

# 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

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*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)  $48^\circ$
  - (B)  $83^\circ$
  - (C)  $49^\circ$
  - (D)  $132^\circ$

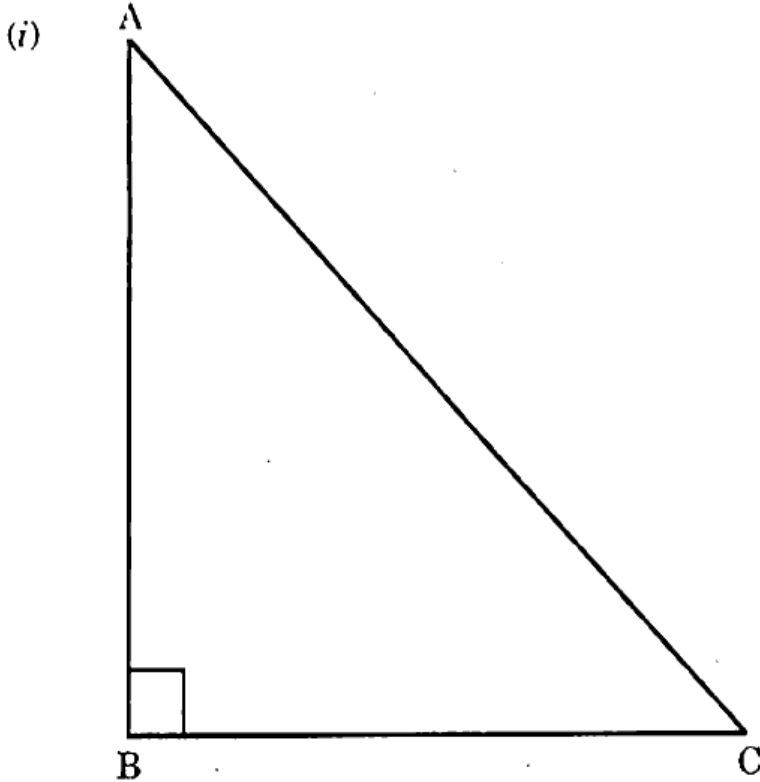
P.T.O.

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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)  $\frac{3}{4}$

(B) Solve the following sub-questions :

4



In  $\triangle ABC$ ,  $\angle ABC = 90^\circ$ ,  $\angle BAC = \angle BCA = 45^\circ$ . 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  $(-2, 1)$ .

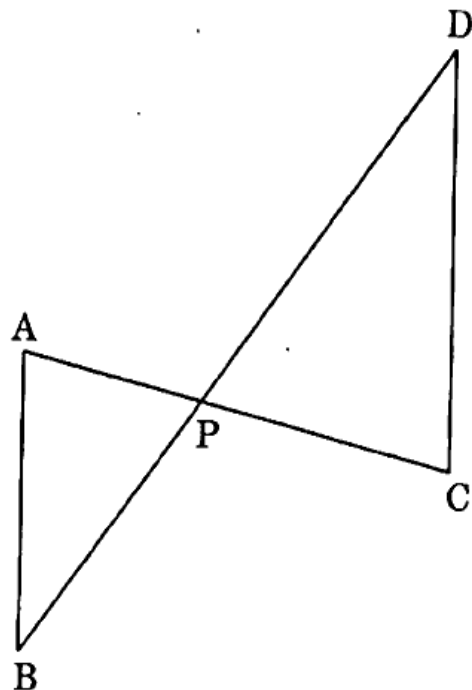
(iv) If  $\sin\theta = \cos\theta$ , then what will be the measure of angle  $\theta$  ?

P.T.O.

## 4/N 723

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  $\triangle ABP \sim \triangle CDP$ .

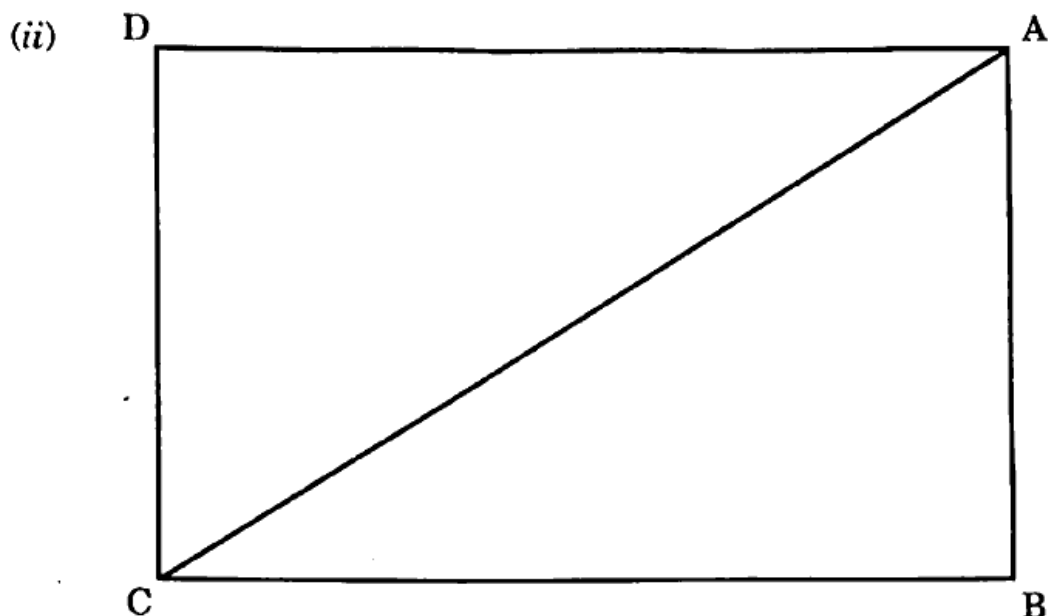
**Activity :** In  $\triangle APB$  and  $\triangle CDP$

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

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

$\therefore \square \sim \triangle CDP \dots\dots\dots \square$  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 :**

$\Delta ABC$  is  $\square$  triangle.

$\therefore$  By Pythagoras theorem

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

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

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

$$\therefore BC = \square$$

P.T.O.

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(iii) Complete the following activity to prove :

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

**Activity :**

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

$$= \frac{\cos \theta}{\sin \theta} + \frac{\boxed{\phantom{000}}}{\cos \theta}$$

$$= \frac{\boxed{\phantom{000}} + \sin^2 \theta}{\sin \theta \times \cos \theta}$$

$$= \frac{1}{\sin \theta \times \cos \theta} \dots \because \boxed{\phantom{000}}$$

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

$$= \boxed{\phantom{000}} \times \sec \theta$$

$$\therefore \text{L.H.S.} = \text{R.H.S.}$$

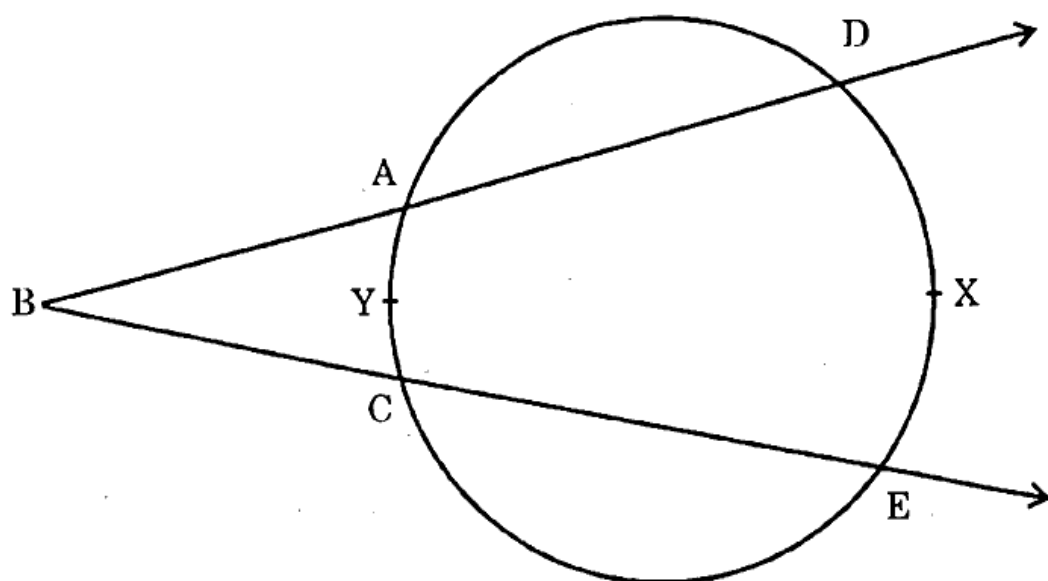
(B) Solve the following sub-questions (Any four) :

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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.

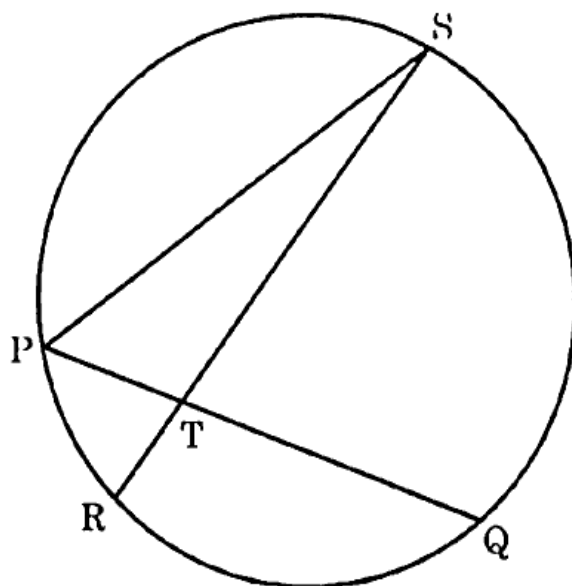
(iv) If  $\sin \theta = \frac{11}{61}$ , then find the value of  $\cos \theta$  using trigonometric identity.

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

P.T.O.

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 : <https://www.maharashtrastudy.com>

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

**Activity :**

In  $\Delta PTS$ ,

$$\angle SPQ = \angle STQ - \boxed{\phantom{00}} \because \text{Exterior angle theorem}$$

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

$$\therefore m(\text{arc QS}) = 2 \times \boxed{\phantom{00}}^\circ = 68^\circ \dots\dots\dots \therefore \boxed{\phantom{00}}$$

$$\text{Similarly } m(\text{arc PR}) = 2\angle PSR = \boxed{\phantom{00}}^\circ$$

$$\therefore \frac{1}{2} [m(\text{arc QS}) + m(\text{arc PR})] = \frac{1}{2} \times \boxed{\phantom{00}}^\circ = 58^\circ \dots\dots\dots \text{(I)}$$

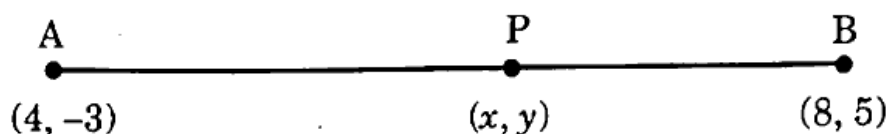
$$\text{but } \angle STQ = 58^\circ \dots\dots\dots \text{(II) given}$$

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

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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,

$$x = \frac{mx_2 + nx_1}{m+n}, \quad y = \frac{\boxed{\phantom{00}}}{m+n}$$

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

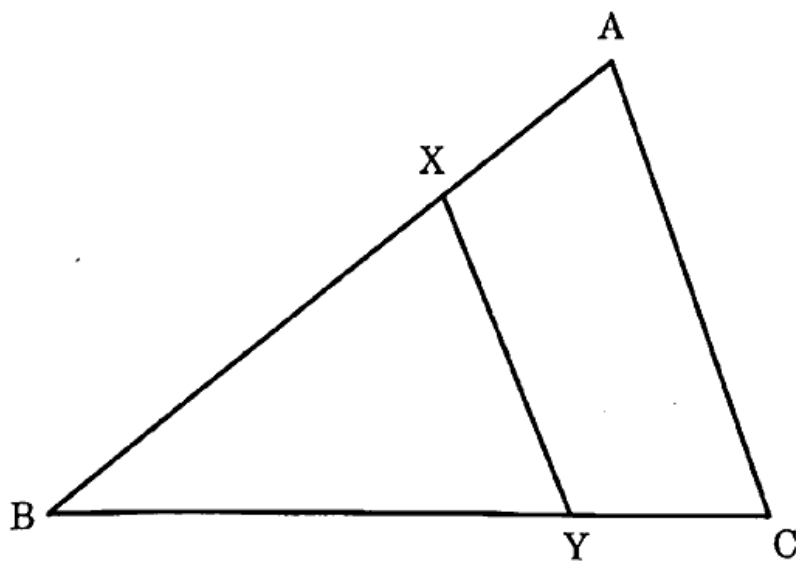
$$= \frac{\boxed{\phantom{00}} + 4}{4} = \frac{\boxed{\phantom{00}} - 3}{4}$$

$$\therefore x = \boxed{\phantom{00}} \quad \therefore y = \boxed{\phantom{00}}$$

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

6

(i)



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

P.T.O.

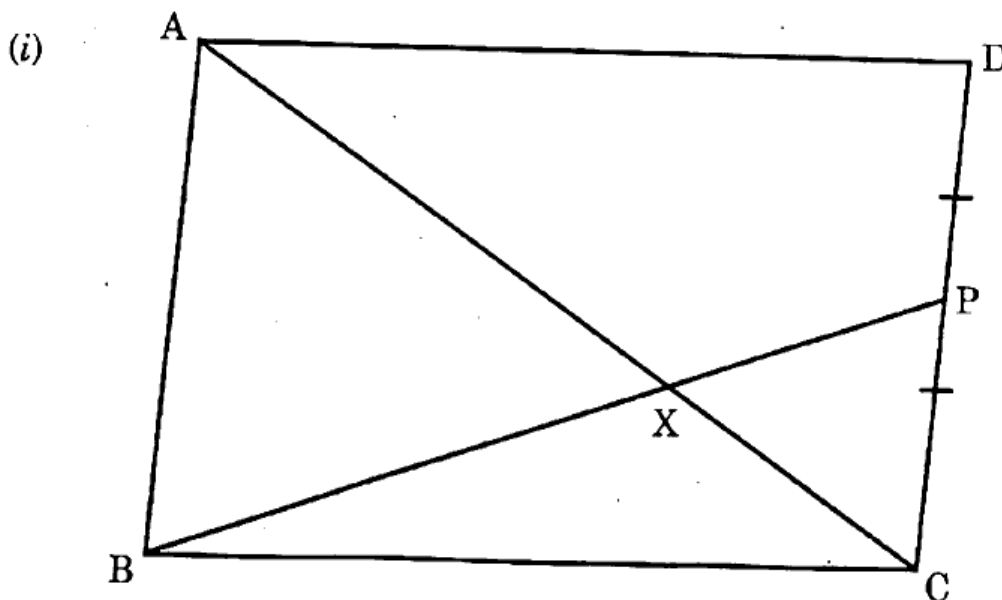
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- (ii) Prove that "Opposite angles of cyclic quadrilateral are supplementary."
- (iii)  $\Delta ABC \sim \Delta PQR$ . In  $\Delta ABC$ ,  $AB = 5.4$  cm,  $BC = 4.2$  cm,  $AC = 6.0$  cm,  $AB : PQ = 3 : 2$ , then construct  $\Delta ABC$  and  $\Delta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

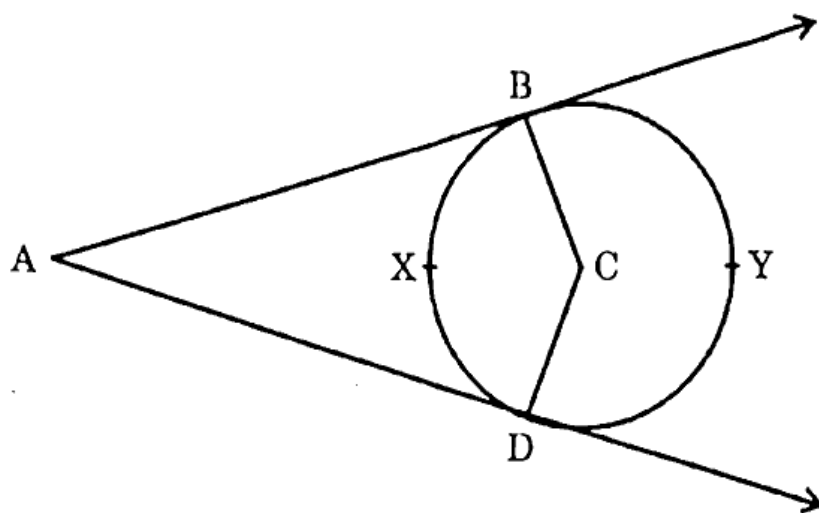
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$\square$  ABCD is a parallelogram. Point P is the midpoint of side CD. seg BP intersects diagonal AC at point X, then prove that :

$$3AX = 2AC$$

(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.