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Mumbai

Class: EM - CLASS 10 **Subject:** Mathematics - Part 2 (Geometry) **Time:**2 hrs
Date: 07-03-2025 **Paper:** March 2024 (Solution) **Marks:**40

Q1(A))
(1) 15/08/17
(2) 6
(3) 1
(4) 0

(B))
(1) 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 (125º - 37º)

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

$\therefore$ m$\angle$NMS = 44º

(2) Let, the radii of two circles be r_1 = 5 cm and r_2 = 3 cm
Then, distance between their centres = $r_1 + r_2$ = 5 + 3 = 8 cm
Hence, distance between their centres is 8 cm.

(3) Let the side of the square be x.
In AABC, 4B = 90°
By Pythagoras Theorem,
$AC^2 = AB^2 + BC^2$
$(10\sqrt{2})^2 = x^2 + x^2$
$2x^2 = 100 \times 2$
$2x^2 = 200$
$x^2 = 100$
$x^2 = \sqrt{100}$
x = 10 ...(Taking square root on both sides)
x = 10 cm
Hence, the side of the square= 10 cm

(4) Since, Slope = tan θ
Here, θ = 45°
$\therefore$ Slope = tan 45°
Hence, Slope = 1

Q2(A))
(1) Area of square = $(\text{Side})^2$ ....(Formula)
= $(14)^2$ = 196 cm^2
Area of circle = πr^2 ....(Formula)
= 22/7 × 7 × 7
= 154 cm^2
(Area of shaded portion) = (Area of square) - (Area of circle)

= 196 - 154 = 42 cm^2

(2) (1) 120° (2) AXC (3) 120°

(3) (1) $(AC)^2$ (2) sin θ (3) cos θ (4) 1

(B))

(1) A(2,3) = A(x1, y1)

B(4, 7) = B(x2, y2)

Slope of line AB = y2 − y1 / x2 − x1

= 7 − 3/4 − 2

= 4/2 = 2

Slope of line AB = 2.

(2) Let Δ ABC be the right angled triangle, right angled at B.

Then, BC = 9 cm, AB = 12 cm

In Δ ABC,

∠ABC = 90°

By Pythagoras theorem,

$AC^2 = BC^2 + AB^2$

$AC^2 = (9)^2 + (12)^2$

$AC^2 = 81 + 144$

$AC^2 = 225$ Taking square root on both sides,

AC = 15 cm

Length of the hypotenuse = 15 cm

(3) Radius of circle, r = 3.5 cm

Length of its arc, l = 2.2 cm

Then, Area of sector = l × r/2

= 2.2 × 3.5/2

= 1.1 × 3.5 = 3.85 cm^2

Area of sector = 385 cm^2

Q3(A))

(1) (1) AB (2) By angle bisector theorem (3) AE (4) Basic proportionality theorem (5) BC (6) AE

(2) (1) Vertically opposite angles (2) By Angle- Angle test of similarilty (3) AE (4) BE (5) Corresponding sides of similar trianlges are proportional

(B))

(1) In △ PQR,

M is the midpoint of seg QR.

QM = MR = $\frac{1}{2}$ QR

$PQ^2 + PR^2 = 2PM^2 + 2QM^2$ ... (by Apollonius theorem)

$290 = 2 \times 9^2 + 2QM^2$

$290 = 2 \times 81 + 2QM^2$

290 = 290 - 162

$2QM^2 = 128$

$QM^2 = 64$

QM = 8

∴ QR = 2 × QM

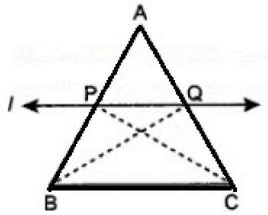
= 2 × 8

= 16

(2)

Given : In ΔABC, line l || line BC and line l intersects AB and AC at point P and Q respectively.

To Prove: $\frac{AP}{PB} = \frac{AQ}{QC}$



Construction : Draw seg PC and seg BQ.

Proof: AAPQ and APQB have equal heights.

$\frac{A(\Delta APQ)}{A(\Delta PQB)} = \frac{AP}{PB}$ ....(areas proportionate to bases) ...(i)

Similarly, $\frac{A(\Delta APQ)}{A(\Delta PQB)} = \frac{AQ}{QC}$ ....(areas proportionate to bases) ...(ii)

Seg PQ is common base of ΔPQB and ΔPQC, seg PQ 11 seg BC.

Hence, ΔPQB and ΔPQC have equal areas.

A(ΔPQB) = A(ΔPQC) ......(iii)

$\frac{A(\Delta APQ)}{A(\Delta PQB)} = \frac{A(\Delta APQ)}{A(\Delta PQC)}$ [From (i), (ii) and (iii)]

$\frac{AP}{PB} = \frac{AQ}{QC}$ [From (i) and (ii)]

Hence, Proved.

Q4)

(1) Let A (1, – 3) ≡ (x_1, y_1),

B (2, – 5) ≡ (x_2, y_2) and

C (– 4, 7) ≡ (x_3, y_3)

By distance formula,

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

= $\sqrt{(2-1)^2 + [(-5) - (-3)]^2}$

= $\sqrt{1^2 + (-5+3)^2}$

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

= $\sqrt{1+4}$

∴ AB = $\sqrt{5}$

By distance formula, ... I

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

= $\sqrt{(-4-2)^2 + [7 - (-5)]^2}$

= $\sqrt{(-6)^2 + (7+5)^2}$

= $\sqrt{(-6)^2 + 12^2}$

= $\sqrt{36 + 144}$

By distance formula,

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

= $\sqrt{(-4-1)^2 + [7-(-3)]^2}$

= $\sqrt{(-5)^2 + 10^2}$

= $\sqrt{25 + 100}$

= $\sqrt{125}$

∴ AC = $5\sqrt{5}$ ... III

AB + AC = $\sqrt{5}$ + $5\sqrt{5}$ ... [From I, III]

= $6\sqrt{5}$

BC = $6\sqrt{5}$ ... [From II]

∴ AB + AC = BC

∴ Points A (1, – 3), B (2, – 5) and C (– 4, 7) are collinear.

(2) Radius of cylinder = 12cm = r1

Raised in height = 6.75cm = h

Volume of water raised = Volume of the sphere

$\pi r_1^2 h = \frac{4}{3}\pi r_2^3 h$

(12 × 12 × 6.75) = $\frac{4}{3}\pi r_2^3$

12 × 12 × 6.75 × 3/4 = r_2^3

r_2^3 = 729

r_2^3 = 9cm

Radius of sphere is 9cm.

(3) $\frac{1}{sin^2\theta} - \frac{1}{cos^2\theta} - \frac{1}{tan^2\theta} - \frac{1}{cot^2\theta} - \frac{1}{sec^2\theta} - \frac{1}{cosec^2\theta} = -3$

= $\text{cosec}^2\,\theta$ - $\sec^2\theta$ - $\cot^2\theta$ - $\tan^2\theta$ - $\cos^2\theta$ - $\sin^2\theta$ = -3

($\sin\theta = \frac{1}{cosec\theta}$, $\cos\theta = \frac{1}{sec\theta}$, $\tan\theta = \frac{1}{cot\theta}$)

(1 + $\cot^2\theta$ = $\text{cosec}^2\,\theta$, 1+ $\sec^2\theta$ = tan2 θ, $\sin^2\theta$ +$\cos^2\theta$ =1)

=1 + $\cot^2\theta$ - 1 - $\tan^2\theta$ - $\cot^2\theta$ - $\tan^2\theta$ - 1 = -3

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

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

$\tan^2\theta$ = -2

$\tan^2\theta$ = 1

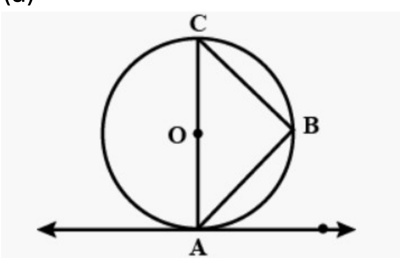
$\tan\theta$ = 1 (Taking square root on both sides)

$\tan\theta$ = tan 45°

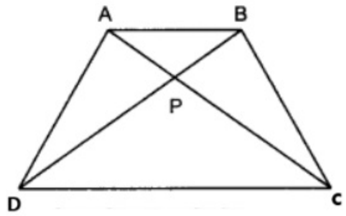
θ = 45°.

Q5)

(1) (a)



(b) ∠CAT = ∠OAT = 90° (By tangent theorem)
and ∠ABC = 90° (Angle in a semi-circle is a right angle.)
(c) ∠CAT = ∠ABC = 90°
∠CAT ≅ ∠ABC,
[∵ The angle between a tangent of a circle and a chord drawn from the point of contact is congruent to the angle inscribed in the arc opposite to the arc intercepted by that angle.]
(2) (a)



(b) Alternate angles, ∠BAP = ∠PCD ...(∵ AB || DC and BD is their transversal.)
Opposite angles, ∠APB = ∠CPD ...(Vertically opposite angles)
(c) ΔAPB ~ ΔCPD ...(By AA test of similarity)

All the Best