11.1

Riding a Ferris Wheel

Introduction to Circles

LEARNING GOALS

In this lesson, you will:

- Review the definition of line segments related to a circle such as chord, diameter, secant, and tangent.
- Review definitions of points related to a circle such as center and point of tangency.
- Review the definitions of angles related to a circle such as central angle and inscribed angle.
- Review the definitions of arcs related to a circle such as major arc, minor arc, and semicircle.
- Prove all circles are similar.

KEY TERMS

- center of a circle
- radius
- chord
- diameter
- secant of a circle
- tangent of a circle
- point of tangency
- central angle
- inscribed angle
- arc
- major arc
- minor arc
- semicircle

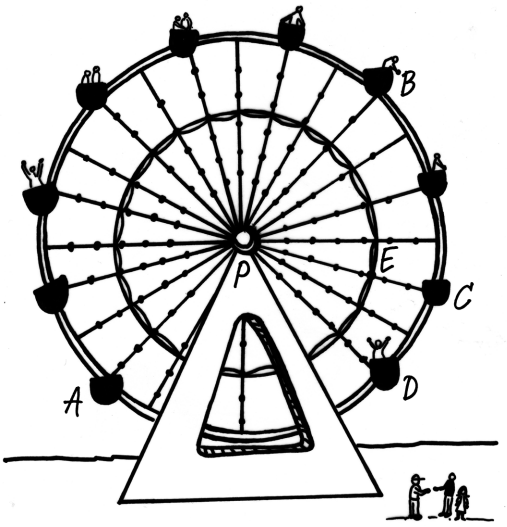
Amusement parks are a very popular destination. Many people like rides that go fast, like roller coasters. Others prefer more relaxing rides. One of the most popular rides is the Ferris wheel.

The invention of the Ferris wheel is credited to George Washington Gale Ferris, Jr., who debuted his new ride at the World's Columbian Exposition in Chicago, Illinois in 1893. It was 264 feet tall, had a capacity of 2160 people, took 10 minutes to complete a revolution, and cost 50 cents to ride. Of course 50 cents was quite a bit of money at the time.

The well-known London Eye in England is the tallest Ferris wheel in the Western Hemisphere. The Singapore Flyer, located near the Singapore River, is currently the tallest in the world. It is more than a third of a mile high!

PROBLEM 1 Going Around and Around

A Ferris wheel is in the shape of a circle.



Recall that a circle is the set of all points in a plane that are equidistant from a given point, which is called the **center of the circle**. The distance from a point on the circle to the center is the **radius** of the circle. A circle is named by its center. For example, the circle seen in the Ferris wheel is circle *P*.

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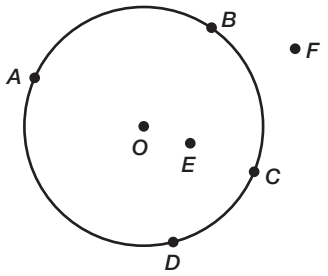
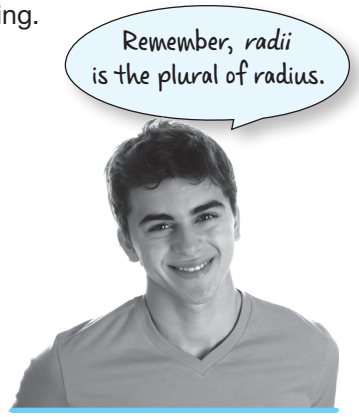
1. Use the circle to answer each question.

a. Name the circle.



b. Use a straightedge to draw $\overline{OB}$, a radius of circle *O*. Where are the endpoints located with respect to the circle?

c. How many radii does a circle have? Explain your reasoning.



d. Use a straightedge to draw $\overline{AC}$. Then, use a straightedge to draw $\overline{BD}$. How are the line segments different? How are they the same?

Both line segments *AC* and *BD* are *chords* of the circle. A **chord** is a line segment with each endpoint on the circle. Line segment *AC* is called a *diameter* of the circle. A **diameter** is a chord that passes through the center of the circle.

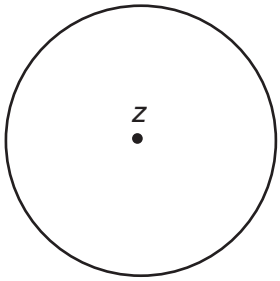
e. Why is $\overline{BD}$ not considered a diameter?

f. How does the length of the diameter of a circle relate to the length of the radius?

g. Are all radii of the same circle, or of congruent circles, always, sometimes, or never congruent? Explain your reasoning.

A **secant of a circle** is a line that intersects a circle at exactly two points.

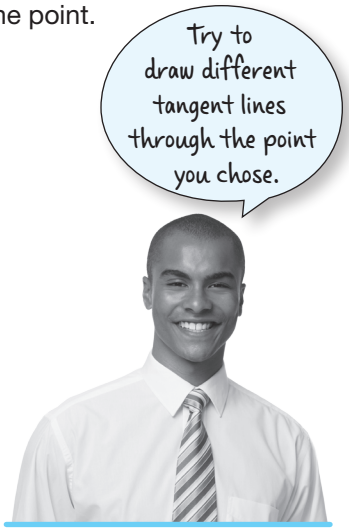
2. Draw a secant using the circle shown.



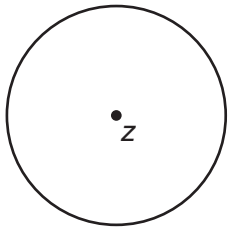
3. Maribel says that a chord is part of a secant. David says that a chord is different from a secant. Explain why Maribel and David are both correct.

4. What is the longest chord in a circle?

A **tangent of a circle** is a line that intersects a circle at exactly one point. The point of intersection is called the **point of tangency**.



5. Draw a tangent using circle *Z* shown.



6. Choose another point on the circle. How many tangent lines can you draw through this point?

7. Explain the difference between a secant and a tangent.

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8. Check the appropriate term(s) associated with each characteristic in the table shown.

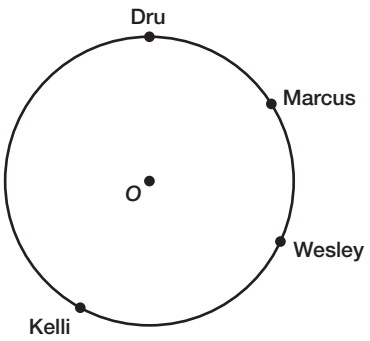
Characteristic	Chord	Secant	Diameter	Radius	Tangent
A line					
A line segment					
A line segment having both endpoints on the circle					
A line segment having one endpoint on the circle					
A line segment passing through the center of the circle					
A line intersecting a circle at exactly two points					
A line intersecting a circle at exactly one point					

PROBLEM 2 Sitting on the Wheel

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

An **inscribed angle** is an angle whose vertex is on the circle.

1. Four friends are riding a Ferris wheel in the positions shown.



   a. Draw a central angle where Dru and Marcus are located on the sides of the angle.
   b. Draw an inscribed angle where Kelli is the vertex and Dru and Marcus are located on the sides of the angle.
   c. Draw an inscribed angle where Wesley is the vertex and Dru and Marcus are located on the sides of the angle.
   d. Compare and contrast these three angles.

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An **arc** of a circle is any unbroken part of the circumference of a circle. An arc is named using its two endpoints. The symbol used to describe arc AB is $\overset{\frown}{AB}$.

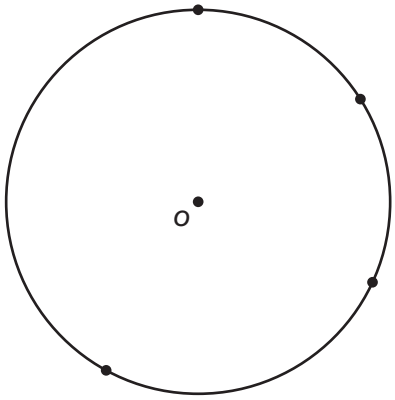
A **major arc** of a circle is the largest arc formed by a secant and a circle. It goes more than halfway around a circle.

A **minor arc** of a circle is the smallest arc formed by a secant and a circle. It goes less than halfway around a circle.

A **semicircle** is exactly half of a circle.

To avoid confusion, three points are used to name semicircles and major arcs. The first point is an endpoint of the arc, the second point is any point at which the arc passes through and the third point is the other endpoint of the arc.

2. Use the same Ferris wheel from Question 1 to answer each question.



a. Label the location of each person with the first letter of his or her name.

b. Identify two different arcs and name them.

c. Draw a diameter on the circle shown so that point *D* is an endpoint. Label the second endpoint as point *Z*. The diameter divided the circle into two semicircles.

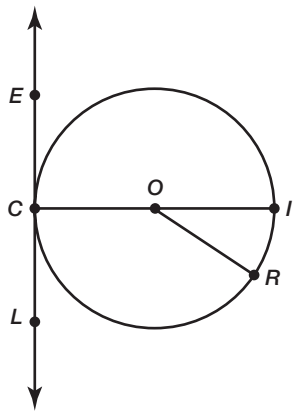
d. Name each semicircle.

e. Name all minor arcs.

f. Name all major arcs.

Talk the Talk

Use the diagram shown to answer Questions 1 through 7.



1. Name a diameter.

2. Name a radius.

3. Name a central angle.

4. Name an inscribed angle.

5. Name a minor arc.

6. Name a major arc.

7. Name a semicircle.

Be prepared to share your solutions and methods.