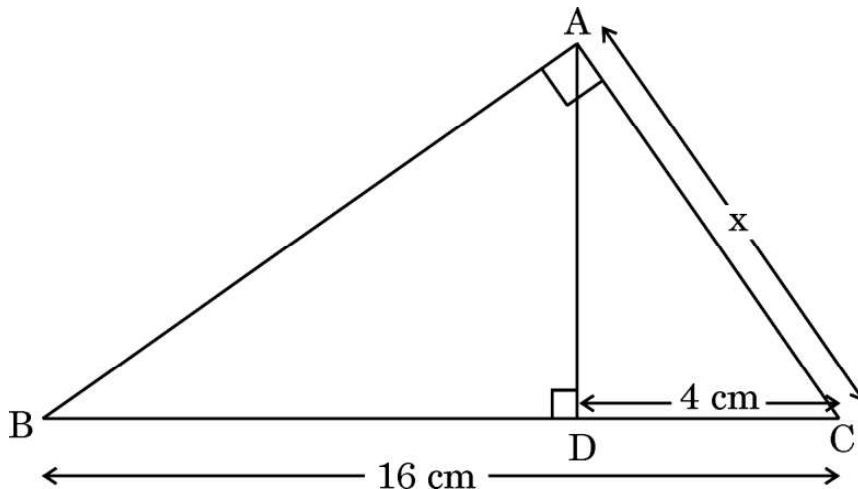


- (A) 40°
- (C) 60°

- (B) 50°
- (D) 80°

2. If the mean of 2, 9, $x+6$, $2x+3$, 5, 10, 5 is 7, then the value of x is :
(A) 9 (B) 6
(C) 5 (D) 3
3. If the volumes of two cubes are in the ratio 8 : 125, then the ratio of their surface areas is :
(A) 8 : 125
(B) 4 : 25
(C) 2 : 5
(D) 16 : 25
4. Two of the vertices of ΔPQR are $P(-1, 5)$ and $Q(5, 2)$. The coordinates of a point which divides PQ in the ratio 2 : 1 are :
(A) $(3, -3)$
(B) $(5, 5)$
(C) $(3, 3)$
(D) $(5, 1)$
5. If $\sin 4\theta = \frac{\sqrt{3}}{2}$, then $\frac{\theta}{3}$ equals :
(A) 60° (B) 20°
(C) 15° (D) 5°
6. Zeroes of the polynomial $p(y) = 7y^2 - \frac{11}{3}y - \frac{2}{3}$ are :
(A) $-\frac{2}{3}, -\frac{1}{7}$ (B) $-\frac{2}{7}, -\frac{1}{3}$
(C) $\frac{2}{3}, \frac{1}{7}$ (D) $\frac{2}{3}, -\frac{1}{7}$
7. A system of two linear equations in two variables is inconsistent, if the lines in the graph are :
(A) coincident (B) parallel
(C) intersecting at one point (D) intersecting at right angles

8. AOBC is a rectangle whose three vertices are A(0, 2), O(0, 0) and B(4, 0). The square of the length of its diagonal is equal to :
- (A) 36 (B) 20
(C) 16 (D) 4
9. If x is the LCM of 4, 6, 8 and y is the LCM of 3, 5, 7 and p is the LCM of x and y, then which of the following is true ?
- (A) $p = 35x$ (B) $p = 4y$
(C) $p = 8x$ (D) $p = 16y$
10. A die is thrown once. The probability of getting a number which is **not** a factor of 36, is :
- (A) $\frac{1}{2}$ (B) $\frac{2}{3}$
(C) $\frac{1}{6}$ (D) $\frac{5}{6}$
11. In the given figure, in $\triangle ABC$, $AD \perp BC$ and $\angle BAC = 90^\circ$. If $BC = 16$ cm and $DC = 4$ cm, then the value of x is :



- (A) 4 cm (B) 5 cm
(C) 8 cm (D) 3 cm
12. If α and β are the zeroes of the polynomial $p(x) = x^2 - ax - b$, then the value of $(\alpha + \beta + \alpha\beta)$ is equal to :
- (A) $a + b$
(B) $-a - b$
(C) $a - b$
(D) $-a + b$

13. $\frac{\cos \theta}{\sqrt{1 - \cos^2 \theta}}$ बराबर है :

(A) $\cot \theta$

(B) $\sqrt{\cos \theta}$

(C) $\frac{\cos \theta}{\sqrt{\sin \theta}}$

(D) $\tan \theta$

14. द्विघात समीकरण $bx^2 + ax + c = 0$; $b \neq 0$ का विविक्तकर है :

(A) $b^2 - 4ac$

(B) $\sqrt{b^2 - 4ac}$

(C) $\sqrt{a^2 - 4bc}$

(D) $a^2 - 4bc$

15. यदि बिंदुओं $(a, 4)$ तथा $(2, 2b)$ को मिलाने वाले रेखाखण्ड का मध्य-बिंदु $(2, 6)$ है, तो $(a + b)$ का मान है :

(A) 6

(B) 7

(C) 8

(D) 16

16. यदि 36 cm त्रिज्या वाले वृत्त के एक त्रिज्यखण्ड का क्षेत्रफल $54\pi \text{ cm}^2$ है, तो इस त्रिज्यखण्ड के संगत चाप की लंबाई है :

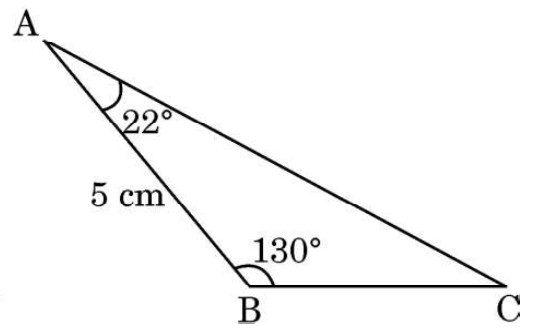
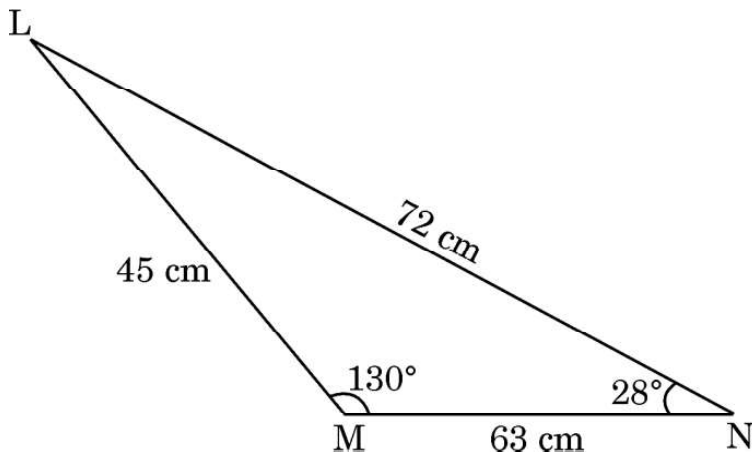
(A) $8\pi \text{ cm}$

(B) $6\pi \text{ cm}$

(C) $4\pi \text{ cm}$

(D) $3\pi \text{ cm}$

17. नीचे दी गई आकृति में दो त्रिभुजों LMN तथा ABC के माप दिए गए हैं। भुजा AC की लंबाई है :



(A) 16 cm

(B) 7 cm

(C) 8 cm

(D) 4 cm

13. $\frac{\cos \theta}{\sqrt{1 - \cos^2 \theta}}$ is equal to :

- (A) $\cot \theta$ (B) $\sqrt{\cos \theta}$
(C) $\frac{\cos \theta}{\sqrt{\sin \theta}}$ (D) $\tan \theta$

14. The discriminant of the quadratic equation $bx^2 + ax + c = 0$; $b \neq 0$ is given by :

- (A) $b^2 - 4ac$ (B) $\sqrt{b^2 - 4ac}$
(C) $\sqrt{a^2 - 4bc}$ (D) $a^2 - 4bc$

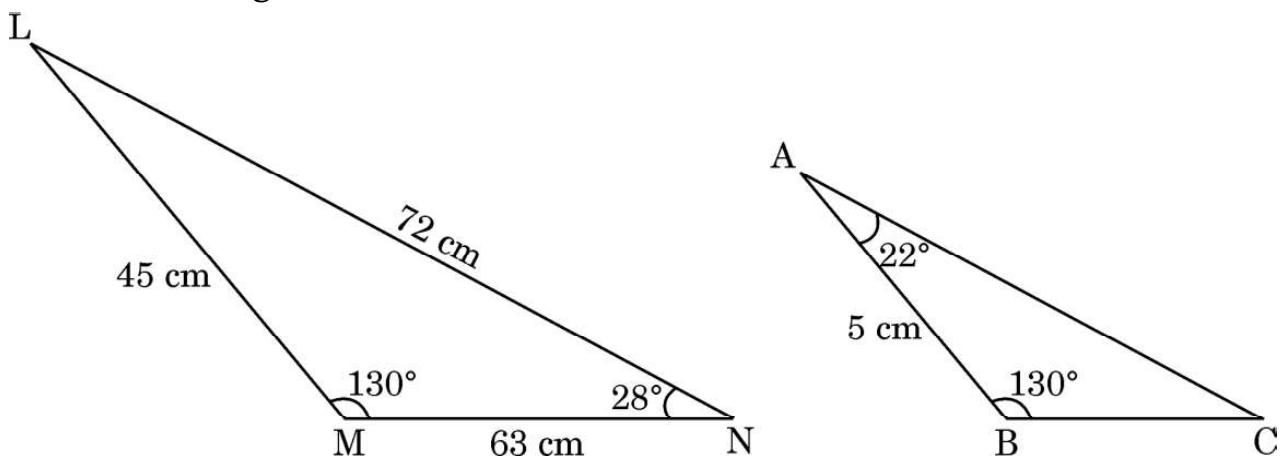
15. If the mid-point of the line segment joining the points $(a, 4)$ and $(2, 2b)$ is $(2, 6)$, then the value of $(a + b)$ is given by :

- (A) 6 (B) 7
(C) 8 (D) 16

16. If the area of a sector of circle of radius 36 cm is $54\pi \text{ cm}^2$, then the length of the corresponding arc of the sector is :

- (A) $8\pi \text{ cm}$ (B) $6\pi \text{ cm}$
(C) $4\pi \text{ cm}$ (D) $3\pi \text{ cm}$

17. The measurements of $\triangle LMN$ and $\triangle ABC$ are shown in the figure given below. The length of side AC is :



- (A) 16 cm (B) 7 cm
(C) 8 cm (D) 4 cm

18. If in two triangles $\triangle DEF$ and $\triangle PQR$, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is **not** true ?

(A) $\frac{DE}{QR} = \frac{DF}{PQ}$	(B) $\frac{EF}{PR} = \frac{DF}{PQ}$
(C) $\frac{EF}{RP} = \frac{DE}{QR}$	(D) $\frac{DE}{PQ} = \frac{EF}{RP}$

Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).
- (C) Assertion (A) is true, but Reason (R) is false.
- (D) Assertion (A) is false, but Reason (R) is true.
19. *Assertion (A)* : If two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre of the circle.
- Reason (R)*: A parallelogram circumscribing a circle is a rhombus.
20. *Assertion (A)* : A ladder leaning against a wall, stands at a horizontal distance of 6 m from the wall. If the height of the wall up to which the ladder reaches is 8 m, then the length of the ladder is 10 m.
- Reason (R)*: The ladder makes an angle of 60° with the ground.

SECTION B

This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each. 5×2=10

21. (a) If the sum of the zeroes of the polynomial $p(x) = (p + 1)x^2 + (2p + 3)x + (3p + 4)$ is -1 , then find the value of 'p'.

OR

- (b) If α and β are zeroes of the polynomial $p(x) = x^2 - 2x - 1$, then find the value of $\frac{1}{2\alpha} + \frac{1}{2\beta} + 3\alpha\beta$.
22. Prove that the tangents drawn at the ends of a diameter of a circle are parallel.
23. (a) Find the smallest number which is divisible by both 644 and 462.
- OR**
- (b) Two numbers are in the ratio 4 : 5 and their HCF is 11. Find the LCM of these numbers.
24. If $4k = \tan^2 60^\circ - 2 \operatorname{cosec}^2 30^\circ - 2 \tan^2 30^\circ$, then find the value of k.
25. The probability of guessing the correct answer of a certain test question is $\frac{x}{12}$. If the probability of not guessing the correct answer is $\frac{5}{6}$, then find the value of x.

SECTION C

This section has 6 Short Answer (SA) type questions carrying 3 marks each. 6×3=18

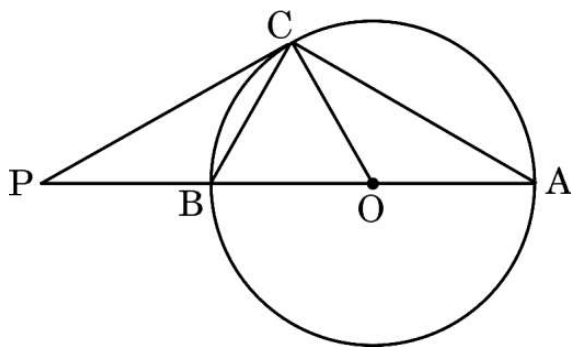
26. Prove that $\left(4\sqrt{2} + \frac{5}{3}\right)$ is an irrational number given that $\sqrt{2}$ is an irrational number.

27. If 65% of the population has black eyes, 25% have brown eyes and the remaining have blue eyes, what is the probability that a person selected at random has :

- (a) blue eyes ?
- (b) brown or black eyes ?

28. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding minor segment.
[Use $\pi = 3.14$]

29. In the given figure, PC is a tangent to the circle at C. AOB is the diameter which when extended meets the tangent at P. Find $\angle CBA$ and $\angle BCO$, if $\angle PCA = 110^\circ$.



30. (a) Prove that : $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$

OR

(b) Prove that : $\left(\frac{1}{\cos A} - \cos A \right) \left(\frac{1}{\sin A} - \sin A \right) = \frac{1}{\tan A + \cot A}$

31. (a) If the mid-point of the line segment joining the points A(3, 4) and B(k, 6) is P(x, y) and $x + y - 10 = 0$, find the value of k.

OR

(b) Find the coordinates of the points which divide the line segment joining A(-2, 2) and B(2, 8) into four equal parts.

SECTION D

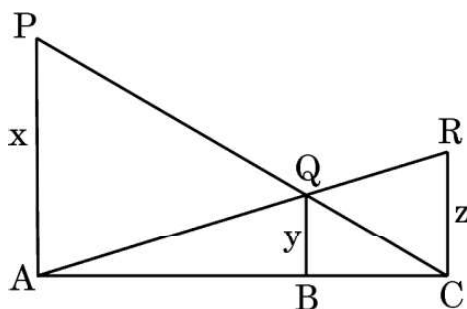
This section has 4 Long Answer (LA) type questions carrying 5 marks each. $4 \times 5 = 20$

32. (a) An AP consists of 'n' terms whose n^{th} term is 4 and the common difference is 2. If the sum of 'n' terms of AP is -14 , then find 'n'. Also, find the sum of the first 20 terms.

OR

- (b) The sum of the first six terms of an arithmetic progression is 42. The ratio of the 10^{th} term to the 30^{th} term is 1 : 3. Calculate the first and the thirteenth terms of the AP.
33. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm, are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.
34. A man lent a part of his money at 10% p.a. and the rest at 15% p.a. His income at the end of the year is ₹ 1,900. If he had interchanged the rate of interest on the two sums, he would have earned ₹ 200 more. Find the amount lent in both cases.

35. (a) In the given figure, PA, QB and RC are perpendicular to AC. If $PA = x$ units, $QB = y$ units and $RC = z$ units, prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$.



OR

- (b) Sides AB and BC and median AD of triangle ABC are respectively proportional to sides PQ and QR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$.

SECTION E

This section has 3 Case Study based questions carrying 4 marks each.

3×4=12

Case Study – 1

36. The India Meteorological Department observes seasonal and annual rainfall every year in different sub-divisions of our country. It helps them to compare and analyse the results.



The table below shows sub-divisions wise seasonal (monsoon) rainfall (in mm) in 2023.

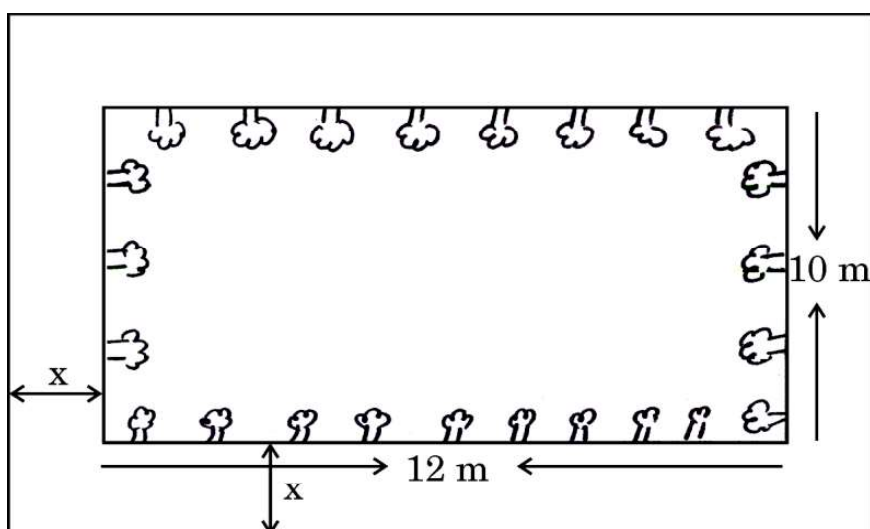
<i>Rainfall (mm)</i>	<i>No. of Sub-divisions</i>
200 – 400	3
400 – 600	4
600 – 800	7
800 – 1000	4
1000 – 1200	3
1200 – 1400	3

Based on the information given above, answer the following questions :

- (i) Write the modal class. 1
- (ii) (a) Find the median of the given data. 2
- OR**
- (b) Find the mean rainfall in the season. 2
- (iii) If a sub-division having at least 800 mm rainfall during monsoon season is considered a good rainfall sub-division, then how many sub-divisions had good rainfall ? 1

Case Study – 2

37. A garden designer is planning a rectangular lawn that is to be surrounded by a uniform walkway.



The total area of the lawn and the walkway is 360 square metres. The width of the walkway is same on all sides. The dimensions of the lawn itself are 12 metres by 10 metres.

Based on the information given above, answer the following questions :

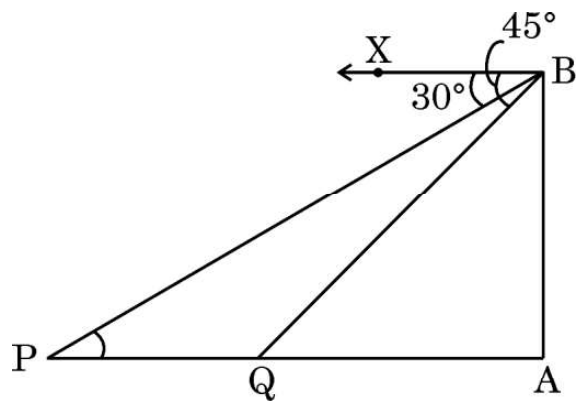
- (i) Formulate the quadratic equation representing the total area of the lawn and the walkway, taking width of walkway = x m. 1
- (ii) (a) Solve the quadratic equation to find the width of the walkway ' x '. 2

OR

- (b) If the cost of paving the walkway at the rate of ₹ 50 per square metre is ₹ 12,000, calculate the area of the walkway. 2
- (iii) Find the perimeter of the lawn. 1

Case Study – 3

38. A lighthouse stands tall on a cliff by the sea, watching over ships that pass by. One day a ship is seen approaching the shore and from the top of the lighthouse, the angles of depression of the ship are observed to be 30° and 45° as it moves from point P to point Q. The height of the lighthouse is 50 metres.



Based on the information given above, answer the following questions :

- (i) Find the distance of the ship from the base of the lighthouse when it is at point Q, where the angle of depression is 45° . 1
- (ii) Find the measures of $\angle PBA$ and $\angle QBA$. 1
- (iii) (a) Find the distance travelled by the ship between points P and Q. 2

OR

- (b) If the ship continues moving towards the shore and takes 10 minutes to travel from Q to A, calculate the speed of the ship in km/h, from Q to A. 2