EDUTECH® ACADEMY
NURTURING THE FUTURE...
Classes 5 to 10

SET B

N 926

Seat No. | | | | | | | |

2025 XII 30 1100 – N 926 – MATHEMATICS (71) GEOMETRY– PART II (E)

(NEW COURSE)

Time : 2 Hours **(Pages 6)** **Max. Marks : 40**

----MODEL ANSWER----

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

(1) Ans. (b)

(2) Ans. (d) triangle

(3) Ans. (d)

DE || BC

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{x}{x-1} = \frac{x-3}{x-5}$$

$$x(x-5) = (x-3)(x-1)$$

$$x^2 - 5x = x^2 - x - 3x + 3$$

$$-5x = -4x + 3$$

$$-5x + 4x = 3$$

$$-x = 3$$

$$x = -3$$

(4) Ans. (A)

$$\frac{Circumference}{Area} = \frac{2}{7}$$

$$\frac{2\Pi r}{\Pi r^2} = \frac{2}{7}$$

$$\frac{2}{r} = \frac{2}{7}$$

$$r = 7cm$$

$$Circumference = 2\Pi r = 2 * \pi * 7 = 14\pi cm$$

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

(1) Ans. ΔPQS & ΔQRS have common base.

$$\therefore \frac{A(\Delta PQS)}{A(\Delta QRS)} = \frac{PM}{RN} \quad [\Delta s \text{ with equal base}]$$

$$\therefore \frac{100}{110} = \frac{10}{RN}$$

$$\therefore RN = \frac{10 \times 110}{100}$$

$$\therefore RN = 11 \text{ cm.}$$

(2) Ans. If two triangles are similar, then the ratio of the area of both triangles is proportional to the square of the ratio of their corresponding sides.

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

$$\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{3^2}{5^2}$$

$$\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{9}{25}$$

(3) Ans. The centroid of a triangle whose vertices are

Diameter of a wheel = 35cm = (x_1, y_1) (x_2, y_3) and (x_3, y_3) is $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 +}{3}\right.$

Given

The vertices of a triangle are (4, -3) (7, 5) and (-2, 1)

To find

The y co-ordinate of the centroid of a triangle.

Solutions

The formula for calculating the centroid of the triangle is

Centroid = $[(x_1+x_2+x_3)/3, (y_1+y_2+y_3)/3]$

Now, substituting the values in the above mentioned formula

Centroid = [(4+7-2)/3, (-3+5+1)/3]

Centroid = [9/3, 3/3]

Centroid = [3, 1]

Here, x co-ordinate is 3 and y co-ordinate is 1.

Hence, the y co-ordinate of the centroid of the triangle is 1

(4) Ans.
$$\begin{aligned} LHS &= \tan^4\theta + \tan^2\theta \\ &= \tan^2\theta\,(1 + \tan^2\theta) \\ &= (\sec^2\theta - 1)(\sec^2\theta) \end{aligned}$$

$$\begin{bmatrix} \because 1 + \tan^2 A = \sec^2 A \\ \therefore \tan^2 A = \sec^2 A - 1 \end{bmatrix}$$

$LHS = \sec^4\theta - \sec^2\theta$

$RHS = \sec^4\theta - \sec^2\theta$

LHS = RHS.

$\therefore \tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta.$

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

(1) Ans. L.H.S = $\cot\theta + \sin\theta$

$$\frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$$

$$= \frac{\cos^2\theta + \sin^2\theta}{\sin\theta \, . \cos\theta}$$

$$\frac{1}{\sin\theta \, . \cos\theta} \text{ .... } \left[\cos^2\theta + \sin^2\theta = 1\right]$$

$$\frac{1}{\sin\theta} \times \frac{1}{\cos\theta}$$

$= \operatorname{cosec}\theta \times \sec\theta$

= R.H.S

(2) Ans. Let BE = x units [supposition]

BC = BE + CE [B – E – C]

$\therefore$ 6.4 = x + CE

$\therefore$ CE = (6.4 – x) units

In ΔABC, seg DE ∥ side AB [Given]

$$\therefore \frac{AD}{DC} = \frac{BE}{EC}$$

$$\therefore \frac{5}{3} = \frac{x}{\boxed{6.4 - x}}$$

$\therefore$ 5(6.4 – x) = 3x

$\therefore$ $\boxed{6.4}$ x 5 – 5x = 3x

$\therefore$ 6.4 x 5 = 3x + $\boxed{5x}$

$$\therefore \frac{6.4 \times 5}{8} = x$$

$\therefore$ x = $\boxed{4}$

$\therefore$ BE = 4 units

(3) Ans. Given: $\angle ACB = 90°$

$\angle CDA = 90°$

CE is angle bisector of $\angle ACB$

To Prove = $\dfrac{AD}{BD} = \dfrac{AE^2}{BE^2}$

Proof:

$\angle ACB = 90°$

$\angle CDA = 90°$

Δ ACB ~ ΔCDA

$$\frac{AC}{CD} = \frac{AB}{AC} = \frac{BC}{AD} \text{ .... (I)}$$

Δ ACB ~ ΔADB

$$\frac{AC}{CD} = \frac{AB}{CB} = \frac{BC}{BD} \text{ .... (II)}$$

From (I)

$AC^2 = AB . CD$

$$\frac{AC^2}{BC^2} = \frac{CD}{BD} \text{ .... (III)}$$

CE is the angle bisector

Δ ACE ~ Δ BCE

$$\frac{AC}{BC} = \frac{AE}{BE} \text{ .... (IV)}$$

Now consider Δ CDA

$CD^2 + AD^2 = AC^2$ .... (2)

In ΔADC & Δ CDB

$$\frac{AD}{CD} = \frac{AC}{BC} = \frac{DC}{DB}$$

CD2 =AD x DB .... (1)

Put (1) in (2)

$AD . DB + AD^2 = AC^2$

$AC^2 = AD (DB + AD)$

$AC^2 = AD (AB)$ .... (IV)

Put (V) in (IV)

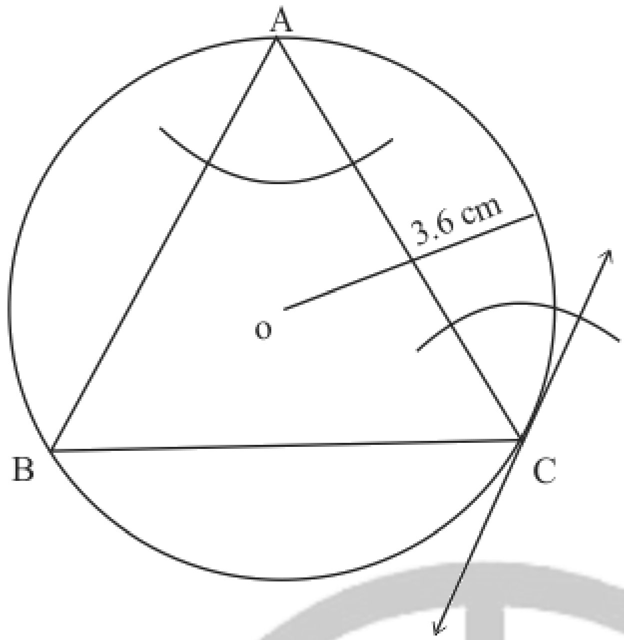
$$\frac{AC^2}{BC^2} = \frac{AE^2}{BE^2}$$

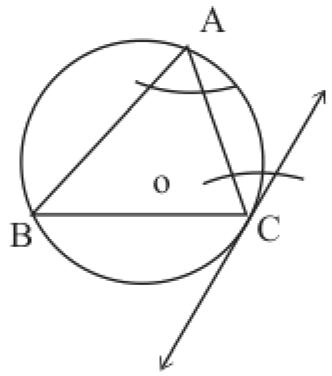
$$\frac{AD \times AB}{AB \times BD} = \frac{AE^2}{BE^2} = \frac{AD}{BD}$$

Hence Proved.

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

(1) Ans.





(2) Ans. By tangent secant theorem,

$PQ^2 = PS \times PR$

$12^2 = PS \times 8$

$PS = \frac{144}{8}$

$PS = 18$

(3) Ans. Seg AB ∥ seg PQ ∥ seg DC [Given]

$\therefore \frac{AP}{PD} = \frac{BQ}{QC}$

[Property of intercepts made by three parallel lines.]

$\therefore \frac{15}{12} = \frac{BQ}{14}$

$\therefore \frac{15 \text{ x } 14}{12} = BQ$

$\therefore$ BQ = 17.5 units

(4) Ans. $r = 21$ cm, $\theta = 150$, $\pi = \frac{22}{7}$

Area of the sector, A $= \frac{\theta}{360} \times \pi r^2$

$= \frac{150}{360} \times \frac{22}{7} \times 21 \times 21$

$= \frac{1155}{2} = 577.5 \text{ cm}^2$

Length of the arc, $l = \frac{\theta}{360} \times 2\pi r$

$= \frac{150}{360} \times 2 \times \frac{22}{7} \times 21$

$= 55$ cm

(5) Ans. In ΔDEF,

line PQ || side EF

$\therefore \frac{DP}{PE} = \frac{DQ}{QF}$ ($\because$ Basic proportionally theorem)

$\therefore \frac{2.4}{7.2} = \frac{1}{QF}$

$\therefore QF \times 2.4 = 7.2$

$\therefore QF = \frac{7.2}{2.4}$

$\therefore QF = 3$

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

(1) Ans. In Δ PQR, $\angle PQR = 90^\circ$, seg QS $\perp$ seg PR

$QS = \sqrt{PS \times SR}$ .... (theorem of geometric mean)

$= \sqrt{10 \times 8}$

$= \sqrt{5 \times 2 \times 8}$

$= \sqrt{5 \times 16}$

$= \boxed{4\sqrt{5}}$

In Δ QSR, by Pythagoras theorem

$QR^2 = QS^2 + SR^2$

$= \left(4\sqrt{5}\right)^2 + 8^2$

$= 16 \times 5 + \boxed{64}$

$= 80 + 64$

$= \boxed{144}$

$\therefore QR = \boxed{12}$

In Δ PSQ, by Pythagoras theorem

$PQ^2 = QS^2 + PS^2$

$= \left(4\sqrt{5}\right)^2 + 10^2$

$= 16 \times 5 + 100$

$= 80 + 100$

$= \boxed{180}$

$= 36 \times 5$

$\therefore PQ = \boxed{6\sqrt{5}}$

(2) 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]

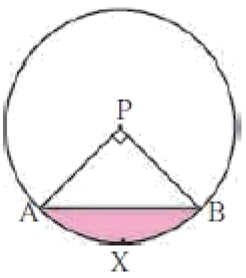
$\therefore$ m (arc QSR) = 130° + 80°

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

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

(1) Ans. $r = 10$ cm, $\theta = 90$, $\pi = 3.14$

$$A(P\text{-}AXB) = \frac{\theta}{360} \times \pi r^2$$
$$= \frac{90}{360} \times 3.14 \times 10^2$$
$$= \frac{1}{4} \times 314$$
$$= 78.5 \text{ cm}^2$$



$$A(\Delta APB) = \frac{1}{2} \text{ base} \times \text{height}$$
$$= \frac{1}{2} \times 10 \times 10$$
$$= 50 \text{ cm}^2$$

$$A(\text{minor segment}) = A(P\text{-}AXB) - A(\Delta PAB)$$
$$= 78.5 - 50$$
$$= 28.5 \text{ cm}^2$$

$$A(\text{major segment}) = A(\text{circle}) - A(\text{minor segment})$$
$$= 3.14 \times 10^2 - 28.5$$
$$= 314 - 28.5$$
$$= 285.5 \text{ cm}^2$$

(2) Ans. $A(8, 9) = (x_1, y_1)$

$B(1, 2) = (x_2, y_2)$

$P(k, 7) = (x, y)$

Let point P divide seg AB in the ratio m : n

By section formula,

$$y = \frac{my_2 + ny_1}{m + n}$$
$$7 = \frac{m \times 2 + n \times 9}{m + n}$$
$$\therefore 7(m + n) = 2m + 9n$$
$$\therefore 7m + 7n = 2m + 9n$$
$$\therefore 5m = 2n$$
$$\therefore \frac{m}{n} = \frac{2}{5}$$
$$\therefore m : n = 2 : 5$$
$$x = \frac{mx_2 + nx_1}{m + n}$$
$$\therefore k = \frac{2 \times 1 + 5 \times 8}{2 + 5}$$
$$\therefore k = \frac{2 + 40}{7}$$
$$\therefore k = \frac{42}{7}$$
$$\therefore k = 6$$

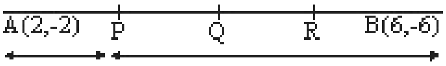
(3) Ans. 1. MT = 9 cm [Radius of bigger circle, given]
2. NT = 2.5 cm
[Radius of smaller circle, given]
MT = MN + NT [M – N – T]
$\therefore$ 9 = MN + 2.5
$\therefore$ 9 – 2.5 = MN
$\therefore$ MN = 6.5 cm
3. MR is tangent to the smaller circle at point S [Given]
Seg NS is the radius of the circle
$\therefore \angle NSM = 90^\circ$
[Tangent and radius are perpendicular to each other at the point of contact] 1
In ΔNSM, $\angle NSM = 90^\circ$ [From 1]
$\therefore MS^2 + SN^2 = MN^2$ [Pythagoras theorem]
$\therefore MS^2 + 2.5^2 = 6.5^2$
$\therefore MS^2 = 6.5^2 - 2.5^2$
$\therefore MS^2 = (6.5 + 2.5)(6.5 - 2.5)$
$\therefore MS^2 = 9 \times 4$
$\therefore$ MS = 3 x 2 [Taking square roots]
$\therefore$ MS = 6cm 2
MR = MS + SR [M – S – R]
$\therefore$ 9 = 6 + SR
$\therefore$ 9 – 6 = SR
$\therefore$ SR = 3 cm 3
$\frac{MS}{SR} = \frac{6}{3}$ [From 2 & 3]
$\therefore$ MS : SR = 2 : 1

(4) Ans. Region P – ABC is a sector
$A(P - ABC) = \frac{\theta}{360} \times \pi r^2$
$\therefore 154 = \frac{\theta}{360} \times \frac{22}{7} \times 14 \times 14$
$\therefore \frac{154 \times 360 \times 7}{22 \times 14 \times 14} = \theta$
$\therefore \theta = 90^\circ$
$\therefore \angle APC = 90^\circ$
Length of arc ABC = $\frac{\theta}{360} \times 2\pi r$
$= \frac{90}{360} \times 2 \times \frac{22}{7} \times 14$
Length of arc ABC = 22 cm
$\therefore$ l(arc ABC) is 22 cm

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

(1) Ans. Let P, Q, R be the three points which divide the line segment joining the points A(2,–2) and B(6,–6) in four equal parts.

Case I - for point P, we have



Hence, $m_1 = 1$, $m_2 = 3$

$X_1 = 2$, $y_1 = -2$

$X_2 = 6$, $y_2 = -6$

Then coordinates of

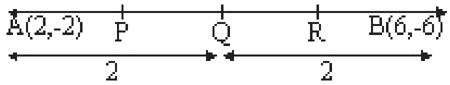
$$P = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$= \frac{1(2) + 3(2)}{1+3}, \frac{1\times(-6) + 3(-2)}{1+3}$$

$$= \frac{2+6}{4}, \frac{-6-6}{4}$$

$$= \frac{8}{4}, \frac{-12}{4} = 2, -3$$

Case II, for point Q, we have



Hence, $m_1 = 2$, $m_2 = 2$

$x_1 = 2$, $y_1 = -2$

$x_2 = 6$, $y_2 = -6$

Then coordinates of

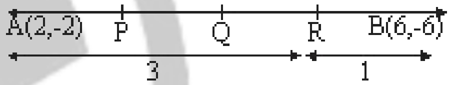
$$Q = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$= \frac{2(6) + 2(2)}{2+2}, \frac{2(-6) + 2(-2)}{2+2}$$

$$= \frac{12+4}{4}, \frac{-12-4}{4}$$

$$= \frac{16}{4}, \frac{-16}{4} = 4, -4$$

Case III for point R, we have



Hence, $m_1 = 3$, $m_2 = 1$

$x_1 = 2$, $y_1 = -2$

$x_2 = 6$, $y_2 = -6$

Then coordinates of

$$R = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

$$= \frac{3\times 6 + 1\times 2}{3+1}, \frac{3\times(-6) + 1\times(-2)}{3+1}$$

$$= \frac{18+2}{4}, \frac{-18-2}{4}$$

$$= \frac{20}{4}, \frac{-20}{4}$$

$= 5, -5$

Hence the coordinates of the points P, Q & R are (2,–3), (4,–4) and (5, –5) respectively.

(2) Ans. Base area of the cone $= \pi r^2 = 78.5$

$\therefore \quad r^2 = \dfrac{78.5}{\pi}$

$\therefore \quad r = 5$ cm

Total surface area of the cone $= \pi r(l + r) = \pi \times 5(7 + 5) = \pi \times 5 \times 12$

$= 188.4$

$\therefore$ Total surface area of the cone $= 188.4 \text{ cm}^2$

$l = \sqrt{h^2 + r^2}$

$l^2 = h^2 + r^2$

$\therefore \quad h^2 = l^2 - r^2$

$= 7^2 - 5^2$

$= 49 - 25$

$h^2 = 24$

$h = \sqrt{24}$

$\therefore \quad h = 2\sqrt{6}$ cm

$\therefore$ Height of the cone is $2\sqrt{6}$ cm.

(3) Ans. (i) $\angle L = \dfrac{1}{2}\, m(\text{arc MN})$ ......inscribed angle theorem.

$\therefore \; 35 = \dfrac{1}{2}\, m(\text{arc MN})$

$\therefore \; 2 \times 35 = m(\text{arc MN}) = 70^\circ$

(ii) $m(\text{arc MLN}) = 360^\circ - m(\text{arc MN})$ ...... definition of measure of arc

$= 360^\circ - 70^\circ = 290^\circ$

Now, chord LM $\cong$ chord LN

$\therefore$ arc LM $\cong$ arc LN

but $m(\text{arc LM}) + m(\text{arc LN}) = m(\text{arc MLN}) = 290^\circ$ ..... arc addition property

$m(\text{arc LM}) = m(\text{arc LN}) = \dfrac{290^\circ}{2} = 145^\circ$

or, (ii) chord LM $\cong$ chord LN

$\therefore \; \angle M = \angle N$ ...... isosceles trinangle theorem.

$\therefore \; 2\angle M = 180^\circ - 35^\circ = 145^\circ$

$\therefore \; \angle M = \dfrac{145^\circ}{2}$

Now, $m(\text{arc LN}) = 2 \times \angle M$

$= 2 \times \dfrac{145^\circ}{2} = 145^\circ$

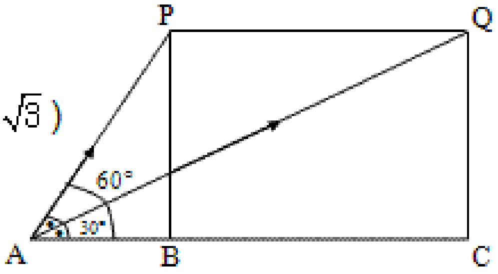
Q.5 Solve the following: (Any ONE) **3**

(1) Ans. Let P and Q be the two positions of the plane and let A be the point of observation.

It is given that angles of elevation of the plane in two positions P and Q from the point A are 60° and 30° respectively.

$\angle PAB = 60°$ and $\angle QAC = 30°$.

$PB = QC = 3600\sqrt{3}\text{m}$, time taken = 30 sec.



In ΔPAB, $\tan 60° = \frac{BP}{AB}$

$\therefore \sqrt{3} = \frac{3600\sqrt{3}}{AB}$ $\quad (\tan 60 = \sqrt{3})$

$\therefore AB = 3600$ meters

In ΔQAC, $\tan 30° = \frac{QC}{AC}$

$\therefore \frac{1}{\sqrt{3}} = \frac{3600\sqrt{3}}{AC}$ $\quad \left(\tan 30 = \frac{1}{\sqrt{3}}\right)$

$\therefore AC = 3600 \times 3 = 10800$ m

$\therefore PQ = BC = AC - AB = 10800 - 3600 = 7200$ m

Thus the plane travels 7200 m in 30 sec.

$\therefore$ Speed of the plane $= \frac{\text{Distance}}{\text{Time}} = \frac{7200}{30} = 240\text{m/sec}$

$= \frac{240}{1000} \times 60 \times 60 = 864$ km/sec

(2) Ans. Since, S and T trisect the line QR

$QS = ST = TR$

$QS = ST = TR = x$

$QT = x + x = 2x$

$QR = 2x + x = 3x$

Now, In $\triangle PQS$

$PS^2 = PQ^2 + QS^2$ [Pythagoras theorem]

$PS^2 = PQ^2 + x^2$

In $\triangle PQT$, $PT^2 = PQ^2 + QT^2$

$PT^2 = PQ^2 + (2x)^2$

$PT^2 = PQ^2 + 4x^2$

In $\triangle PQR$, $PR^2 = PQ^2 + QR^2$

$PR^2 = PQ^2 + (3x)^2$

$PR^2 = PQ^2 + 9x^2$

$3PR^2 + 5PS^2 = 3(PQ^2 + 9x^2) + 5(PQ^2 + x^2)$

$3PR^2 + 5PS^2 = 3PQ^2 + 27x^2 + 5PQ^2 + 5x^2$

$3PR^2 + 5PS^2 = 8PQ^2 + 32x^2$

$3PR^2 + 5PS^2 = 8(PQ^2 + 4x^2)$

$3PR^2 + 5PS^2 = 8PT^2$

Hence proved

....All The Best....

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