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Mumbai

Class: EM - CLASS 10 **Subject:** Mathematics - Part 2 (Geometry) **Time:**2 hrs
Date: 05-02-2025 **Paper:** PreBoard 1 (Solution) **Marks:**40

Q1(A))
(1) 6
(2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{1}$
(4) (3, 4, 5)

(B))
(1) Surface area of sphere = $4\pi r^2$
$= 4 \times \frac{22}{7} \times 7 \times 7$
$= 4 \times 22 \times 7$
Surface area of sphere = 616 cm^2.
(2) Chords EN and FS intersect externally at point M.
$\therefore$ m $\angle$NMS = $\frac{1}{2}$ x [m(arc NS) - m(arc EF)]

$\therefore$ m $\angle$NMS = $\frac{1}{2}$ x (125° - 37°)

$\therefore$ m $\angle$NMS = $\frac{1}{2}$ × 88°

$\therefore$ m$\angle$NMS = 44°
(3) $\sin^2\theta + \cos^2\theta = 1$

$\left(\frac{20}{29}\right)^2 + \cos^2\theta = 1$

$\frac{400}{841} + \cos^2\theta = 1$

$\cos^2\theta = 1 - \frac{400}{841}$

$= \frac{441}{841}$

Taking square root of both sides.

$\cos\theta = \frac{21}{29}$
(4) $\triangle$ ABC and $\triangle$ DCB have same base BC
$\therefore \frac{A(\Delta ABC)}{A(\Delta DCB)} = \frac{AB}{DC}$ = {bases are same, hence areas proportional to height}

$\therefore \frac{A(\Delta ABC)}{A(\Delta DCB)} = \frac{6}{8} = \frac{3}{4}$

Q2(A))
(1) 1) (7.5) 2) $\frac{3.14-3}{12}$ 3) $\frac{225x0.07}{2x12}$ 4) 0.07

5) 0.651

(2) (1) 45° (2) $\frac{1}{\sqrt{2}}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{\sqrt{2}}$ (5) 2

(3) 1) (x_2 , y_2) 2) $\frac{y_2-y_1}{x_2-x_1}$ 3) $\frac{3-(-2)}{7-5}$ 4) $\frac{5}{2}$ 5) $\frac{5}{2}$

(B))

(1) By theorem on intersecting chords,

PN × PM = PR × PS... (I)

Let PN = x

∴ PM = 11 - x

Substituting the values in (I),

x (11 – x) = 6 × 4

∴ 11x – x2 - 24 = 0

∴ x2 − 11x + 24 = 0

∴ (x – 3) (x - 8) = 0

∴ x – 3 = 0 or x – 8 = 0

∴ x = 3 or x = 8

∴ PN = 3 or PN = 8

(2) In □ ABCD

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

∴ $\frac{AP}{PD}$ = $\frac{BQ}{14}$ ... (The ratio of the intercepts made on a transversal by three parallel lines is equal to the ratio of the corresponding intercepts made on any other transversal by the same parallel lines.)

∴ $\frac{15}{12}$ = $\frac{BQ}{14}$

∴ 12 × BQ = 15 × 14

∴ BQ = $\frac{15x14}{12}$

∴ BQ = $\frac{35}{2}$

∴ BQ = 17.5 Units.

(3) Area of shaded region = $r^2\left(\frac{\Pi\Theta}{360} - \frac{sin\Theta}{360}\right)$ ...(∴ θ = 90° Area of shaded region = 114cm²)

114 = r² $\left(\frac{\Pi x90}{360} - \frac{sin90}{2}\right)$

114 = r² $\left(\frac{3.14}{4} - \frac{1}{2}\right)$

114 = r² $\left(\frac{3.14-2}{4}\right)$

114 × 4 = r² (1.14)

r² = $\frac{114x4}{1.14}$

r² = 4 × 100

∴ r = 20cm

(4) P(- 12, - 3) and Q(4, k)

Let $P(x_1 , y_1)$ and $Q(x_2 , y_2)$

Here, x_1 = - 12, y_1 = - 3, x_2 = 4 and y_2 = k

Slope of the line = m = $\frac{1}{2}$

m = $\frac{y_2-y_1}{x_2-x_1}$

$\therefore \frac{1}{2} = \frac{k-(-3)}{4-(-12)}$

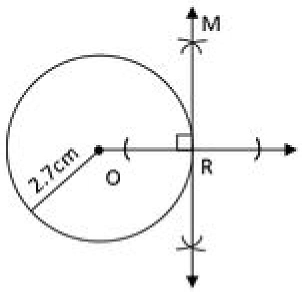
$\therefore \frac{1}{2} = \frac{k+3}{4+12}$

$\therefore \frac{1}{2} = \frac{k+3}{16}$

$\therefore \frac{16}{2} = k + 3$

$\therefore 8 = k + 3$
$\therefore 8 - 3 = k$
$\therefore k = 5$

(5)



Line M is the required tangent.

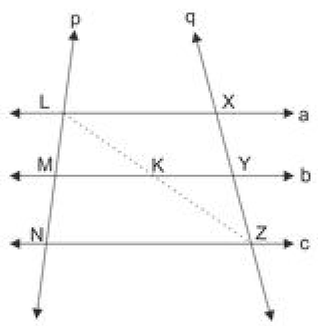
Q3(A))

(1) 1) OM + MR 2) $5\sqrt{3}$cm 3) Tangents drawn from same external points to the circle 4) $\frac{1}{2}$ × OR
5) 30° 6) ∠ORM + ∠ORN

(2) 1) 60º 2) 90 m 3) $\frac{AB}{BC}$ 4) $\frac{90x\sqrt{3}}{\sqrt{3}x\sqrt{3}}$ 5) $30\sqrt{3}$ 6) 51.90 m

(B))

(1)



Given: Line a || line b || line c. Transversal p intersects lines a, b and c in points L, M and N respectively. Transversal q intersects line a, b and c in points X, Y, and Z respectively.
To prove: LM MN =XY/YZ
Construction: Draw seg LZ. Let seg LZ intersect seg MY at point K such that M–K–Y and L–K–Z.
Proof:
In Δ LNZ,
seg MK || side NZ ... (Given)
∴ by basic proportionality theorem,
$\frac{LM}{MN} = \frac{LK}{KZ}$ ... (1)

In Δ LZX seg KY || side LX ... (Given)

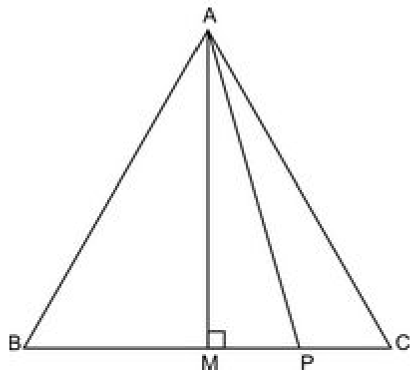
∴ by basic proportionality theorem,

$\frac{LK}{KZ} = \frac{XY}{YZ}$ ... (2)

∴ from (1) and (2)

$\frac{LM}{MN} = \frac{XY}{YZ}$

(2)



Draw seg AM ⊥ side BC such that B-M-C

Δ ABC is equilateral triangle.

∴ AB = BC = AC = 6cm ...(Sides of an equilateral triangle) ... (1)

∠C = 60° ...(Sides of an equilateral triangle) ... (2)

In Δ AMC, ∠AMC + ∠ACM + ∠MAC = 180° ...(Sum of all angles of a triangle is 180°)

∴ 90° + 60° + ∠MAC = 180° ...(From (1) and (2)

∴ 150 + ∠MAC - 180°

∴ ∠MAC = 180° - 150°

∴ ∠MAC = 30°

∴ Δ AMC is a 30°-60°-90° triangle

∴ by 30°- 60°-90° triangle theorem

AM = $\frac{\sqrt{3}}{2}$ x AC ... (Side opposite to 60°)

∴ AM = $\frac{\sqrt{3}}{2}$ × 6 ... [From (1)]

∴ AM = $3\sqrt{3}$ cm

MC = $\frac{1}{2}$ x BC ... (Side opposite to 30°)

∴ MC = $\frac{1}{2}$ × 6 ... [From (1)]

∴ MC = 3cm

PC = $\frac{1}{3}$ x BC ... (Given)

∴ PC = $\frac{1}{3}$ × 6 ... [Fom (1)

∴ PC = 2cm

MP + PC = MC (M-P-C)

∴ MP + 2 = 3

∴ MP = 3 - 2

∴ MP = 1cm

In Δ AMP,

∠AMP - 90° ... (Construction)

∴ by Pythagoras theorem,

$AP^2 = AM^2 + MP^2$

∴ $AP^2 = (3\sqrt{3})^2 + 1^2$

∴ $AP^2 = 27 + 1$

∴ $AP^2 = 28$

∴ $AP^2 = 4 \times 7$

∴ $AP = 2\sqrt{7}$ cm ...(Taking square roots on both the sides)

(3) (1) □ PQRS in a rectangle

∴ chord PQ ≅ chord SR ..... opposites sides of a rectangle

∴ arc PQ ≅ arc SR ..... arcs corresponding to congruent chords.

(2) chord PS ≅ chord QR ..... Opposite sides of a rectangles

∴ arc SP ≅ chord QR ..... arcs corresponding to congruent chords.

∴ measures of arcs SP and QR are equal

Now, m(arc SP) + m(arc PQ) = m(arc PQ) + m(arc QR)

∴ m(arc SPQ) = m(arc PQR)

∴ arc SPQ ≅ arc PQR

(4) (r) = 2.8 m, (h) = 3.5 m, p = $\frac{22}{7}$

Capacity of the water reservoir = Volume of the cylindrical reservoir

$= \pi r^2 h$

$= \frac{22}{7} \times 2.8 \times 2.8 \times 3.5$

$= 86.24\ m^3$

$= 86.24 \times 1000$ (∵ $1m^3 = 1000$ litre)

= 86240.00 litre.

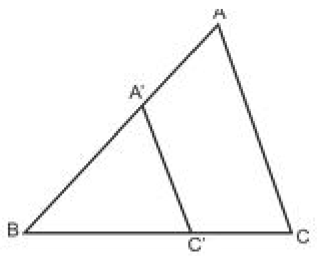
∴ The reservoir can hold 86240 litre of water.

The daily requirement of water of a person is 70 litre.

∴ Water in the tank is sufficient for $\frac{86240}{70}$ = 1232 persons.

Q4)

(1)



In the figure, let the points B, A, A' and B, C, C' be collinear.

△ ABC ~ △ A'BC' ∴ ∠ ABC = ∠A'BC'

$$\frac{AB}{A'B} = \frac{BC'}{BC} = \frac{AC}{A'C'} = \frac{5}{3}$$

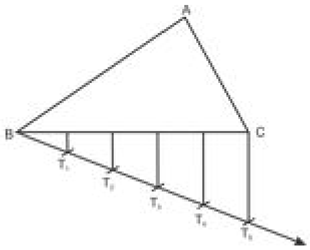
∴ sides of △ ABC are longer than corresponding sides of △ A'BC' .

∴ the length of side BC' will be equal to 3 parts out of 5 equal parts of side BC.

So if we construct △ ABC, point C' will be on the side BC, at a distance equal to 3 parts from B.

Now A' is the point of intersection of AB and a line through C', parallel to CA.

$$\frac{BA'}{BA} = \frac{BC'}{BC} = \frac{3}{5} \text{ i.e. } \frac{BA}{BA'} = \frac{BC}{BC'} = \frac{5}{3}$$ ... Taking inverse



(2) Let R (0, 3) ≡ (x_1 , y_1),
D (2, 1) ≡ (x_2 , y_2) and
S (3, – 1) ≡ (x_3 , y_3)

By distance formula,

RD = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

= $\sqrt{(2-0)^2 + (1-3)^2}$

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

= $\sqrt{4+4}$

= $\sqrt{8}$

∴ RD = $2\sqrt{2}$ ... I

By distance formula,

DS = $\sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2}$

= $\sqrt{(3-2)^2 + (-1-1)^2}$

= $\sqrt{1^2 + (-2)^2}$

= $\sqrt{1+4}$

∴ DS = $\sqrt{5}$ ... II

By distance formula,

RS = $\sqrt{(x_3 - x_1)^2 + (y_3 - y_1)^2}$

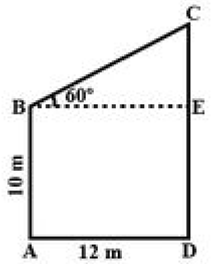
= $\sqrt{(3-0)^2 + (-1-3)^2}$

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

= $\sqrt{9+16}$

= $\sqrt{25}$

∴ RS = 5 ... III



Let AB and DC are two buildings.
∴ AB = 10 m.
AD is the width of road.
∴ AD = 12 m.
Draw Seg BE ⊥ Seg DC such that C-E-D.
∴ m∠EBC = 60° [angle of elevation]
☐ ABED is a rectangle. ...(Each angle is 90°)
∴ AB = DE = 10 m and AD = BE = 12 m ...(Opposite sides of rectangle are congruent)
In right angled Δ CEB,
tan 60° = $\frac{CE}{BE}$

∴ $\sqrt{3}$ = $\frac{CE}{12}$

CD = CE + ED ...(C - E - D)
CD = 12$\sqrt{3}$ + 10
CD = 12 × 1.73 + 10
∴ CD = 30.76
∴ Height of the second building is 30.76 m.

Q5)

(1) In △ AOB and △ COD
∠AOB ≅ ∠COD ... (Vertically opposite)
∠ABO ≅ ∠CDO ... (Alternate angles)
∴ △ AOB ~ △ COD ... (AA)
$\frac{AO}{CO}$ = $\frac{OB}{OD}$ = $\frac{AB}{CD}$ ... (C.S.S.T.)
$\frac{15}{OD}$ = $\frac{20}{6}$
∴ 15 × 6 = 20 × OD
∴ $\frac{15x6}{20}$ = OD
∴ OD = $\frac{45}{10}$
∴ OD = 4.5

(2) In △ DEF, ∠DFE = 90° and FG ⊥ ED
∴ FG^2 = EG × GD ... [Geometric mean property]
∴ 12^2 = EG × 8
∴ $\frac{144}{8}$ = EG
∴ EG = 18 units

In △ FGE, ∠FGE = 90°
∴ $EF^2 = FG^2 + EG^2$ ... [Pythagoras theorem]
∴ $EF^2 = 12^2 + 18^2$ ... [from (1), give]
∴ EF^2 = 144 + 324
∴ EF^2 = 468
∴ EF = $\sqrt{468}$ ... [Taking square root]
∴ = $\sqrt{36 \times 13}$

$\therefore$ EF = 6 $\sqrt{13}$ units

In $\triangle$ FGD, $\angle$FGD = 90°

$\therefore$ $DF^2 = GD^2 + GF^2$ ... [Pythagoras theorem]

$\therefore$ $DF^2 = 81^2 + 12^2$

$\therefore$ $DF^2 = 64 + 144$

$\therefore$ $DF^2 = 208$

$\therefore$ DF = $\sqrt{208}$ ... [Taking square root]

= $\sqrt{16 \times 13}$

$\therefore$ DF = $4\sqrt{13}$ units

All the Best