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 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?

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.

<table>
<thead>
<tr>
<th>Measure of Inscribed Angle</th>
<th>Measure of Central Angle</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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?

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

<table>
<thead>
<tr>
<th>Angle Measure 1</th>
<th>Angle Measure 2</th>
<th>Angle Measure 3</th>
<th>Angle Measure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 \(\angle E = 80^\circ\). What is \(\angle G\)?
   Explain.
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:

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:
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:

**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:

**Theorem 10.13 Inscribed Quadrilateral Theorem**

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

Notes:
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. \( m\overline{AC} \)

5. \( m\overline{AB} \)

6. Name two pairs of congruent angles.

7. Find the value of each variable.