

# 10.2

## Find Arc Measures

**Goal** • Use angle measures to find arc measures.

### Your Notes

#### VOCABULARY

**Central angle** A central angle of a circle is an angle whose vertex is the center of the circle.

**Minor arc** Part of a circle measuring less than  $180^\circ$ .

**Major arc** Part of a circle measuring between  $180^\circ$  and  $360^\circ$ .

**Semicircle** A semicircle is an arc with endpoints that are the endpoints of a diameter.

**Measure of a minor arc** The measure of a minor arc is the measure of its central angle.

**Measure of a major arc** The measure of a major arc is the difference between  $360^\circ$  and the measure of the related minor arc.

**Congruent circles** Two circles are congruent circles if they have the same radius.

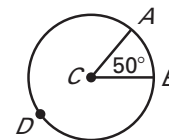
**Congruent arcs** Two arcs are congruent arcs if they have the same measure and they are arcs of the same circle or of congruent circles.

#### MEASURING ARCS

The measure of a minor arc is the measure of its central angle. The expression  $m\widehat{AB}$  is read as “the measure of arc  $AB$ .”

The measure of the entire circle is  $360^\circ$ . The measure of a major arc is the difference between  $360^\circ$  and the measure of the related minor arc.

The measure of a semicircle is  $180^\circ$ .



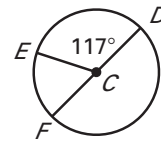
$$m\widehat{AB} = 50^\circ$$

$$m\widehat{ADB} = 310^\circ$$

**Your Notes**

**Example 1** Find measures of arcs

Find the measure of each arc of  $\odot C$ , where  $\overline{DF}$  is a diameter.



- a.  $\widehat{DE}$                       b.  $\widehat{DFE}$                       c.  $\widehat{DEF}$

a.  $\widehat{DE}$  is a minor arc, so  $m\widehat{DE} = m\angle DCE = \underline{117^\circ}$ .

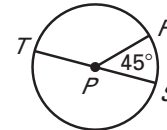
b.  $\widehat{DFE}$  is a major arc, so  
 $m\widehat{DFE} = \underline{360^\circ} - \underline{117^\circ} = \underline{243^\circ}$ .

c.  $\overline{DF}$  is a diameter, so  $\widehat{DEF}$  is a semicircle, and  
 $m\widehat{DEF} = \underline{180^\circ}$ .

**✓ Checkpoint** Complete the following exercise.

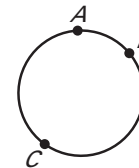
1. Find  $m\widehat{RTS}$  in the diagram at the right.

$m\widehat{RTS} = 315^\circ$



**POSTULATE 23: ARC ADDITION POSTULATE**

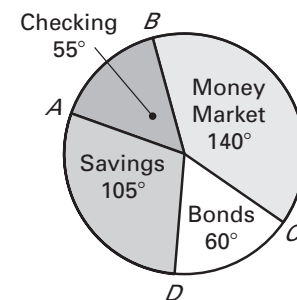
The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.



$m\widehat{ABC} = m\widehat{AB} + m\widehat{BC}$

**Example 2** Find measures of arcs

**Money** You join a new bank and divide your money several ways, as shown in the circle graph at the right. Find the indicated arc measures.



- a.  $m\widehat{BD}$                       b.  $m\widehat{BCD}$

**Solution**

a.  $m\widehat{BD} = m\widehat{BA} + m\widehat{AD}$   
 $= \underline{55^\circ} + \underline{105^\circ}$   
 $= \underline{160^\circ}$

b.  $m\widehat{BCD} = 360^\circ - m\widehat{BD}$   
 $= 360^\circ - \underline{160^\circ}$   
 $= \underline{200^\circ}$

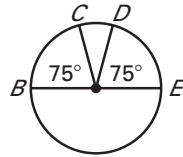
The measure of a minor arc is less than  $180^\circ$ . The measure of a major arc is greater than  $180^\circ$ .

**Your Notes**

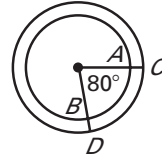
**Example 3** Identify congruent arcs

Tell whether the given arcs are congruent. Explain why or why not.

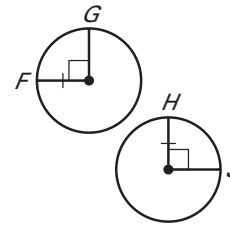
a.  $\widehat{BC}$  and  $\widehat{DE}$



b.  $\widehat{AB}$  and  $\widehat{CD}$



c.  $\widehat{FG}$  and  $\widehat{HJ}$



**Solution**

a.  $\widehat{BC} \cong \widehat{DE}$  because they are in the same circle and  $m\widehat{BC} = m\widehat{DE}$ .

b.  $\widehat{AB}$  and  $\widehat{CD}$  have the same measure, but they are not congruent because they are arcs of circles that are not congruent.

c.  $\widehat{FG} \cong \widehat{HJ}$  because they are in congruent circles and  $m\widehat{FG} = m\widehat{HJ}$ .

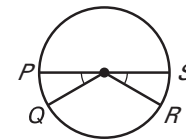
**Checkpoint** Complete the following exercises.

2. In Example 2, find (a)  $m\widehat{BCA}$  and (b)  $m\widehat{ABC}$ .

(a)  $m\widehat{BCA} = 305^\circ$ , (b)  $m\widehat{ABC} = 195^\circ$

3. In the diagram at the right, is  $\widehat{PQ} \cong \widehat{SR}$ ? Explain why or why not.

$\widehat{PQ} \cong \widehat{SR}$  because they are in the same circle and  $m\widehat{PQ} = m\widehat{SR}$ .



**Homework**