EDUTECH ACADEMY

Preliminary Examination [MODEL ANSWER]

Std: SSC (E.M) **Subject: Mathematics II** **Time: 2 Hours**

Date : 20/Jan/2026 **Max Marks: 40**

(i) All questions are compulsory.
(ii) Use of calculator is not allowed.
(iii) Total marks are shown on the right side of the question.

Q.1 (A) Choose the correct alternative: **4**

(1) Ans. (c) any one side

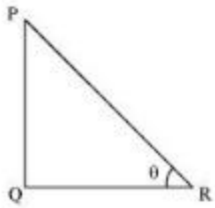
(2) Ans. (a)

The x -axis is a horizontal line with the equation y=0. There are an infinite number of lines that are parallel to the x -axis, y=0. All horizontal lines have slope of 0.

(3) Ans. (c)

Since ΔABC and ΔRQP are similar, therefore,
$\angle A=\angle R$, $\angle B=\angle Q$ and $\angle C=\angle P$
But $\angle A = 80°$ and $\angle B = 60°$ (Given)
$\angle$ PR = $\angle$ A = 80° and $\angle$ Q= $\angle$ B = 60°
$\angle$ P = 180° - $\angle$R - $\angle$ Q
= 180° – 80° – 60° [$\therefore$ $\angle$R = 80° and $\angle$Q = 60°]
= 180° - 140°
$\angle$P = 40°.

(4) Ans. (b)



Let PQ be Atul's height and R be Kumar's position.
Accordingly, QR is the horizontal distance between them.
$\therefore$ PQ = 160 cm

$$\tan\theta = \frac{PQ}{QR} = 1$$

hence $\theta = 45°$

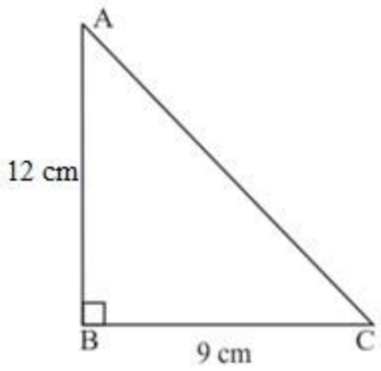
(B) Solve the following: **4**

(1) Ans. For the sphere,
Radius (r) = 7 cm
Curved surface area of the sphere = $4\pi r^2$

$$= 4 \times \frac{22}{7} \times 7 \times 7$$

$$= 616 \text{ cm}^2$$

(2) Ans.



In ΔABC, $\angle ABC = 90^\circ$ [Given]

$\therefore AC^2 = AB^2 + BC^2$ [Pythagoras theorem]

$\therefore AC^2 = 9^2 + 12^2$

$= 81 + 144$

$\therefore AC^2 = 225$

$\therefore AC = 15$ cm [Taking square roots]

$\therefore$ Length of the hypotenuse is 15 cm

(3) Ans.

$\Delta ABC \sim \Delta PQR$

$AB : PQ = 2 : 3$

According to theorem of areas of similar triangles "When two triangles are similar, the ratio of areas of those triangles is equal to the ratio of the squares of their corresponding sides".

If $\Delta ABC \sim \Delta PQR$ and $AB : PQ = 2 : 3$,

then find the value of $= \therefore \frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{AB^2}{PQ^2} = \frac{2^2}{3^2} = \frac{4}{9}$

(4) Ans. Slope $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{7-3}{4-2} = \frac{4}{2} = 2$

Slope $= 2$

Q.2 (A) Complete the following activities:(Any TWO) **4**

(1) Ans.

$\tan\theta = \frac{3}{4}$ [Given]

$1 + \tan^2\theta = \sec^2\theta$ [Identity]

$\therefore 1 + \left(\frac{3}{4}\right)^2 = \sec^2\theta$

$\therefore 1 + \boxed{\frac{9}{16}} = \sec^2\theta$

$\therefore \frac{16 + 9}{16} = \sec^2\theta$

$\therefore \sec^2\theta = \boxed{\frac{25}{16}}$

$\therefore \sec\theta = \frac{5}{4}$ [Taking square roots]

$\cos\theta = \frac{1}{\sec\theta}$

$\therefore \cos\theta = 1 \div \frac{5}{4}$

$\therefore \cos\theta = 1 \text{ x} \boxed{\frac{4}{5}}$

$\therefore \cos\theta = \boxed{\frac{4}{5}}$

(2) Ans. In ΔMNP, NQ bisects $\angle MNP$ [Given]

$\therefore \frac{MN}{PN} = \boxed{\frac{MQ}{PQ}}$

[Angle bisector property of a triangle]

$\therefore \frac{5}{7} = \boxed{\frac{2.5}{PQ}}$

$\therefore 5 \text{ x } PQ = \boxed{2.5} \text{ x } 7$

$\therefore PQ = \frac{2.5 \text{ x } 7}{5}$

$\therefore PQ = \boxed{3.5 \text{ units.}}$

(3) Ans. In Δ ADC

$\angle ADC = 90^\circ$, $\angle C = 45^\circ$, $\therefore \angle DAC = 45^\circ$

$AD = DC = \frac{1}{\sqrt{2}} \times \boxed{8\sqrt{2}}$ … by $45^\circ - 45^\circ - 90^\circ$ theorem

$DC = 8 \quad \therefore AD = 8$

$BC = BD + \boxed{DC}$

$= 5 + \boxed{8}$

$BC = \boxed{13}$

(B) Solve the following: (Any FOUR) **8**

(1) Ans. Let point T divides seg PQ in the ratio m : n.

T(-1, 6) = (x, y)

P(-3, 10) = (x_1, y_1)

Q(6, -8) = (x_2, y_2)

By section formula,

$$x = \frac{mx_2 + nx_1}{m + n}$$

$$-1 = \frac{m \times 6 + n(-3)}{m + n}$$

$\therefore$ -1 (m + n) = 6m – 3n

$\therefore$ -m – n = -3n + n

-m – n = 6m- 3n

6m + m = - n + 3n

7m = 2n

m/n = 2/7

Point T divides seg PQ in the ratio 2 : 7.

(2) Ans. $\Delta ABC \sim \Delta DEF$

$$\frac{A(\Delta ABC)}{A(\Delta DEF)} = \frac{AB^2}{DE^2}$$

$$\frac{1}{2} = \frac{4^2}{DE^2}$$

$$\frac{1}{2} = \frac{16}{DE^2}$$

$\therefore DE^2 = 16 \times 2 \therefore DE = 4\sqrt{2}$

(3) Ans. □ MRPN is a cyclic quadrilateral [Given]

$\therefore \angle R + \angle N = 180°$

[Opposite angles of cyclic quadrilateral are supplementary]

$\therefore 5x - 13 + 4x + 4 = 180$

$\therefore 9x - 9 = 180$

$\therefore 9x = 180 + 9$

$\therefore 9x = 189$

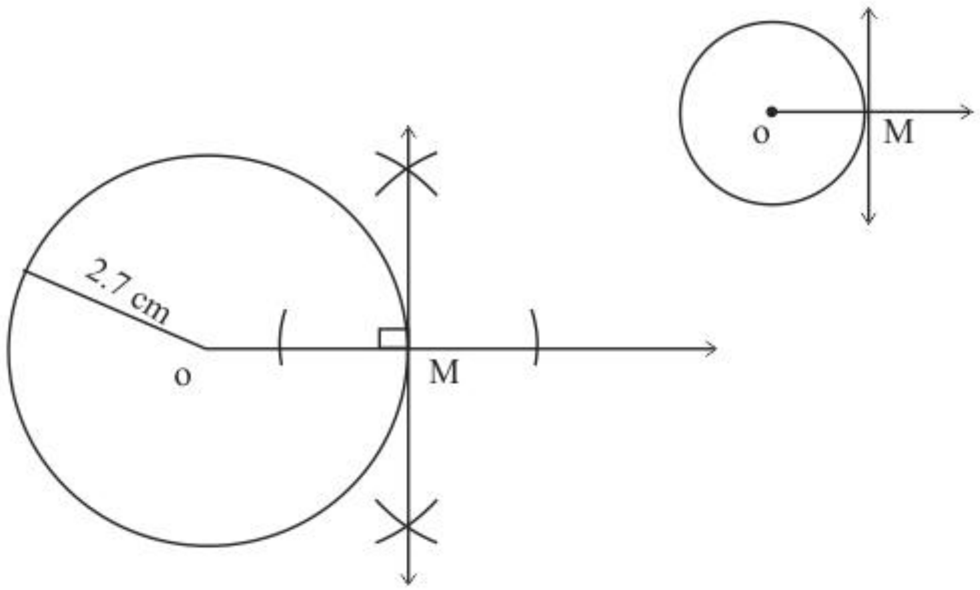
$$\therefore x = \frac{189}{9}$$

$\therefore x = 21$

$\therefore m\angle R = 5x - 13 = 5 \times 21 - 13 = 105 - 13 = 92$

$M\angle N = 4x + 4 = 4 \times 21 + 4 = 84 + 4 = 88$

(4) Ans.



(5) Ans. (i) In ΔPQB and ΔADB,

$\angle B \cong \angle B$

$\angle PQB \cong \angle ADB$................. (each right angle)

$\therefore \Delta PQB \sim \Delta ADB$................. (A-A test of similarity)

$$\therefore \frac{A(\Delta PQB)}{A(\Delta ADB)} = \frac{PQ^2}{AD^2} = \frac{4^2}{6^2} = \frac{16}{36} = \frac{4}{9} \quad \text{...(Theorem of areas of similar triangle)}$$

$$\text{(ii)} \frac{A(\Delta PBC)}{A(\Delta ABC)} = \frac{PQ}{AD} = \frac{4}{6} = \frac{2}{3} \quad \text{......(triangles having eqal bases)}$$

Q.3 (A) Complete the following activity:(Any ONE) **3**

(1) Ans. M (arc PR) = m $\angle$POR

[Definition of measure of minor arc]

$\therefore$ m (arc PR) = $\boxed{70^\circ}$ 1

Chord PQ $\cong$ chord $\boxed{RS}$ [Given]

$\therefore$ ($\boxed{\text{arc PQ}}$) $\cong$ (arc RS)

[In a circle, congruent chords have corresponding minor are congruent]

$\therefore$ m (arc PQ) = $\boxed{80^\circ}$ 2

M (arc PR) + m (arc RS) + m (arc PQ) + m (arc QS) = 360° [Measure of a circle]

$\therefore$ 70° + 80° + 80° + m ($\boxed{\text{arc QS}}$) = 360°

$\therefore$ m (arc QS) = 360° - 230°

$\therefore$ m (arc QS) = 130° 3

M (arc QSR) = m (QS) + m (arc SR)

[Arc addition property]

$\therefore$ m (arc QSR) = 130° + 80°

$\therefore$ m (arc QSR) = $\boxed{210^\circ}$

(2) Ans. (i) For arc RXQ, $\theta = \angle ROQ = 60°$

OR (r) = $\boxed{7\text{ cm}}$

Length of arc RXQ = $\boxed{\dfrac{\theta}{360}}$ x $2\pi r$

$= \dfrac{60}{360} \times 2 \times \dfrac{22}{7} \times 7$

= $\boxed{7.33\text{ cm}}$

Length of arc RXQ is $\boxed{7.33\text{ cm}}$

(ii) For arc MYN, OM(r) = 21 cm, $\theta = \angle MON$ = 60°

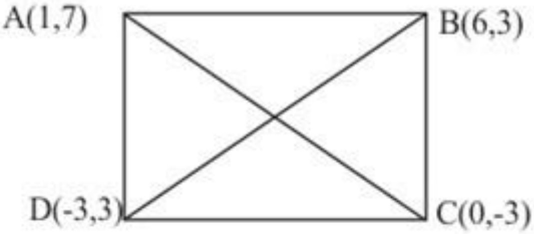
Length of arc MYN = $\dfrac{60}{360} \times 2 \times \dfrac{22}{7} \times 21$

= $\boxed{22\text{ cm}}$

Length of arc(MYN) is $\boxed{22\text{ cm}}$

(B) Solve the following: (Any TWO) **6**

(1) Ans.



A(1, 7), B(6, 3), C(0, -3) and D(-3, 3)

□ ABCD has two diagonals seg AC and seg BD.

Slope of AC = $\dfrac{7-(-3)}{1-0}$

$= \dfrac{7+3}{1}$

$= \dfrac{10}{1}$

∴ Slope of AC = 10

Slope of BD = $\dfrac{3-3}{6-(-3)}$

$= \dfrac{0}{6+3}$

Slope of BD = 0

∴ Slope of BD = 0

(2) Ans. In ΔCPA & ΔCQB

(i) $\angle C \cong \angle C$ [Common angle]

(ii) $\angle APC \cong \angle BQC$ [Each 90°]

∴ $\Delta CPA \sim \Delta CQB$ [AA test]

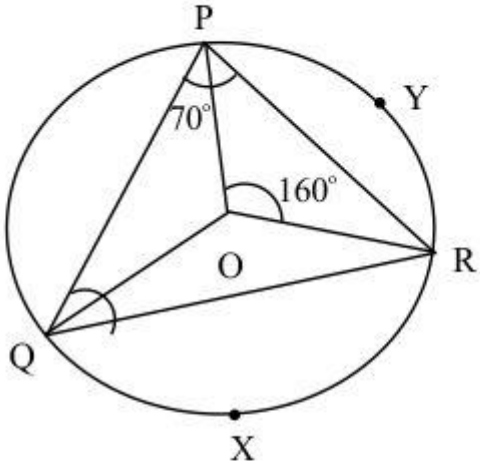
$\dfrac{AP}{BQ} = \boxed{\dfrac{AC}{BC}}$ [c.s.s.t]

∴ $\dfrac{7}{\boxed{8}} = \dfrac{\boxed{AC}}{12}$

∴ $\dfrac{7 \times \boxed{12}}{\boxed{8}} = AC$

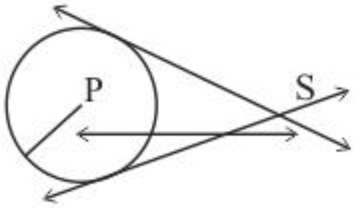
∴ AC = $\boxed{10.5}$ units

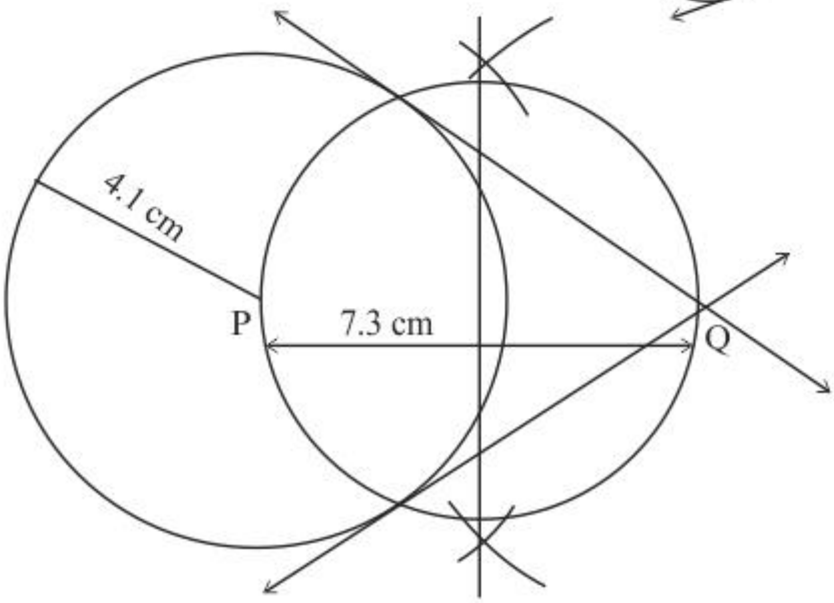
(3) Ans.



Given:
(i) $\angle QPR = 70°$
(ii) m(arc PYR) = 160°
$\angle POR = 160°$
To Find:
(a) m(arc QXR) = m($\angle$ QOR)
$\angle$ QOR = 2 x $\angle$QPR = 140° [Angle at the centre is twice the angle at the circumference]
$\angle$ QOR = 140°
(b) $\angle$ QOR = 160°
(c) $\angle$PQR = 80° [Angle at the circumference is half of the angle the centre]

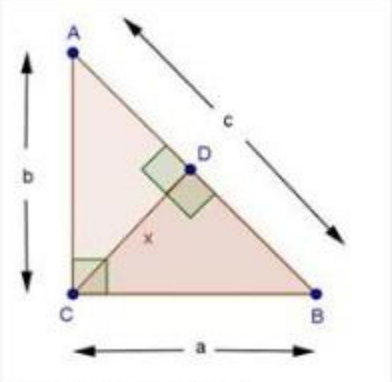
(4) Ans.





Q.4 Solve the following: (Any TWO) 8

(1) Ans. We have: $\angle C = 90^\circ$ and $CD \perp AB$



In ΔACB and ΔCDB

$\angle B = \angle B$ [Common]

$\angle ACB = \angle CDB$ [Each 90°]

Then, $\Delta ACB \sim \Delta CDB$ [By AA similarity]

$\therefore \quad \frac{AC}{CD} = \frac{AB}{CB}$ [Corresponding parts of similar Δ are proportional]

$\Rightarrow \quad \frac{b}{x} = \frac{C}{a}$

$\Rightarrow \quad ab = cx$

(2) Ans. $R.H.S. = m^2 + n^2$

$= (a\cos\theta + b\sin\theta)^2 + (a\sin\theta - b\cos\theta)^2$

$= a^2\cos^2 + 2ab\sin\theta\cos\theta + b^2\sin^2\theta + a^2\sin^2\theta - 2ab\sin\theta\cos\theta + b^2\cos^2\theta$

$= a^2\cos^2\theta + a^2\sin^2\theta + b^2\sin^2\theta + b^2\cos^2\theta$

$= a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$

$= a^2 \times 1 + b^2 \times 1$

$= a^2 + b^2$

$= L.H.S$

$\therefore a^2 + b^2 = m^2 + n^2$

(3) Ans. Given : In the circle with centre O, line l is tangent to the circle at point T.

□ABCD is a square. Diameter is 10 cm.

To find : Side of the square

Construction : Draw seg OT, seg OB. Extend seg OT to intersect side AB at point E such that A-E-B and T-O-E.

Solution :

$$r = \frac{D}{2} = \frac{10}{2} = 5$$

$\therefore$ r = 5 cm

$\therefore$ OT = OB = 5 cm ---(i)[Radii of same circle]

In □EBCT,

$\angle EBC = \angle BCT = 90^\circ$ ----[Angles of a square]

$\angle ETC = 90^\circ$ ----[Tangent is perpendicular to radius]

$\therefore$ $\angle TEB = 90^\circ$ ----(ii)[Remaining angle of a quadrilateral]

$\therefore$ □EBCT is a rectangle.

Let the side of the square be 2x.

$\therefore$ ET = BC = 2x ----[Opposide sides of a rectangle

ET = EO + OT ----[E-O-T]

2x = OE + 5 ----[From (i)]

$\therefore$ OE = $(2x - 5)$ cm -----(iii)

seg OE $\perp$ chord AB ----[From (ii)]

$\therefore$ $EB = \frac{1}{2} AB$

$= \frac{1}{2} \times 2x = x$ ----[Perpendicular drawn from centre of the circle to the chord bisects the chord]

In ΔOEB, $\angle OEB = 90^\circ$

$OB^2 = OE^2 + EB^2$ ----[By Pythagoras theorem]

$5^2 = (2x - 5)^2 + x^2$ ----[From (i) and (iii)]

$25 = 4x^2 - 20x + 25 + x^2$

$5x^2 - 20x = 0$

$\therefore$ $5x(x - 4) = 0$

$\therefore$ $5x = 0$ or $x - 4 = 0$

$\therefore$ $x = 0$ or $x = 4$

$x \neq 0$ as side of square cannot be zero.

$\therefore$ $x = 4$

$\therefore$ $2x = 8$

$\therefore$ Side of square = 8 cm

Q.5 Solve the following: (Any ONE) 3

(1) Ans. Volume of hemisphere $= \frac{2}{3}\pi R^3$

Volume of cone $= \frac{1}{3}\pi r^2 \times h$

By the given condition;

$2 \times$ volume of cone $=$ volume of hemisphere

$\therefore 2 \times \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi R^3$

$\therefore r^2 h = R^3$

$\therefore$ if $r = h = R$ ....then both sides will be equal.

$\therefore$ if radius of base of the cone is R and its height is R,

which is equal to radius of the bowl, then a cone satisfying

the given condition can be made.

(2) Ans. Given, r =35 cm and $\angle AOB = 90^\circ$

Thus, the area of the major segment = Area of the circle – area of the minor segment

$$= \pi r^2 - \left\{\frac{\theta}{360^\circ} x\pi - \frac{1}{2}\sin\theta\right\} r^2 cm^2$$

$$= r^2\left[\pi - \left\{\frac{\theta}{360^\circ} x\pi - \frac{1}{2}\sin\theta\right\}\right] cm^2$$

$$= (35)^2\left[\frac{22}{7} - \left[\frac{90}{360} x \frac{22}{7} - \frac{1}{2}\sin 90^\circ\right]\right] cm^2$$

$$= 1225\left[\frac{22}{7} - \left\{\frac{1}{4} x \frac{22}{7} - \frac{1}{2}\right\}\right] cm^2$$

$$= 1225\left[\frac{22}{7} - \frac{22}{28} + \frac{1}{2}\right]$$

$$= 3500 cm^2$$