

N 723

Seat No.

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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 $\angle A = 48^\circ$, then $\angle D = \dots\dots\dots$

- (A) 48°
- (B) 83°
- (C) 49°
- (D) 132°

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

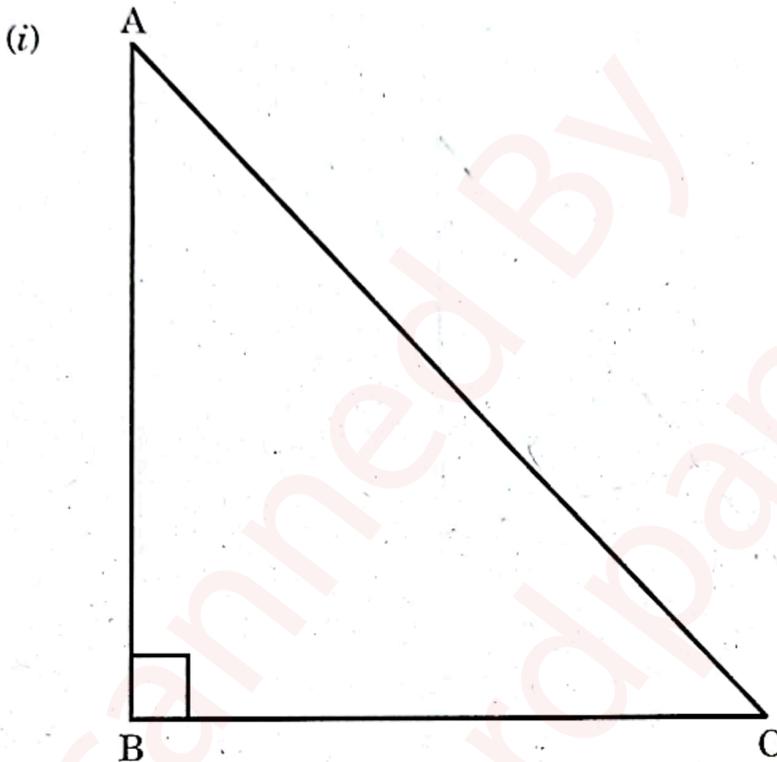
(iv) The value of $2\tan 45^\circ - 2\sin 30^\circ$ is

- (A) 2
- (B) 1
- (C) $\frac{1}{2}$
- (D) $\frac{3}{4}$

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(B) Solve the following sub-questions :

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In ΔABC , $\angle ABC = 90^\circ$, $\angle BAC = \angle BCA = 45^\circ$. 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 $m(\text{arc } AB) = 120^\circ$, then find the $m(\text{arc } CD)$.

(iii) Find the Y-co-ordinate of the centroid of a triangle whose vertices

are $(4, -3)$, $(7, 5)$ and $(-2, 1)$.

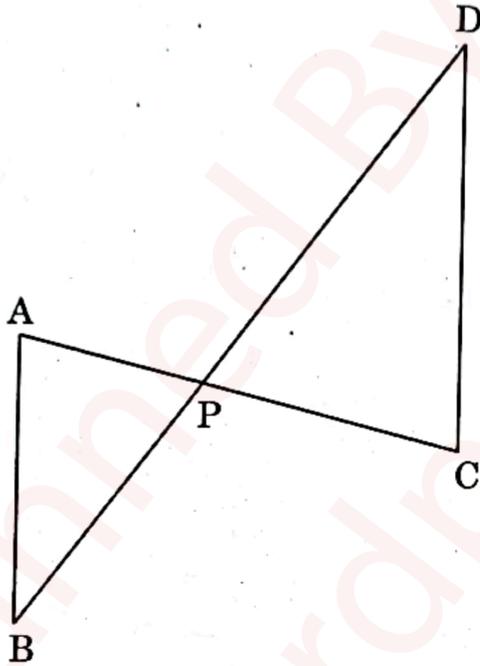
(iv) If $\sin\theta = \cos\theta$, then what will be the measure of angle θ ?

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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 $\Delta ABP \sim \Delta CDP$.

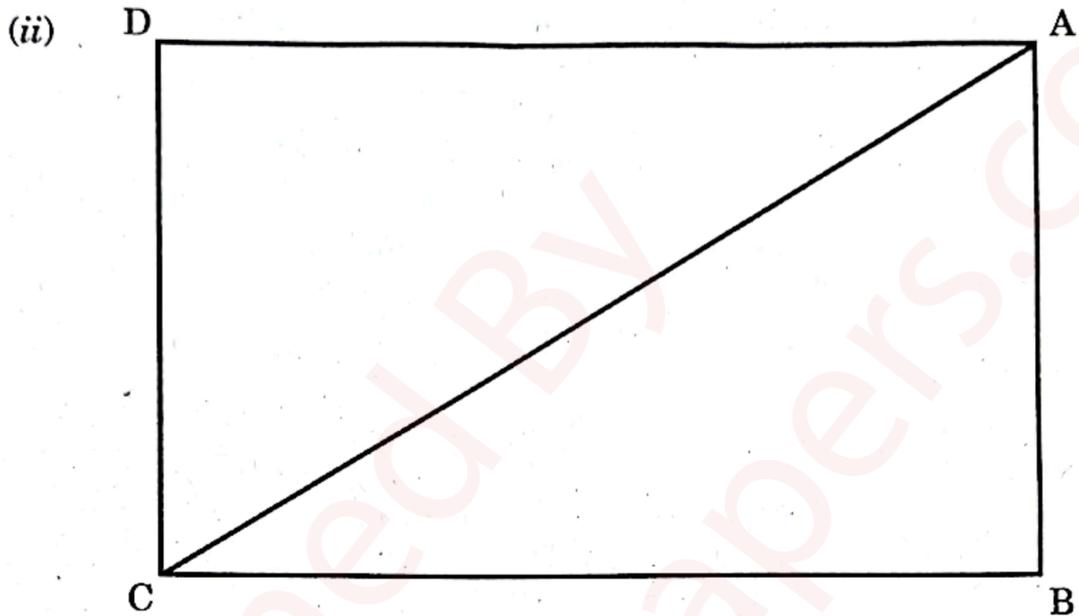
Activity : In ΔAPB and ΔCDP

$$\frac{AP}{CP} = \frac{BP}{DP} \dots\dots\dots \square$$

$\therefore \angle APB \cong \square$ vertically opposite angles

$\therefore \square \sim \Delta CDP$ \square test of similarity.

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

Activity :

Δ ABC is \square triangle.

\therefore By Pythagoras theorem

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

$$\therefore 25 + BC^2 = \square$$

$$\therefore BC^2 = \square$$

$$\therefore BC = \square$$

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(iii) Complete the following activity to prove :

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

Activity :

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

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

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

$$= \frac{1}{\sin\theta \times \cos\theta} \dots \therefore \boxed{}$$

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

$$= \boxed{} \times \sec\theta$$

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

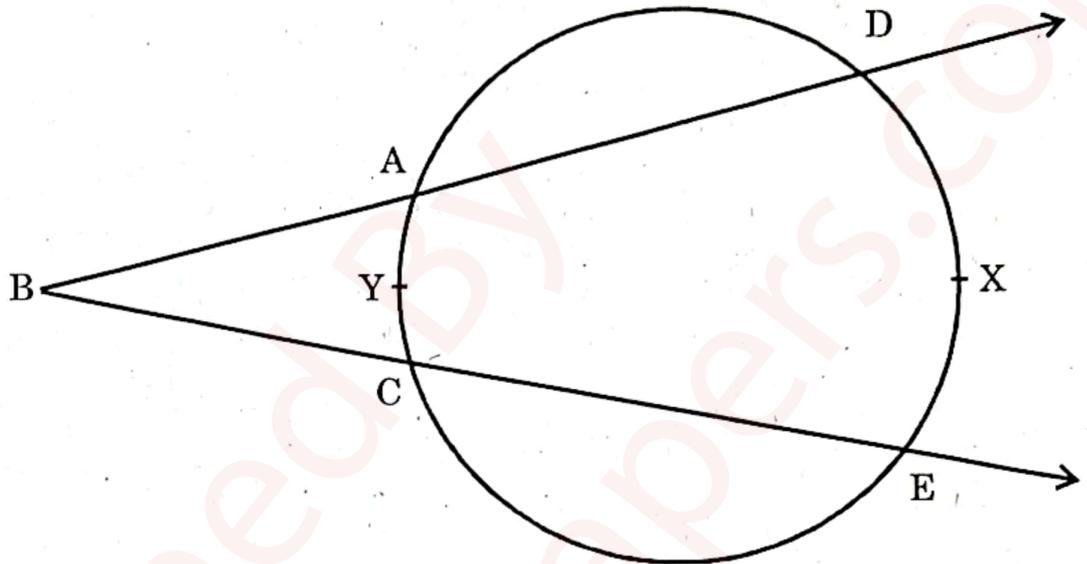
(B) Solve the following sub-questions (Any four) :

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- (i) If $\triangle ABC \sim \triangle PQR$, $AB : PQ = 4 : 5$ and $A(\triangle PQR) = 125 \text{ cm}^2$, then find $A(\triangle ABC)$.

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(ii)



In the above figure, $m(\text{arc } DXE) = 105^\circ$, $m(\text{arc } AYC) = 47^\circ$, then find the measure of $\angle DBE$.

(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.

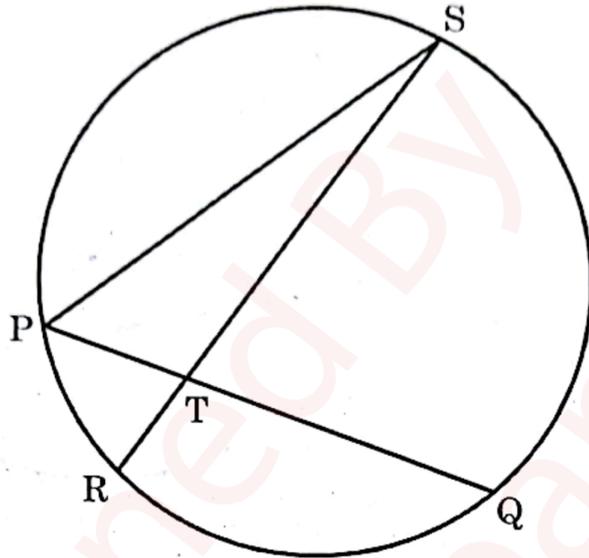
(iv) If $\sin \theta = \frac{11}{61}$, then find the value of $\cos \theta$ using trigonometric identity.

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

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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 $\angle STQ = 58^\circ$ and $\angle PSR = 24^\circ$, then complete the following activity to verify :

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

Activity :

In ΔPTS ,

$$\angle SPQ = \angle STQ - \boxed{} \quad \because \text{Exterior angle theorem}$$

$$\therefore \angle SPQ = 34^\circ$$

$$\therefore m(\text{arc QS}) = 2 \times \boxed{}^\circ = 68^\circ \dots\dots\dots \therefore \boxed{}$$

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

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

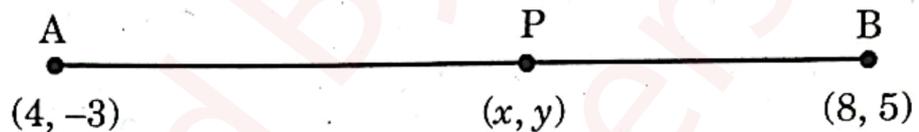
but $\angle STQ = 58^\circ \dots\dots\dots \text{(II) given}$

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

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- (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,

$$x = \frac{mx_2 + nx_1}{m+n}, \quad y = \frac{my_2 + ny_1}{m+n}$$

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

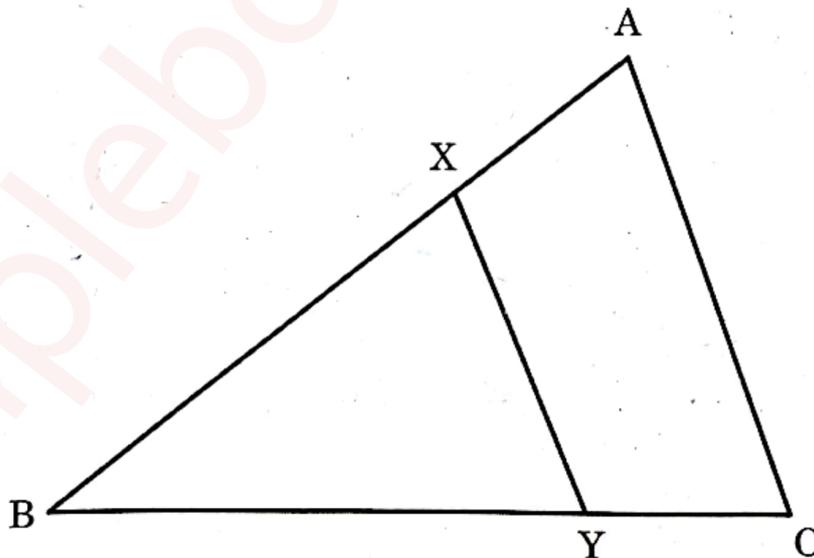
$$= \frac{\boxed{} + 4}{4} = \frac{\boxed{} - 3}{4}$$

$$\therefore x = \boxed{} \quad \therefore y = \boxed{}$$

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

6

(i)



In ΔABC , seg $XY \parallel$ side AC . If $2AX = 3BX$ and $XY = 9$, then find the value of AC .

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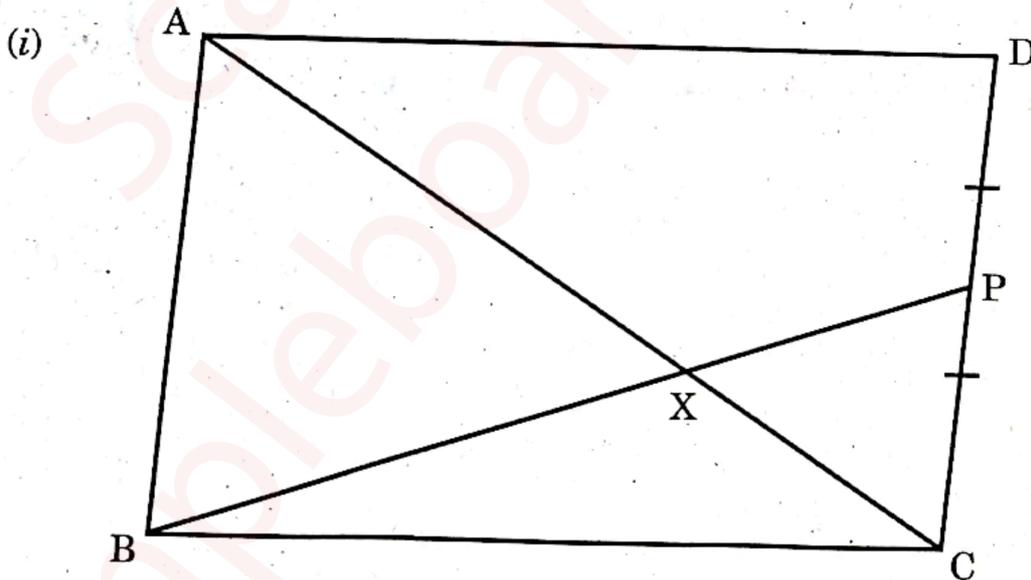
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- (ii) Prove that "Opposite angles of cyclic quadrilateral are supplementary."
- (iii) $\Delta ABC \sim \Delta PQR$. In ΔABC , $AB = 5.4$ cm, $BC = 4.2$ cm, $AC = 6.0$ cm, $AB : PQ = 3 : 2$, then construct ΔABC and ΔPQR .
- (iv) Show that :

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

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

8

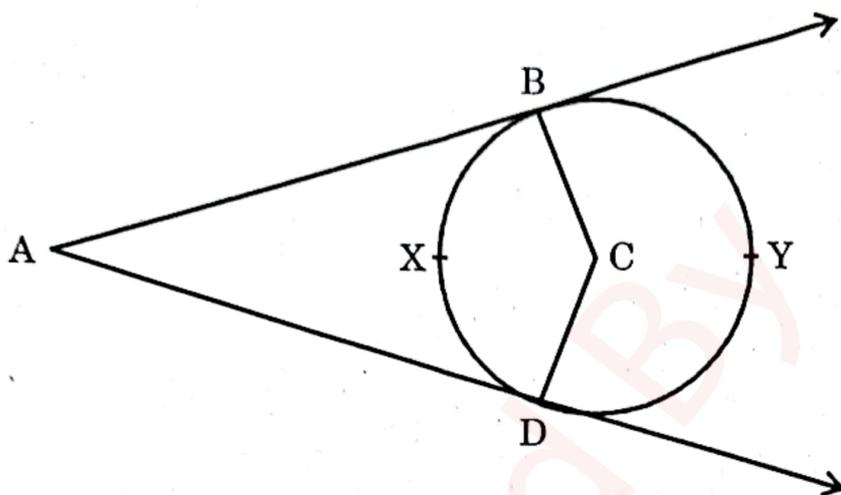


\square ABCD is a parallelogram. Point P is the midpoint of side CD . seg BP intersects diagonal AC at point X, then prove that :

$$3AX = 2AC$$

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(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.