

SET~2

प्रश्न-पत्र कोड
Q.P. Code **30/1/2**

NOTE

- (I) Please check that this question paper contains **27** 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

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General Instructions :

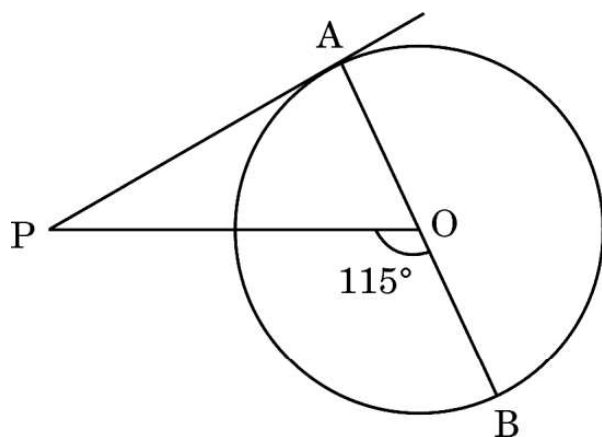
Read the following instructions very carefully and strictly follow them :

- (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. $20 \times 1 = 20$

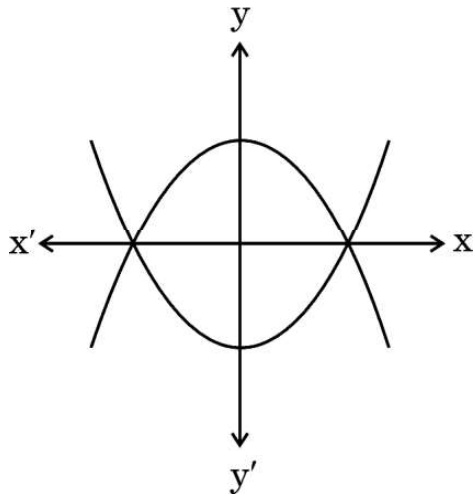
1. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 115^\circ$, then $\angle APO$ is equal to :



- | | |
|----------------|----------------|
| (A) 25° | (B) 65° |
| (C) 90° | (D) 35° |

2. A piece of wire 20 cm long is bent into the form of an arc of a circle of radius $\frac{60}{\pi}$ cm. The angle subtended by the arc at the centre of the circle is :
- (A) 30°
(B) 60°
(C) 90°
(D) 50°
3. Three numbers in AP have the sum 30. What is its middle term ?
- (A) 4
(B) 10
(C) 16
(D) 8
4. An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm². Its radius is :
- (A) 10 cm
(B) 1 cm
(C) 5 cm
(D) 8 cm
5. If $x = 1$ and $y = 2$ is a solution of the pair of linear equations $2x - 3y + a = 0$ and $2x + 3y - b = 0$, then :
- (A) $a = 2b$
(B) $2a = b$
(C) $a + 2b = 0$
(D) $2a + b = 0$

6. Two polynomials are shown in the graph below. The number of distinct zeroes of both the polynomials is :



- (A) 3 (B) 5
(C) 2 (D) 4
7. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then $\cos^2 \alpha + \sin^2 \beta$ is equal to :
- (A) 0
(B) $\frac{1}{2}$
(C) 1
(D) 2
8. A card is selected at random from a deck of 52 playing cards. The probability of it being a red face card is :
- (A) $\frac{3}{13}$
(B) $\frac{2}{13}$
(C) $\frac{1}{2}$
(D) $\frac{3}{26}$

9. If α and β are the zeroes of polynomial $3x^2 + 6x + k$ such that $\alpha + \beta + \alpha\beta = -\frac{2}{3}$, then the value of k is :
- (A) -8
(B) 8
(C) -4
(D) 4
10. The value of $\tan^2 \theta - \left(\frac{1}{\cos \theta} \times \sec \theta \right)$ is :
- (A) 1
(B) 0
(C) -1
(D) 2
11. Which of the following is a rational number between $\sqrt{3}$ and $\sqrt{5}$?
- (A) $1.4142387954012 \dots$
(B) $2.32\overline{6}$
(C) π
(D) 1.857142
12. If $\text{HCF}(98, 28) = m$ and $\text{LCM}(98, 28) = n$, then the value of $n - 7m$ is :
- (A) 0
(B) 28
(C) 98
(D) 198
13. If the length of a chord of a circle is equal to its radius, then the angle subtended by chord at the centre is :
- (A) 60°
(B) 30°
(C) 120°
(D) 90°

14. The greatest number which divides 70 and 125, leaving remainders 5 and 8 respectively, is :
- (A) 13
 - (B) 65
 - (C) 875
 - (D) 1750
15. A ladder 14 m long leans against a wall. If the foot of the ladder is 7 m from the wall, then the angle of elevation of the top of the wall is :
- (A) 15°
 - (B) 30°
 - (C) 45°
 - (D) 60°
16. In triangles ABC and DEF, $\angle B = \angle E$, $\angle F = \angle C$ and $AB = 3 DE$. Then, the two triangles are :
- (A) congruent but not similar
 - (B) congruent as well as similar
 - (C) neither congruent nor similar
 - (D) similar but not congruent
17. The mid-point of the line segment joining the points P(- 4, 5) and Q(4, 6) lies on :
- (A) x-axis
 - (B) y-axis
 - (C) origin
 - (D) neither x-axis nor y-axis

18. Mode and Mean of a data are $15x$ and $18x$, respectively. Then the median of the data is :
- (A) x
 - (B) $11x$
 - (C) $17x$
 - (D) $34x$

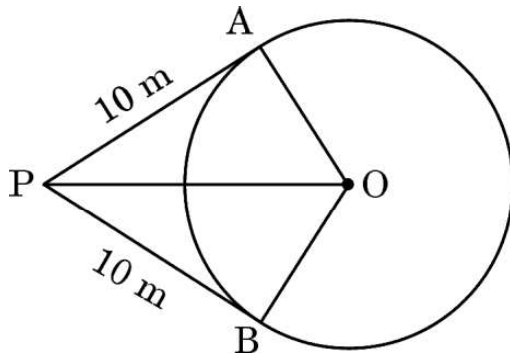
Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (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 we join two hemispheres of same radius along their bases, then we get a sphere.
- Reason (R)*: Total Surface Area of a sphere of radius r is $3\pi r^2$.
20. *Assertion (A)* : The probability of selecting a number at random from the numbers 1 to 20 is 1.
- Reason (R)*: For any event E , if $P(E) = 1$, then E is called a sure event.

SECTION B

This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each. $5 \times 2 = 10$

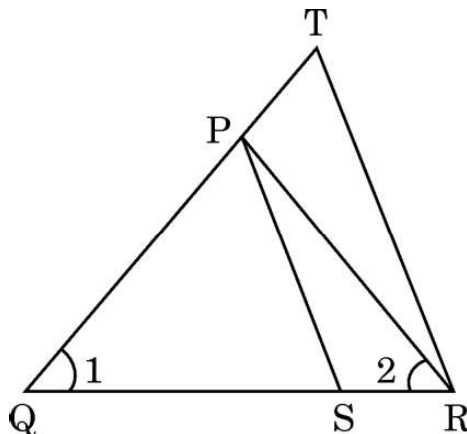
- 21.** If the zeroes of the polynomial $x^2 + ax + b$ are in the ratio 3 : 4, then prove that $12a^2 = 49b$.
- 22.** A person is standing at P outside a circular ground at a distance of 26 m from the centre of the ground. He found that his distances from the points A and B on the ground are 10 m (PA and PB are tangents to the circle). Find the radius of the circular ground.



- 23.** (a) If $\Delta ABC \sim \Delta PQR$ in which $AB = 6$ cm, $BC = 4$ cm, $AC = 8$ cm and $PR = 6$ cm, then find the length of $(PQ + QR)$.

OR

- (b) In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$, show that $\Delta PQS \sim \Delta TQR$.



24. (a) If $x \cos 60^\circ + y \cos 0^\circ + \sin 30^\circ - \cot 45^\circ = 5$, then find the value of $x + 2y$.

OR

(b) Evaluate : $\frac{\tan^2 60^\circ}{\sin^2 60^\circ + \cos^2 30^\circ}$

25. The coordinates of the centre of a circle are $(2a, a - 7)$. Find the value(s) of 'a' if the circle passes through the point $(11, -9)$ and has diameter $10\sqrt{2}$ units.

SECTION C

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

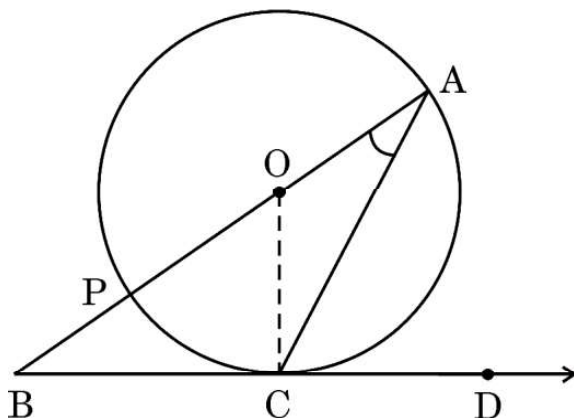
26. If the radii of the bases of a cylinder and a cone are in the ratio 3 : 4 and their heights are in the ratio 2 : 3, find the ratio of their volumes.
27. Three sets of Physics, Chemistry and Mathematics books have to be stacked in such a way that all the books are stored subject-wise and the height of each stack is the same. The number of Physics books is 144, the number of Chemistry books is 180 and the number of Mathematics books is 192. Assuming that the books are of same thickness, determine the number of stacks of Physics, Chemistry and Mathematics books.
28. Two dice are thrown at the same time. Determine the probability that the difference of the numbers on the two dice is 2.

29. (a) Prove that : $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$

OR

(b) Prove that : $\frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{2 \sin^2 A - 1}$

30. (a) In the given figure, O is the centre of the circle and BCD is tangent to it at C. Prove that $\angle BAC + \angle ACD = 90^\circ$.



OR

- (b) Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.
31. Find the ratio in which the y-axis divides the line segment joining the points $(5, -6)$ and $(-1, -4)$. Also find the point of intersection.

SECTION D

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

32. (a) The diagonal BD of a parallelogram ABCD intersects the line segment AE at the point F, where E is any point on the side BC. Prove that $DF \times EF = FB \times FA$.

OR

- (b) In $\triangle ABC$, if $AD \perp BC$ and $AD^2 = BD \times DC$, then prove that $\angle BAC = 90^\circ$.

- 33.** The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the mean and mode of the data :

<i>Monthly Consumption (in units)</i>	<i>Number of Consumers</i>
65 – 85	4
85 – 105	5
105 – 125	13
125 – 145	20
145 – 165	14
165 – 185	8
185 – 205	4

- 34.** Vijay invested certain amounts of money in two schemes A and B, which offer interest at the rate of 8% per annum and 9% per annum, respectively. He received ₹ 1,860 as the total annual interest. However, had he interchanged the amounts of investments in the two schemes, he would have received ₹ 20 more as annual interest. How much money did he invest in each scheme ?
- 35.** (a) A two-digit number is such that the product of its digits is 12. When 36 is added to this number, the digits interchange their places. Find the number.

OR

- (b) A student scored a total of 32 marks in class tests in Mathematics and Science. Had he scored 2 marks less in Science and 4 marks more in Mathematics, the product of his marks would have been 253. Find his marks in the two subjects.

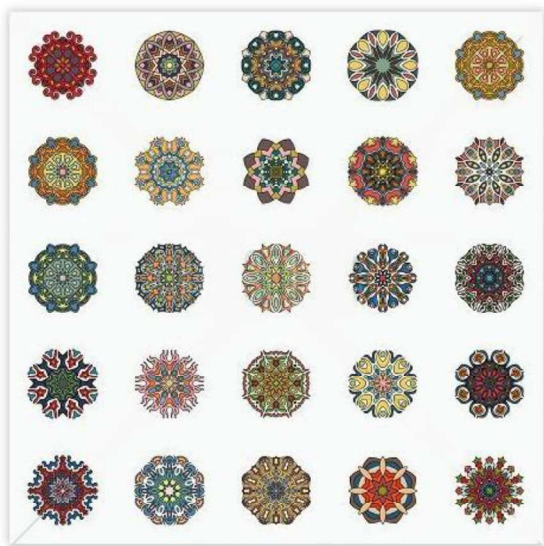
SECTION E

This section has 3 case study based questions carrying 4 marks each.

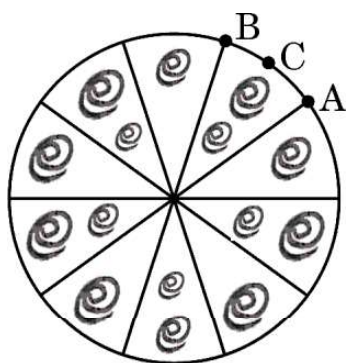
3×4=12

Case Study – 1

36. A brooch is a decorative piece often worn on clothing like jackets, blouses or dresses to add elegance. Made from precious metals and decorated with gemstones, brooches come in many shapes and designs.



One such brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the figure.



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

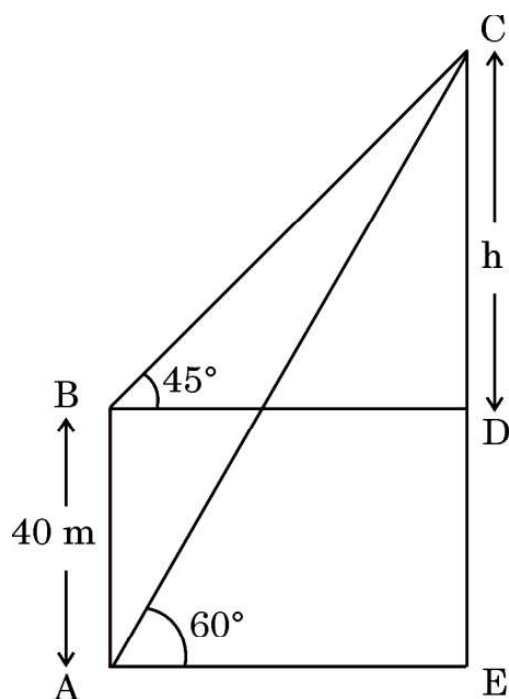
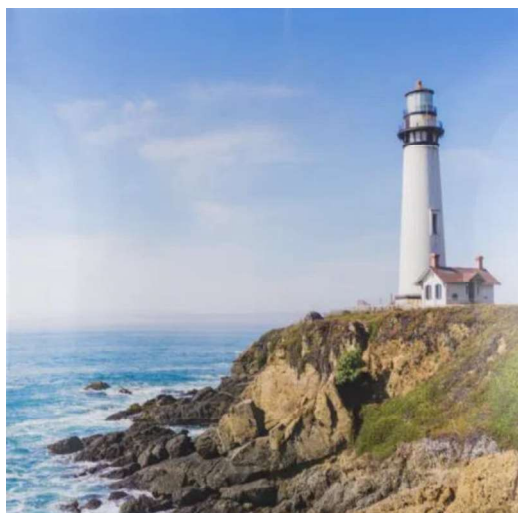
- | | | |
|-------|---|---|
| (i) | Find the central angle of each sector. | 1 |
| (ii) | Find the length of the arc ACB. | 1 |
| (iii) | (a) Find the area of each sector of the brooch. | 2 |

OR

- | | | |
|-------|--|---|
| (iii) | (b) Find the total length of the silver wire used. | 2 |
|-------|--|---|

Case Study – 2

37. Amrita stood near the base of a lighthouse, gazing up at its towering height. She measured the angle of elevation to the top and found it to be 60° . Then, she climbed a nearby observation deck, 40 metres higher than her original position and noticed the angle of elevation to the top of lighthouse to be 45° .



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

- | | | |
|-----------|---|---|
| (i) | If CD is h metres, find the distance BD in terms of ' h '. | 1 |
| (ii) | Find distance BC in terms of ' h '. | 1 |
| (iii) | (a) Find the height CE of the lighthouse [Use $\sqrt{3} = 1.73$] | 2 |
| OR | | |
| (iii) | (b) Find distance AE, if AC = 100 m. | 2 |

Case Study – 3

38. A school is organizing a charity run to raise funds for a local hospital. The run is planned as a series of rounds around a track, with each round being 300 metres. To make the event more challenging and engaging, the organizers decide to increase the distance of each subsequent round by 50 metres. For example, the second round will be 350 metres, the third round will be 400 metres and so on. The total number of rounds planned is 10.



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

- (i) Write the fourth, fifth and sixth term of the Arithmetic Progression so formed. 1
- (ii) Determine the distance of the 8th round. 1
- (iii) (a) Find the total distance run after completing all 10 rounds. 2

OR

- (iii) (b) If a runner completes only the first 6 rounds, what is the total distance run by the runner ? 2