प्र. क्र.
Q. No. **1 (A)**

(i) (A) *(1 mark)*

(ii) (A) *(1 mark)*

(iii) (C) *(1 mark)*

(iv) (C) *(1 mark)*

1 (B)

Note : Here answers with solution are expected.

(i) Ans.

$\triangle ABC \sim \triangle PQR$ ... (Given)

$$\frac{A(\triangle ABC)}{A(\triangle PQR)} = \frac{AB^2}{PQ^2}$$

... (Theorem of areas of two similar triangles) *(½ mark)*

$$= \left(\frac{AB}{PQ}\right)^2 = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$$ *(½ mark)*

The value of $\frac{A(\triangle ABC)}{A(\triangle PQR)}$ is $\frac{4}{9}$.

(ii) Ans.

The radius of the first circle $(r_1) = 5$ cm

The radius of the second circle $(r_2) = 3$ cm

By theorem of touching circles, the distance between the centres of two externally touching circles $= r_1 + r_2$ *(½ mark)*

$= 5 + 3$

$= 8$ cm *(½ mark)*

Distance between the centres of two externally touching circles is 8 cm.

प्र. क्र.
Q. No. 1 (B)

(iii) Ans.

Diagonal of square $= \sqrt{2} \times \text{side}$ *(½ mark)*

$\therefore 10\sqrt{2} = \sqrt{2} \times \text{side}$

$\therefore \frac{10\sqrt{2}}{\sqrt{2}} = \text{side}$

$\therefore \text{side} = 10$ *(½ mark)*

The side of the square is 10 cm.

(iv) Ans.

Angle made by a line with the positive direction of X-axis $(\theta) = 45°$.

Slope of the line $= \tan\theta = \tan 45°$ *(½ mark)*

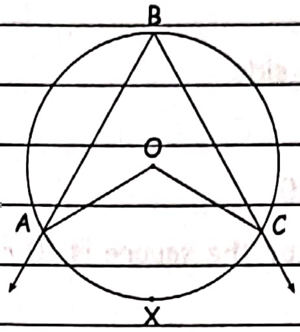
$= \tan 45° = 1$. *(½ mark)*

The slope of the line is 1.

प्र. क्र.
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 :

$\angle ABC = \frac{1}{2}$ m(arc AXC) ... (Inscribed angle theorem) *(½ mark)*

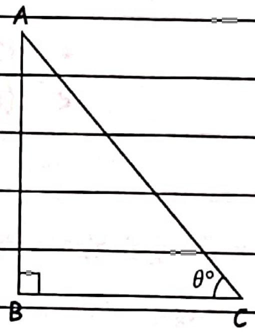
$\therefore 60° = \frac{1}{2}$ m(arc AXC)

120° = m(arc AXC) *(½ mark)*

But m$\angle AOC$ = m(arc AXC) ... (Property of central angle) *(½ mark)*

$\therefore$ m$\angle AOC$ = 120° *(½ mark)*

(ii) Activity :



In $\triangle ABC$, $\angle ABC = 90°$, $\angle C = \theta°$.

$AB^2 + BC^2 = AC^2$ ... (Pythagoras theorem) *(½ mark)*

Dividing both the sides by AC^2,

$$\frac{AB^2}{AC^2} + \frac{BC^2}{AC^2} = \frac{AC^2}{AC^2}$$

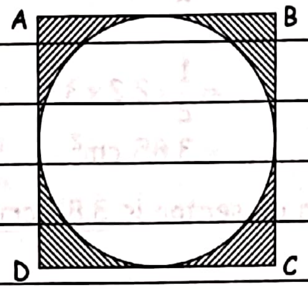
प्र. क्र.
Q. No. 2 (A)

$\therefore \left(\frac{AB}{AC}\right)^2 + \left(\frac{BC}{AC}\right)^2 = 1$

But $\frac{AB}{AC} = \boxed{\sin\theta}$ and $\frac{BC}{AC} = \boxed{\cos\theta}$ *(½ + ½ mark)*

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

(iii) Activity :



Area of square $= \left(\boxed{\text{side}}\right)^2$ ... (Formula) *(½ mark)*

$= 14^2$

$= \boxed{196}\ cm^2$ *(½ mark)*

Area of circle $= \boxed{\pi r^2}$ ... (Formula) *(½ mark)*

$= \frac{22}{7} \times 7 \times 7 = 154\ cm^2$

$\left(\text{Area of shaded portion}\right) = \left(\text{Area of square}\right) - \left(\text{Area of circle}\right)$

$= 196 - 154$

$= \boxed{42}\ cm^2$ *(½ mark)*

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***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 :

Radius of circle (r) = 3.5 cm

Length of arc (l) = 2.2 cm

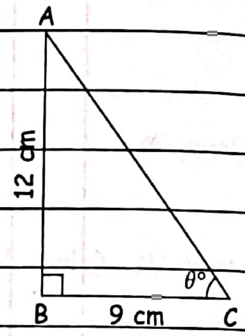
Area of sector $= \frac{1}{2} \times l \times r$ ... (Formula) *(1 mark)*

$= \frac{1}{2} \times 2.2 \times 3.5$

$= 3.85\ cm^2$ *(1 mark)*

Ans. Area of sector is $3.85\ cm^2$.

(ii) Solution :



Let $\triangle ABC$ be the given right angled triangle. AB = 12 cm and BC = 9 cm.

In $\triangle ABC$, $\angle ABC = 90°$

$\therefore$ by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$ *(½ mark)*

$\therefore AC^2 = 12^2 + 9^2$ *(½ mark)*

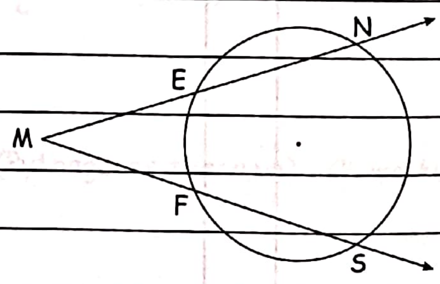
$\therefore AC^2 = 144 + 81$

$\therefore AC^2 = 225$ *(½ mark)*

$\therefore AC = 15$ ... (Taking square roots of both the sides) *(½ mark)*

Ans. Hypotenuse of right angled triangle is 15 cm.

(iii) Solution :



The vertex of $\angle NMS$ is in exterior of the given circle and it intercepts arc NS and arc EF.

$\angle NMS = \frac{1}{2}[m(\text{arc } NS) - m(\text{arc } EF)]$ *(1 mark)*

प्र. क्र.
Q. No. 2 (B)

$= \frac{1}{2}[125° - 37°]$ *(½ mark)*

$= \frac{1}{2} \times 88°$

$= 44°$ *(½ mark)*

Ans. The measure of $\angle NMS$ is $44°$.

(iv) Solution :

$A(2, 3) \equiv (x_1, y_1)$

$B(4, 7) \equiv (x_2, y_2)$

Slope of $AB = \frac{y_2 - y_1}{x_2 - x_1}$ ... (Formula) *(½ mark)*

$= \frac{7-3}{4-2}$ *(½ mark)*

$= \frac{4}{2}$ *(½ mark)*

$= 2$ *(½ mark)*

Ans. Slope of line AB is 2.

(v) Solution :

Radius of sphere $(r) = 7$ cm

Surface area of sphere $= 4\pi r^2$ ... (Formula) *(½ mark)*

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

$= 4 \times 22 \times 7$ *(½ mark)*

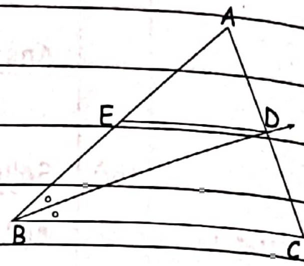
$= 616 \text{ cm}^2$ *(½ mark)*

Ans. Surface area of sphere is 616 cm^2.

प्र. क्र.
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) Proof :



In $\triangle ABC$, ray BD bisects $\angle B$.

$\therefore \frac{AB}{BC} = \frac{AD}{DC}$ ... (1) (By theorem of an angle bisector of a triangle)

(½ + ½ mark)

In $\triangle ABC$, $DE \parallel BC$.

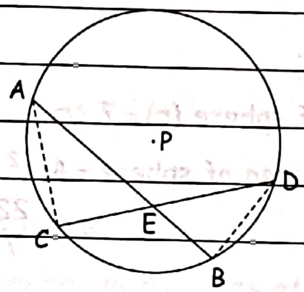
$\therefore \frac{AE}{EB} = \frac{AD}{DC}$ ... (2) (By Basic Proportionality theorem)

(½ + ½ mark)

$\therefore \frac{AB}{BC} = \frac{AE}{EB}$ ... [From (1) and (2)]

(½ + ½ mark)

(ii) Proof :



In $\triangle CAE$ and $\triangle BDE$,

$\angle AEC \cong \angle DEB$ ... Vertically opposite angles *(½ mark)*

$\angle CAE \cong \angle BDE$ ... (Angles inscribed in the same arc) *(½ mark)*

$\therefore \triangle CAE \sim \triangle BDE$ ... AA test of similarity *(½ mark)*

$\therefore \frac{AE}{DE} = \frac{CE}{BE}$ ... Corresponding sides of similar triangles

(½ + ½ + ½ marks)

$\therefore AE \times EB = CE \times ED$.

प्र. क्र. 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 :

A(1, −3), B(2, −5), C(−4, 7)

Let $A(1, -3) \equiv (x_1, y_1)$, $B(2, -5) \equiv (x_2, y_2)$ and $C(-4, 7) \equiv (x_3, y_3)$

Slope of line AB $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-(-3)}{2-1} = \frac{-5+3}{1} = -2$ *(1 mark)*

Slope of line BC $= \frac{y_3 - y_2}{x_3 - x_2} = \frac{7-(-5)}{-4-2} = \frac{7+5}{-6} = \frac{12}{-6} = -2$ *(1 mark)*

∵ slope of line AB = slope of line BC and B is the common point. *(½ mark)*

Ans. Points A, B and C are collinear. *(½ mark)*

(ii) Solution :

For △ABC, the lengths of three sides are known.

∴ △ABC can be constructed.

△ABC ~ △LMN

∴ $\frac{AB}{LM} = \frac{BC}{MN} = \frac{AC}{LN}$ ... (Corresponding sides of similar triangles are in proportion)

∴ $\frac{5.5}{LM} = \frac{6}{MN} = \frac{4.5}{LN} = \frac{5}{4}$

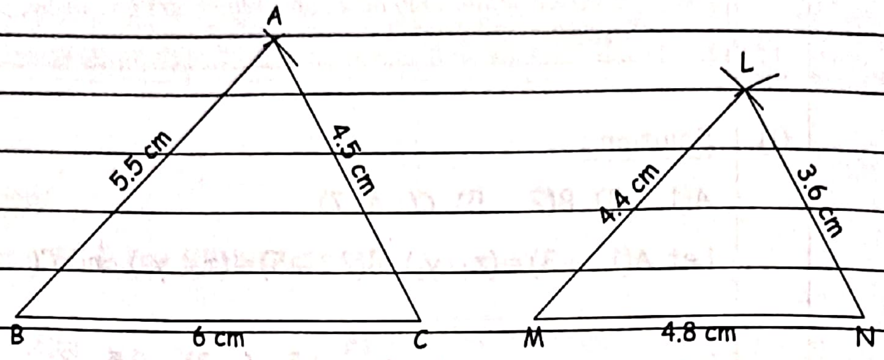
∴ $\frac{5.5}{LM} = \frac{5}{4}$	$\frac{6}{MN} = \frac{5}{4}$	$\frac{4.5}{LN} = \frac{5}{4}$
∴ $LM = \frac{5.5 \times 4}{5}$	∴ $MN = \frac{6 \times 4}{5}$	∴ $LN = \frac{4.5 \times 4}{5}$
∴ $LM = 1.1 \times 4$	∴ $MN = \frac{24}{5}$	∴ $LN = \frac{18}{5}$
∴ LM = 4.4 cm	∴ MN = 4.8 cm	∴ LN = 3.6 cm

For △LMN, the lengths of three sides are known.

∴ △LMN can be constructed.

प्र. क्र.
Q. No. 3 (B)

Ans.



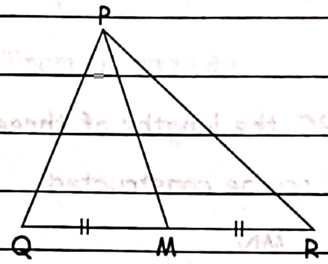
[Marking scheme :

(1) To find the measures of $\triangle LMN$. *(1 mark)*

(2) To construct $\triangle ABC$. *(1 mark)*

(3) To construct $\triangle LMN$. *(1 mark)]*

(iii) Solution :



In $\triangle PQR$,

seg PM is the median.

$PQ^2 + PR^2 = 2PM^2 + 2QM^2$ ... (Apollonius theorem) *(½ mark)*

$\therefore 290 = 2 \times 9^2 + 2 \times QM^2$ *(½ mark)*

$\therefore 290 = 162 + 2QM^2$

$\therefore 2QM^2 = 290 - 162$ *(½ mark)*

$\therefore 2QM^2 = 128$

$\therefore QM^2 = 64$

$\therefore QM = \sqrt{64}$

$\therefore QM = 8$ *(½ mark)*

$QR = 2 \times QM$ ... [M is the midpoint of QR] *(½ mark)*

$\therefore QR = 2 \times 8$

$\therefore QR = 16$ units

Ans. $QR = 16$ units *(½ mark)*

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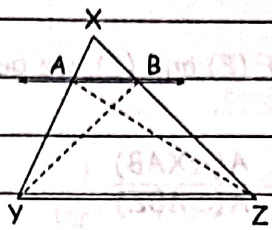
Q. No. 3 (B) (iv)



(½ mark)

Given : In $\triangle XYZ$,

(i) Line AB $\parallel$ side YZ.

(ii) Line AB intersects side XY and side XZ in points A and B respectively such that X – A – Y and X – B – Z. *(½ mark)*

To prove : $\frac{XA}{AY} = \frac{XB}{BZ}$

Construction : Draw seg BY and seg AZ.

Proof : $\triangle XAB$ and $\triangle BAY$ have a common vertex B and their bases XA and AY lie on the same line XY.

$\therefore$ they have equal heights.

$\therefore \frac{A(\triangle XAB)}{A(\triangle BAY)} = \frac{XA}{AY}$ ... (Triangles of equal heights) ... (1) *(½ mark)*

$\triangle XAB$ and $\triangle ABZ$ have a common vertex A and their bases XB and BZ lie on the same line XZ.

$\therefore$ they have equal heights.

$\therefore \frac{A(\triangle XAB)}{A(\triangle ABZ)} = \frac{XB}{BZ}$ ... (Triangles of equal heights) ... (2) *(½ mark)*

$\triangle BAY$ and $\triangle ABZ$ lie between the same two parallel lines AB and YZ.

$\therefore$ they have equal heights, also they have same base AB.

$\therefore A(\triangle BAY) = A(\triangle ABZ)$

... [Triangles with same base and equal heights] ... (3) *(½ mark)*

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प्र. क्र.
Q. No. 3 (B)

$\therefore$ from (1), (2) and (3), we get,

$$\frac{A(\triangle XAB)}{A(\triangle BAY)} = \frac{A(\triangle XAB)}{A(\triangle ABZ)} \quad \text{... (4)}$$

$\therefore$ from (1), (2) and (4), we get,

$$\frac{XA}{AY} = \frac{XB}{BZ}.$$ *(½ mark)*

प्र. क्र.
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) Solution : $\frac{1}{\sin^2\theta} - \frac{1}{\cos^2\theta} - \frac{1}{\tan^2\theta} - \frac{1}{\cot^2\theta} - \frac{1}{\sec^2\theta} - \frac{1}{\operatorname{cosec}^2\theta} = -3$

$\therefore \operatorname{cosec}^2\theta - \sec^2\theta - \cot^2\theta - \tan^2\theta - \cos^2\theta - \sin^2\theta = -3$ *(½ mark)*

$\ldots \left[\because \frac{1}{\sin\theta} = \operatorname{cosec}\theta, \frac{1}{\cos\theta} = \sec\theta, \frac{1}{\tan\theta} = \cot\theta, \frac{1}{\cot\theta} = \tan\theta, \frac{1}{\sec\theta} = \cos\theta \text{ and } \frac{1}{\operatorname{cosec}\theta} = \sin\theta\right]$

$\therefore (\operatorname{cosec}^2\theta - \cot^2\theta) - (\cos^2\theta + \sin^2\theta) - (\sec^2\theta + \tan^2\theta) = -3$

$\therefore 1 - 1 - (\sec^2\theta + \tan^2\theta) = -3$

$\left[\begin{array}{r}\operatorname{cosec}^2\theta = 1 + \cot^2\theta,\ \operatorname{cosec}^2\theta - \cot^2\theta = 1 \\ \sin^2\theta + \cos^2\theta = 1\end{array}\right]$ *(½ mark)*

$\therefore (\sec^2\theta + \tan^2\theta) = 3$ *(½ mark)*

$\therefore 1 + \tan^2\theta + \tan^2\theta = 3$ $\ldots [\sec^2\theta = 1 + \tan^2\theta]$ *(½ mark)*

$\therefore 2\tan^2\theta = 3 - 1$

$\therefore 2\tan^2\theta = 2$

$\therefore \tan^2\theta = 1$ *(½ mark)*

$\therefore \tan\theta = 1$ *(½ mark)*

We know that, $\tan 45° = 1$ *(½ mark)*

$\therefore \theta = 45°$ *(½ mark)*

Ans. $\theta = 45°$.

(ii) Solution :

Let the radius of the spherical ball be (R).

Radius of the cylinder $(r) = 12$ cm.

Height of the raised water $(h) = 6.75$ cm. *(½ mark)*

Volume of iron ball = Volume of water raised *(½ mark)*

$\therefore \frac{4}{3}\pi R^3 = \pi r^2 h$ *(½ mark)*

प्र. क्र.
Q. No. 4

$\therefore \frac{4}{3}R^3 = r^2h$ *(½ mark)*

$\therefore \frac{4}{3} \times R^3 = 12 \times 12 \times 6.75$ *(½ mark)*

$\therefore R^3 = \frac{12 \times 12 \times 6.75 \times 3}{4}$ *(½ mark)*

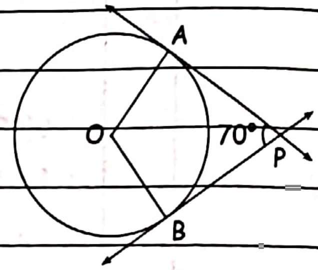
$\therefore R^3 = 729$ *(½ mark)*

$\therefore R = 9$ cm *(½ mark)*

Ans. Radius of the iron ball is 9 cm.

(iii) Solution :

Analytical figure :



$\angle OAP = \angle OBP = 90°$ ... (Tangent theorem)

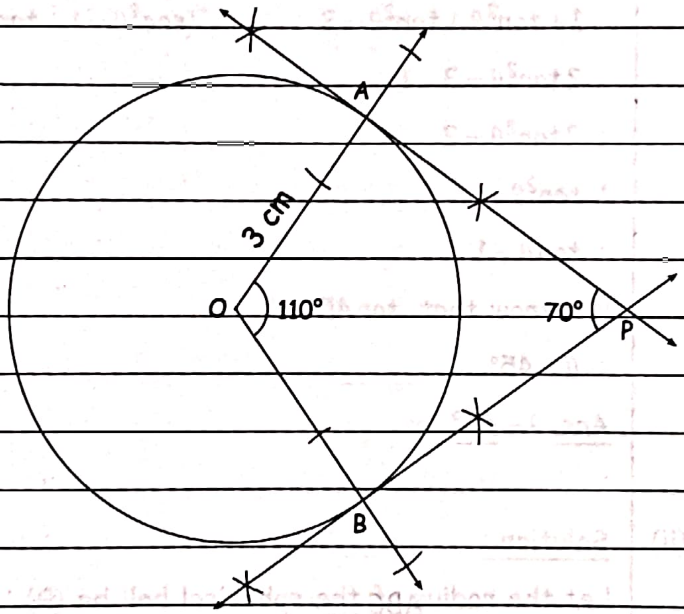
$\angle OAP + \angle OBP + \angle APB + \angle AOB = 360°$

... (Sum of all angles of a quadrilateral is 360°)

$90° + 90° + 70° + \angle AOB = 360°$

$\therefore \angle AOB = 360° - 250°$ $\quad \therefore \angle AOB = 110°$

Ans.



[Marking scheme :

(1) For analytical figure and analysis. *(1 mark)*

(2) To draw circle of radius 3 cm. *(1 mark)*

(3) To draw $\angle AOB = 110°$. *(1 mark)*

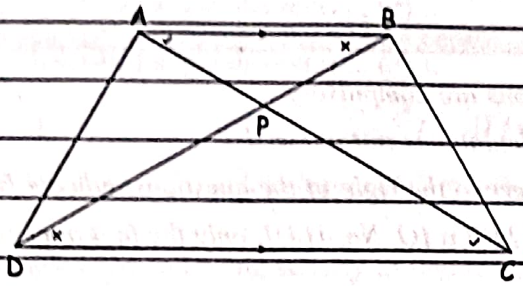
(4) To draw tangents at A and B. *(1 mark)]*

प्र. क्र. 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) Ans.

(a)



(1 mark)

(b) ∠PAB and ∠PCD are one pair of alternate angles.

(Note : Student can even write ∠PBA and ∠PDC.) *(½ mark)*

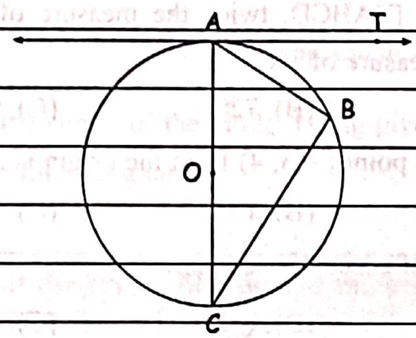
∠APB and ∠CPD are one pair of opposite angles.

(Note : Student can even write ∠BPC and ∠APD.) *(½ mark)*

(c) △APB ~ △CPD ...(AA test of similarity) *(1 mark)*

(ii) Ans.

(a)



(1 mark)

(b) ∠CAT = 90° ...(Tangent theorem) *(½ mark)*

∠ABC = 90° ...(Angle inscribed in a semicircle is a right angle) *(½ mark)*

(c) ∠CAT ≅ ∠ABC ...(Both measure 90°) *(1 mark)*