

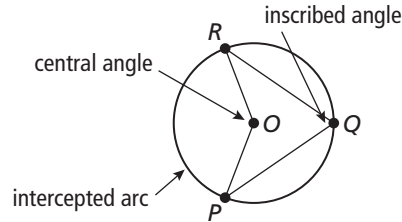
# 10.4

## Inscribed Angles and Polygons

For use with Exploration 10.4

**Essential Question** How are inscribed angles related to their intercepted arcs? How are the angles of an inscribed quadrilateral related to each other?

An **inscribed angle** is an angle whose vertex is on a circle and whose sides contain chords of the circle. An arc that lies between two lines, rays, or segments is called an **intercepted arc**. A polygon is an **inscribed polygon** when all its vertices lie on a circle.



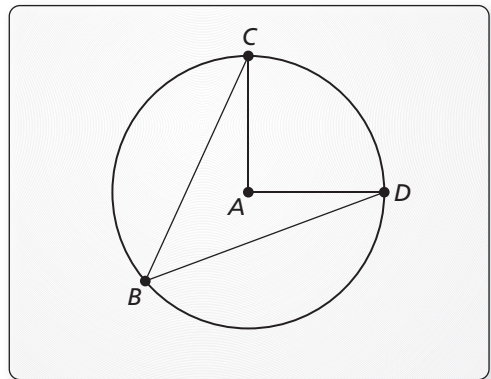
### 1 EXPLORATION: Inscribed Angles and Central Angles

Go to [BigIdeasMath.com](http://BigIdeasMath.com) for an interactive tool to investigate this exploration.

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

- a. Construct an inscribed angle in a circle. Then construct the corresponding central angle.
- b. Measure both angles. How is the inscribed angle related to its intercepted arc?

**Sample**



- c. Repeat parts (a) and (b) several times. Record your results in the following table. Write a conjecture about how an inscribed angle is related to its intercepted arc.

Measure of Inscribed Angle	Measure of Central Angle	Relationship

**10.4** Inscribed Angles and Polygons (continued)

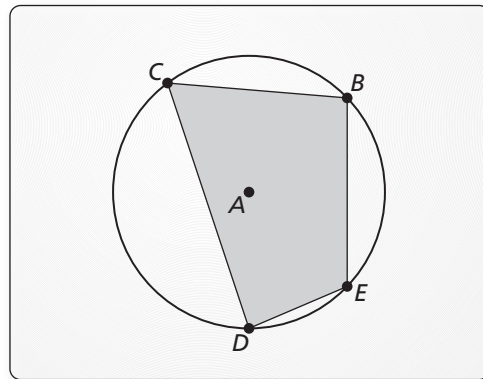
**2** **EXPLORATION:** A Quadrilateral with Inscribed Angles

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.

- a. Construct a quadrilateral with each vertex on a circle.
- b. Measure all four angles.  
What relationships do you notice?

**Sample**



- c. Repeat parts (a) and (b) several times.  
Record your results in the following table.  
Then write a conjecture that summarizes the data.

Angle Measure 1	Angle Measure 2	Angle Measure 3	Angle Measure 4

**Communicate Your Answer**

- 3. How are inscribed angles related to their intercepted arcs? How are the angles of an inscribed quadrilateral related to each other?
- 4. Quadrilateral  $EFGH$  is inscribed in  $\odot C$ , and  $m\angle E = 80^\circ$ . What is  $m\angle G$ ?  
Explain.

**10.4****Notetaking with Vocabulary**

For use after Lesson 10.4

In your own words, write the meaning of each vocabulary term.

inscribed angle

intercepted arc

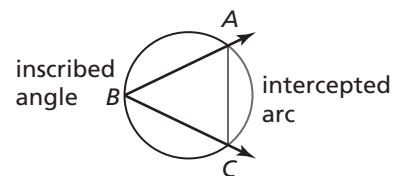
subtend

inscribed polygon

circumscribed circle

**Core Concepts****Inscribed Angle and Intercepted Arc**

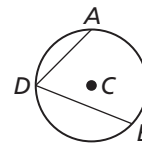
An **inscribed angle** is an angle whose vertex is on a circle and whose sides contain chords of the circle. An arc that lies between two lines, rays, or segments is called an **intercepted arc**. If the endpoints of a chord or arc lie on the sides of an inscribed angle, then the chord or arc is said to **subtend** the angle.

**Notes:**

$\angle B$  intercepts  $\widehat{AC}$ .  
 $\widehat{AC}$  subtends  $\angle B$ .  
 $\overline{AC}$  subtends  $\angle B$ .

**Theorems****Theorem 10.10 Measure of an Inscribed Angle Theorem**

The measure of an inscribed angle is one-half the measure of its intercepted arc.

**Notes:**

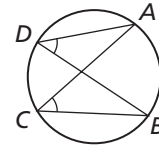
$$m\angle ADB = \frac{1}{2}m\widehat{AB}$$

**10.4** Notetaking with Vocabulary (continued)

**Theorem 10.11 Inscribed Angles of a Circle Theorem**

If two inscribed angles of a circle intercept the same arc, then the angles are congruent.

**Notes:**



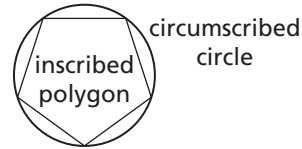
$$\angle ADB \cong \angle ACB$$

**Core Concepts**

**Inscribed Polygon**

A polygon is an **inscribed polygon** when all its vertices lie on a circle. The circle that contains the vertices is a **circumscribed circle**.

**Notes:**

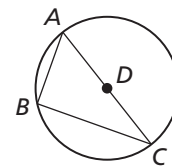


**Theorems**

**Theorem 10.12 Inscribed Right Triangle Theorem**

If a right triangle is inscribed in a circle, then the hypotenuse is a diameter of the circle. Conversely, if one side of an inscribed triangle is a diameter of the circle, then the triangle is a right triangle and the angle opposite the diameter is the right angle.

**Notes:**

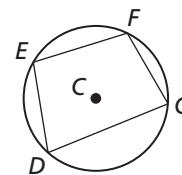


$$m\angle ABC = 90^\circ \text{ if and only if } \overline{AC} \text{ is a diameter of the circle.}$$

**Theorem 10.13 Inscribed Quadrilateral Theorem**

A quadrilateral can be inscribed in a circle if and only if its opposite angles are supplementary.

**Notes:**



$$D, E, F, \text{ and } G \text{ lie on } \odot C \text{ if and only if } m\angle D + m\angle F = m\angle E + m\angle G = 180^\circ.$$

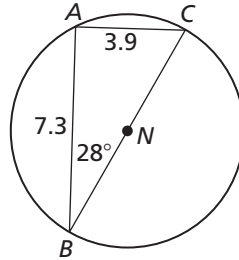
**10.4** Notetaking with Vocabulary (continued)

**Extra Practice**

In Exercises 1–5, use the diagram to find the indicated measure.

1.  $m\angle A$

2.  $m\angle C$

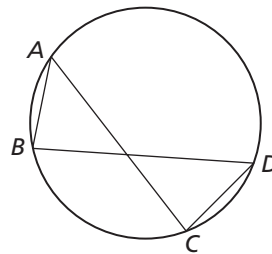


3.  $BC$

4.  $m\widehat{AC}$

5.  $m\widehat{AB}$

6. Name two pairs of congruent angles.



7. Find the value of each variable.

