Solution to Board's Question Paper (March 2023)

प्र. क्र. Q. No.		
1 (A)		
	(i)	(C) *(1 mark)*
	(ii)	(B) *(1 mark)*
	(iii)	(A) *(1 mark)*
	(iv)	(D). *(1 mark)*

1 (B)

Note : Here answers with solution are expected.

(i) Solution :

$\triangle ABC \sim \triangle PQR$

$\therefore \frac{A(\triangle ABC)}{A(\triangle PQR)} = \frac{AB^2}{PQ^2}$ ... (Theorem of areas of similar triangles)

$\therefore \frac{16}{25} = \frac{AB^2}{PQ^2}$ *(½ mark)*

$\therefore \frac{AB}{PQ} = \frac{4}{5}$ ... (Taking square roots of both the sides)

Ans. AB : PQ = 4 : 5. *(½ mark)*

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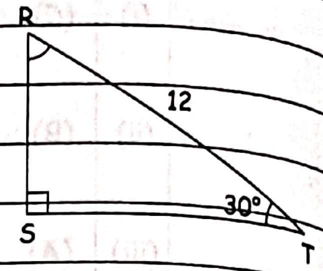
Q. No. 1 (B)

(ii) Solution :



In $\triangle RST$,

$\angle S = 90°$, $\angle T = 30°$ ... (Given)

$\therefore \angle R = 60°$ ... (Remaining angle of the triangle)

$\therefore \triangle RST$ is a $30° - 60° - 90°$ triangle

$\therefore$ by $30° - 60° - 90°$ triangle theorem,

$RS = \frac{1}{2} \times RT$ ... (Side opposite to 30°) (½ mark)

$= \frac{1}{2} \times 12 = 6$ cm (½ mark)

Ans. RS = 6 cm.

(iii) Solution :

Radius (r) = 5 cm

Diameter is the longest chord of the circle. (½ mark)

$d = 2r$

$= 2 \times 5 = 10$ cm (½ mark)

Ans. The length of the longest chord is 10 cm.

(iv) Solution :

O(0, 0) and P(3, 4)

$O(0, 0) \equiv (x_1, y_1)$; $P(3, 4) \equiv (x_2, y_2)$

Using distance formula,

$d(O, P) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ (½ mark)

$= \sqrt{(3-0)^2 + (4-0)^2}$

$= \sqrt{3^2 + 4^2}$

$= \sqrt{9 + 16}$

$= \sqrt{25} = 5$ (½ mark)

Ans. d(O, P) = 5.

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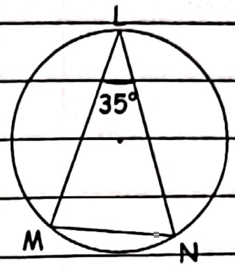
Q. No. 2 (A)

Note : In this question type, students are required to solve any 2 of 3 activities. However, solutions to all 3 activities are given here, for the guidance of the students.

(i) Activity :



(1) $\angle L = \frac{1}{2} m(\text{arc } MN)$

... (By inscribed angle theorem)

$\therefore \boxed{\angle 35^\circ} = \frac{1}{2} m(\text{arc } MN)$ *(½ mark)*

$\therefore 2 \times 35^\circ = m(\text{arc } MN)$

$\therefore m(\text{arc } MN) = \boxed{70^\circ}$ *(½ mark)*

(2) $m(\text{arc } MLN) = \boxed{360^\circ} - m(\text{arc } MN)$

... (Definition of measure of an arc) *(½ mark)*

$= 360^\circ - 70^\circ$

$\therefore m(\text{arc } MLN) = \boxed{290^\circ}$ *(½ mark)*

(ii) Activity :

$\text{LHS} = \cot\theta + \tan\theta$

$= \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$

$= \frac{\boxed{\cos^2\theta} + \boxed{\sin^2\theta}}{\sin\theta \times \cos\theta}$ *(½ + ½ mark)*

$= \frac{1}{\sin\theta \times \cos\theta}$ ... $(\boxed{\sin^2\theta + \cos^2\theta = 1})$ *(½ mark)*

$= \frac{1}{\sin\theta} \times \frac{1}{\boxed{\cos\theta}}$ *(½ mark)*

$= \operatorname{cosec}\theta \times \sec\theta$

LHS = RHS

$\therefore \cot\theta + \tan\theta = \operatorname{cosec}\theta \times \sec\theta.$

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(iii) **Activity :**

Surface area of sphere $= 4\pi r^2$

$$= 4 \times \frac{22}{7} \times \boxed{7}^2$$ (½ mark)

$$= 4 \times \frac{22}{7} \times \boxed{49}$$ (½ mark)

$$= \boxed{88} \times 7$$ (½ mark)

$\therefore$ surface area of sphere $= \boxed{616}$ sq cm. (½ mark)

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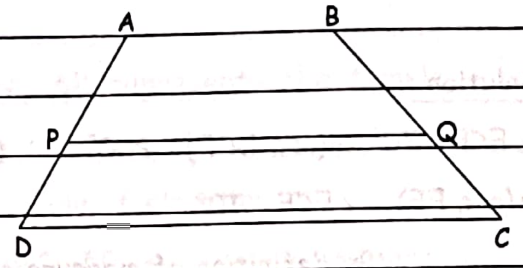
Q. No. 2 (B)

Note : In this question type, students are required to solve any 4 of 5 subquestions. However, solutions to all 5 subquestions are given here, for the guidance of the students.

(i) Solution :

side AB ∥ side PQ ∥ side DC ... (Given)



$\therefore \dfrac{AP}{PD} = \dfrac{BQ}{QC}$ ... (Property of three parallel lines and their transversals)

(½ mark)

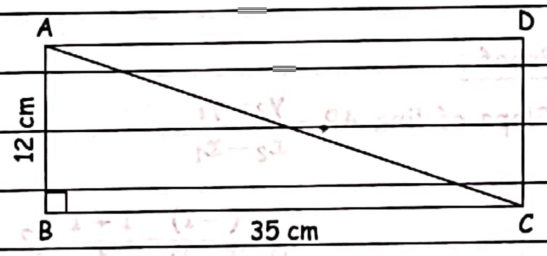
$\therefore \dfrac{15}{12} = \dfrac{BQ}{14}$ *(½ mark)*

$\therefore BQ = \dfrac{15 \times 14}{12}$ *(½ mark)*

$\therefore BQ = 17.5$ *(½ mark)*

Ans. The value of BQ is 17.5

(ii) Solution :



□ABCD is a rectangle.

$\therefore \angle ABC = 90°$ ... (Measure of an angle of a rectangle) ... (1)

In $\triangle ABC$,

$\angle ABC = 90°$ ... [From (1)]

$\therefore$ by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$ *(½ mark)*

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$AC^2 = (12)^2 + (35)^2$ (½ mark)

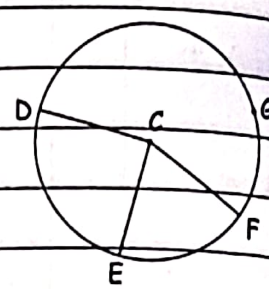
$= 144 + 1225$

$\therefore AC^2 = 1369$ (½ mark)

$\therefore AC = 37$ ... (Taking square roots of both sides) (½ mark)

Ans. The length of the diagonal of the rectangle is 37 cm.

(iii) Solution :



$\angle ECF = 70°$, m(arc DGF) $= 200°$ ... (Given)

m(arc EF) $= \angle ECF = 70°$

... (By definition of measure of an arc)

(1) m(arc DE) + m(arc EF) + m(arc DGF) $= 360°$

... (Measure of a circle is 360°)

$\therefore$ m(arc DE) $+ 70° + 200° = 360°$ (½ mark)

m(arc DE) $= 360° - 270°$

m(arc DE) $= 90°$ (½ mark)

(2) m(arc DEF) = m(arc DE) + m(arc EF)

$= 90° + 70°$ (½ mark)

$= 160°$ (½ mark)

Ans. (1) m(arc DE) $= 90°$ (2) m(arc DEF) $= 160°$

(iv) Proof :

Slope of line AB $= \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{1-(-1)}{0-(-1)} = \dfrac{1+1}{1} = 2$ (½ mark)

Slope of line BC $= \dfrac{y_3 - y_2}{x_3 - x_2}$

$= \dfrac{3-1}{1-0} = \dfrac{2}{1} = 2$ (½ mark)

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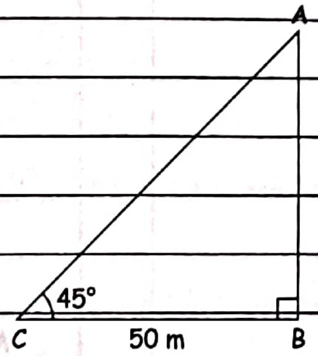
Slope of line AB = Slope of line BC

$\therefore$ line AB || line BC. *(½ mark)*

But point B is common to both the lines

$\therefore$ points A, B and C are collinear. *(½ mark)*

(v) Solution :



In the figure, AB represents the temple,

C is the position of the observer.

$\angle ACB$ is the angle of elevation.

$\angle ACB = 45°$, $BC = 50$ m. *(½ mark)*

In right angled $\triangle ABC$,

$\tan 45° = \frac{AB}{BC}$ *(½ mark)*

$\therefore 1 = \frac{AB}{50}$ *(½ mark)*

$\therefore AB = 50$ m *(½ mark)*

Ans. Height of the temple is 50 m.

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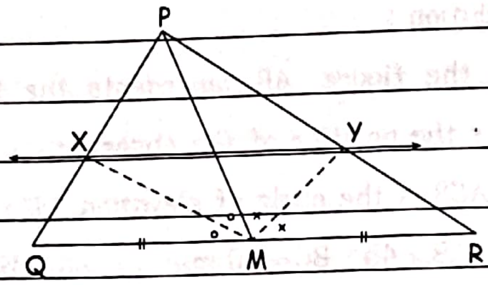
Q. No. 3 (A)

Note : In this question type, students are required to attempt any 1 of 2 activities. However, solutions to both the activities are given here, for the guidance of the students.

(i) Activity :

In $\triangle PMQ$, ray MX is the bisector of $\angle PMQ$



$\therefore \frac{MP}{MQ} = \frac{\boxed{PX}}{\boxed{XQ}}$ ... (Theorem of angle bisector) ... (1)

(½ + ½ mark)

Similarly, in $\triangle PMR$, ray MY is the bisector of $\angle PMR$

$\therefore \frac{MP}{MR} = \frac{\boxed{PY}}{\boxed{YR}}$ ... (Theorem of angle bisector) ... (2)

(½ + ½ mark)

But $\frac{MP}{MQ} = \frac{MP}{MR}$ ... (As M is the midpoint of QR) ... (3)

Hence $MQ = MR$

$\therefore \frac{PX}{\boxed{XQ}} = \frac{\boxed{PY}}{YR}$ ... [From (1), (2) and (3)] *(½ + ½ mark)*

$\therefore XY \parallel QR$ ... (By converse of basic proportionality theorem)

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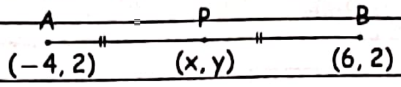
(ii) Activity :



Suppose, $(-4, 2) \equiv (x_1, y_1)$ and $(6, 2) \equiv (x_2, y_2)$

and coordinates of P are (x, y)

$\therefore$ according to midpoint theorem,

$$x = \frac{x_1 + x_2}{2} = \frac{\boxed{-4} + 6}{2} = \frac{\boxed{2}}{2} = \boxed{1}$$ *(½ + ½ + ½ mark)*

$$y = \frac{y_1 + y_2}{2} = \frac{2 + \boxed{2}}{2} = \frac{4}{2} = \boxed{2}$$ *(½ + ½ mark)*

$\therefore$ coordinates of midpoint P are $\boxed{(1, 2)}$ *(½ mark)*

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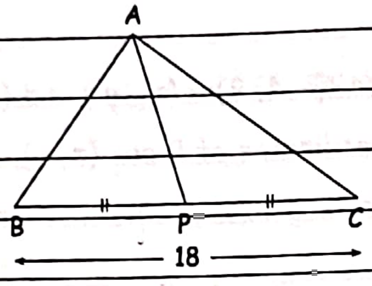
Q. No. 3 (B)

Note : In this question type, students are required to solve any 2 of 4 subquestions. However, solutions to all 4 subquestions are given here, for the guidance of the students.

(i) Solution :



$BP = PC = \frac{1}{2} BC$ ... (P is the midpoint of BC)

$= \frac{1}{2} \times 18$

$= 9$ cm *(½ mark)*

In $\triangle ABC$,

seg AP is the median

$\therefore$ by Apollonius theorem,

$AB^2 + AC^2 = 2BP^2 + 2AP^2$ *(½ mark)*

$\therefore 260 = 2[9^2 + AP^2]$ *(½ mark)*

$\therefore \frac{260}{2} = 81 + AP^2$ *(½ mark)*

$\therefore 130 - 81 = AP^2$

$\therefore 49 = AP^2$ *(½ mark)*

$\therefore AP = 7$ ... (Taking square root of both the sides) *(½ mark)*

Ans. AP = 7.

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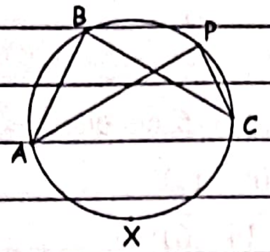
Q. No. 3 (B)

(ii)



(½ mark)

Given : $\angle ABC$ and $\angle APC$ are inscribed in arc ABC and their intercepted arc is arc AXC *(½ mark)*

To prove : $\angle ABC \cong \angle APC$ *(½ mark)*

Proof : $\angle ABC = \frac{1}{2}$ m(arc AXC) ... (Inscribed angle theorem)

... (1) *(½ mark)*

Similarly,

$\angle APC = \frac{1}{2}$ m(arc AXC) ... (Inscribed angle theorem)

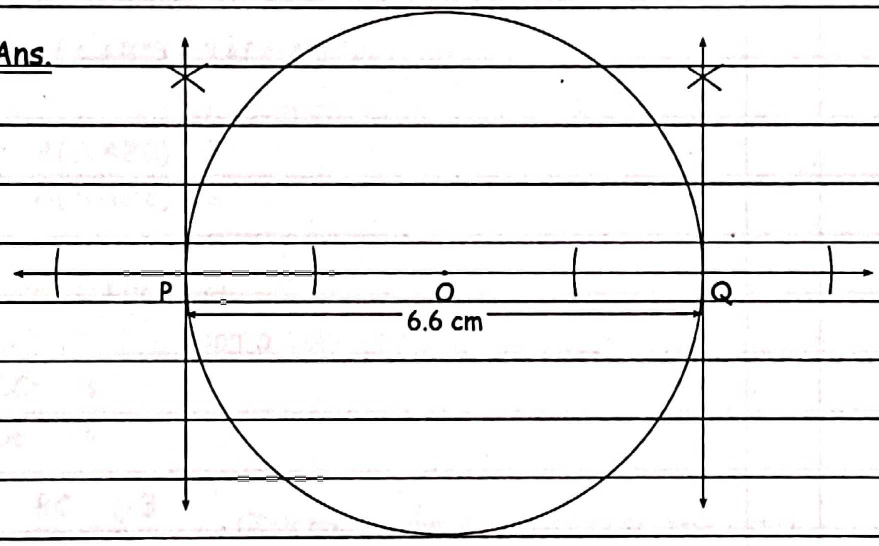
... (2) *(½ mark)*

$\therefore$ from (1) and (2),

$\angle ABC = \angle APC$

$\therefore \angle ABC \cong \angle APC$. *(½ mark)*

(iii) Ans.



[Marking scheme :

(1) To draw a circle of radius 3.3 cm *(½ mark)*

(2) To draw a chord passing through the centre of the circle. *(½ mark)*

(3) To draw tangent at point P *(1 mark)*

(4) To draw tangent at point Q *(1 mark)]*

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Q. No. 3 (B)

(iv) Solution :

$r_1 = 14$ cm, $r_2 = 6$ cm and $h = 6$ cm

$l = \sqrt{h^2 + (r_1 - r_2)^2}$ (½ mark)

$= \sqrt{6^2 + (14-6)^2}$ (½ mark)

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64}$

$= \sqrt{100}$

$= 10$ cm (½ mark)

Curved surface area of the frustum $= \pi(r_1 + r_2)l$ (½ mark)

$= 3.14(14 + 6) \times 10$ (½ mark)

$= 31.4 \times 20$

$= 628 \text{ cm}^2$ (½ mark)

Ans. The curved surface area of the frustum is 628 cm^2.

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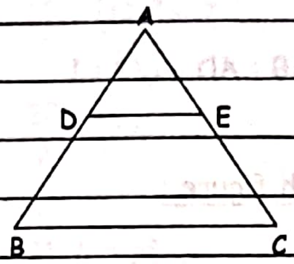
Q. No. 4

Note : In this question type, students are required to attempt any 2 of 3 subquestions. However, solutions to all 3 subquestions are given here, for the guidance of the students.

(i) Proof :



In $\triangle ABC$ and $\triangle ADE$,

$\angle BAC \cong \angle DAE$ ... (Common angle)

$\angle ABC \cong \angle ADE$ ... (Corresponding angles) *(½ mark)*

$\therefore \triangle ABC \sim \triangle ADE$ ... (AA test of similarity) *(1 mark)*

$\therefore \dfrac{A(\triangle ABC)}{A(\triangle ADE)} = \dfrac{BC^2}{DE^2}$ (Theorem on areas of similar triangles) ... (1) *(½ mark)*

$A(\triangle ABC) = A(\triangle ADE) + A(\square DBCE)$ ... (Area addition postulate)

$\therefore A(\triangle ABC) = A(\triangle ADE) + 2A(\triangle ADE)$ *(½ mark)*

[Given : $2A(\triangle ADE) = A(\square DBCE)$]

$\therefore A(\triangle ABC) = 3A(\triangle ADE)$

$\therefore \dfrac{A(\triangle ABC)}{A(\triangle ADE)} = \dfrac{3}{1}$ ... (2) *(½ mark)*

From (1) and (2),

$\dfrac{BC^2}{DE^2} = \dfrac{3}{1}$

$\therefore \dfrac{BC}{DE} = \dfrac{\sqrt{3}}{1}$ ... (Taking square roots of both the side) ... (3)

i.e. $BC = \sqrt{3}\ DE$ *(½ mark)*

Now $\triangle ABC \sim \triangle ADE$ ... (Proved)

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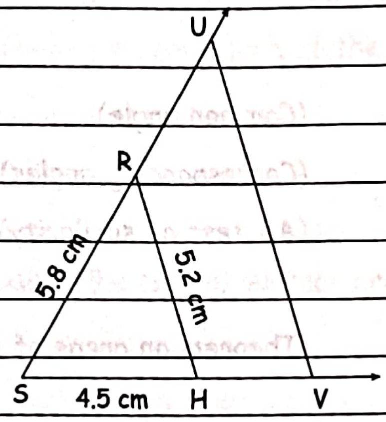
$\therefore \frac{AB}{AD} = \frac{BC}{DE}$ ... (c.s.s.t.)

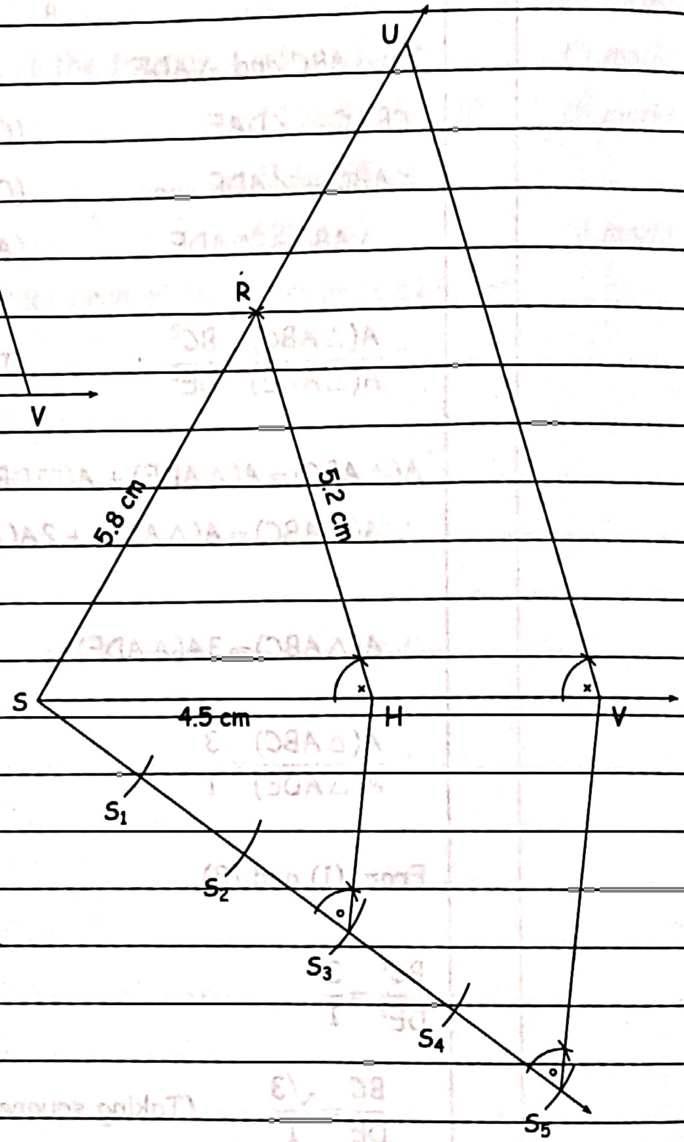
$\therefore \frac{AB}{AD} = \frac{\sqrt{3}}{1}$ ... [From (3)]

i.e. $AB : AD = \sqrt{3} : 1$. (½ mark)

(ii) Rough figure :



Ans.



[Marking scheme :

(1) For rough figure (1 mark)

(2) For construction of $\triangle SHR$ (1 mark)

(3) For drawing line $S_5V \parallel S_3H$ (1 mark)

(4) For drawing line $VU \parallel HR$ (1 mark)]

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Q. No. 4

(iii) **Solution :**

Volume of cylindrical pot $= \pi r^2 h$ *(½ mark)*

$$= \frac{22}{7} \times (12)^2 \times 7$$

$$= \frac{22}{7} \times 144 \times 7$$

$$= 3168 \text{ cm}^3$$

Volume of ice cream in the pot $= 3168 \text{ cm}^3$ *(½ mark)*

Volume of each cone $= \frac{1}{3} \pi r^2 h$ *(½ mark)*

$$= \frac{1}{3} \times \frac{22}{7} \times (2)^2 \times 3.5 \quad (\text{As } d = 4 \text{ cm} \therefore r = 2 \text{ cm})$$

$$= \frac{1}{3} \times \frac{22}{7} \times 4 \times 3.5$$

$$= \frac{44}{3} \text{ cm}^3$$ *(½ mark)*

Number of ice-cream cones $= \frac{\text{Volume of ice cream in the pot}}{\text{Volume of ice cream in each cone}}$

(½ mark)

$$= \frac{3168 \times 3}{44}$$ *(½ mark)*

$$= 216$$ *(½ mark)*

Ans. 216 students can be served the ice-cream cones. *(½ mark)*

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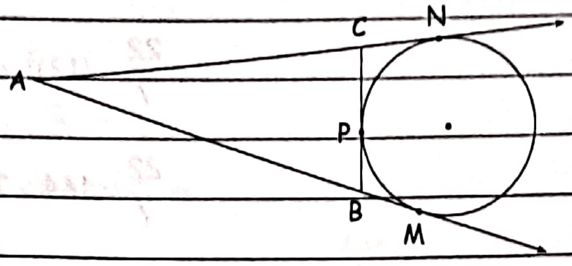
Q. No. 5

Note : In this question type, students are required to solve any 1 of 2 subquestions. However, solutions to both the subquestions are given here, for the guidance of the students.

(i)



Proof :

Tangent segments drawn from an exterior point to the circle are congruent *(½ mark)*

$\therefore$ $BP = BM$ ...(1)

$CP = CN$ ...(2) *(½ mark)*

$AM = AN$ ...(3)

$AB + BC + AC =$ Perimeter of $\triangle ABC$ *(½ mark)*

$\therefore$ $AB + BP + PC + AC =$ Perimeter of $\triangle ABC$ ...[B-P-C]

$\therefore$ $AB + BM + CN + AC =$ Perimeter of $\triangle ABC$

...[From (1) and (2)] *(½ mark)*

$AM + AN =$ Perimeter of $\triangle ABC$ ...(A-B-M and A-C-N) *(½ mark)*

$AM + AM =$ Perimeter of $\triangle ABC$ ...[From (3)]

$\therefore$ $2AM =$ Perimeter of $\triangle ABC$

$\therefore$ $AM = \frac{1}{2}$ (Perimeter of $\triangle ABC$) *(½ mark)*

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(ii) Solution :

$x = r \cdot \cos\theta$ ... (Given)

$\therefore \cos\theta = \dfrac{x}{r}$ ... (1) (½ mark)

$y = r \cdot \sin\theta$ ... (Given)

$\therefore \sin\theta = \dfrac{y}{r}$ ... (2) (½ mark)

Now, $\sin^2\theta + \cos^2\theta = 1$ (½ mark)

$\therefore \left(\dfrac{x}{r}\right)^2 + \left(\dfrac{y}{r}\right)^2 = 1$ (½ mark)

$\therefore \dfrac{x^2}{r^2} + \dfrac{y^2}{r^2} = 1$

$\therefore \dfrac{x^2 + y^2}{r^2} = 1$ (½ mark)

$\therefore x^2 + y^2 = r^2$ (½ mark)

Ans. $x^2 + y^2 = r^2$