

SET~3

प्रश्न-पत्र कोड
Q.P. Code **30/2/3**

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

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

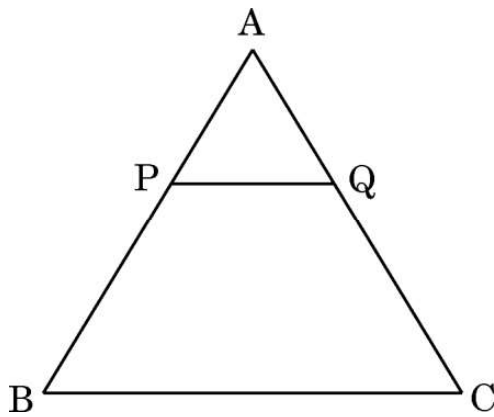
*This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each.*

20×1=20

- 1. If for any event E, $P(E) + P(\bar{E}) = q$, then the value of $q^2 - 3$ is :
 - (A) 0
 - (B) -2
 - (C) 2
 - (D) 1
- 2. If $\sin \theta = \cos \theta$ ($0^\circ < \theta < 90^\circ$), then the value of $\sec \theta \cdot \sin \theta$ is :
 - (A) $\frac{1}{\sqrt{2}}$
 - (B) $\sqrt{2}$
 - (C) 0
 - (D) 1

3. If an arc of a circle of diameter 10 cm subtends an angle of 144° at the centre of the circle, then the length of the arc is :
- (A) 2π cm (B) 4π cm
(C) 5π cm (D) 6π cm
4. If $a^b = 32$, where 'a' and 'b' are positive integers, then the value of b^{ab} is :
- (A) 72 (B) 5^{10}
(C) 2^{10} (D) 5^{12}
5. If one zero of the polynomial $q(x) = (p^2 + 4)x^2 + 65x + 4p$ is reciprocal of the other, then the value of 'p' is :
- (A) -1 (B) 1
(C) -2 (D) 2
6. The equation of a line parallel to y-axis and at a distance of 5 units to the right of y-axis is :
- (A) $x = 5$ (B) $x = -5$
(C) $y = 5$ (D) $y = -5$
7. The sum of the exponents of prime factors in the prime factorisation of 4004 is :
- (A) 5
(B) 4
(C) 3
(D) 2

- 8.** The probability of drawing an even prime number out of numbers from 1 to 30 is :
- (A) $\frac{1}{30}$
- (B) $\frac{4}{15}$
- (C) $\frac{7}{30}$
- (D) 0
- 9.** In the given figure, $PQ \parallel BC$. If $\frac{AP}{PB} = \frac{4}{13}$ and $AC = 20.4$ cm, then the length of AQ is :



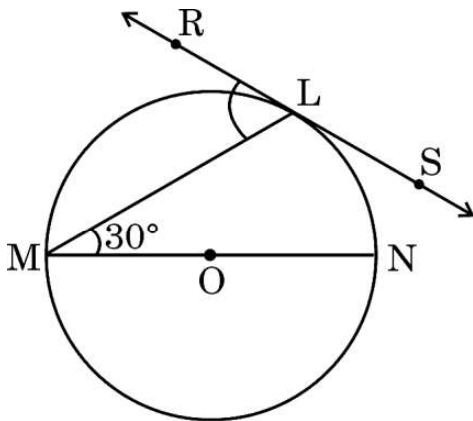
- (A) 2.8 cm (B) 5.8 cm
(C) 3.8 cm (D) 4.8 cm
10. The line represented by the equation $x - y = 0$ is :
- (A) parallel to x-axis
(B) parallel to y-axis
(C) passing through the origin
(D) passing through the point (3, 2)
11. The points $(-5, 0)$, $(5, 0)$ and $(0, 4)$ are the vertices of a triangle which is a/an :
- (A) right-angled triangle
(B) isosceles triangle
(C) equilateral triangle
(D) scalene triangle

12. The 10th term of the AP

$5, \frac{19}{4}, \frac{9}{2}, \frac{17}{4}, \dots$ is :

- (A) $\frac{11}{4}$
- (B) $\frac{4}{11}$
- (C) $\frac{13}{4}$
- (D) $\frac{4}{13}$

13. In the given figure, RS is the tangent to the circle at the point L and MN is the diameter. If $\angle NML = 30^\circ$, then $\angle RLM$ is :



- | | |
|----------------|-----------------|
| (A) 30° | (B) 60° |
| (C) 90° | (D) 120° |

14. The coordinates of the end points of a diameter of a circle are $(5, -2)$ and $(5, 2)$. The length of the radius of the circle is :

- | | |
|-------------|-------------|
| (A) ± 2 | (B) ± 4 |
| (C) 4 | (D) 2 |

15. Which of the following statements is **incorrect** ?

- (A) Two congruent figures are always similar.
- (B) A square and a rhombus of the same area are always similar.
- (C) Two equilateral triangles are always similar.
- (D) Two similar triangles need not be congruent.

16. The least number which is a perfect square and is divisible by each of 16, 20 and 50, is :
- (A) 1200
(B) 100
(C) 3600
(D) 2400
17. If $\sin 30^\circ \tan 45^\circ = \frac{\sec 60^\circ}{k}$, then the value of k is :
- (A) 4
(B) 3
(C) 2
(D) 1
18. The quadratic equation whose roots are 7 and $\frac{1}{7}$ is :
- (A) $7x^2 - 50x + 7 = 0$
(B) $7x^2 - 50x + 1 = 0$
(C) $7x^2 + 50x - 7 = 0$
(D) $7x^2 + 50x - 1 = 0$

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.

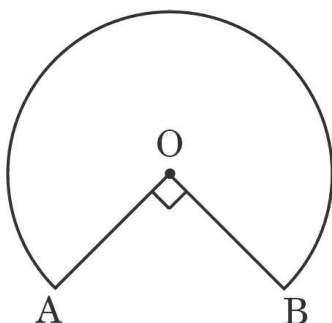
- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.

- 19.** *Assertion (A) :* Common difference of the AP : 5, 1, - 3, - 7, ... is 4.
Reason (R): Common difference of the AP : $a_1, a_2, a_3, \dots, a_n$ is obtained by $d = a_n - a_{n-1}$.
- 20.** *Assertion (A) :* The pair of linear equations $px + 3y + 59 = 0$ and $2x + 6y + 118 = 0$ will have infinitely many solutions if $p = 1$.
Reason (R): If the pair of linear equations $px + 3y + 19 = 0$ and $2x + 6y + 157 = 0$ has a unique solution, then $p \neq 1$.

SECTION B

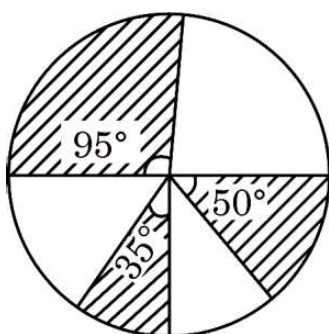
This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each. $5 \times 2 = 10$

- 21.** (a) In the given figure, the shape of the top of a table is that of a sector of a circle with centre O and $\angle AOB = 90^\circ$. If $AO = OB = 42$ cm, then find the perimeter of the top of the table.

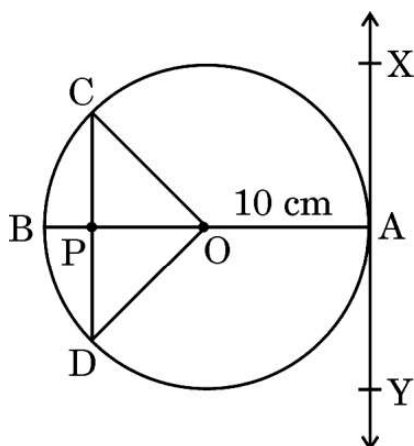


OR

- (b) In the given figure, three sectors of a circle of radius 5 cm, making angles 35° , 50° and 95° at the centre are shaded. Find the area of the shaded region. [Use $\pi = \frac{22}{7}$]



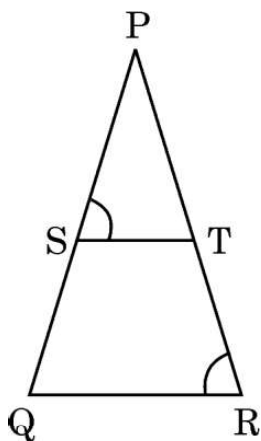
22. At point A on the diameter AB of a circle of radius 10 cm, tangent XAY is drawn to the circle. Find the length of the chord CD parallel to XY at a distance of 16 cm from A.



23. If p and q are zeroes of the polynomial $p(y) = 21y^2 - y - 2$, then find the value of $(1 - p) \cdot (1 - q)$.

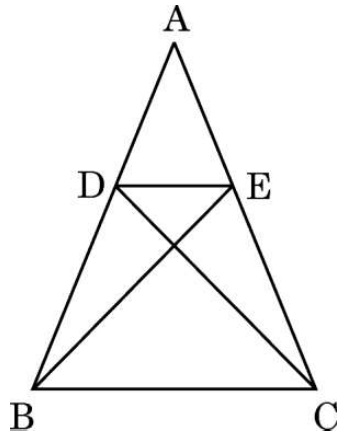
24. If $\tan A = \sqrt{3}$; where A is an acute angle, then find the value of $\frac{\sin^2 A}{1 + \cos^2 A}$.

25. (a) In the given figure, $\frac{PS}{SQ} = \frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that $\triangle PQR$ is an isosceles triangle.



OR

- (b) In the given figure, $\triangle ABE \cong \triangle ACD$. Prove that $\triangle ADE \sim \triangle ABC$.



SECTION C

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

- 26.** (a) Prove that : $\sqrt{\sec^2 \theta + \operatorname{cosec}^2 \theta} = \tan \theta + \cot \theta$

OR

- (b) If $\operatorname{cosec} \theta = x + \frac{1}{4x}$, prove that $\operatorname{cosec} \theta + \cot \theta = 2x$ or $\frac{1}{2x}$.

- 27.** Find the sum of all 3-digit natural numbers which are divisible by 11.

- 28.** The length of the hour hand of a clock is 10 cm. Find the area of the minor sector swept by the hour hand of the clock between 5 a.m. to 8 a.m. Also, find the area of the major sector.

- 29.** (a) Prove that the parallelogram circumscribing a circle is a rhombus.

OR

(b) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

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

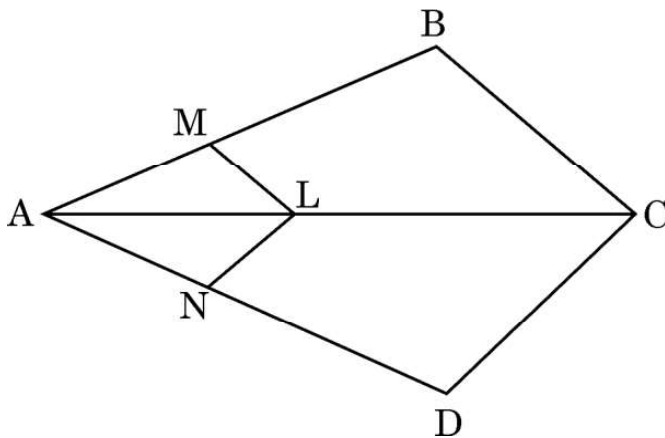
31. Prove that $\sqrt{3}$ is an irrational number.

SECTION D

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

32. Prove that a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points divides the other two sides in the same ratio. Hence, in the figure given below, prove that $\frac{AM}{MB} = \frac{AN}{ND}$ where

$LM \parallel CB$ and $LN \parallel CD$.



- 33.** (a) Two ships are sailing in the sea on either side of a lighthouse. The angles of depression to the two ships as observed from the top of the lighthouse are 60° and 45° , respectively. If the distance between the ships is $100 \left(\frac{1 + \sqrt{3}}{\sqrt{3}} \right)$ m, then find the height of the lighthouse.

OR

- (b) The angles of depression of the top and the bottom of an 8 m tall building from the top of another multistoried building are 30° and 45° , respectively. Find the height of the multistoried building and the distance between the two buildings.

- 34.** Find the Mean and Mode of the following data :

<i>Class</i>	<i>Frequency</i>
4 – 8	2
8 – 12	12
12 – 16	15
16 – 20	25
20 – 24	18
24 – 28	12
28 – 32	13
32 – 36	3

- 35.** (a) The numerator of a fraction is 3 less than its denominator. If 2 is added to both numerator and denominator, then the sum of the new fraction and the original fraction is $1\frac{9}{20}$. Find the original fraction.

OR

- (b) A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train.

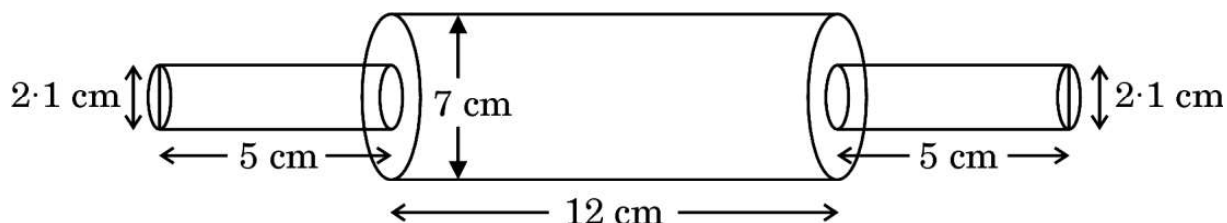
SECTION E

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

3×4=12

Case Study – 1

36. A skilled carpenter decided to craft a special rolling pin for the local baker. He carefully joined three cylindrical pieces of wood – two small ones on the ends and one larger in the centre to create a perfect tool. The baker loved the rolling pin, as it rolled out the smoothest dough for breads and pastries.



The length of the bigger cylindrical part is 12 cm and diameter is 7 cm and the length of each smaller cylindrical part is 5 cm and diameter is 2.1 cm.

Based on the above information, answer the following questions :

- | | | |
|-----------|---|---|
| (i) | Find the volume of the bigger cylindrical part. | 1 |
| (ii) | Find the curved surface area of the bigger cylindrical part. | 1 |
| (iii) | (a) Find the ratio of the volume of the bigger cylindrical part to the total volume of the two smaller (identical) cylindrical parts. | 2 |
| OR | | |
| (b) | Find the sum of the curved surface areas of the two identical smaller cylindrical parts. | 2 |

Case Study – 2

37. A school is organizing a grand cultural event to show the talent of its students. To accommodate the guests, the school plans to rent chairs and tables from a local supplier. It finds that rent for each chair is ₹ 50 and for each table is ₹ 200. The school spends ₹ 30,000 for renting the chairs and tables. Also, the total number of items (chairs and tables) rented are 300.

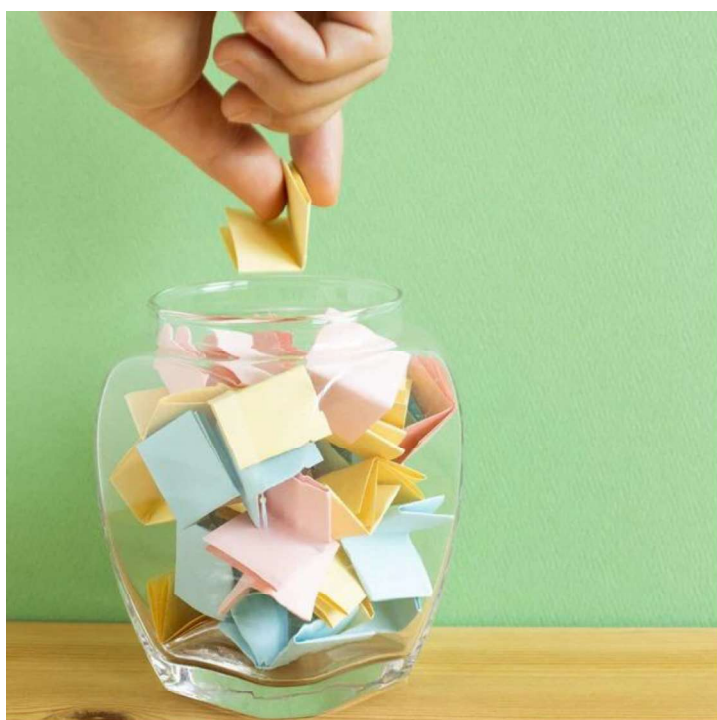


If the school rents 'x' chairs and 'y' tables, answer the following questions :

- (i) Write down the pair of linear equations representing the given information. 1
- (ii) (a) Find the number of chairs and number of tables rented by the school. 2
- OR**
- (b) If the school wants to spend a maximum of ₹ 27,000 on 300 items (tables and chairs), then find the number of chairs and tables it can rent. 2
- (iii) What is maximum number of tables that can be rented in ₹ 30,000 if no chairs are rented ? 1

Case Study – 3

38. Rahul is a lucky charm for his cricket team. He has a jar of cards with numbers from 10 to 74. Before each match, he draws a card from the jar. If the card bears an even number, the team wins. If the number is even and divisible by 5, they win by a big margin. If the number is an odd number less than 30, they win by a small margin. And if the number is a prime number between 50 and 74, they lose.



Answer the following questions if Rahul draws a card today :

- (i) What is the probability that Rahul draws a card with an even number ? 1
- (ii) What is the probability that Rahul draws a card with an odd number less than 30 ? 1
- (iii) (a) What is the probability that Rahul draws a card with a prime number between 50 and 74 ? 2

OR

- (b) What is the probability that Rahul draws a card with an even number divisible by 5 ? 2