N 723

Seat No. | | | | | | | |

2022 III 26 1030 – N 723– MATHEMATICS (71) GEOMETRY—PART II (E)

(REVISED COURSE)

Time : 2 Hours (Pages 11) Max. Marks : 40

Note :—

(*i*) *All* questions are compulsory.

(*ii*) Use of calculator is not allowed.

(*iii*) The numbers to the right of the questions indicate full marks.

(*iv*) In case of MCQs [Q. No. **1(A)**] only the first attempt will be evaluated and will be given credit.

(*v*) For every MCQ, the correct alternative (A), (B), (C) or (D) with sub-question number is to be written as an answer.

(*vi*) Draw proper figures for answers wherever necessary.

(*vii*) The marks of construction should be clear. Do not erase them.

(*viii*) Diagram is essential for writing the proof of the theorem.

1. (A) For each of the following sub-questions four alternative answers are given. Choose the correct alternative and write its alphabet : 4

(*i*) If $\Delta ABC \sim \Delta DEF$ and $\angle A = 48°$, then $\angle D$ = ...

(A) 48°

(B) 83°

(C) 49°

(D) 132°

P.T.O.

(*ii*) AP is a tangent at A drawn to the circle with centre O from an external point P. OP = 12 cm and $\angle OPA = 30°$, then the radius of a circle is .....

(A) 12 cm

(B) $6\sqrt{3}$ cm

(C) 6 cm

(D) $12\sqrt{3}$ cm

(*iii*) Seg AB is parallel to X-axis and co-ordinates of the point A are (1, 3), then the co-ordinates of the point B can be .....

(A) (–3, 1)

(B) (5, 1)

(C) (3, 0)

(D) (–5, 3)

(*iv*) The value of $2\tan 45° - 2\sin 30°$ is .....

(A) 2

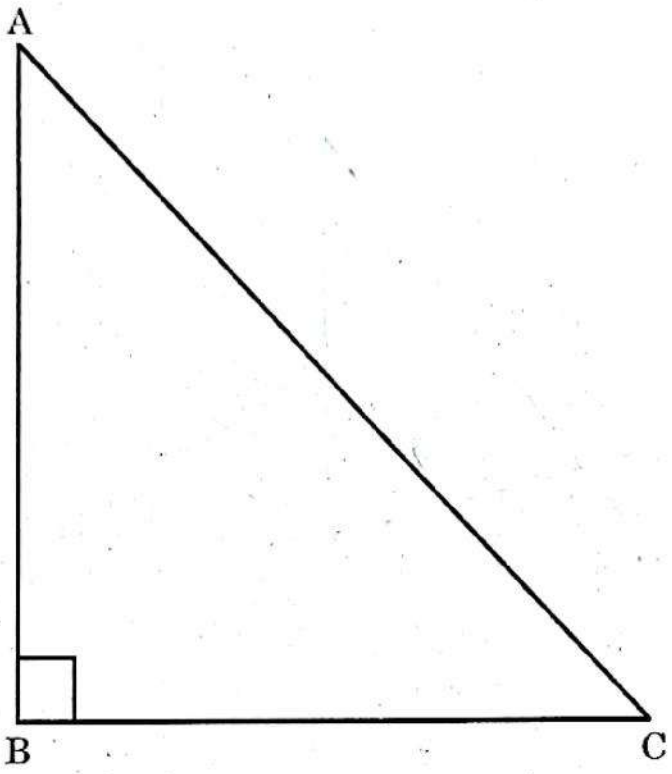
(B) 1

(C) $\frac{1}{2}$

(D) $\frac{3}{4}$

(B) Solve the following sub-questions : 4

(*i*)



In Δ ABC, $\angle ABC = 90°$, $\angle BAC = \angle BCA = 45°$. If AC = $9\sqrt{2}$, then find the value of AB.

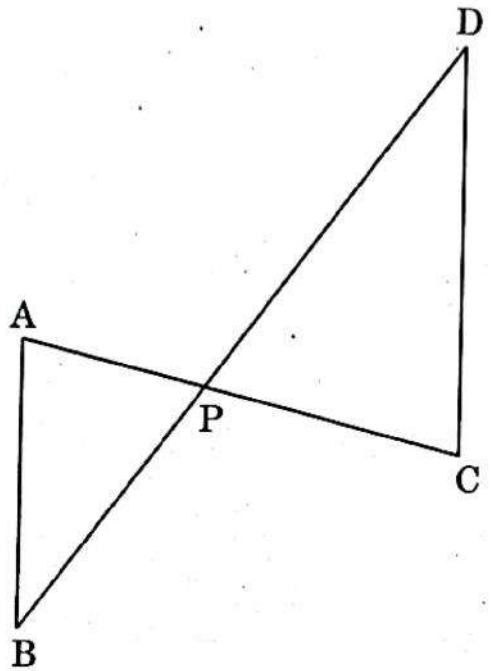
(*ii*) Chord AB and chord CD of a circle with centre O are congruent. If m(arc AB) = 120°, then find the m(arc CD).

(*iii*) Find the Y-co-ordinate of the centroid of a triangle whose vertices are (4, –3), (7, 5) and (–2, 1).

(*iv*) If $\sin\theta = \cos\theta$, then what will be the measure of angle θ ?

2. (A) Complete the following activities and rewrite it (any *two*) : 4

(*i*)



In the above figure, seg AC and seg BD intersect each other in point P. If $\frac{AP}{CP} = \frac{BP}{DP}$, then complete the following activity to prove Δ ABP ~ Δ CDP.

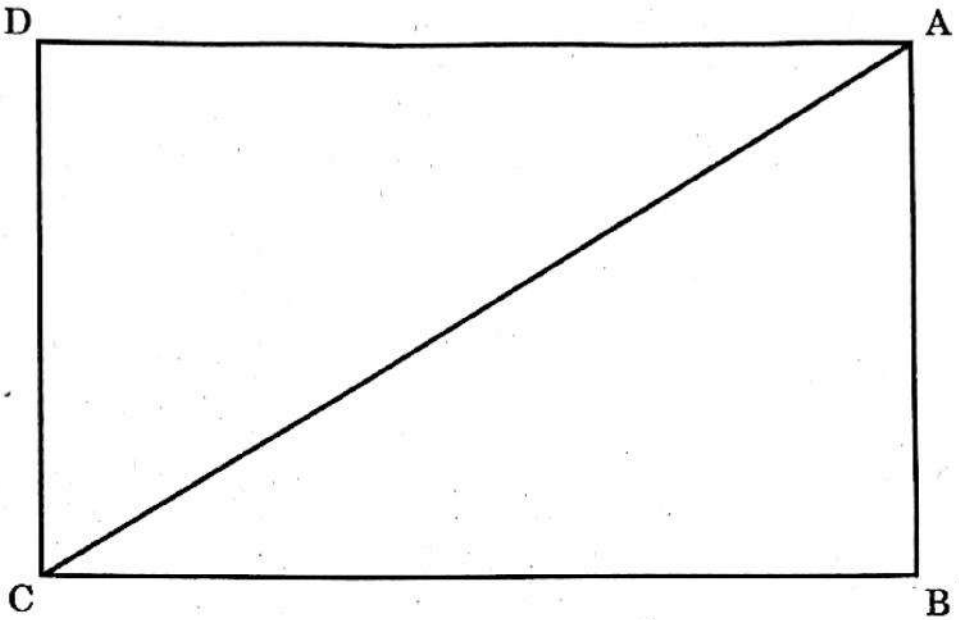
Activity : In Δ APB and Δ CDP

$\frac{AP}{CP} = \frac{BP}{DP}$ ..... [ ]

$\therefore$ $\angle APB \cong$ [ ] ..... vertically opposite angles

$\therefore$ [ ] ~ ΔCDP ..... [ ] test of similarity.

(*ii*)



In the above figure, □ ABCD is a rectangle. If AB = 5, AC = 13, then complete the following activity to find BC.

Activity :

Δ ABC is □ triangle.

$\therefore$ By Pythagoras theorem

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

$\therefore$ $25 + BC^2 =$ □

$\therefore$ $BC^2 =$ □

$\therefore$ $BC =$ □

(*iii*) Complete the following activity to prove :

$$\cot\theta + \tan\theta = \operatorname{cosec}\theta \times \sec\theta$$

Activity :

$$\text{L.H.S.} = \cot\theta + \tan\theta$$

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

$$= \frac{\square + \sin^2\theta}{\sin\theta \times \cos\theta}$$

$$= \frac{1}{\sin\theta \times \cos\theta} \ldots\ldots\ldots \because \square$$

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

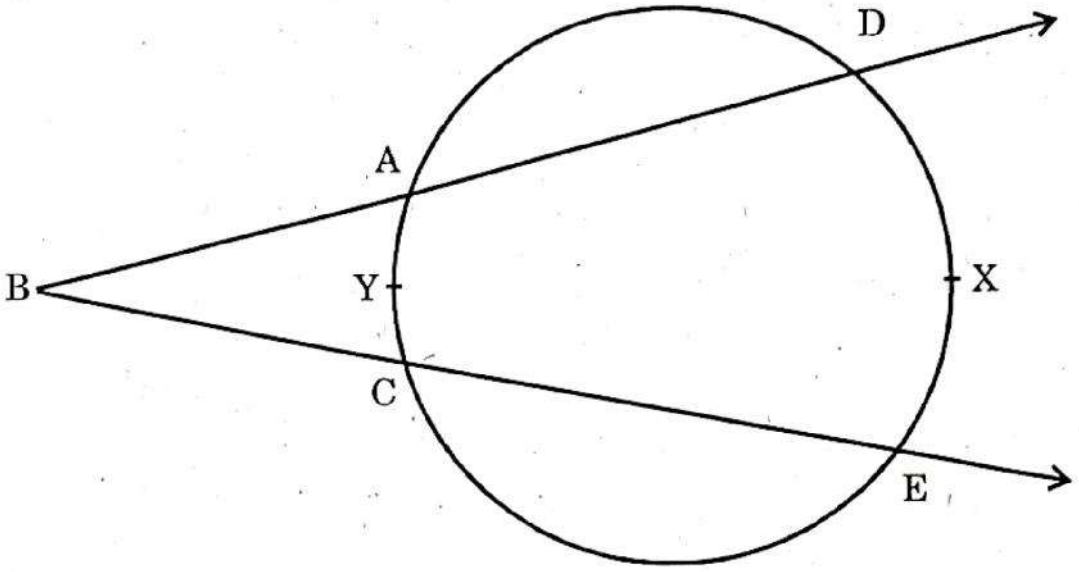
$$= \square \times \sec\theta$$

$\therefore$ L.H.S. = R.H.S.

(B) Solve the following sub-questions (Any *four*) : 8

(*i*) If $\Delta ABC \sim \Delta PQR$, AB : PQ = 4 : 5 and A($\Delta$ PQR) = 125 cm^2, then find A(Δ ABC).

(*ii*)



In the above figure, m(arc DXE) = 105°, m(arc AYC) = 47°, then find the measure of ∠DBE.

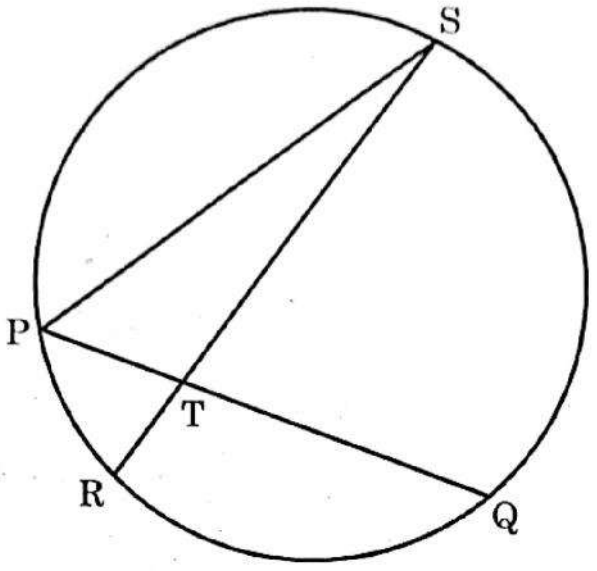
(*iii*) Draw a circle of radius 3.2 cm and centre 'O'. Take any point P on it. Draw tangent to the circle through point P using the centre of the circle.

(*iv*) If $\sin\theta = \frac{11}{61}$, then find the value of $\cos\theta$ using trigonometric identity.

(*v*) In Δ ABC, AB = 9 cm, BC = 40 cm, AC = 41 cm. State whether Δ ABC is a right-angled triangle or not ? Write reason.

3. (A) Complete the following activities and rewrite it (Any *one*) : 3

(*i*)



In the above figure, chord PQ and chord RS intersect each other at point T. If $\angle STQ = 58°$ and $\angle PSR = 24°$, then complete the following activity to verify :

$$\angle STQ = \frac{1}{2}\,[m(\text{arc PR}) + m(\text{arc SQ})]$$

Activity :

In Δ PTS,

$\angle SPQ = \angle STQ - \square$ $\because$ Exterior angle theorem

$\therefore$ $\angle SPQ = 34°$

$\therefore$ $m(\text{arc QS}) = 2 \times \square^{\circ} = 68°$ ..... $\because$ $\square$

Similarly $m(\text{arc PR}) = 2\angle PSR = \square^{\circ}$

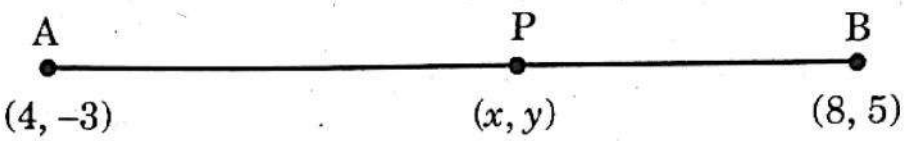
$\therefore$ $\frac{1}{2}\,[m(\text{arc QS}) + m(\text{arc PR})] = \frac{1}{2} \times \square^{\circ} = 58°$ ..... (I)

but $\angle STQ = 58°$ ..... (II) given

$\therefore$ $\frac{1}{2}\,[m(\text{arc PR}) + m(\text{arc QS})] = \boxed{\angle\ldots.}$ ..... from (I) and (II)

(*ii*) Complete the following activity to find the co-ordinates of point P which divides seg AB in the ratio 3 : 1 where A(4, –3) and B(8, 5)

Activity :



∴ By section formula,

$$x = \frac{mx_2 + nx_1}{\square}, \quad y = \frac{\square}{m+n}$$

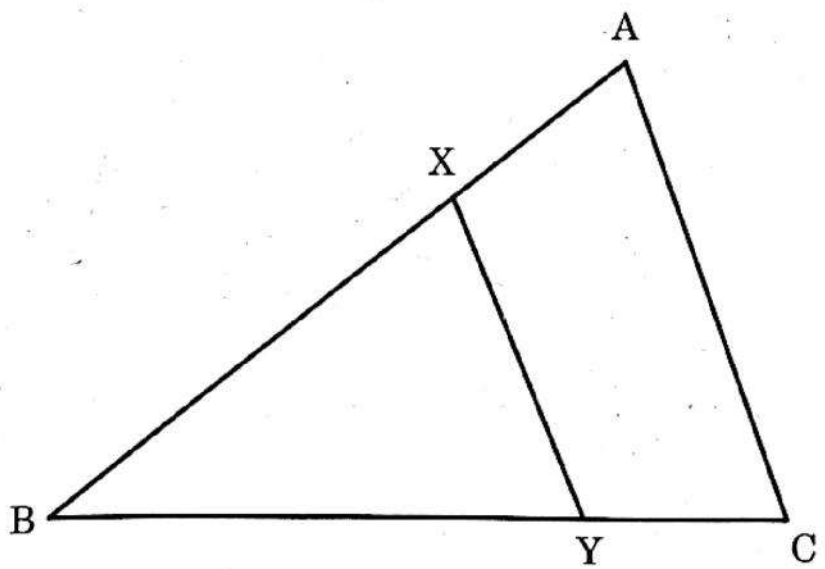
$$\therefore \quad x = \frac{3\times 8 + 1\times 4}{3+1}, \quad y = \frac{3\times 5 + 1\times(-3)}{3+1}$$

$$= \frac{\square + 4}{4} \quad = \frac{\square - 3}{4}$$

$$\therefore \quad x = \square \quad \therefore \quad y = \square$$

(B) Solve the following sub-questions (Any *two*) : **6**

(*i*)



In Δ ABC, seg XY ∥ side AC. If 2AX = 3BX and XY = 9, then find the value of AC.

(*ii*) Prove that "Opposite angles of cyclic quadrilateral are supplementary."

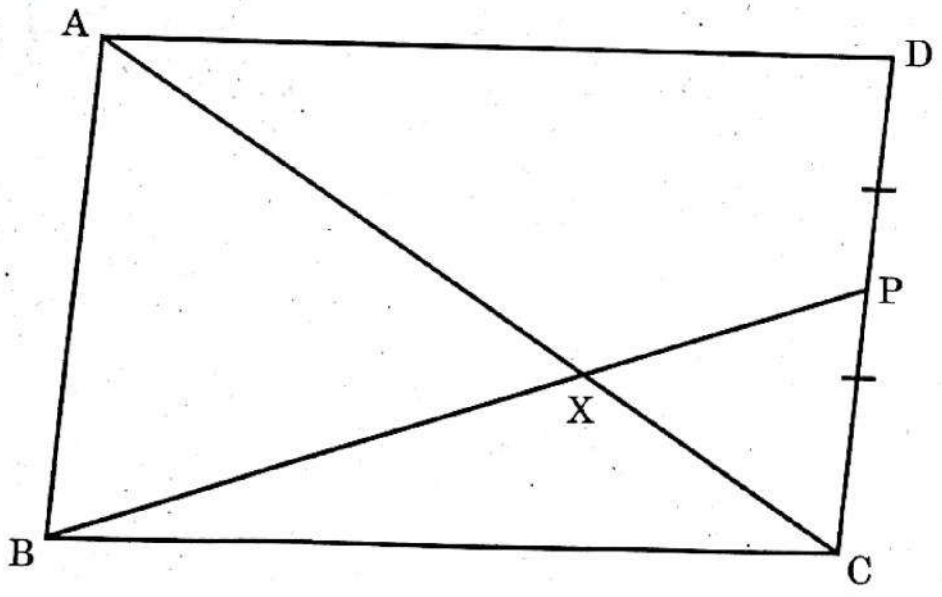
(*iii*) Δ ABC ~ Δ PQR. In Δ ABC, AB = 5.4 cm, BC = 4.2 cm, AC = 6.0 cm, AB : PQ = 3 : 2, then construct Δ ABC and Δ PQR.

(*iv*) Show that :

$$\frac{\tan A}{(1+\tan^2 A)^2}+\frac{\cot A}{(1+\cot^2 A)^2}=\sin A \times \cos A .$$

4. Solve the following sub-questions (Any *two*) : 8

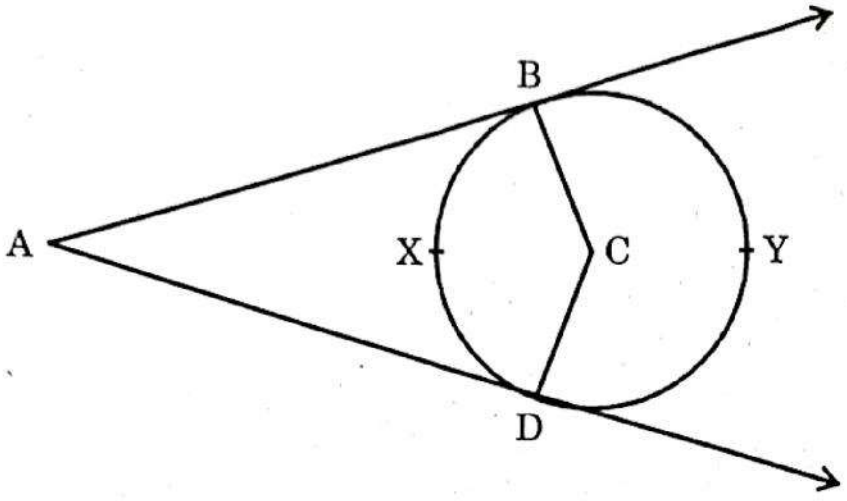
(*i*)



$\square$ ABCD is a parallelogram. Point P is the midpoint of side CD . seg BP intersects diagonal AC at point X, then prove that :

$$3AX = 2AC$$

(*ii*)



In the above figure, seg AB and seg AD are tangent segments drawn to a circle with centre C from exterior point A, then prove that :

$$\angle A = \frac{1}{2}[m(\text{arc BYD}) - m(\text{arc BXD})]$$

(*iii*) Find the co-ordinates of centroid of a triangle if points D(–7, 6), E(8, 5) and F(2, –2) are the mid-points of the sides of that triangle.

5. Solve the following sub-questions (Any *one*) : **3**

(*i*) If a and b are natural numbers and $a > b$. If $(a^2 + b^2)$, $(a^2 - b^2)$ and $2ab$ are the sides of the triangle, then prove that the triangle is right angled.

Find out two Pythagorean triplets by taking suitable values of a and b.

(*ii*) Construct two concentric circles with centre O with radii 3 cm and 5 cm. Construct tangent to a smaller circle from any point A on the larger circle. Measure and write the length of tangent segment. Calculate the length of tangent segment using Pythagoras theorem.