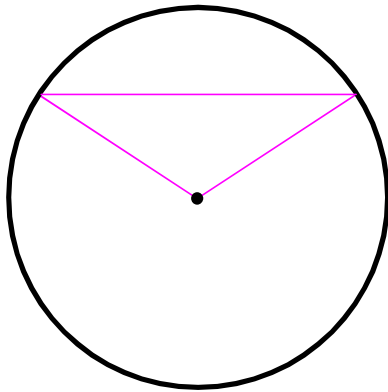


*Angles, Circles and Symmetry - Lesson 2***Finding Angles in Circles with Triangles and Tangents**LI

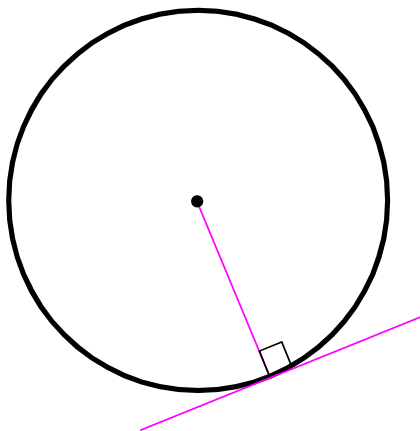
- Identify a Tangent Line to a circle.
- Find missing angles in triangles formed in such a situation.

SC

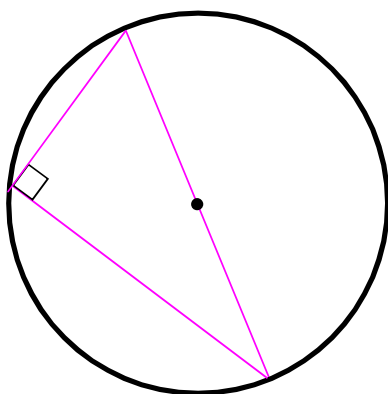
- Properties of triangles in, and tangent lines to, circles.

Property 1

A **triangle** formed by two radii and a chord is **isosceles**

Property 2

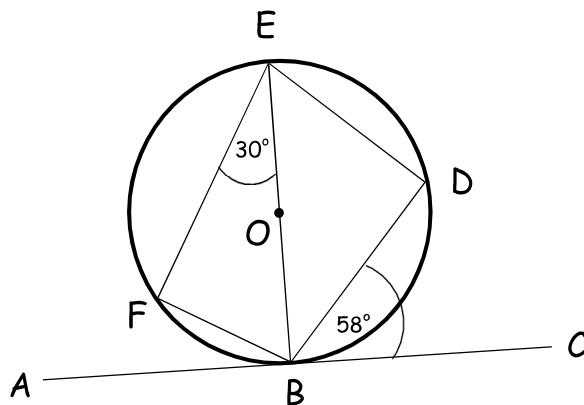
A **tangent line** is perpendicular to the radius at the point of contact

Property 3

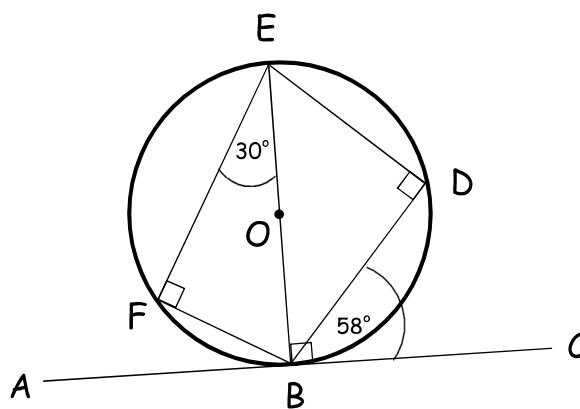
A **triangle** with one side being the **diameter of a circle** and the other two sides meeting at a point on the circle is **right-angled**

Example 1

Find  $\widehat{FBD}$  if  $ABC$  is a tangent to the circle with centre  $O$ .



$\widehat{FBD}$  is the sum of  $\widehat{FBE}$  and  $\widehat{EBD}$ . First mark in any right angles :



$$\widehat{FBE} = 180^\circ - 90^\circ - 30^\circ$$

$$\widehat{FBE} = 60^\circ$$

$$\widehat{EBD} = 90^\circ - 58^\circ$$

$$\widehat{EBD} = 32^\circ$$

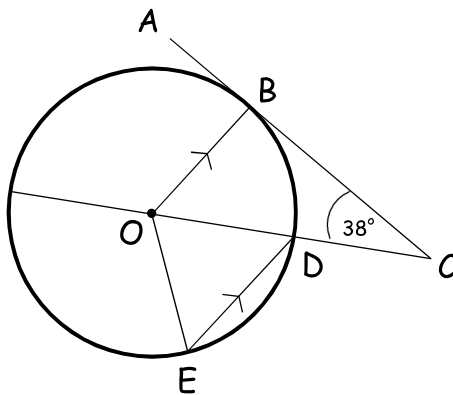
$$\widehat{FBD} = \widehat{FBE} + \widehat{EBD}$$

$$\widehat{FBD} = 60^\circ + 32^\circ$$

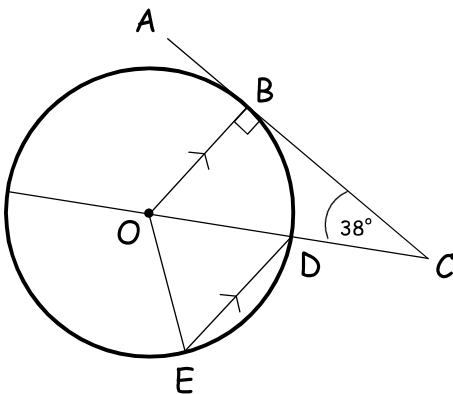
$$\widehat{FBD} = 92^\circ$$

Example 2

Find  $\widehat{EOD}$  if  $ABC$  is a tangent to the circle with centre  $O$ .



First mark in any right angles :



$$\widehat{BOC} = 180^\circ - 90^\circ - 38^\circ$$

$$\widehat{BOC} = 52^\circ$$

$$\widehat{ODE} = \widehat{BOC} = 52^\circ$$

$$\widehat{ODE} = 52^\circ$$

$$\widehat{OED} = \widehat{ODE}$$

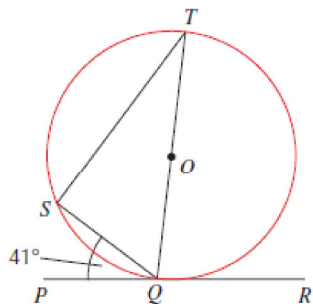
$$\widehat{OED} = 52^\circ$$

$$\widehat{EOD} = 180^\circ - 52^\circ - 52^\circ$$

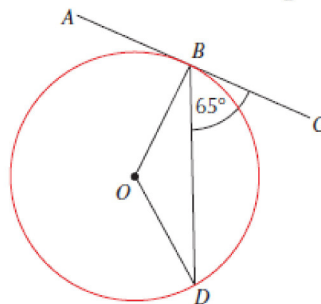
$$\widehat{EOD} = 76^\circ$$

# Questions

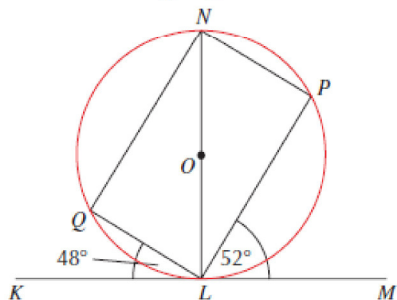
- 1  $O$  is the centre.  $PQR$  is a tangent.  $QT$  is a diameter. Calculate the size of angle  $STQ$ .



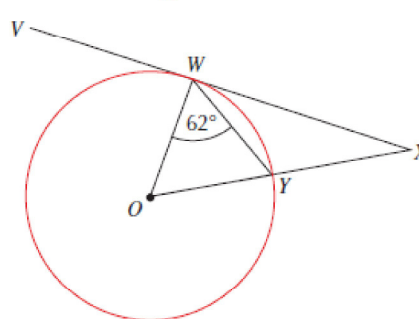
- 2  $O$  is the centre.  $ABC$  is a tangent. Calculate the size of angle  $BOD$ .



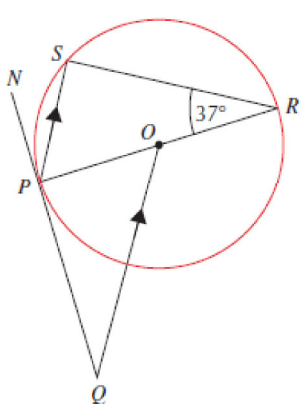
- 3  $O$  is the centre.  $KLM$  is a tangent. Calculate the size of angle  $QNP$ .



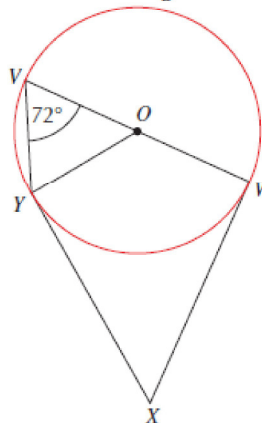
- 4  $O$  is the centre.  $VWX$  is a tangent. Calculate the size of angle  $WXY$ .



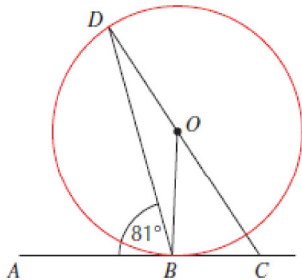
- 5  $O$  is the centre.  $NPQ$  is a tangent.  $PR$  is a diameter. Calculate the size of angle  $PQO$ .



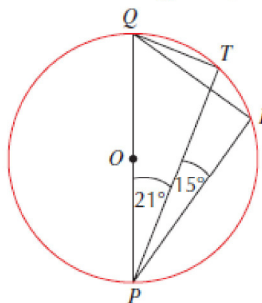
- 6  $O$  is the centre.  $VW$  is a diameter. Calculate the size of angle  $YXW$ .



- 7  $O$  is the centre.  $ABC$  is a tangent. Calculate the size of angle  $OCB$ .



- 8  $O$  is the centre.  $PQ$  is a diameter. Calculate the size of angle  $RQT$ .



**Answers**

- 1  $STQ = 41^\circ$
- 2  $BOD = 130^\circ$
- 3  $QNP = 100^\circ$
- 4  $WXY = 34^\circ$
- 5  $PQO = 37^\circ$
- 6  $YXW = 36^\circ$
- 7  $OCB = 72^\circ$
- 8  $RQT = 15^\circ$