



TAGORE INTERNATIONAL SCHOOL
VASANT VIHAR, NEW DELHI
PRE-BOARD EXAMINATION (2023-24)
MATHEMATICS (STANDARD)

CLASS: X
SET - II

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X-A

Date: 26.12.2023
No. of Pages: 09

Time: 3 Hours
Max Marks:80

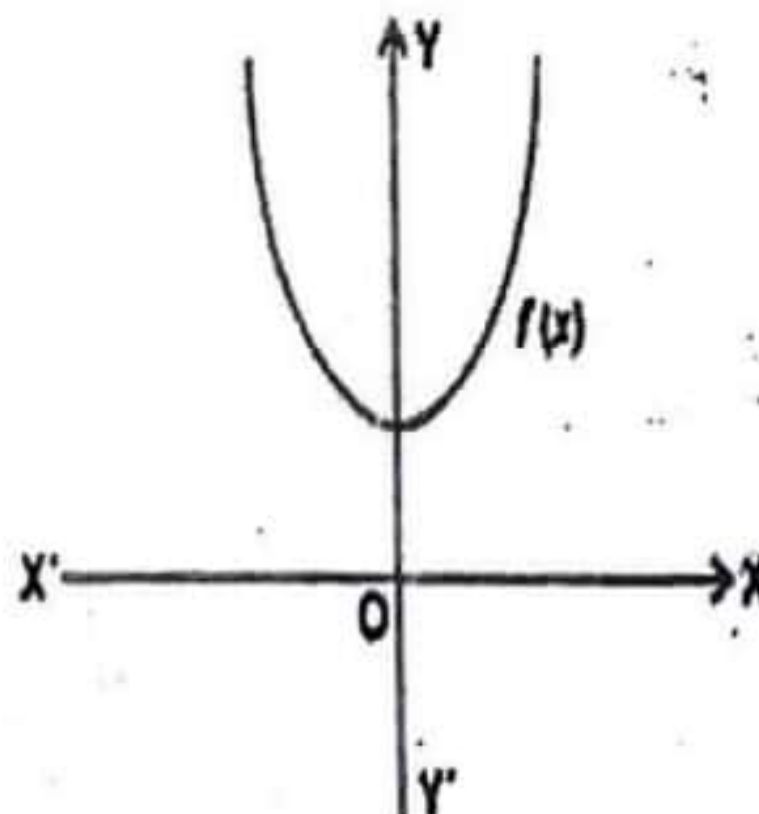
General Instructions:

1. This Question Paper has 5 Sections A – E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 2 and 1 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Questions of 5 marks, 2 Questions of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

- Q1. The nature of the roots of the quadratic equation $2x^2 + 4x - 7 = 0$ is (1mark)
- (a) no real roots (b) two equal and real roots
(c) Two distinct and real roots (d) more than two real roots
- Q2. In the given figure, the number of zeroes of the polynomial $f(x)$ are (1mark)



- (a) 0 (b) 1 (c) 2 (d) 3

Q3. If the coordinates of one end of a diameter of a circle are (2, 3) and the coordinates of its center are (-2, 5), then the coordinates of the other end of the diameter are (1mark)

- (a) (6, 7) (b) (6, -7) (c) (-6, 7) (d) (-6, -7)

Q4. The smallest number which when increased by 17 is exactly divisible by 520 and 468 is (1mark)

- (a) 4680 (b) 4663 (c) 4860 (d) 4636

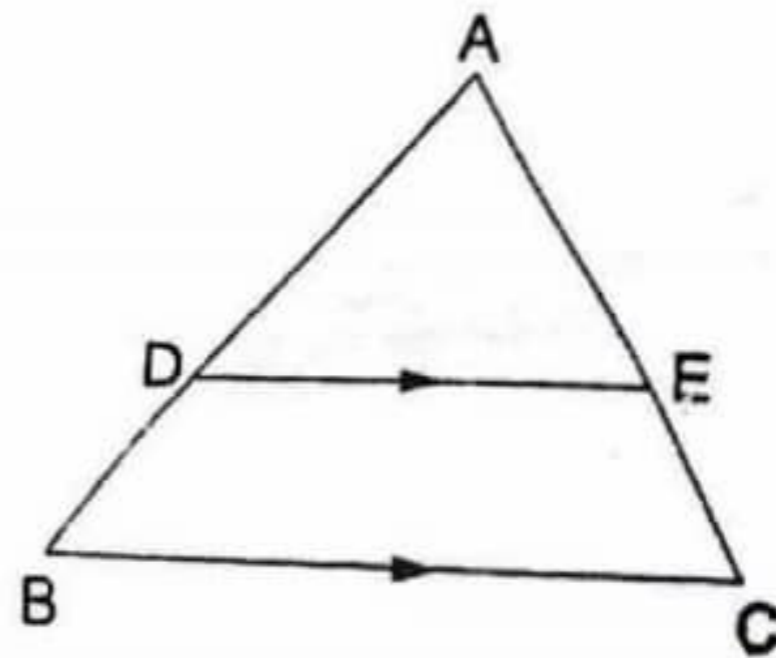
Q5. If $\frac{4}{5}, a, 2$ are three consecutive terms of an AP, then the value of a is (1mark)

- (a) $\frac{5}{2}$ (b) $\frac{2}{7}$ (c) $\frac{5}{7}$ (d) $\frac{7}{5}$

Q6. The point which lies on the perpendicular bisector of the line segment joining the points A(-2, -5) and B(2, 5) is (1mark)

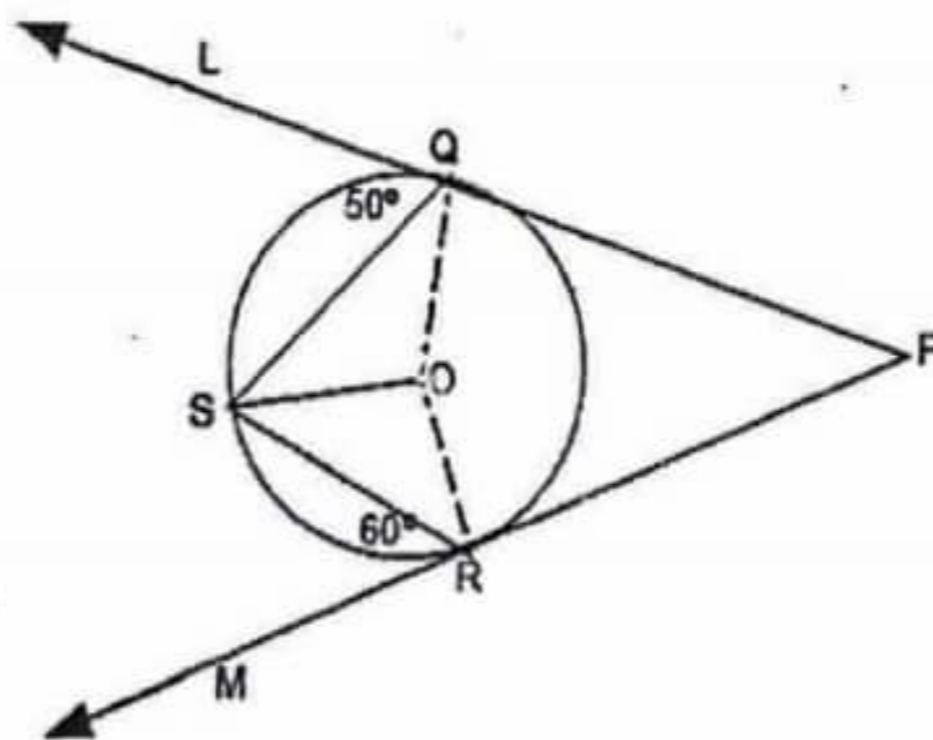
- (a) (0,0) (b) (0,2) (c) (2, 0) (d) (-2, 0)

Q7. In the given figure if $DE \parallel BC$, $\frac{AD}{BD} = \frac{3}{5}$ and $AC = 4.8$ cm, then the length of AE is (1mark)



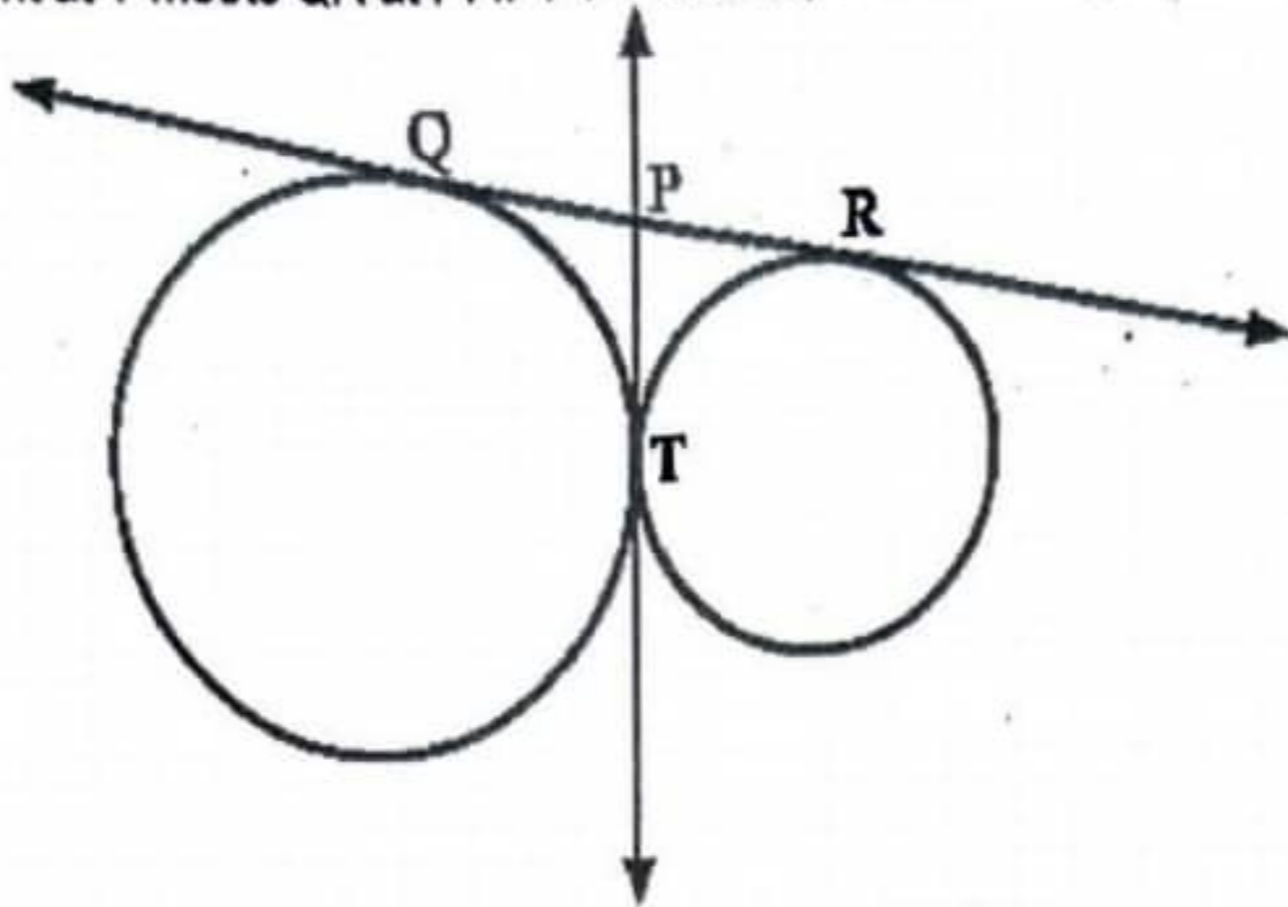
- (a) 4.5 cm (b) 2.5 cm (c) 9 cm (d) 1.8 cm

Q8. In the given figure, O is the centre of a circle. If PQL and PRM are the tangents of the points Q and R respectively and S is a point on the circle such that $\angle SQL = 50^\circ$ and $\angle SRM = 60^\circ$ then the value of $\angle QOR$ is (1mark)



- (a) 100° (b) 110° (c) 120° (d) 140°

- Q9. In the given figure, QR is a common tangent to the given circles, touching externally at the point T. (1mark)
The tangent at T meets QR at P. If PT = 3.8 cm, then the length of QR is



- (a) 3.8 cm (b) 5.7 cm (c) 1.9 cm (d) 7.6 cm

- Q10. The value of $\frac{2 \tan 30^\circ}{1 + \tan^2 30^\circ}$ is (1mark)
(a) $\sin 60^\circ$ (b) $\cos 60^\circ$
(c) $\tan 60^\circ$ (d) $\sin 30^\circ$

- Q11. If a sector of 120° cut out from a circle has a area of $9\frac{3}{7} \text{ cm}^2$, then the radius of the circle is (1mark)
(a) 5 cm (b) 1 cm (c) 6 cm (d) 3 cm

- Q12. If $2x = \sec \theta$ and $\frac{2}{x} = \tan \theta$, then $2(x^2 - \frac{1}{x^2})$ is equal to (1mark)
(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{4}$ (d) 4

- Q13. Given that $\cos \theta = \frac{p}{q}$, then $\sin \theta$ is (1mark)
(a) $\frac{q}{\sqrt{q^2 - p^2}}$ (b) $\frac{p}{\sqrt{q^2 - p^2}}$ (c) $\frac{\sqrt{q^2 - p^2}}{q}$ (d) $\frac{q}{p}$

- Q14. A chord AB of a circle of radius 10cm subtends a right angle at the centre. The area of the minor sector is (1mark)
[Take $\pi = 3.14$]
(a) 38.5 cm^2 (b) 42 cm^2 (c) 78.5 cm^2 (d) 82 cm^2

- Q15. If an arc of length 22 cm subtends an angle of 60° at the centre of the circle then length of the radius of the circle is (1mark)
(a) 21 cm (b) 11 cm (c) 14 (d) 7 cm

- Q16. A right circular cylinder of radius 'r' cm and height "h" cm ($h > 2r$) just encloses a sphere of diameter (1mark)
(a) r cm (b) 2r cm (c) 3r cm (d) 4r cm

- Q17. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, then the probability that it bears a prime number less than 23 is (1mark)
- (a) $\frac{7}{90}$ (b) $\frac{1}{9}$ (c) $\frac{4}{45}$ (d) $\frac{9}{89}$

- Q18. Two cards of diamonds and 4 cards of clubs are missing from a pack of 52 cards. If a card is drawn at random from the remaining cards, then the probability of getting a black card is (1mark)
- (a) $\frac{22}{52}$ (b) $\frac{22}{46}$ (c) $\frac{24}{52}$ (d) $\frac{24}{46}$

DIRECTION: In the question number 19 and 20, a statement of **assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option.

- Q19. **Statement A (Assertion):** The curved surface area of a cone of base radius 6 cm and slant height 10 cm is 60π cm². (1mark)
- Statement R (Reason):** Curved surface area of a cone is equal to $\pi r^2 h$, where 'r' be the radius and 'h' be the height of the cone.
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
 (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A).
 (c) Assertion (A) is true but reason (R) is false.
 (d) Assertion (A) is false but reason (R) is true.

- Q20. **Statement A (Assertion):** The arrangement of numbers i.e., $-4, 16, -64, 256, -1024, 4096 \dots$ form a sequence. (1mark)
- Statement R (Reason):** An arrangement of numbers which are arranged in a definite order according to some rule, is called a sequence.
- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason (R) is false.
 (d) Assertion (A) is false but reason (R) is true.

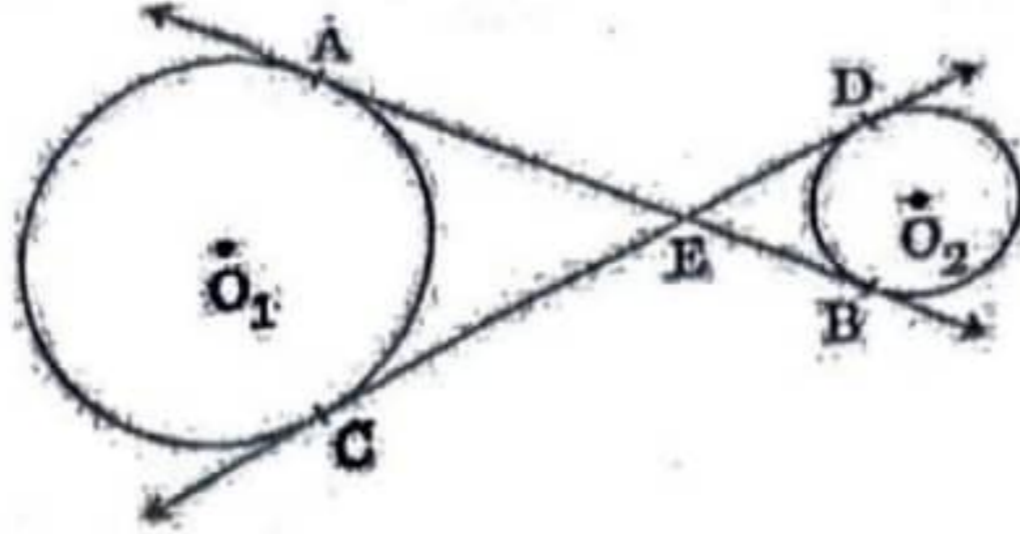
SECTION B

Section B consists of 5 questions of 2 marks each.

- Q21. Check if $(2\sqrt{3} + \sqrt{5})(2\sqrt{3} - \sqrt{5})$ is irrational number. Justify. (2marks)
- Q22. The cost of fencing a circular field at the rate of ₹ 24 per meter is ₹5280. The field is ploughed at the rate of ₹ 2.50 per square meter. Find the cost of ploughing the field. (2marks)
- OR**
- From a rectangular sheet of paper ABCD with AB = 40 cm and AD = 28 cm, a semicircular portion with BC as diameter is cut off. Find the area of the remaining paper. (2marks)

Q23. In the given figure, if common tangents AB and CD to the circles with centres O_1 and O_2 intersect at a point E, then prove $AB = CD$

(2marks)



Q24. If $\sin(A + B) = 1$ and $\tan(A + B) = \frac{1}{\sqrt{3}}$, then find the value of $\sec A - \operatorname{cosec} B$.

(2marks)

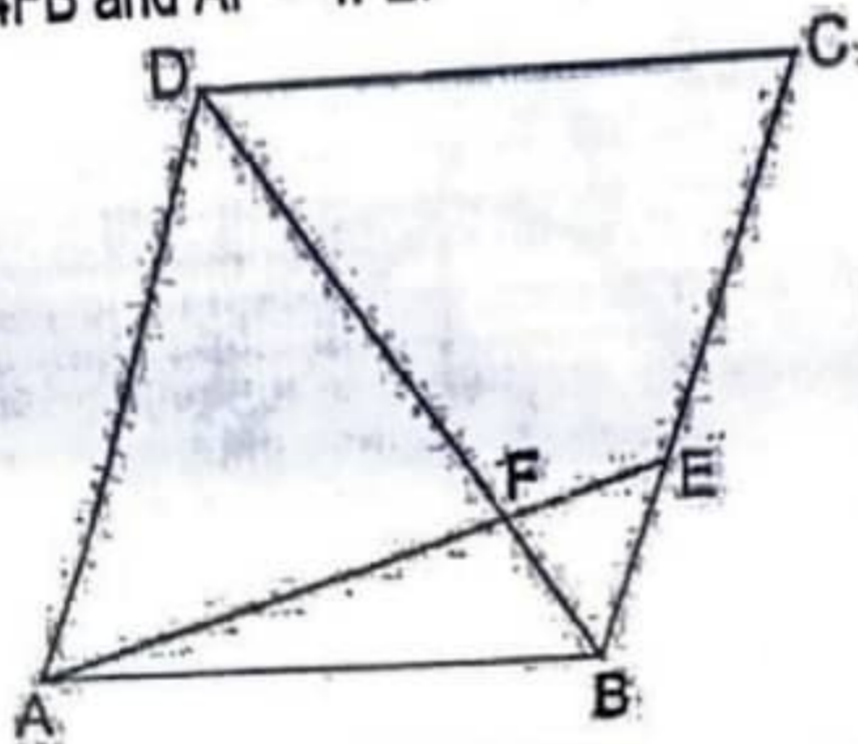
OR

Given that $\cos(A - B) = \cos A \cos B + \sin A \sin B$, find the value of $\cos 15^\circ$ taking $A = 60^\circ$ and $B = 45^\circ$

(2marks)

Q25. In the given figure, ABCD is a parallelogram and E divides BC in the ratio 1 : 3 and DB and AE intersect at F. Show that $DF = 4FB$ and $AF = 4FE$.

(2marks)



SECTION C

Section C consists of 6 questions of 3 marks each.

Q26. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one of the numbers is 280, then find the other number.

(3marks)

Q27. The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

(3marks)

OR

Two numbers are in the ratio of 5 : 6. If 8 is subtracted from each of the numbers, then the ratio becomes 4 : 5. Find the numbers.

(3marks)

Q28. If α and β are the roots of the quadratic polynomial $p(x) = x^2 + x - 2$, then find the polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.

(3marks)

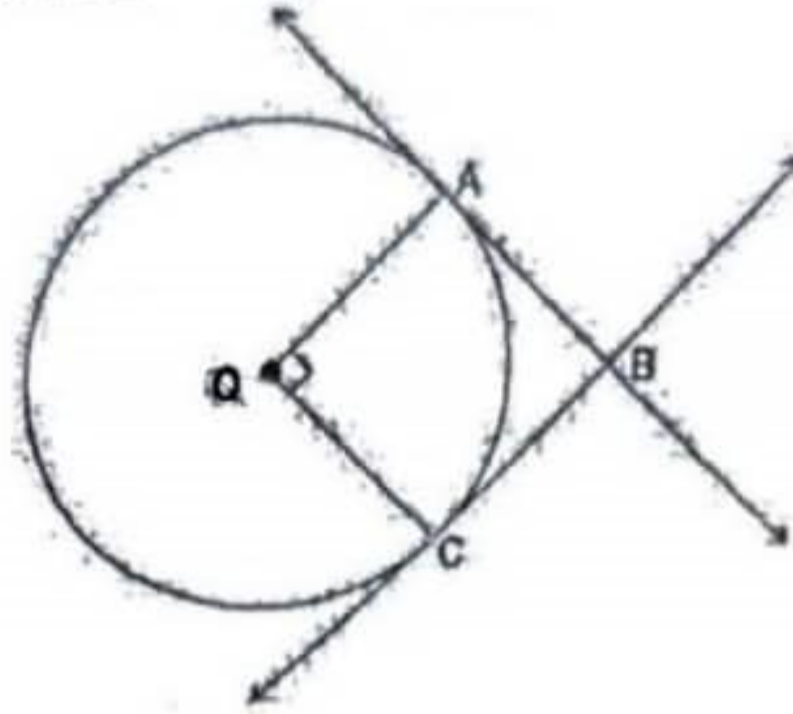
Q29. Find the mean age (in years) from the frequency distribution given below:

(3marks)

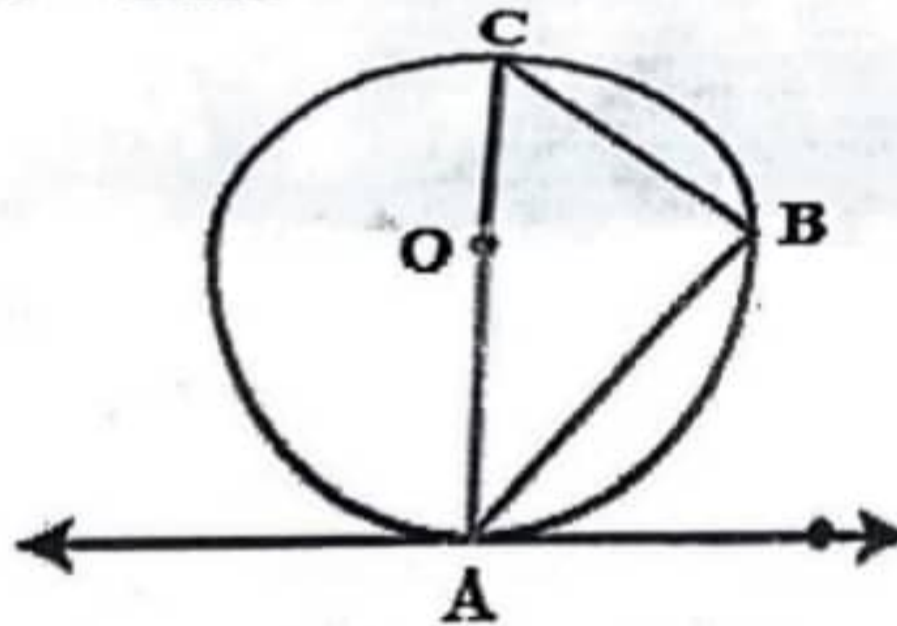
Class (age in years)	25 - 29	30 - 34	35 - 39	40 - 44	44 ⁴⁵ - 49	50 - 54	55 - 59
Frequency (number of people)	4	14	22	16	6	5	3

Q30. If $7\sin^2 \theta + 3\cos^2 \theta = 4$, then show that $\tan \theta = \frac{1}{\sqrt{3}}$. (3marks)

Q31. Shown below is a circle with centre O. Tangents are drawn at points A and C, such that they intersect at point B. If $OA \perp OC$, then show that quadrilateral OABC is a square. (3marks)



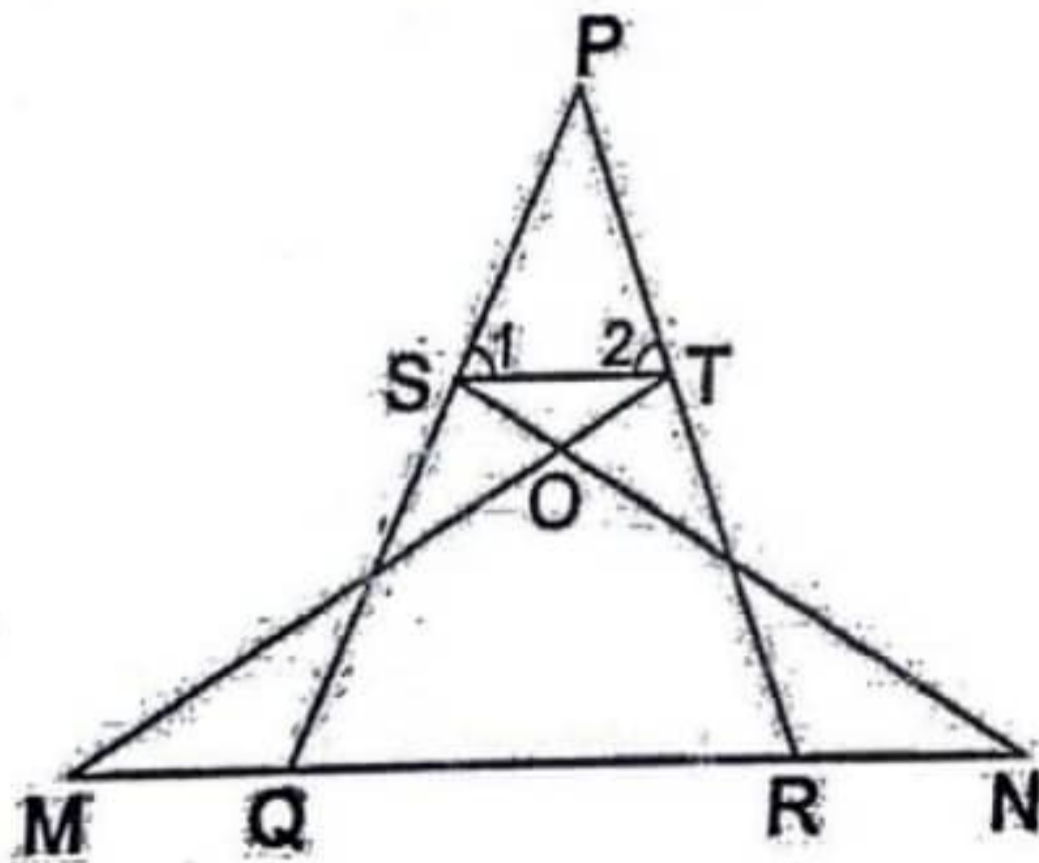
OR
If AB is a chord of a circle with centre O, AOC is a diameter and AT is a tangent at A as shown in the figure. Prove that $\angle BAT = \angle ACB$. (3marks)



SECTION D

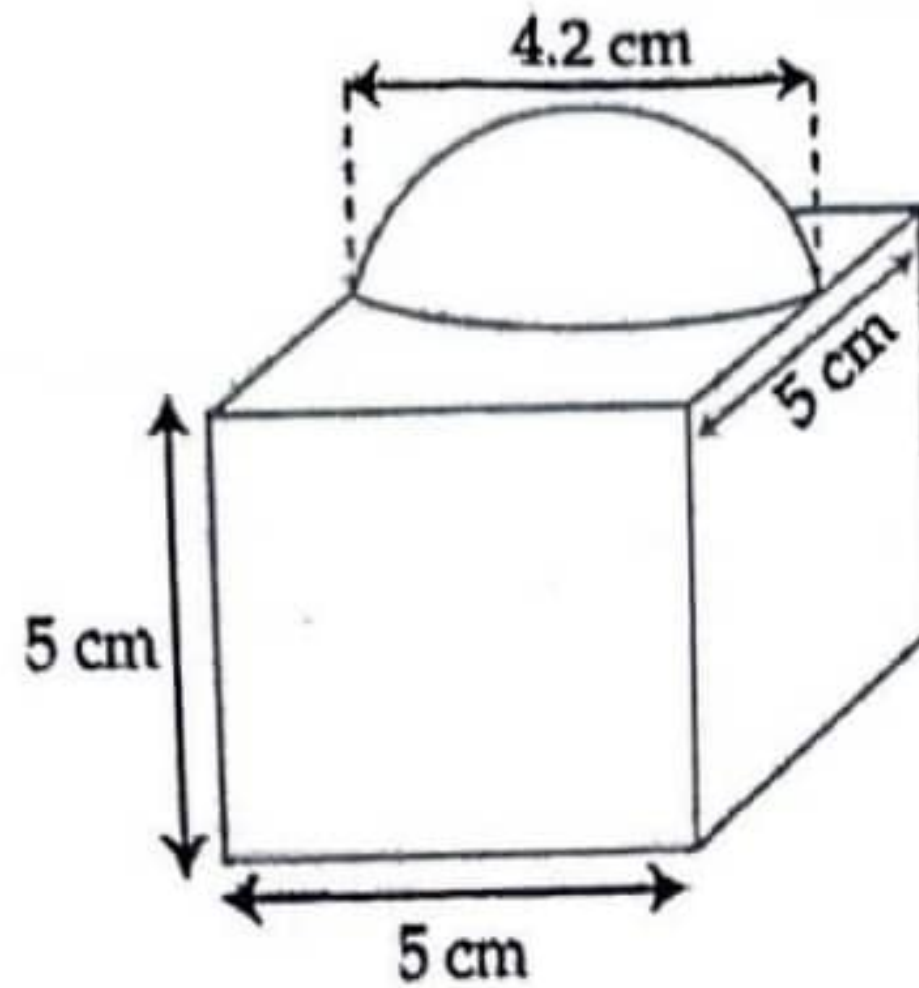
Section D consists of 4 questions of 5 marks each.

Q32. (A) Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the other two sides are divided in the same ratio. (3+2=5marks)
(B) In the given figure, $\angle 1 = \angle 2$ and $\Delta NSQ \cong \Delta MTR$, then prove that $\Delta PTS \sim \Delta PRQ$.



Q33. In the given figure, a decorative block is shown which is made of two solids, a cube and a hemisphere. The base of the block is a cube with edge 5 cm and the hemisphere is fixed on top has a diameter of 4.2 cm. Find the total surface area and the volume of the block so formed.

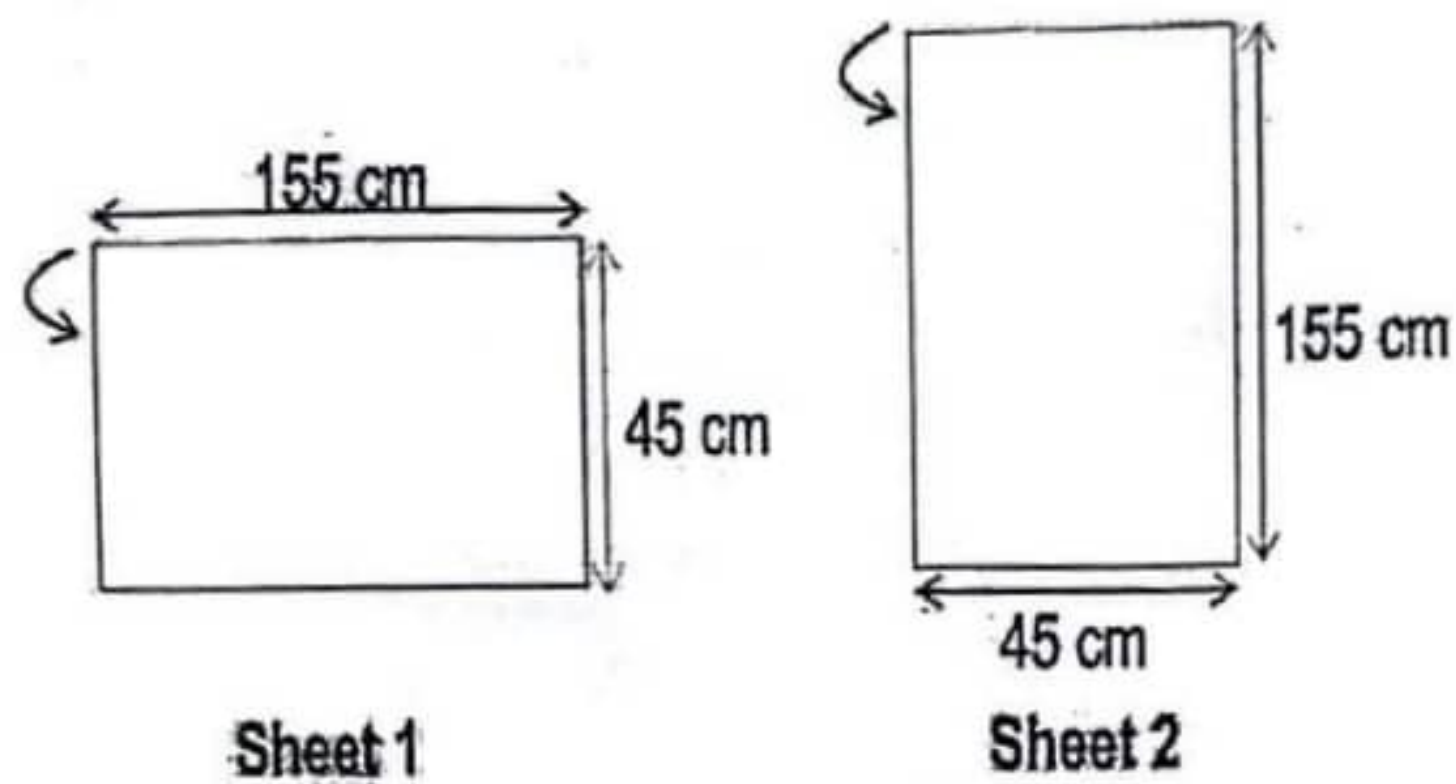
(5marks)



OR

Two rectangular sheets of dimensions 45 cm × 155 cm are folded to make hollow right circular cylindrical pipes, such that there is exactly 1 cm of overlap when sticking the ends of the sheet. Sheet 1 is folded along its length, while Sheet 2 is folded along its width. That is, the top edge of the sheet is joined with its bottom edge in both the sheets, as depicted by the arrow in the figure below. Both pipes are closed on both ends to form cylinders.

(5marks)



(Note: The figures are not to scale.)

- Find the difference in the curved surface areas of the two cylinders.
- Find the ratio of the volumes of the two cylinders formed.

(Note: Use π as $\frac{22}{7}$. Assume that the sheets have negligible thickness.)

Q34. Two pipes running together can fill a cistern in $11\frac{1}{9}$ min. if one pipe takes 5 minutes more than the other to fill it, then find the time in which each pipe can fill the cistern separately.

(5marks)

OR

While boarding the plane, few passengers slipped from the stairs and got hurt. The pilot took them to the emergency clinic at the airport for treatment. Due to this, the plane got delayed by 30 minutes. To reach the destination 1500 km away in time, so that the passengers could catch the connecting flight, the speed of the plane was increased by 250 km/h than the usual speed. Find the usual speed of the plane.

(5marks)

Q35. The mode of the following data is 45. Find the values of x and y given that $\sum f_i = 50$. Also find the median of the given data if the mean is 27.

(5marks)

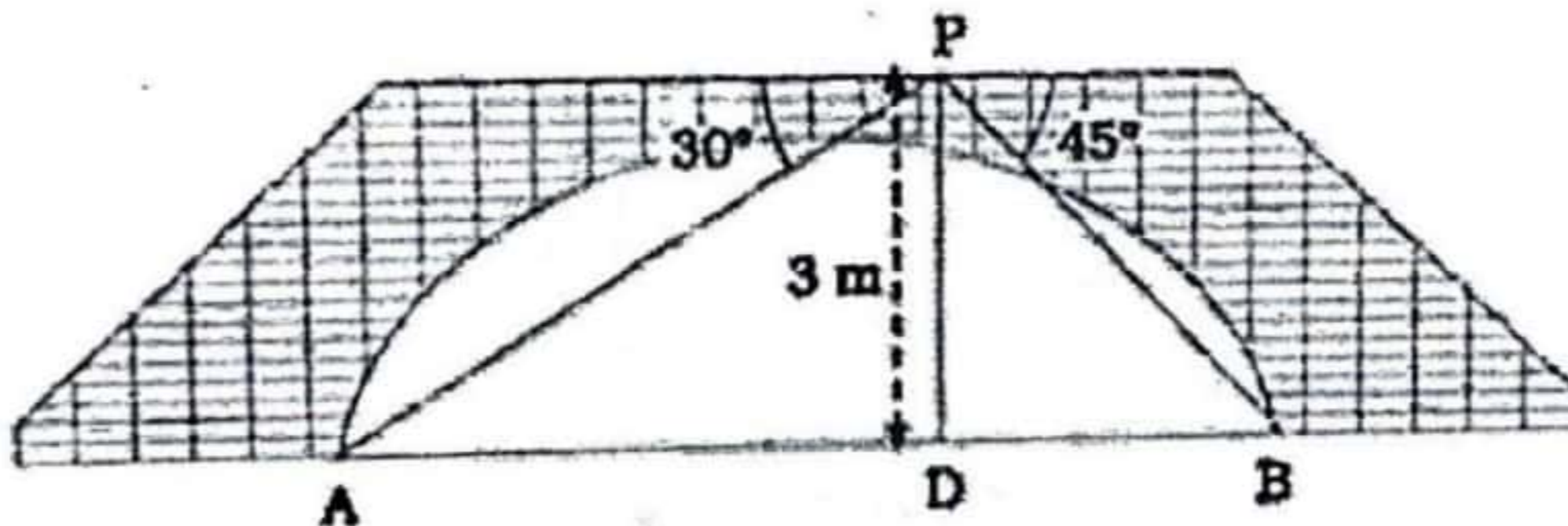
Class Interval	Frequency
10 – 20	4
20 – 30	8
30 – 40	x
40 – 50	12
50 – 60	10
60 – 70	4
70 – 80	y

SECTION E

Case Study-Based questions are compulsory.

CASE STUDY I

Q36. From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45° , respectively. The height of the bridge is 3 m from the banks of the river.



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

- Find the distance between edge A and point D.
- Find the width of the river AB.

(1mark)
(2marks)

OR

- If the height of the bridge is 4m, then find the width of the river AB.
- If the height of the bridge is 7 m, then find the length between edge B and point D.

(2marks)
(1mark)

CASE STUDY 2

Q37. In a math class, teacher asked the students to mark points $(4, -1)$ and $(-3, 2)$ on a graph paper. However Shweta mistakenly located the points $(-1, 4)$ and $(3, -2)$.



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

- a) What is the distance between the points, that the teacher asked to mark?
- b) Find the coordinates of the point which divides the line-segment joining the points Plotted by Shweta in the ratio $1 : 2$.

(1mark)
(2marks)

OR

If all the four points are plotted on a graph paper, then find the mid-point of the line joining the points lying in the II Quadrant.

(2marks)

- c) Find the mid-point of the line segment joining the points plotted by Shweta.

(1mark)

CASE STUDY 3

Q38. In a pathology lab, a culture has been conducted. In a test, the number of bacteria taken into consideration in various samples is all 3-digit numbers that are divisible by 7, taken in order. Based on the information given above, answer the following questions:



- a) How many bacteria are considered in the fifth sample?
- b) How many samples should be taken for consideration?

(1mark)
(2marks)

OR

Find the total number of bacteria in the first 10 samples.

(2marks)
(1mark)

- c) How many bacteria are there in the 7th sample from last?