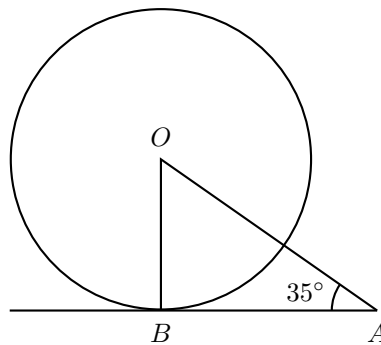# Chapter 8

Tangents

Questions: 8.1–8.32

Concept : Tangent is perpendicular to the radius through the point of contact

Q.8.1 In the figure, AB is the tangent at B of the circle centred at O
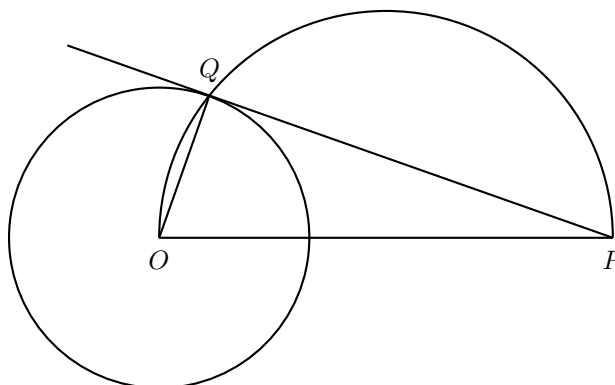

How much is $\angle OBA$? How much is $\angle AOB$?

Score : 2, Time : 2 minutes

Concept : Line perpendicular to the radius through a point on the circle is a tangent

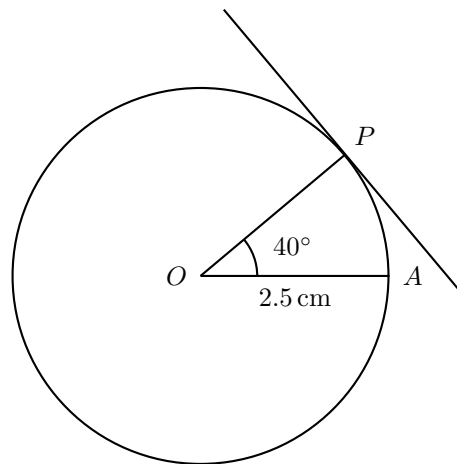**Q.8.2** In the figure, the semicircle with diameter OP intersects the circle centred at O at Q

1

Prove that PQ is a tangent to the circle centred at O

Concept : Line perpendicular to the radius through a point on the circle is a tangent

Q.8.3 In the figure, O is the centre of the circle

Draw this figure with the given specifications

Concept : Line perpendicular to the radius through a point on the circle is a tangent
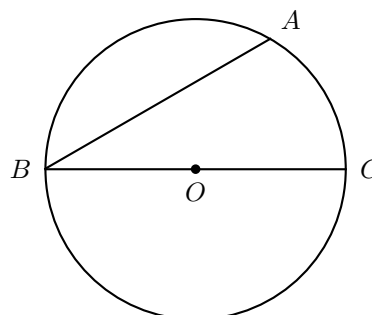
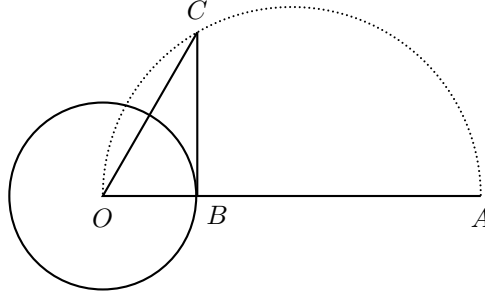**Q.8.4** In the figure, O is the centre of the circle, $BC = 6$ cm, $\angle ABC = 30°$

Draw this figure according to specifications and draw the tangent at A.

Concept : Tangent is perpendicular to the radius through the point of contact

Q.8.5 In the figure, O is the centre of the circle and OA is the diameter of the semicircle with $OB = 1\,\text{cm}$ and $AB = 3\,\text{cm}$. The tangent to the circle at B cuts the semicircle at C

What is the length of BC? Find the angles of ΔOBC

Score : 4, Time : 6 minutes

Concept : Tangent is perpendicular to the radius through the point of contact

Q.8.6 Draw a circle of radius 3 centimetres and draw the chord AB of length 4 centimetres in it. Draw the tangents at A and B

Score : 4, Time : 6 minutes

Concept : Tangent is perpendicular to the radius through the point of contact

Q.8.7 Draw a circle of radius 3.5 centimetres and draw two non-perpendicular diameters. Draw the tangents at the ends of these diameters. What is the specialty of the quadrilateral formed by these tangents?

Score : 5, Time : 8 minutes

Concept : Two tangents can be drawn from an external point

Q.8.8 Draw a circle of radius 3.2 centimetres and mark a point P, 8 centimetres from its centre. Draw tangents from P to the circle and write down the measurements of their lengths

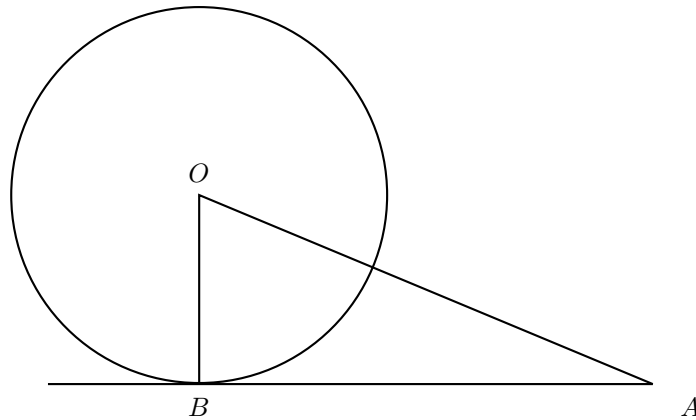**Score : 4, Time : 6 minutes**

Concept : Tangent is perpendicular to the radius through the point of contact

Q.8.9 Draw two circles of radii 3 centimetres and 6 centimetres with the same centre. From a point on the larger circle, draw tangents to the smaller circle. Write down the measurements of these tangents.

Concept : Lengths of tangents from an external point are equal

Q.8.10 In the figure, O is the centre of the circle and AB is the tangent at B on the circle, with $OA = 13$ centimetres and $OB = 5$ centimetres
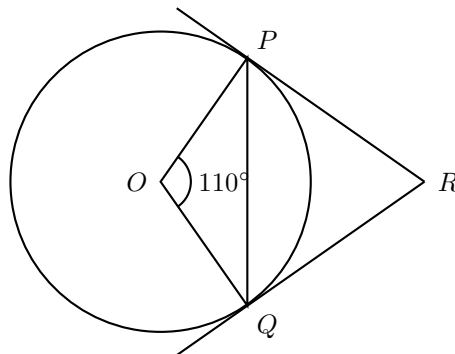

What is the length of AB? What is the length of the second tangent from A to the circle?

Score : 3, Time : 5 minutes

Concept : Lengths of tangents from an external point are equal

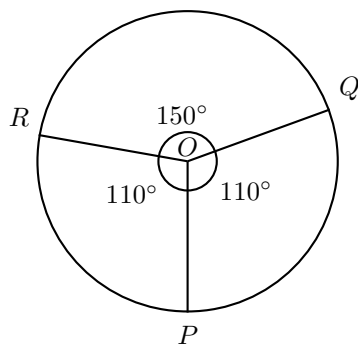**Q.8.11** In the figure, O is the centre of the circle and the tangents at P and Q meet at R.

Find the angles of ΔPQR

Score : 3, Time : 4 minutes

Concept : The central angle of the smaller arc determined by two points on the circle and the angle between the tangents at these points are supplementary

Q.8.12 In the figure, O is the centre of the circle and P, Q, R are points on it
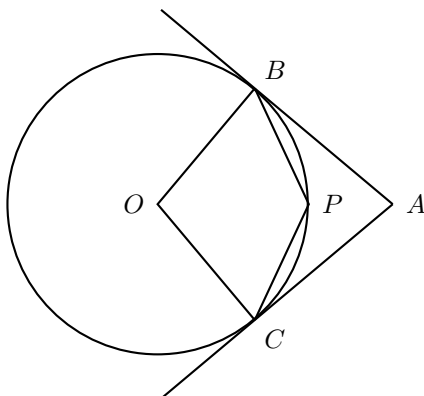
Find the angles of the triangle formed by the tangents at P, Q, R.

<div align="right">**Score : 3, Time : 4 minutes**</div>

Concept : The central angle of the smaller arc determined by two points on the circle and the angle between the tangents at these points are supplementary

Q.8.13 In the figure, O is the centre of the circle and AB, AC are tangents from A, with $\angle BAC = 80°$.

Find $\angle BOC$ and $\angle BPC$

<div align="right">**Score : 3, Time : 4 minutes**</div>

Concept : The central angle of the smaller arc determined by two points on the circle and the angle between the tangents at these points are supplementary

Q.8.14 Draw a circle of radius 3.5 centimetres and draw an equilateral triangle with all three sides touching the circle. What is the circumradius of this triangle?

<div align="right">**Score : 4, Time : 6 minutes**</div>

Concept : The central angle of the smaller arc determined by two points on the circle and the angle between the tangents at these points are supplementary

Q.8.15 Draw a circle of radius 3 centimetres and draw a triangle with angles $60°$ and $70°$, and all three sides touching the circle.
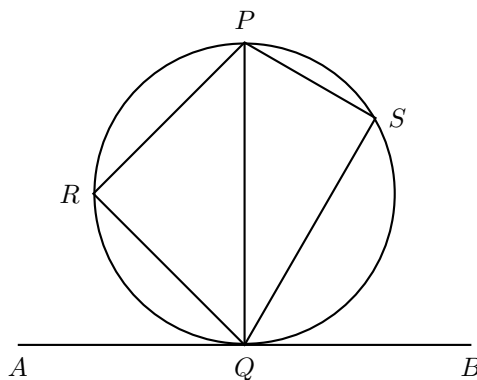
Q.8.16 Draw a circle of radius 2 centimetres and draw a regular hexagon with all sides touching the circle.

Concept : Each angle between a chord and the tangent at one end is equal to the angle in the segment on the other side

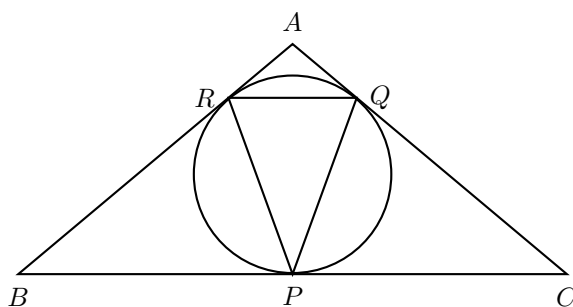**Q.8.17** In the figure, PQ is a diameter of the circle and $\angle AQR = 45°$

  (i) Find $\angle PRQ$, $\angle PSQ$, $\angle QPR$

  (ii) Given that $QR = 3\,\text{cm}$, what is the radius of the circle?

Concept : Each angle between a chord and the tangent at one end is equal to the angle in the segment on the other side

Q.8.18 In the figure, ABC is a triangle with $\angle A = 100°$ and $AB = AC$. Its incircle touches the sides at P, Q, R
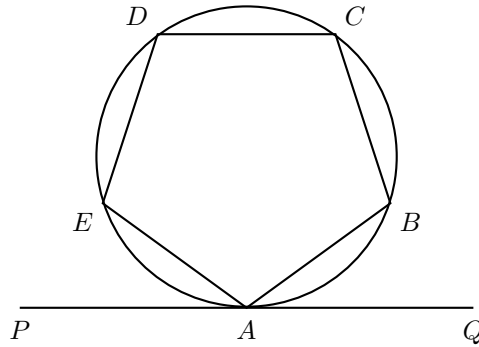

  (i) How much are $\angle B$ and $\angle C$?

  (ii) Calculate the angles of ΔPQR

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Concept : Each angle between a chord and the tangent at one end is equal to the angle in the segment on the other side

Q.8.19 In the figure, the circumcircle of the regular pentagon $ABCDE$ is drawn and also its tangent PQ at the point A.
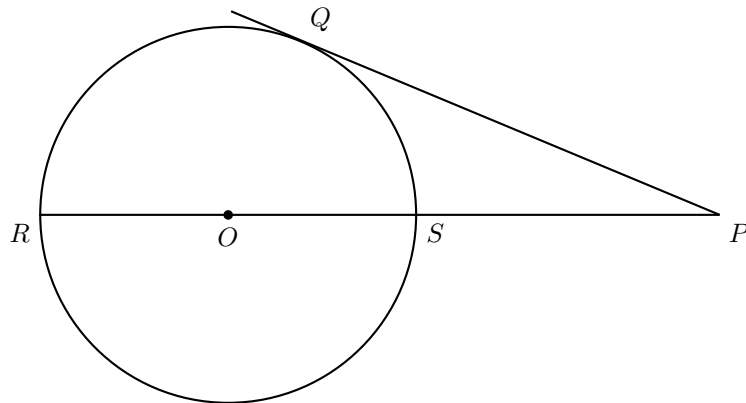

How much is $\angle PAE$?

Score : 3, Time : 4 minutes

Concept : Relation between tangent from an external point and portions of line cutting the circle at two points

Q.8.20 In the figure, O is the center of the circle and PQ is a tangent, with $PQ = 12\,\text{cm}$ and $PR = 18\,\text{cm}$.
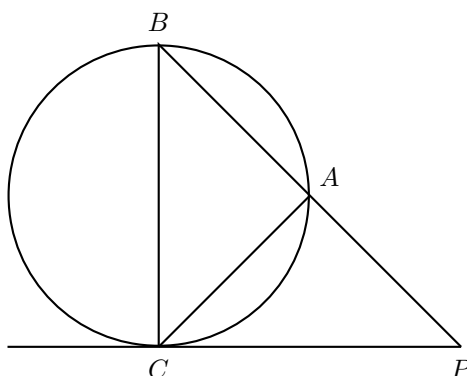

How much is PS? What is the radius of the circle?

Score : 3, Time : 5 minutes

Concept : Relation between tangent from an external point and portions of line cutting the circle at two points

Q.8.21 In the figure, BC is a diameter of the circle and PC is the tangent at C. Also, A is a point on the circle with $AC = 5\,\text{cm}$ and $\angle ACP = 45°$
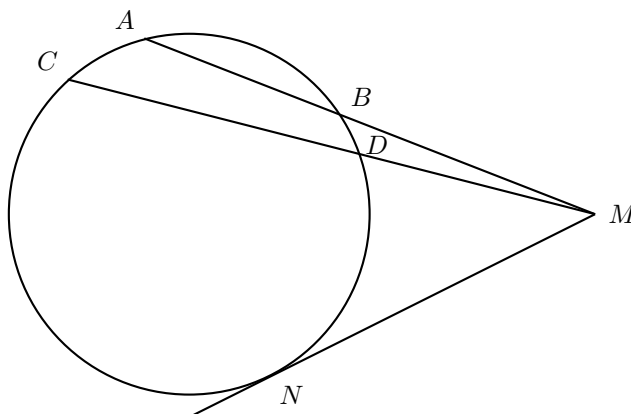

How much are $\angle P$ and $\angle B$? Find also the lengths of PC, BC, PB

Score : 5, Time : 7 minutes

Concept : Relation between tangent from an external point and portions of line cutting the circle at two points

Q.8.22 In the figure, the tangent from M to the circle touches it at N and two other lines through M cut the circle at A, B and C, D. Also, $MN = 12\,\text{cm}$, $MB = 9\,\text{cm}$ and $MD = 8\,\text{cm}$.
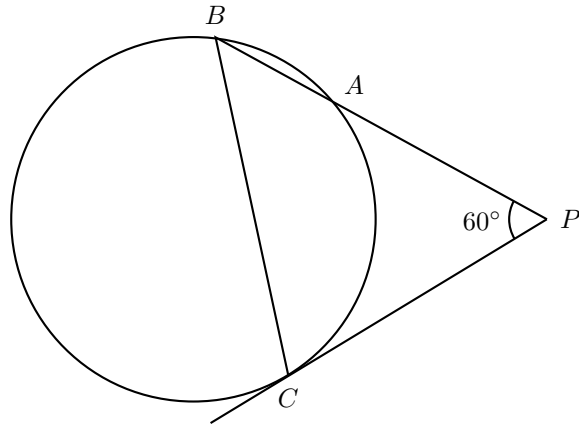

Which are products in the figure are equal to $MA \times MB$? Calculate the lengths of AB and CD

Score : 4, Time : 6 minutes

Concept : Relation between tangent from an external point and portions of line cutting the circle at two points

Q.8.23 In the circle the tangent from P to the circle touches it at C and another line from P cuts it at A and B. Also, $PA = 16\,\text{cm}$, $AB = 9\,\text{cm}$, $\angle CPB = 60°$
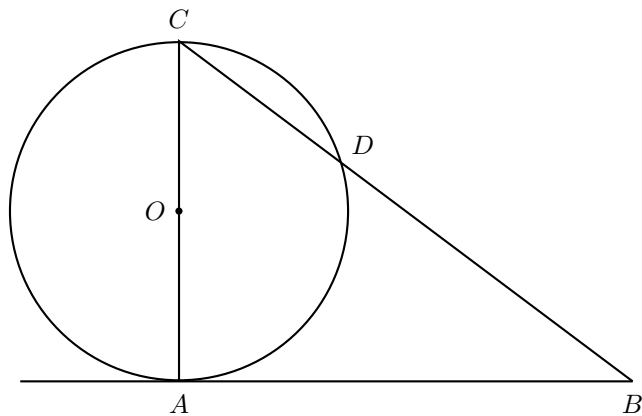
What is the length of PC? Calculate the area of $\triangle PCB$

Score : 4, Time : 6 minutes

Concept : Relation between tangent from an external point and portions of line cutting the circle at two points

Q.8.24 In the figure, O is the centre of the circle and the tangent from B touches the circle at A. Also $BD = 16\,\text{cm}$ and $CD = 9\,\text{cm}$.
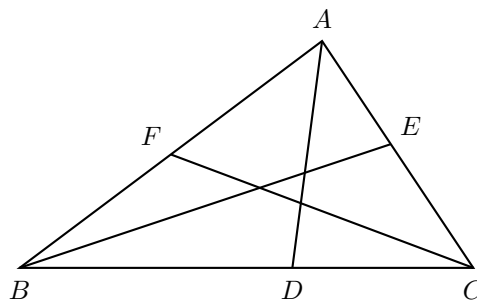

What is the length of AB? What is the radius of the circle?

Score : 4, Time : 6 minutes

Concept : The angle bisectors of a triangle meet at a point

Q.8.25 In the figure, AD and CF are bisectors of the angles A and C.
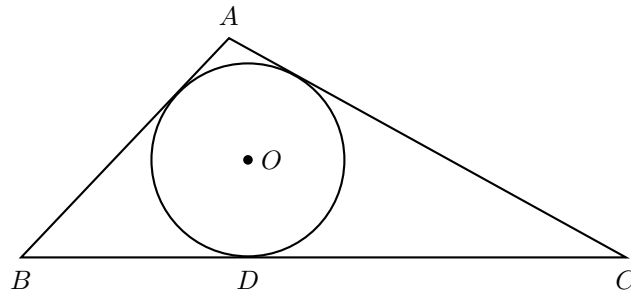

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Is BE the bisector of $\angle B$? Why?

<div align="right">**Score : 2, Time : 4 minutes**</div>

Concept : Angle bisectors of a triangle pass through its incentre

Q.8.26 In the figure, the sides of $\triangle ABC$ are tangents to the circle. Also, $AB = 4\,\text{cm}$, $AC = 6\,\text{cm}$, $BC = 8\,\text{cm}$.

What are the lengths of BD and CD?

<div align="right">**Score : 3, Time : 5 minutes**</div>

Concept : Incircle of a triangle

Q.8.27 Draw $\triangle PQR$ with $PQ = 6\,\text{cm}$, $PR = 6\,\text{cm}$ and $\angle P = 65°$. Draw its incircle. Measure the inradius and write it down

<div align="right">**Score : 4, Time : 8 minutes**</div>

Q.8.28 In the figure, $BC = 35\,\text{cm}$, $AC = 37\,\text{cm}$ and $\angle B = 90°$

(a) How much is AB?

(b) Calculate the inradius of the triangle

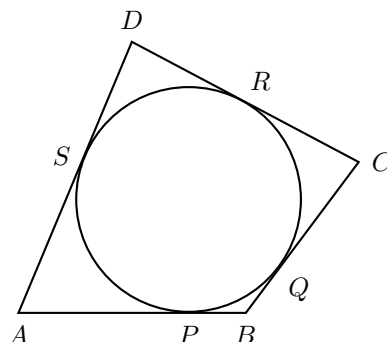<div align="right">**Score : 4, Time : 7 minutes**</div>

Concept : Incircle of a triangle

Q.8.29 Draw a triangle of sides 6 centimetres, 8 centimetres and 10 centimetres and draw its incentre. Measure the inradius and write it down

<div align="right">**Score : 4, Time : 8 minutes**</div>

Concept : Tangents drawn from an external point are of equal length

Q.8.30 In the figure, AB, BC, CD, DA are the tangents to the circle at P, Q, R, S.

Prove that the perimeter of the quadrilateral $ABCD$ is $2(AP + BQ + CR + DS)$

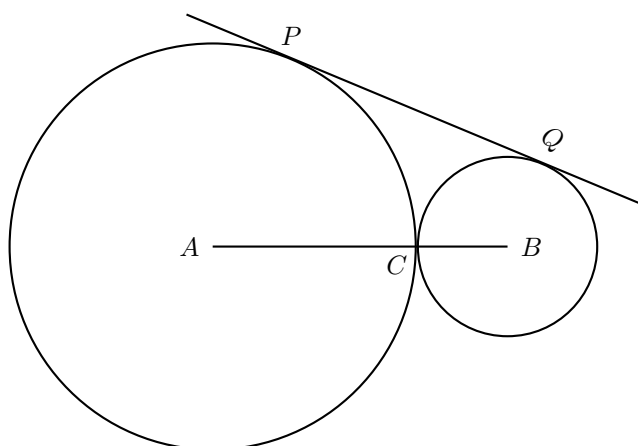<div align="right">**Score : 4, Time : 6 minutes**</div>

Concept : The bisector of the angle formed by two tangents to a circle pass through the centre of the circle

Q.8.31 Draw quadrilateral $ABCD$ with $AB = 7$ cm, $BC = 4.5$ cm, $AD = 6$ cm, $CD = 5$ cm, $\angle A = 70°$, Draw the circle touching the sides AB, BC, AD. Is the side CD also a tangent to the circle?

<div align="right">**Score : 5, Time : 10 minutes**</div>

Concept : General properties of tangent to a circle

Q.8.32 In the figure, circled centres at A and B touch at C, with $AC = 9$ cm and $BC = 4$ cm. The line PQ touches these circles at P and Q

(a) How much are angle APQ and $\angle BQP$?

(b) Calculate the length of PQ