# Chords, Secants, and Tangents

## Exploration

**a.** Using a geometry utility, draw a circle whose diameter is approximately two-thirds the width of the screen.

**b.**

1. A **chord** is a line segment joining any two points on a circle. Draw two chords of your circle.
2. Predict where the perpendicular bisectors of the two chords will intersect. Draw a point at that location.
3. Construct the perpendicular bisectors of the chords. Mark the intersection point (if different from the location predicted in Step **2**).
4. Drag the endpoints of the chords to change their sizes and locations. Record your observations.
5. Change the size of the circle. Record your observations.

**c.**

1. Draw a new circle and construct a diameter.
2. Identify the intersection points of the diameter and the circle.
3. Construct a line through one of the points of intersection.
4. Measure an angle at the intersection of the diameter and the line constructed in Step **3**.
5. Adjust the angle constructed in Step **3** until its measure is 90°.
6. Record your observations.

### Mathematics Note

A **secant** of a circle is a line that intersects a circle in two points.

A **tangent** of a circle is a line, segment, or ray in the plane of the circle that intersects the circle in exactly one point and is perpendicular to a radius at that point. This intersection is the **point of tangency**.

For example, Figure **14** shows circle $O$ with secant $\overleftrightarrow{AB}$, tangent $\overleftrightarrow{BC}$, and $B$, a point of tangency.

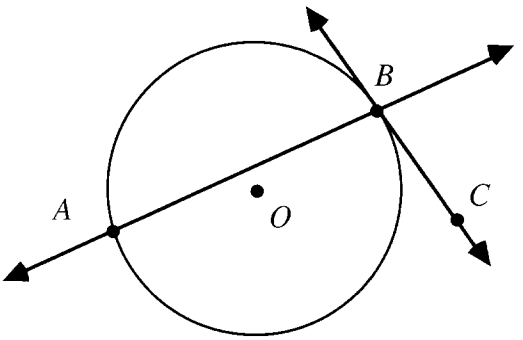


**Figure 14: Circle with secant and tangent lines**

## Discussion 2

**a.** 1. What is the measure of the angle between a diameter of a circle and a tangent to that circle whose point of tangency is the endpoint of the diameter?

2. Suppose that a secant does not contain the center of a circle. If a tangent to the circle is then drawn as in Figure **14**, what can be said about the measure of an angle formed by this secant and tangent?

**b.** Describe how to use paper folding to find a line tangent to a circle.

**c.** What is true about two tangents whose points of tangency are opposite endpoints of a diameter? Explain your response.

**d.** Figure **15** shows a fragment of American Indian pottery. Before beginning reconstruction of the circular plate, a museum curator might first make a sketch of the original artifact, including its center. Using your observations from the exploration, describe how to find the center of this circular plate.

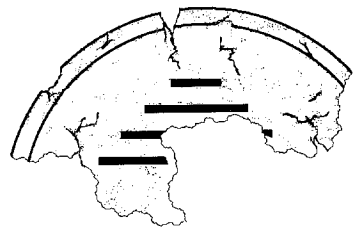

**Figure 15: Pottery fragment**

**e.** Describe how to use paper folding to find the center of a circle.

**f.** The perpendicular bisector of a chord is the set of points in the plane equidistant from the ends of the chord. This means that for any point $C$ in Figure **16** below, $AC = BC$.

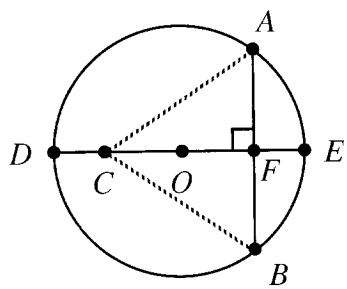


**Figure 16: Chord $AB$ and its perpendicular bisector**

How does this verify that the intersection of the perpendicular bisectors of two chords is the center of the circle?

**g.** In Figure **16**, $\Delta ABC$ is isosceles and $\overline{CF}$ is an altitude. What is the relationship between the altitude of an isosceles triangle and its base?