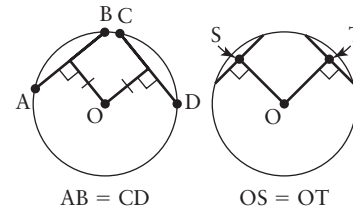


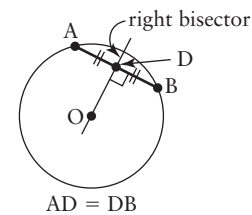
7.5 Investigating Properties of Circles

KEY CONCEPTS

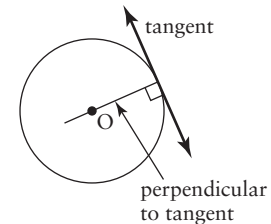
- Chords in a circle that are equidistant from the centre of the circle are equal in length. Chords of equal length are equidistant from the centre of a circle.



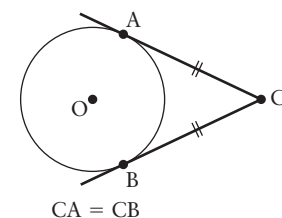
- A line from the centre of a circle that is perpendicular to a chord bisects the chord. A line from the centre of a circle to the midpoint of a chord is perpendicular to the chord. The right bisector of a chord passes through the centre of the circle.



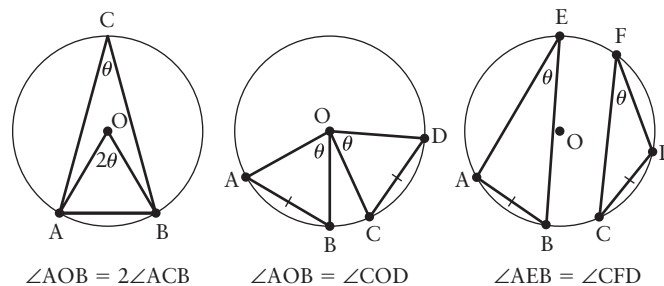
- The line that is perpendicular to the endpoint of the radius of a circle is a tangent to the circle. A line that is perpendicular to the tangent of a circle at the point of tangency and the circle passes through the centre of the circle.



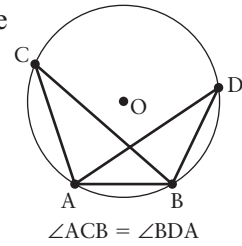
- Two tangents can be drawn to a circle from a point outside the circle. These tangents are equal in length.



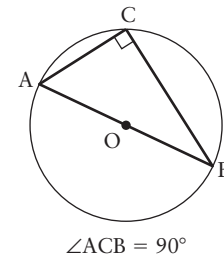
- If a central angle and an inscribed angle are subtended by the same chord and are on the same side of the chord, the central angle is twice the inscribed angle. Equal chords subtend equal central angles and equal inscribed angles.



- If two angles are inscribed on the same chord and are on the same side of the chord, the angles are equal.



- An inscribed angle subtended by the diameter is a right angle.



Example

Use geometry software to show that a line that is drawn from the centre of a circle to a chord, and that is perpendicular to the chord, bisects the chord.

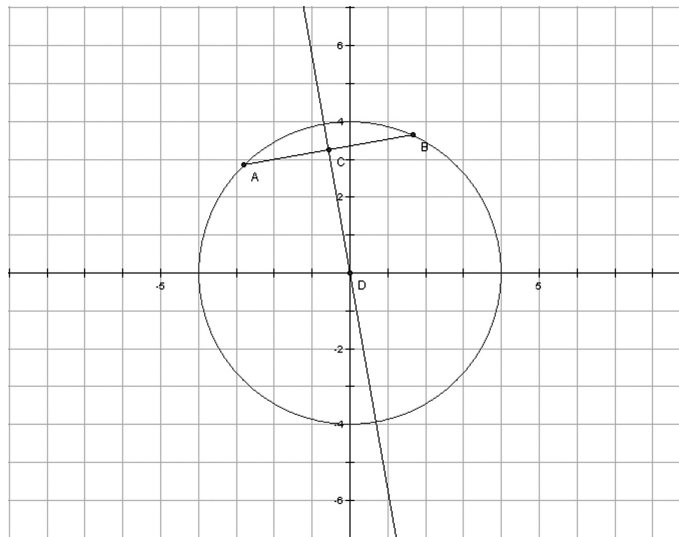
Solution

Draw a circle with radius 4 cm.

Label two points on the circle A and B. Construct segment AB.

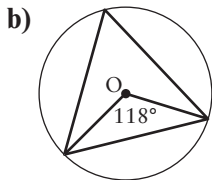
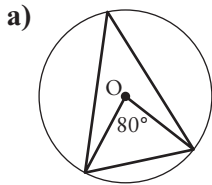
Construct a line through the centre of the circle, D, that is perpendicular to the chord AB and meets chord AB at point C.

Since $AC = BC$, the line from D that is perpendicular to chord AB bisects the chord AB.

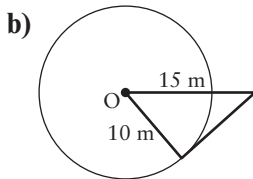
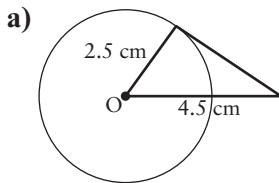


A

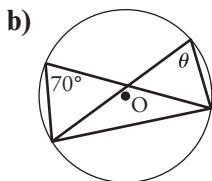
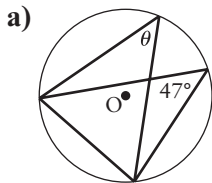
1. Given the measure of the central angle, determine the measure of the inscribed angle that is subtended by the same chord.



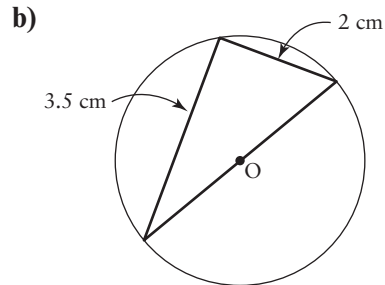
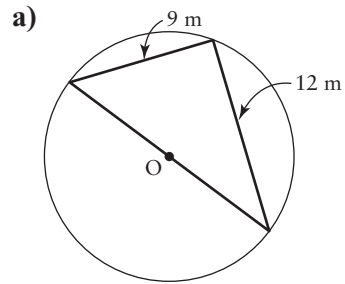
2. Determine the length of each tangent.



3. Determine the measure of θ .



4. Determine the length of each diameter.



5. The distance from the centre of a circle to point A outside the circle is 15 in. The length of the tangent from point A to the circle is 10 in. Determine the radius of the circle.
6. The distance from the centre of a circle to point G outside the circle is 12 ft. The radius of the circle is 10 ft. What is the length of the tangent from point G to the point of tangency?

B

7. **Use Technology** Use geometry software to investigate the relationship between the measures of an inscribed angle and a central angle that are subtended by the same chord and are on the same side of the chord.
- ★ 8. **Use Technology** Use geometry software to show that there are two tangents that are equal in length that can be drawn to a circle from a point that is outside the circle.

★9. Use Technology

- How could you use geometry software to show that the right bisector of a chord will pass through the centre of the circle?
- Show that a line that is drawn from the centre of a circle to the midpoint of a chord is perpendicular to the chord.

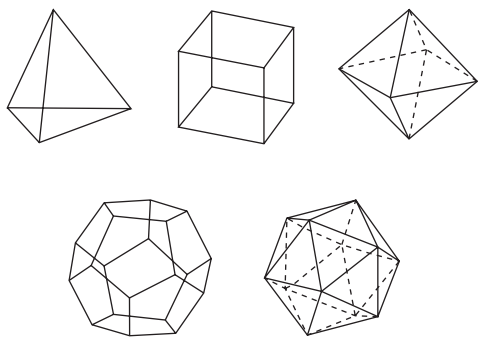
10. **Use Technology** Use geometry software to show that a line that is perpendicular to the tangent of a circle at the point of tangency passes through the centre of a circle.

11. **Use Technology** Use geometry software to show that if two angles are inscribed on the same chord and are on the same side of the chord, then the measures of the angles are equal.

12. **Use Technology** Use geometry software to show that an inscribed angle subtended by the diameter is a right angle.

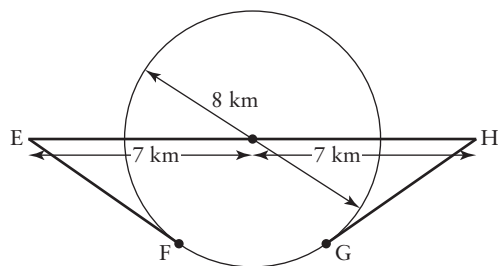
- Is there a central angle involved in this situation? If yes, what is the central angle?
- How does this explain the measure of the inscribed angle?

13. The figures shown are examples of Platonic solids.



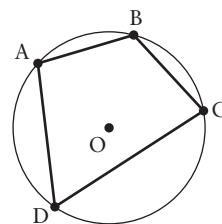
Research and prepare a report on the Platonic solids.

14. Joe plans to walk around a circular lake that has diameter 8 km. Points E and H are on opposite sides of the lake and lie on a straight line through the centre of the lake. Each point is 7 km from the centre. In the route EFGH, EF and GH are tangents to the lake and FG is an arc along the shore of the lake. If Joe starts at point E, walks to point F, walks to point G, and ends at point H, what is the total distance he will walk?



C

15. A cyclic quadrilateral is formed by connecting four points on the circumference of a circle. Show that the opposite angles of a cyclic quadrilateral are supplementary.



16. This circle has radius 10 cm. The length of chord AB is 8 cm. Determine the measure of $\angle ACB$. Explain.

