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Class: EM - CLASS 10 | **Subject:** Mathematics - Part 2 (Geometry) | **Time:**2 hrs

Date: 04-10-2025 | **Paper:** Semester 1 (Solution) | **Marks:**40

Q1(A))

(1) △ ABC is bigger

(2) Statement 2

(3) 15 units

(4) 36°

(B))

(1) Chords EN and FS intersect externally at point M.

∴ m ∠NMS = $\frac{1}{2}$ x [m(arc NS) - m(arc EF)]

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

∴ m ∠NMS = $\frac{1}{2}$ × 88°

∴ m∠NMS = 44°

(2) (5, 12, 13)

$13^2 = 169$

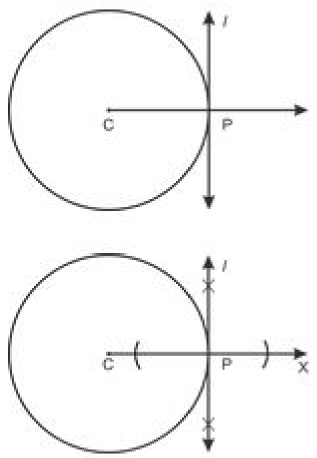
and $51^2 + 12^2 = 25 + 144$

$= 169$

∴ $13^2 = 5^2 + 12^2$

∴ (5, 12, 13) is a Pythagorean triplet

(3)



(4) For a triangle,

base (b_1) = 9

height (h_1) = 5

For other triangle,

base (b_2) = 10

height (h_2) = 6

$\frac{A(\Delta_1)}{A(\Delta_2)}$ = \(\frac{b_{1}\times h_{1}}{b_{2}\times h_{2}}\) ... (Ratio of areas of two triangles is equal to the ratio of the product of bases and corresponding heights)

= $\frac{9}{10}$ x $\frac{5}{6}$

$\frac{A(\Delta_1)}{A(\Delta_2)}$ = $\frac{3}{4}$

Q2(A))

(1) 1) $\frac{(AB)^2}{(PQ)^2}$ 2) $\frac{4}{9}$

(2) 1) OA 2) OT - AT 3) 4.8 - 3.5 4) 1.3 5) 1.3

(3) 1) $AB^2 + BC^2$ 2) $9^2 + 12^2$ 3)144 4) 15 5) 15 cm

(B))

(1) In △ RPQ

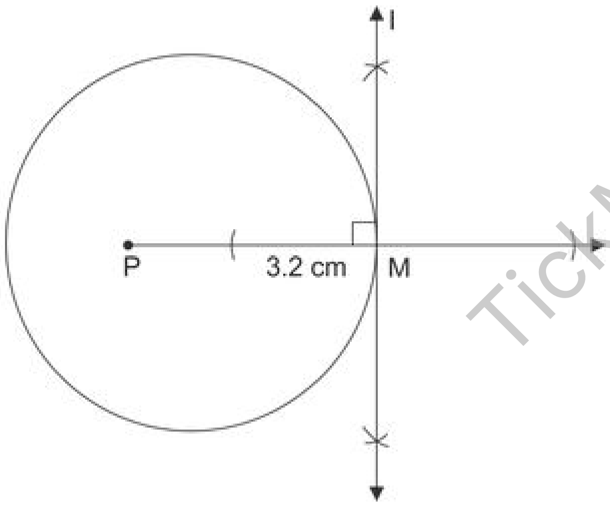
$\frac{PR}{PQ} = \frac{10}{9}$ ... (1)

$\frac{RM}{QM} = \frac{4}{3.6} = \frac{40}{36} = \frac{20}{18} = \frac{10}{9}$ ... (2)

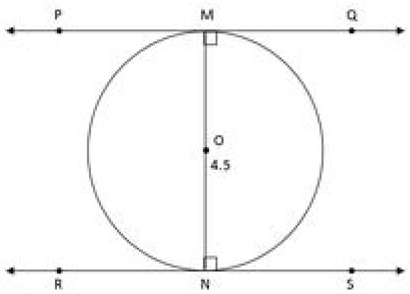
$\frac{PR}{PQ} = \frac{RM}{QM}$ from (1) & (2)

∴ PM is the bisector of ∠QPR (Converse of Angle bisector property)

(2)



(3)



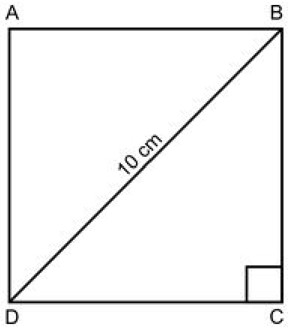
It is given that two lines are parallel to each other and tangent to the same circle.
These two tangents are shown in the figure.
Let the point of contact of two tangents be M and N and let the centre be O.
OM ⊥ PM ... [Radius perpendicular to tangent]
∴ ON ⊥ RN ... [Radius perpendicular to tangent]
Also,
OM = ON = 4.5 cm ... [Radius of circle]
∴ The perpendicular distance between two tangents will be MN
MN = OM + ON

= 4.5 + 4.5

∴ MN = 9cm

∴ The perpendicular distance between the points will be 9cm.

(4)



ABCD is a square

∴ ∠C = 90° [Angle of a square]

∴ and AB = BC = CD = AD ... [All sides of a square are equal]

In △ BCD, ∠BCD = 90°

∴ $BD^2 = BC^2 + DC^2$ ... [Pythagoras theorem]

∴ $10^2 = BC^2 + BC^2$ ... [From (1)]

∴ $100^2 = BC^2$

∴ $BC^2 = 100^2$

∴ $BC^2 = 50$

∴ BC = $\sqrt{50}$

∴ BC = $\sqrt{25}$ × 2

∴ BC = $5\sqrt{2}$ cm

∴ Length of side of the square is $5\sqrt{2}$ cm.

Perimeter of a square = 4 × side

= 4 × $5\sqrt{2}$ ... [from (2)]

= $20\sqrt{2}$ cm

(5) Given : PQ = 6 units

QR = 10 units

PS = 8 units

To find : TS = ?

Solution :

PQ + QR = PR ... {P-Q-R}

6 + 10 = PR PR = 16 units

TP × SP = RP × QP... {By property of intersecting chords outside the circle}

TP × 8 = 16 × 6

TP = 12 units

TS + SP = TP ... {T-S-P}

TS + 8 = 12

TS = 12 - 8

= 4

TS = 4 units

Q3(A))

(1) 1) $\frac{1}{2}$ bc 2) $\sqrt{AB^2+AC^2}$ 3) $\sqrt{b^2+c^2}$ 4) $\sqrt{b^2+c^2}$ x AD 5) From iii 6) $\frac{bc}{\sqrt{b^2+c^2}}$

(2) 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

(B))

(1) In △ ABY, ray BX bisects ∠B. ... [Given]

∴ $\frac{AB}{BY} = \frac{AX}{XY}$ ... [Angle bisector theorem of a triangle]

In △ ACY, ray CX bisects ∠C. ... [Given]

$\frac{AC}{CY} = \frac{AX}{XY}$ ... [Angle bisector theorem of a triangle]

$\frac{AX}{XY} = \frac{AB}{BY} = \frac{AC}{CY}$ ... [from (1), (2)]

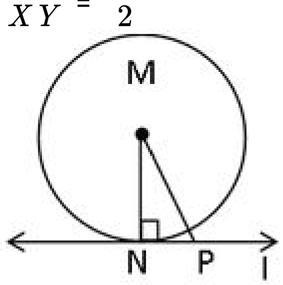
$\frac{AX}{XY} = \frac{AB+AC}{BY+CY}$ ... [from (3), theorem on equal ratios]

$= \frac{5+4}{BC}$ ... [Given, B-Y-C]

$= \frac{9}{6}$

∴ $\frac{AX}{XY} = \frac{3}{2}$

(2)



Given : M is the centre of a circle seg MN is a radius. Line l ⊥ seg MN at N.

To prove : Line l is a tangent to the circle.

Proof : Take any point P, other that N, on the line l. Draw seg MP.

Now in Δ MNP, ∠N is a right angle.

∴ seg MP is the hypotenuse.

∴ seg MP > seg MN.

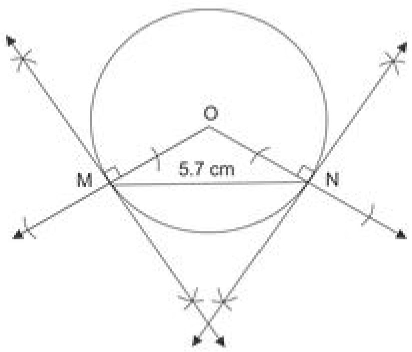
As seg MN is radius, point P can't be on the circle.

∴ no other point, except point N, of line l is on the circle.

∴ line l intersects the circle in only one point N.

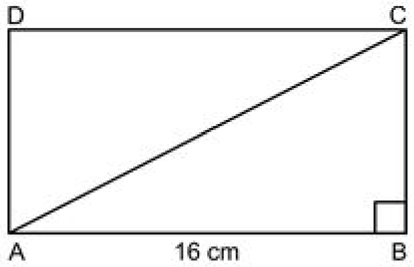
∴ line l is a tangent to the circle

(3)



Line l and line M are the required tangents.

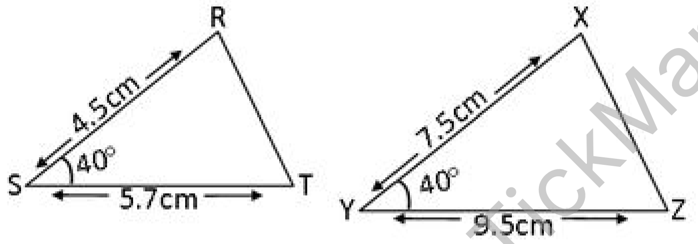
(4)



∴ ☐ ABCD is a rectangle such that AB = 16 cm and A (☐ ABCD) = 192 cm²
(☐ ABCD) = AB × BC ... [Area of rectangle = l × b]
∴ 192 = 16 × BC
∴ BC = $\frac{192}{16}$
∴ BC = 12 cm

In △ ABC, ∠ABC = 90° ... [Angle of a rectangle]
∴ $AC^2 = AB^2 + BC^2$ ... [Pythagoras theorem]
$= 16^2 + 12^2$
= 256 + 144
∴ $AC^2 = 400$
∴ AC = 20 cm ... [Taking square root]
∴ The length of diagonal of rectangle is 20 cm.

Q4)
(1)



△RST ~△XYZ ... (Given)

∴ $\frac{RS}{XY} = \frac{ST}{YZ} = \frac{3}{5}$ ... [corresponding sides of similar triangles]

∴ $\frac{RS}{XY} = \frac{3}{5}$, $\frac{ST}{YZ} = \frac{3}{5}$

∴ $\frac{4.5}{XY} = \frac{3}{5}$, $\frac{5.7}{YZ} = \frac{3}{5}$

∴ XY = $\frac{4.5x5}{3}$, YZ = $\frac{5.7x5}{3}$

∴ XY= 7.5 cm, YZ = 9.5 cm
∠RST = ∠XYZ = 40° ... [Corresponding angles of similar triangles]
Thus, in ΔXYZ, XY = 7.5cm, YZ = 9.5 cm and ∠XYZ = 40°

(2) AH = AE = 4.5
EB = BF = 5.5 Let,
HD = DG = X
FC = GC = Y

[The lengths of the two tangent segments a circle drawn from an external point are equal)

▫ ABCD is a parallelogram

∴ AB = CD ... (∴ opposite side of parallelogram are congruent)

∴ AE + EB = DG + GC

4.5 + 5.5 = DG + GC

∴ X + Y = 10 ... I

AD = BC ... (∴ opposite sides of parallelogram are congruent)

AH + HD = BF + FC

X + 4.5 = Y + 5.5

X - Y = 5.5 - 4.5

X - Y = 1 II

From I and II

X + Y = 10

X - Y = 1

2X = 11

(Add)

∴ X = 5.5 units

X + Y = 10 ... From I

∴ 5.5 + Y = 10

∴ Y = 4.5 units

AD = AH + HD

= 4.5 + X

= 4.5 + 5.5

AD = 10 units

(3) Proof: I

n △ ABC, ∠BAC = 90° ... [given]

∴ $BC^2 = AB^2 + AC^2$ ... [Pythagoras theorem]

In △ BAL, ∠BAL = 90° ... [given, C-L-A]

∴ $BL^2 = AB^2 + AL^2$ ... [Pythagoras theorem]

$= AB^2 + (\frac{1}{2}AC)^2$ ... [L is the midpoint of seg

∴ $BL^2 = AB^2 + \frac{1}{4} AC^2$

∴ $4 BL^2 = 4 AB^2 + AC^2$ ... [Multiplying both sides by 4]

In △ MAC, ∠MAC = 90° ... [given, B-M-A]

∴ $CM^2 = AM^2 + AC^2$ ... [Pythagoras theorem]

$= (\frac{1}{2} AB)^2 + AC^2$ ... [M is the midpoint of seg A]

∴ $CM^2 = \frac{1}{4} AM^2 + AC^2$

∴ $4 CM^2 = AB^2 + 4AC^2$ ... [Multiplying both sides by 4]

$4 BL^2 + 4 CM^2 = 4 AB^2 + AC^2 + AB^2 + 4AC^2$ ... [Adding (2), (3)

$= 5 AB^2 + 5AC^2$

$= 5 (AB^2 + AC^2)$

∴ $4 (BL^2 + CM^2) = 5 BC^2$ ... [From (1)]

Q5)

(1) Δ ABC ~ Δ LMN ... [Given]

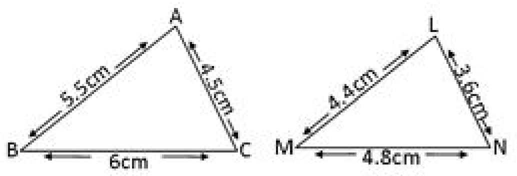
∴ $\frac{AB}{LM} = \frac{BC}{MN} = \frac{AC}{LN} = \frac{5}{4}$ ... [Corresponding side of similar triangle]

$\therefore \frac{AB}{LM} = \frac{5}{4}, \frac{BC}{MN} = \frac{5}{4}, \frac{AC}{LN} = \frac{5}{4}$

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

$\therefore$ LM = $\frac{5.5x4}{5}$, MN = $\frac{6x4}{5}$, LN = $\frac{4.5x4}{5}$

$\therefore$ LM = 4.4cm , MN = 4.8cm , LN = 3.6cm
Thus, in Δ LMN, LM = 4.4cm, MN = 4.8cm and LN = 3.6cm



(2) △ MNT ~ △ QRS ... (given)
$\therefore$ ∠N ≅ ∠R ... (c.a.s.t.) .... (1)
In △ TXN and △ SYR (Each 90°)
∠N ≅ ∠R ... (from (1))
∠X ≅ ∠Y ... (each 90°)
△ TXN ~ △ SYR ... (AA test of similarity)

$\frac{TX}{SY} = \frac{XN}{YR} = \frac{TN}{SR}$ ... (c.s.s.t.)

$\frac{5}{9} = \frac{TN}{SR}$ ... (2)

$\frac{A(\Delta MNT)}{A(\Delta QRS)} = \frac{TN}{RS}$ ... (Theorem of areas of similar triangles)

$\frac{A(\Delta MNT)}{A(\Delta QRS)} = \left(\frac{5}{9}\right)^2$ ... (from (2))

$\frac{A(\Delta MNT)}{A(\Delta QRS)} = \frac{25}{81}$

All the Best