

10.2 Lesson

Core Vocabulary

- central angle, p. 542
- minor arc, p. 542
- major arc, p. 542
- semicircle, p. 542
- measure of a minor arc, p. 542
- measure of a major arc, p. 542
- adjacent arcs, p. 543
- congruent circles, p. 544
- congruent arcs, p. 544
- similar arcs, p. 545

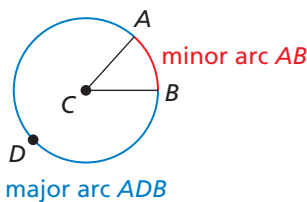
What You Will Learn

- ▶ Find arc measures.
- ▶ Identify congruent arcs.
- ▶ Prove circles are similar.

Finding Arc Measures

A **central angle** of a circle is an angle whose vertex is the center of the circle. In the diagram, $\angle ACB$ is a central angle of $\odot C$.

If $m\angle ACB$ is less than 180° , then the points on $\odot C$ that lie in the interior of $\angle ACB$ form a **minor arc** with endpoints A and B . The points on $\odot C$ that do not lie on the minor arc AB form a **major arc** with endpoints A and B . A **semicircle** is an arc with endpoints that are the endpoints of a diameter.



Minor arcs are named by their endpoints. The minor arc associated with $\angle ACB$ is named \widehat{AB} . Major arcs and semicircles are named by their endpoints and a point on the arc. The major arc associated with $\angle ACB$ can be named \widehat{ADB} .

STUDY TIP

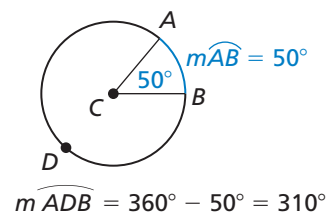
The measure of a minor arc is less than 180° . The measure of a major arc is greater than 180° .

Core Concept

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 .”

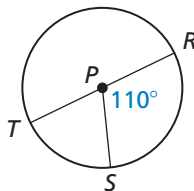
The measure of the entire circle is 360° . The **measure of a major arc** is the difference of 360° and the measure of the related minor arc. The measure of a semicircle is 180° .



EXAMPLE 1 Finding Measures of Arcs

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

- a. \widehat{RS}
- b. \widehat{RTS}
- c. \widehat{RST}



SOLUTION

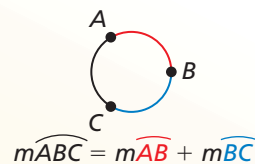
- a. \widehat{RS} is a minor arc, so $m\widehat{RS} = m\angle RPS = 110^\circ$.
- b. \widehat{RTS} is a major arc, so $m\widehat{RTS} = 360^\circ - 110^\circ = 250^\circ$.
- c. \overline{RT} is a diameter, so \widehat{RST} is a semicircle, and $m\widehat{RST} = 180^\circ$.

Two arcs of the same circle are **adjacent arcs** when they intersect at exactly one point. You can add the measures of two adjacent arcs.

Postulate

Postulate 10.1 Arc Addition Postulate

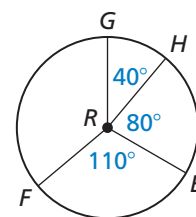
The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.



EXAMPLE 2 Using the Arc Addition Postulate

Find the measure of each arc.

- a. \widehat{GE} b. \widehat{GEF} c. \widehat{GF}



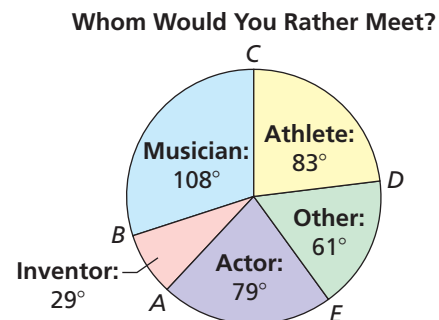
SOLUTION

- a. $m\widehat{GE} = m\widehat{GH} + m\widehat{HE} = 40^\circ + 80^\circ = 120^\circ$
 b. $m\widehat{GEF} = m\widehat{GE} + m\widehat{EF} = 120^\circ + 110^\circ = 230^\circ$
 c. $m\widehat{GF} = 360^\circ - m\widehat{GEF} = 360^\circ - 230^\circ = 130^\circ$

EXAMPLE 3 Finding Measures of Arcs

A recent survey asked teenagers whether they would rather meet a famous musician, athlete, actor, inventor, or other person. The circle graph shows the results. Find the indicated arc measures.

- a. $m\widehat{AC}$ b. $m\widehat{ACD}$
 c. $m\widehat{ADC}$ d. $m\widehat{EBD}$



SOLUTION

- a. $m\widehat{AC} = m\widehat{AB} + m\widehat{BC}$
 $= 29^\circ + 108^\circ$
 $= 137^\circ$
 b. $m\widehat{ACD} = m\widehat{AC} + m\widehat{CD}$
 $= 137^\circ + 83^\circ$
 $= 220^\circ$
 c. $m\widehat{ADC} = 360^\circ - m\widehat{AC}$
 $= 360^\circ - 137^\circ$
 $= 223^\circ$
 d. $m\widehat{EBD} = 360^\circ - m\widehat{ED}$
 $= 360^\circ - 61^\circ$
 $= 299^\circ$

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Identify the given arc as a *major arc*, *minor arc*, or *semicircle*. Then find the measure of the arc.

1. \widehat{TQ} 2. \widehat{QRT} 3. \widehat{TQR}
 4. \widehat{QS} 5. \widehat{TS} 6. \widehat{RST}

