CIRCLES
PPT-3

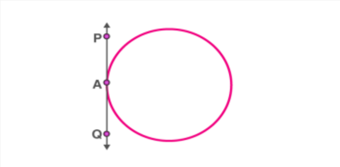
SUBJECT : MATHEMATICS
CHAPTER NUMBER: 10
CHAPTER NAME : CIRCLES

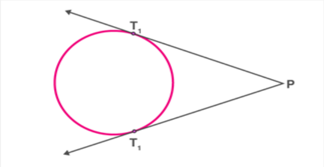
Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

i) If the point is in an **interior region of the circle**, any line through that point will be a secant. So, **no tangent** can be drawn to a circle which passes through a point that lies inside it.

ii) When a point of tangency lies on the circle, there is **exactly one tangent** to a circle that passes through it.





iii) When the point lies outside of the circle, there are **accurately two tangents** to a circle through it

The length of the segment of the tangent from the external point and the point of contact with the circle is called the length of the tangent.

LEARNING OUTCOME

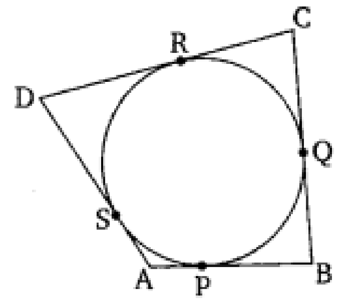
1.Students will be able to prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact

2. Students will be able to prove that he lengths of tangents drawn from an external point to a circle are equal.

3. Students will be able to apply the knowledge of above theorem in solving questions

Problem solving on Theorem 10.1 & Theorem 10.2
https://youtu.be/bHWzFLD0qNc (11.04)

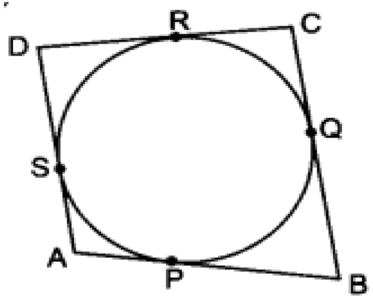
1.Quadrilateral ABCD is drawn to circumscribe a circle . Prove that AB + CD = AD + BC.



1.Quadrilateral ABCD is drawn to circumscribe a circle . Prove that AB + CD = AD + BC.

AP = AS ...(i)

[Lengths of tangents from an external point are equal]



BP = BQ ...(ii)

CR = CQ ...(iii)

DR = DS ...(iv)

Adding equations (i), (ii), (iii) and (iv), we get

AP + BP + CR + DR = AS + BQ + CQ + DS

⇒ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

⇒ AB + CD = AD + BC

Hence proved.

2. Prove that the parallelogram circumscribing a circle is a rhombus.

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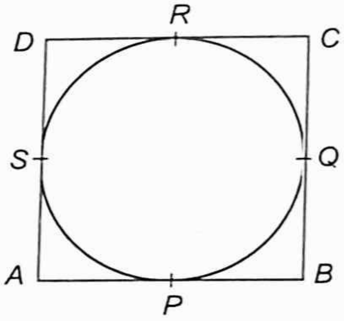
Solution. *Given.* $ABCD$ is a quadrilateral touching a circle at P, Q, R and S.

To Prove. $AB + CD = AD + BC$.



Proof. The lengths of the two tangents drawn from an external point to a circle are equal. Therefore,

$$AP = AS \quad ...(i)$$

$$BP = BQ \quad ...(ii)$$

$$CR = CQ \quad ...(iii)$$

$$DR = DS \quad ...(iv)$$

On adding (*i*) to (*iv*), we get

$$(AP + BP) + (CR + DR) = (AS + DS) + (CQ + BQ)$$

Hence, $AB + CD = AD + BC.$

3. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the Centre.

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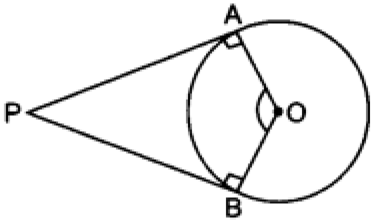
PA and PB are two tangents, A and B are the points of contact of the tangents.

OA ⊥ AP and OB ⊥ BP

∠OAP = ∠OBP = 90°

[Radius and tangent are perpendicular to each other]



p In quadrilateral OAPB

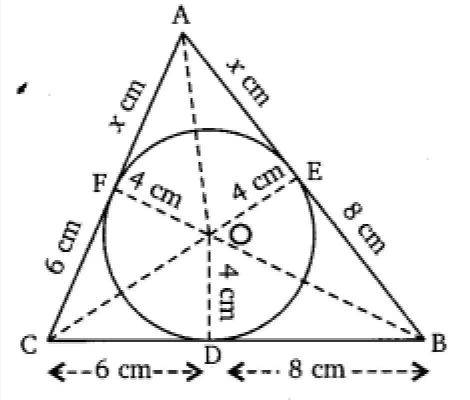
∠OAP + ∠OBP + ∠APB + ∠AOB = 360°

⇒ 90° + 90° + ∠APB + ∠AOB = 360°

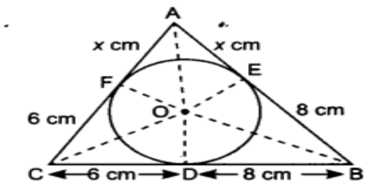
∠APB + ∠AOB = 360°- 180° = 180°

Hence, ∠APB and ∠AOB are supplementary angles.

4. A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 8 cm and 6 cm respectively . Find the sides AB and AC



4. A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 8 cm and 6 cm respectively . Find the sides AB and AC



BD = 8 cm and DC = 6 cm

BE = BD = 8 cm

CD = CF = 6 cm

Let AE = AF = x cm

In ΔABC, a = 6 + 8 = 14 cm

b = (x + 6) cm

c = (x + 8) cm

$$s = \frac{a+b+c}{2} = \frac{14+x+6+x+8}{2} = \frac{2x+28}{2} = (x + 14) \text{ cm}$$

$$\text{ar}(\Delta ABC) = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{(x+14)\times x \times 8 \times 6} = \sqrt{48x \times (x+14)} \text{ cm}^2 \quad ...(i)$$

Again, $\text{ar}(\Delta ABC) = \text{ar}(\Delta OBC) + \text{ar}(\Delta OCA) + \text{ar}(\Delta OAB)$

$$= \frac{1}{2} \times 4 \times a + \frac{1}{2} \times 4 \times b + \frac{1}{2} \times 4 \times c$$

$$= 2a + 2b + 2c = 2(a + b + c) = 2 \times 2(x + 14) \quad ...(ii)$$

From (i) and (ii), we get

$$\sqrt{48x(x+14)} = 4(x+14) \Rightarrow 48x(x + 14) = 4^2(x + 14)^2$$

$$\Rightarrow 48x(x + 14) = 16(x + 14)^2 \Rightarrow 3x(x + 14) = (x + 14)^2$$

$$\Rightarrow 3x = x + 14 \Rightarrow 2x = 14 \Rightarrow x = 7$$

$$AB = x + 8 = 7 + 8 = 15 \text{ cm}$$

$$AC = x + 6 = 7 + 6 = 13 \text{ cm}$$

5.Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

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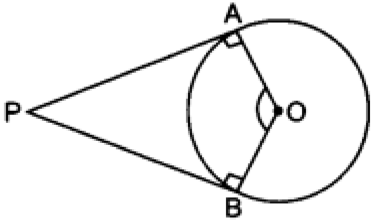
OA ⊥ AP and OB ⊥ BP

∠OAP = ∠OBP = 90°

[Radius and tangent are perpendicular to each other]



p In quadrilateral OAPB

∠OAP + ∠OBP + ∠APB + ∠AOB = 360°

⇒ 90° + 90° + ∠APB + ∠AOB = 360°

∠APB + ∠AOB = 360°- 180° = 180°

Hence, ∠APB and ∠AOB are supplementary angles.

HOME ASSIGNMENT Ex. 10.2 Q. No 8 TO Q13.

1. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

THANKING YOU

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