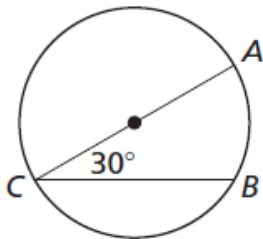
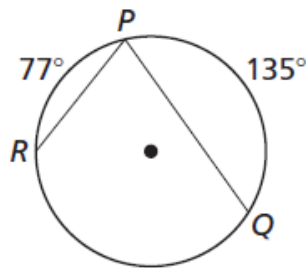


Find the indicated measure.

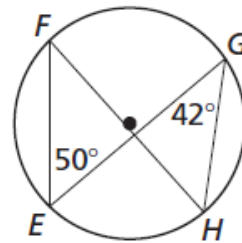
1.  $m\widehat{BC}$



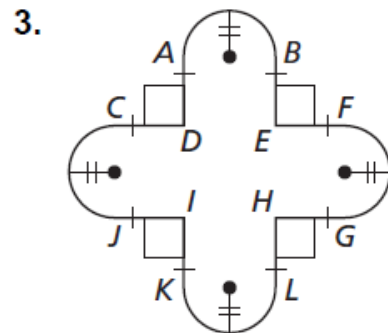
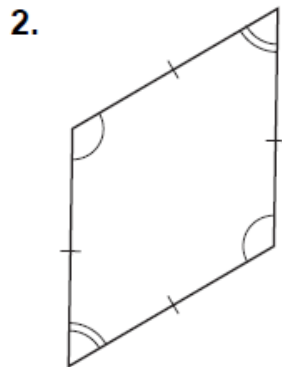
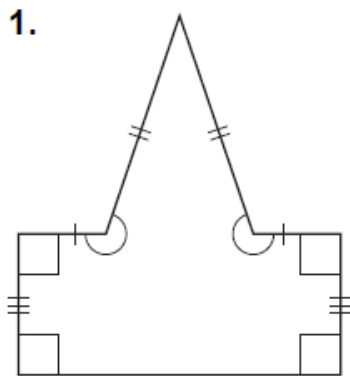
2.  $m\angle P$



3.  $m\widehat{EH}$



Determine the number of lines of symmetry for the figure.



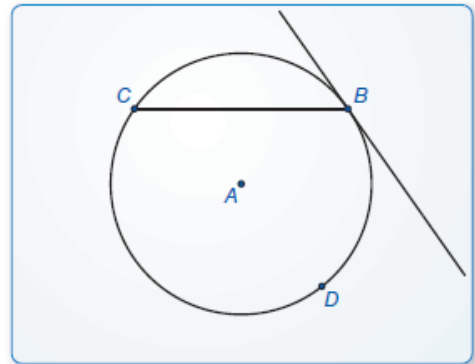
## **Essential Question**

When a chord intersects a tangent line or another chord, what relationships exist among the angles and arcs formed?

**Work with a partner.** Use dynamic geometry software.

**a.** Construct a chord in a circle. At one of the endpoints of the chord, construct a tangent line to the circle.

Sample



**b.** Find the measures of the two angles formed by the chord and the tangent line.

c. Find the measures of the two circular arcs determined by the chord.

d. Repeat parts (a)–(c) several times.

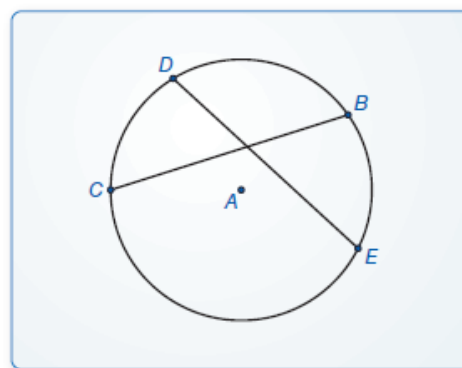
Record your results in a table.

Then write a conjecture that summarizes the data.

**Work with a partner.** Use dynamic geometry software.

**a.** Construct two chords that intersect inside a circle.

Sample



**b.** Find the measure of one of the angles formed by the intersecting chords.

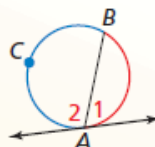
**c.** Find the measures of the arcs intercepted by the angle in part (b) and its vertical angle. What do you observe?

**d.** Repeat parts (a)–(c) several times. Record your results in a table. Then write a conjecture that summarizes the data.

## Finding Angle and Arc Measures

 Theorem**Theorem 10.14 Tangent and Intersected Chord Theorem**

If a tangent and a chord intersect at a point on a circle, then the measure of each angle formed is one-half the measure of its intercepted arc.

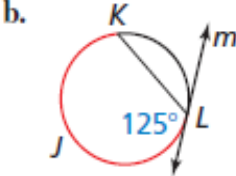
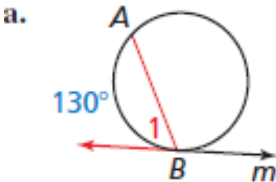


$$m\angle 1 = \frac{1}{2}m\widehat{AB} \quad m\angle 2 = \frac{1}{2}m\widehat{BCA}$$

*Proof* Ex. 33, p. 568

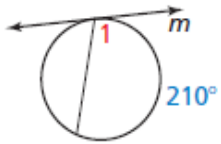


Line  $m$  is tangent to the circle. Find the measure of the red angle or arc.

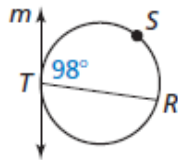


Line  $m$  is tangent to the circle. Find the indicated measure.

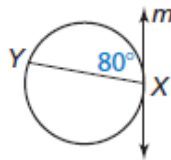
1.  $m\angle 1$



2.  $m\widehat{RST}$



3.  $m\widehat{XY}$



 **Core Concept****Intersecting Lines and Circles**

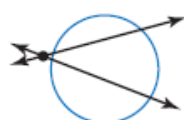
If two nonparallel lines intersect a circle, there are three places where the lines can intersect.



on the circle



inside the circle

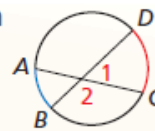


outside the circle

## Theorems

### Theorem 10.15 Angles Inside the Circle Theorem

If two chords intersect *inside* a circle, then the measure of each angle is one-half the *sum* of the measures of the arcs intercepted by the angle and its vertical angle.



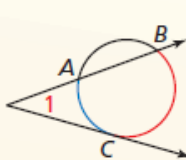
$$m\angle 1 = \frac{1}{2}(m\widehat{DC} + m\widehat{AB}),$$

$$m\angle 2 = \frac{1}{2}(m\widehat{AD} + m\widehat{BC})$$

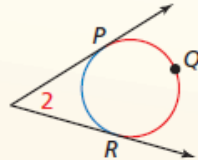
*Proof* Ex. 35, p. 568

### Theorem 10.16 Angles Outside the Circle Theorem

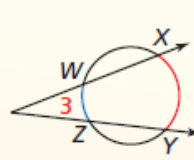
If a tangent and a secant, two tangents, or two secants intersect *outside* a circle, then the measure of the angle formed is one-half the *difference* of the measures of the intercepted arcs.



$$m\angle 1 = \frac{1}{2}(m\widehat{BC} - m\widehat{AC})$$



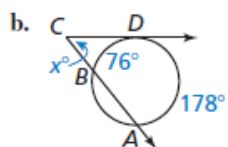
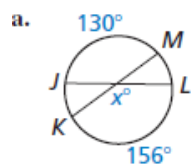
$$m\angle 2 = \frac{1}{2}(m\widehat{PQR} - m\widehat{PR})$$



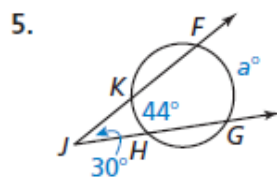
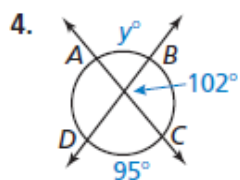
$$m\angle 3 = \frac{1}{2}(m\widehat{XY} - m\widehat{WZ})$$

*Proof* Ex. 37, p. 568

Find the value of  $x$ .



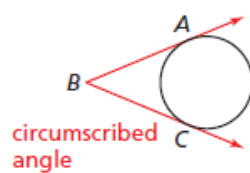
Find the value of the variable.



### Core Concept

#### Circumscribed Angle

A **circumscribed angle** is an angle whose sides are tangent to a circle.

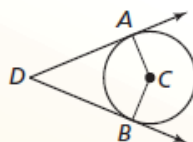


## Theorem

### Theorem 10.17 Circumscribed Angle Theorem

The measure of a circumscribed angle is equal to  $180^\circ$  minus the measure of the central angle that intercepts the same arc.

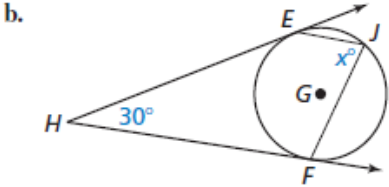
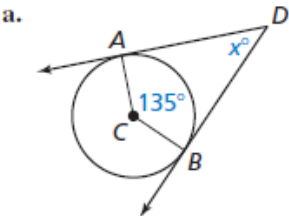
*Proof* Ex. 38, p. 568



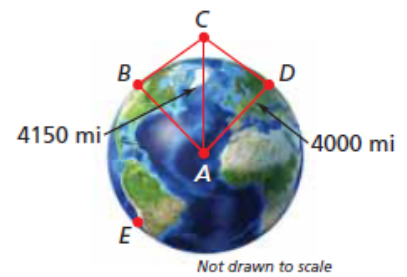
$$m\angle ADB = 180^\circ - m\angle ACB$$



Find the value of  $x$ .

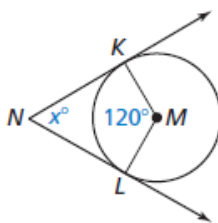


The northern lights are bright flashes of colored light between 50 and 200 miles above Earth. A flash occurs 150 miles above Earth at point  $C$ . What is the measure of  $\widehat{BD}$ , the portion of Earth from which the flash is visible? (Earth's radius is approximately 4000 miles.)

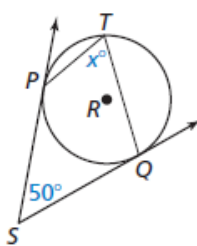


Find the value of  $x$ .

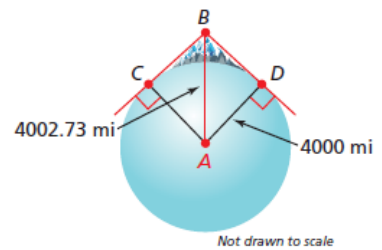
6.



7.



8. You are on top of Mount Rainier on a clear day. You are about 2.73 miles above sea level at point  $B$ . Find  $m\widehat{CD}$ , which represents the part of Earth that you can see.



- **Point of Most Significance:** Ask students to identify, aloud or on paper, the most significant point (or part) in the lesson that aided their learning.