Name _____ Date _____

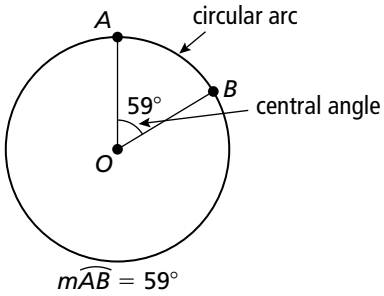
7.2 Finding Arc Measures

For use with Exploration 7.2

Essential Question How are circular arcs measured?

A **central angle** of a circle is an angle whose vertex is the center of the circle. A *circular arc* is a portion of a circle, as shown below. The measure of a circular arc is the measure of its central angle.

If $m\angle AOB < 180°$, then the circular arc is called a **minor arc** and is denoted by $\overset{\frown}{AB}$.

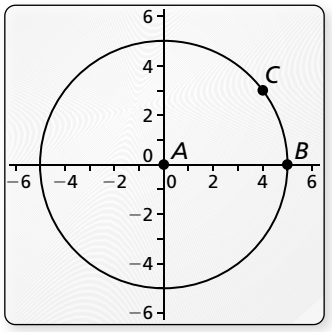


1 EXPLORATION: Measuring Circular Arcs

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

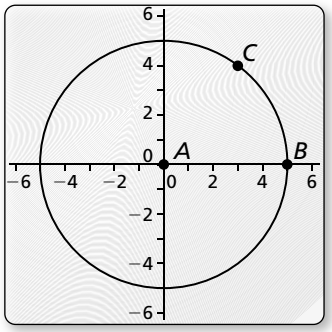
Work with a partner. Use dynamic geometry software to find the measure of $\overset{\frown}{BC}$. Verify your answers using trigonometry.

a.



Points
$A(0, 0)$
$B(5, 0)$
$C(4, 3)$

b.



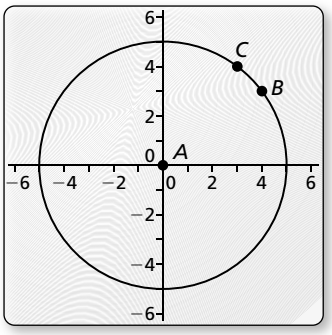
Points
$A(0, 0)$
$B(5, 0)$
$C(3, 4)$

Name_____ Date _____

7.2 Finding Arc Measures (continued)

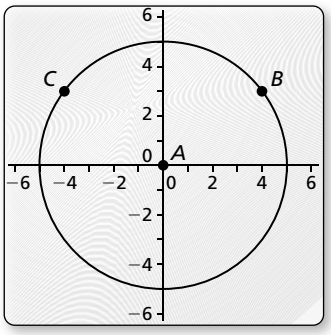
1 EXPLORATION: Measuring Circular Arcs (continued)

c.



Points
$A(0, 0)$
$B(4, 3)$
$C(3, 4)$

d.



Points
$A(0, 0)$
$B(4, 3)$
$C(-4, 3)$

Communicate Your Answer

2. How are circular arcs measured?

3. Use dynamic geometry software to draw a circular arc with the given measure.

a. 30°

b. 45°

c. 60°

d. 90°

Name _____ Date _____

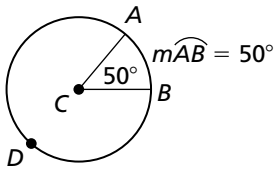
7.2 Practice
For use after Lesson 7.2

Core Concepts

Measuring Arcs

The **measure of a minor arc** is the measure of its central angle. The expression $m\overset{\frown}{AB}$ is read as "the measure of arc AB."

The measure of the entire circle is 360°. The **measure of a major arc** is the difference of 360° and the measure of the related minor arc. The measure of a semicircle is 180°.



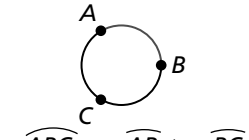
$m\overset{\frown}{ADB} = 360° - 50° = 310°$

Notes:

Postulates

Arc Addition Postulate

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



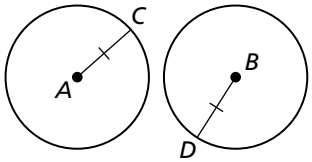
$m\overset{\frown}{ABC} = m\overset{\frown}{AB} + m\overset{\frown}{BC}$

Notes:

Theorems

Congruent Circles Theorem

Two circles are congruent circles if and only if they have the same radius.



$\odot A \cong \odot B$ if and only if $\overline{AC} \cong \overline{BD}$.

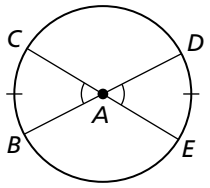
Notes:

Name_____ Date _____

7.2 Practice (continued)

Congruent Central Angles Theorem

In the same circle, or in congruent circles, two minor arcs are congruent if and only if their corresponding central angles are congruent.



$\overset{\frown}{BC} \cong \overset{\frown}{DE}$ if and only if $\angle BAC \cong \angle DAE$.

Notes:

Similar Circles Theorem

All circles are similar.

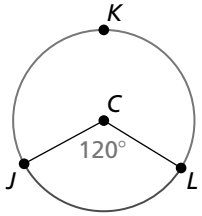
Notes:

Worked-Out Examples

Example #1

Name the minor arc and find its measure. Then name the major arc and find its measure.

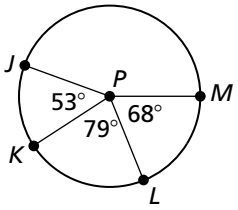
The minor arc is $\overset{\frown}{JL}$ and it has a measure of 120°. The major arc is $\overset{\frown}{JKL}$ and its measure is $360° - 120° = 240°$.



Example #2

Find the measure of each arc.

a. $\overset{\frown}{JL}$
b. $\overset{\frown}{KM}$
c. $\overset{\frown}{JLM}$
d. $\overset{\frown}{JM}$



a. $m\overset{\frown}{JL} = m\overset{\frown}{JK} + m\overset{\frown}{KL} = 53° + 79° = 132°$
b. $m\overset{\frown}{KM} = m\overset{\frown}{KL} + m\overset{\frown}{LM} = 79° + 68° = 147°$
c. $m\overset{\frown}{JLM} = m\overset{\frown}{JK} + m\overset{\frown}{KL} + m\overset{\frown}{LM} = 53° + 79° + 68° = 200°$
d. $m\overset{\frown}{JM} = 360° - 200° = 160°$

Name _____ Date _____

7.2 Practice (continued)

Practice A

In Exercises 1–8, identify the given arc as a *major arc*, *minor arc*, or *semicircle*. Then find the measure of the arc.

1. $\overset{\frown}{AB}$

2. $\overset{\frown}{ABC}$

3. $\overset{\frown}{ABD}$

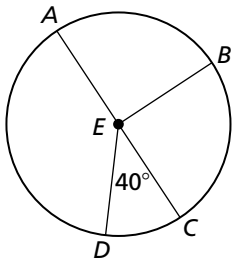
4. $\overset{\frown}{BC}$

5. $\overset{\frown}{BAC}$

6. $\overset{\frown}{DAB}$

7. $\overset{\frown}{AD}$

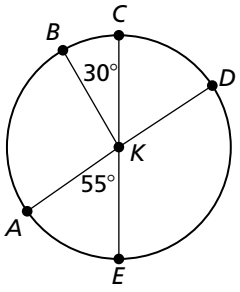
8. $\overset{\frown}{CD}$



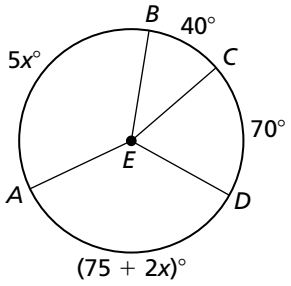
AC ⊥ BE

9. In $\odot E$ above, tell whether $\overset{\frown}{ABC} \cong \overset{\frown}{ADC}$. Explain why or why not.

10. In $\odot K$, find the measure of $\overset{\frown}{DE}$.



11. Find the value of x. Then find the measure of $\overset{\frown}{AB}$.

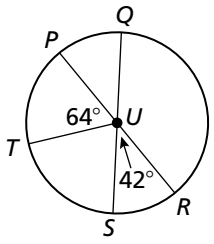


Name _____ Date _____

Practice B

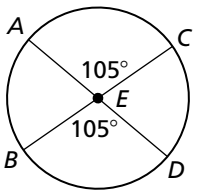
In Exercises 1–4, identify the given arc as a *major arc*, *minor arc*, or *semicircle*. Then find the measure of the arc of $\odot U$ if $\overline{SQ}$ and $\overline{PR}$ are diameters.

1. $\overset{\frown}{QRS}$
2. $\overset{\frown}{TS}$
3. $\overset{\frown}{TPS}$
4. $\overset{\frown}{PQ}$

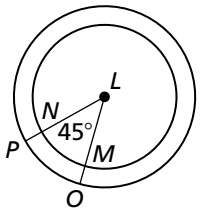


In Exercises 5–7, tell whether the given arcs are congruent. Explain why or why not.

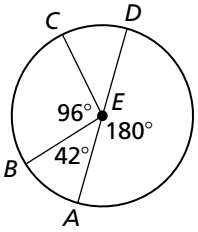
5. $\overset{\frown}{AC}$ and $\overset{\frown}{BD}$



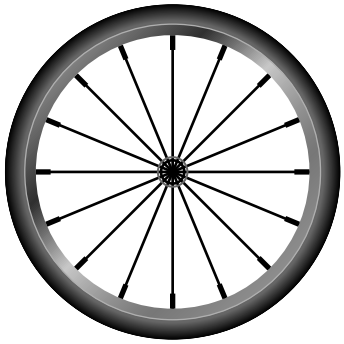
6. $\overset{\frown}{NM}$ and $\overset{\frown}{OP}$



7. $\overset{\frown}{AB}$ and $\overset{\frown}{CD}$

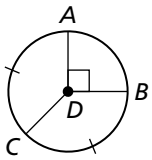


8. The spokes on a bicycle wheel divide the wheel into congruent sections. What is the measure of each arc in this circle?

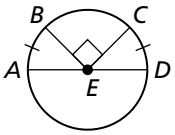


9. Find the measure of each arc.

   a. $\overset{\frown}{AC}$



   b. $\overset{\frown}{DAB}$



10. A water sprinkler covers the area shown in the figure. It moves through the covered area at a rate of about 5° per second.

    a. What is the measure of the arc covered by the sprinkler?

    b. When the sprinkler starts at the far left position, how long will it take for the sprinkler to reach the far right position?