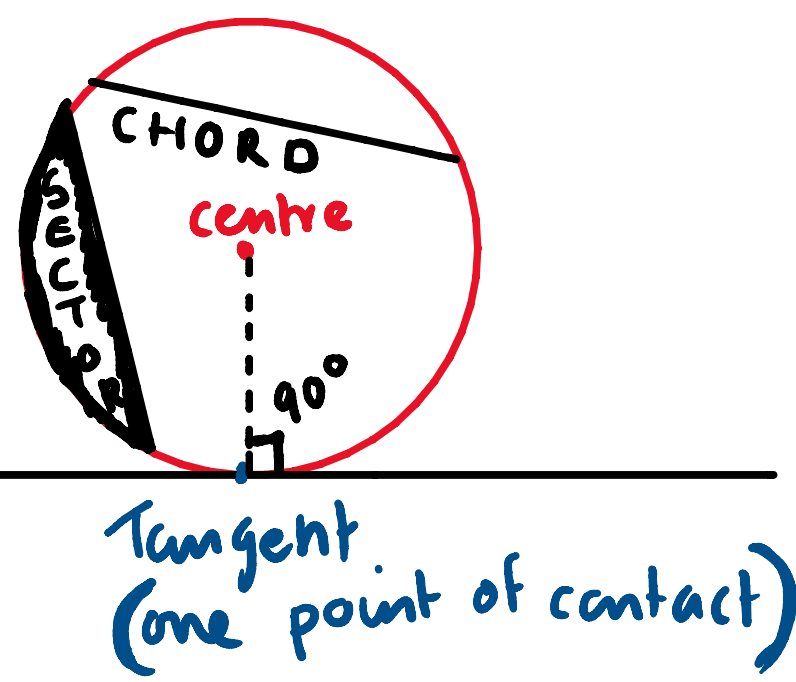
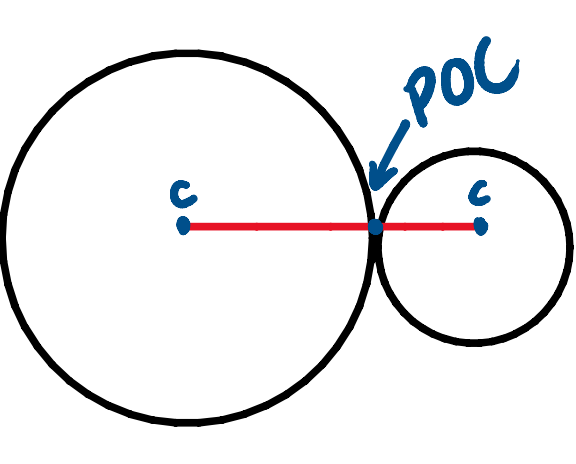


Theorem: The angle in a semi circle is  $90^\circ$   
The angle that sits on the diameter is  $90^\circ$



The tangent is perpendicular  $\perp$  to the radius that goes to the point of contact.  
 $\therefore$  The tangent is at  $90^\circ$  to the circle.



Pg 322 Q1+2

If two circles intersect at one point only, then the two centres and the point of contact are **COLLINEAR** (on the same line)



Chapter 11 Geometry 1

Section 11.4 Circle theorems

**Example 1**

In the given diagram, O is the centre of the circle and [OM] is perpendicular to [AB]. If  $OM = 5$  and  $OB = 13$ , find [AB].

**Example 2**

In the given diagram, PT is a tangent to the circle and [OT] is a radius. If  $\angle TOQ = 120^\circ$ , find the measures of the angles marked x and y.

**Exercise 11.4**

1. Find the measure of the angles marked with letters in the following circles with O as centre:

**Exercise 11.4**

2. In the given circle, O is the centre. Explain why  $\triangle OAC$  is isosceles. Now write down

(i)  $\angle OCA$   
(ii)  $\angle ACB$   
(iii)  $\angle OBC$

**Exercise 11.4**

3. Find the measure of the angles marked with letters in the following diagrams, where O is the centre of the circles.

$a=42$   
 $90-42=48$   
 $b=48$

$c=50$   
 $d=90-50=40$

$180-70=110$   
 $110/2=55$

**Exercise 11.4**

4. In the given diagram, O is the centre of the circle,  $AB = 6$  and  $OB = 5$ .

(i) Name the right-angled triangle:  $\angle B$  or  $\angle ABC$  or  $\angle CBA$   
(ii)  $OB = 5$ .

Name two other line segments that are 5 units in length:  $OA$  and  $OC$

(iii) Find [AC].  $5+5=10$   
(iv) Find [BC].  $8$   
(v) Find the area of  $\triangle ABC$ .

Area of  $\triangle$  is  $\frac{1}{2} \times \text{base} \times \text{height}$

$c^2 = a^2 + b^2$   
 $10^2 = 6^2 + x^2$   
 $100 = 36 + x^2$   
 $64 = x^2$   
 $x = 8$

$\frac{1}{2}(6) \times (8)$   
 $3x = 24u^2$

**Exercise 11.4**

5. In the given figure, O is the centre of the circle and  $OM \perp AB$ . If  $OM = 5$  cm and  $AB = 12$  cm, find

(i)  $AM = 6$   
(ii) the length of the radius of the circle.

$c^2 = a^2 + b^2$   
 $x^2 = 5^2 + 6^2$   
 $x^2 = 25 + 36$   
 $x^2 = 61$   
 $x = \sqrt{61} \approx 7.8$

**Exercise 11.4**

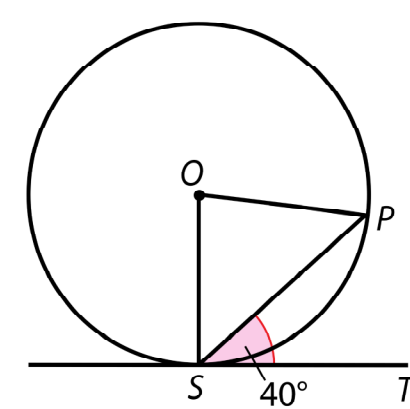
**Hint** In the given diagram, O is the centre of the circle of radius 26 cm. OX is perpendicular to CD and  $OX = 10$  cm. Find [CD].

Exercise 11.4

7. ST is a tangent to the given circle with O as centre.

If  $\angle PST = 40^\circ$ , find

- $\angle OST$
- $\angle OSP$
- $\angle OPS$
- $\angle SOP$

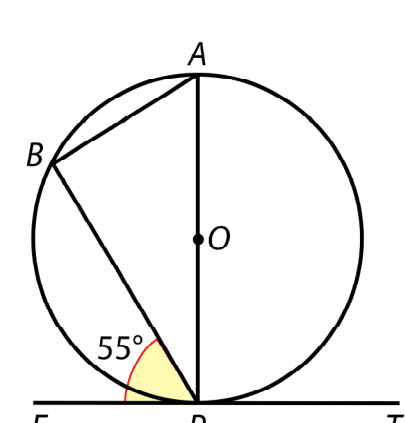


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Exercise 11.4

8. In the given diagram, PT is a tangent to the circle of centre O and  $\angle BPE = 55^\circ$ .

- Find
- $\angle EPO$
  - $\angle BPO$
  - $\angle ABP$
  - $\angle BAP$

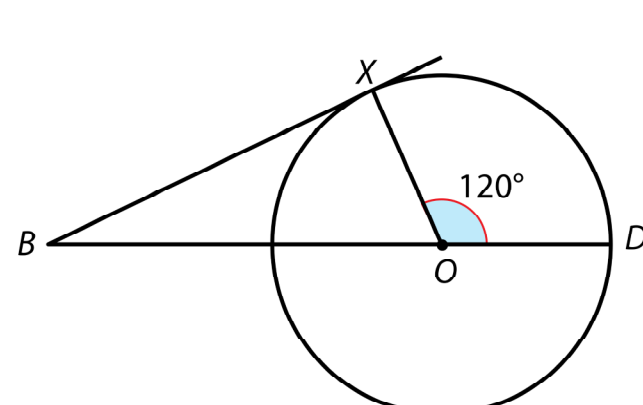


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Exercise 11.4

9. In the given figure, BX is a tangent to the circle with centre O.

If  $\angle XOD = 120^\circ$ , find  $\angle OBX$ .

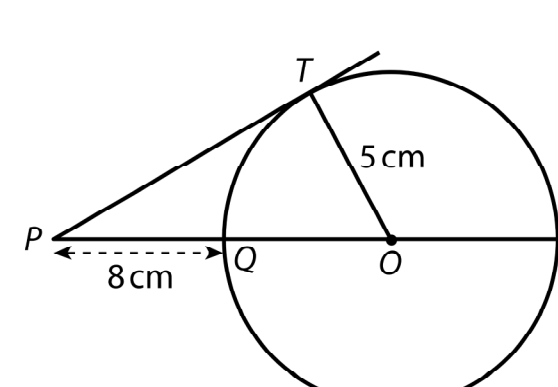


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Exercise 11.4

10. In the given diagram, PT is a tangent to the circle of centre O and radius length 5 cm.

If  $PQ = 8$  cm, find  $PT$ .



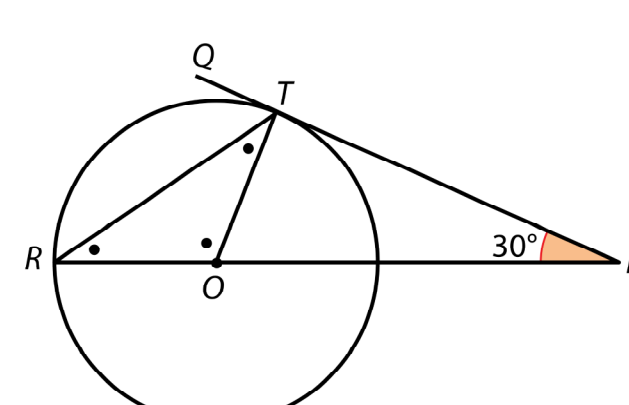
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Exercise 11.4

11. In the given diagram, PQ is a tangent to the circle of centre O.

If  $\angle TPO = 30^\circ$ , find

- $\angle POT$
- $\angle TOR$
- $\angle ORT$
- $\angle RTO$



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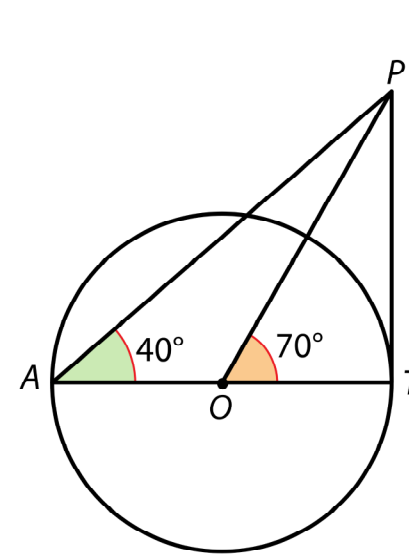
Exercise 11.4

12. PT is a tangent to the circle of centre O.

If  $\angle POT = 70^\circ$  and  $\angle PAO = 40^\circ$ ,

find

- $\angle OPT$
- $\angle OPA$



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Exercise 11.4

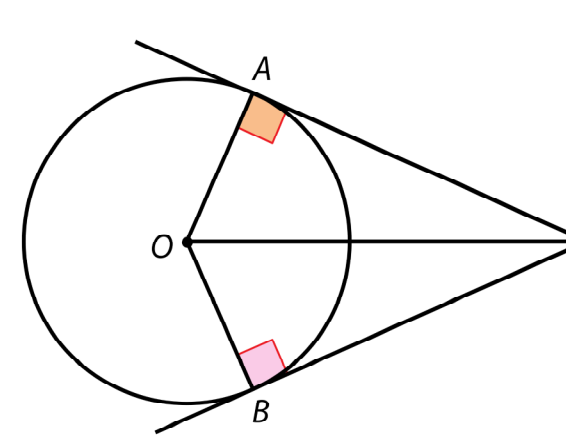
13. In the given diagram, O is the centre of the circle.

PA and PB are tangents to the circle.

(i) Explain why the triangles AOP and BOP are congruent.

(ii) Hence show that  $PA = PB$ .

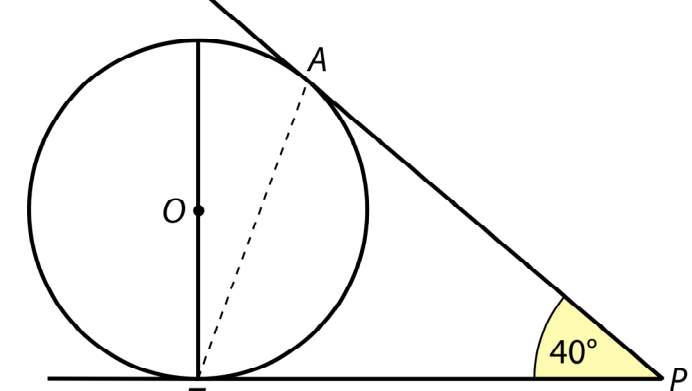
The lengths of two tangents from a point to a circle are equal.



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Exercise 11.4

14. In the given diagram, PA and PT are tangents to the circle of centre O.



If  $\angle APT = 40^\circ$ , find  $\angle ATO$ .

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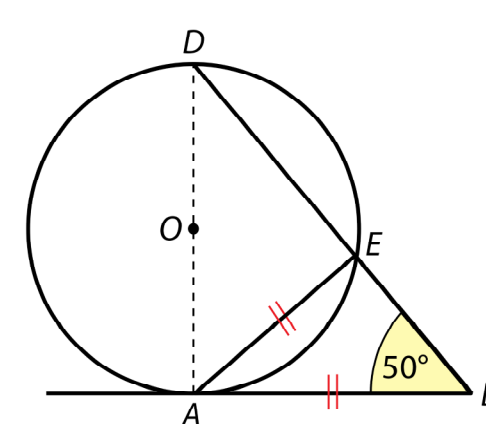
Exercise 11.4

15. In the given diagram, AB is a tangent to the circle and AD is a diameter.

If  $\angle ABD = 50^\circ$  and  $AB = AE$ ,

find

- $\angle EAB$
- $\angle DAE$
- $\angle ADE$



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Answers 11.4

- $a = 90^\circ, b = 90^\circ, c = 45^\circ$
- As  $|AO| = |OC| = \text{radius}$ :
  - $43^\circ$
  - $90^\circ$
  - $47^\circ$
- $a = 42^\circ, b = 48^\circ, c = 50^\circ, d = 40^\circ, e = 55^\circ, f = 35^\circ$
- (i)  $\triangle ABC$  (ii)  $[AO] + [OC]$   
(iii) 10 units (iv) 8 units (v) 24 sq. unit
- (i) 6 cm (ii)  $\sqrt{61}$  cm
- 48 cm
- (i)  $90^\circ$  (ii)  $50^\circ$  (iii)  $50^\circ$  (iv)  $80^\circ$
- (i)  $90^\circ$  (ii)  $35^\circ$  (iii)  $90^\circ$  (iv)  $55^\circ$
- $30^\circ$
- 12 cm
- (i)  $60^\circ$  (ii)  $120^\circ$  (iii)  $30^\circ$  (iv)  $30^\circ$
- (i)  $20^\circ$  (ii)  $30^\circ$
- $20^\circ$
- (i)  $80^\circ$  (ii)  $10^\circ$  (iii)  $80^\circ$