LESSON

1.6

Circles

I can never remember things I didn't understand in the first place.

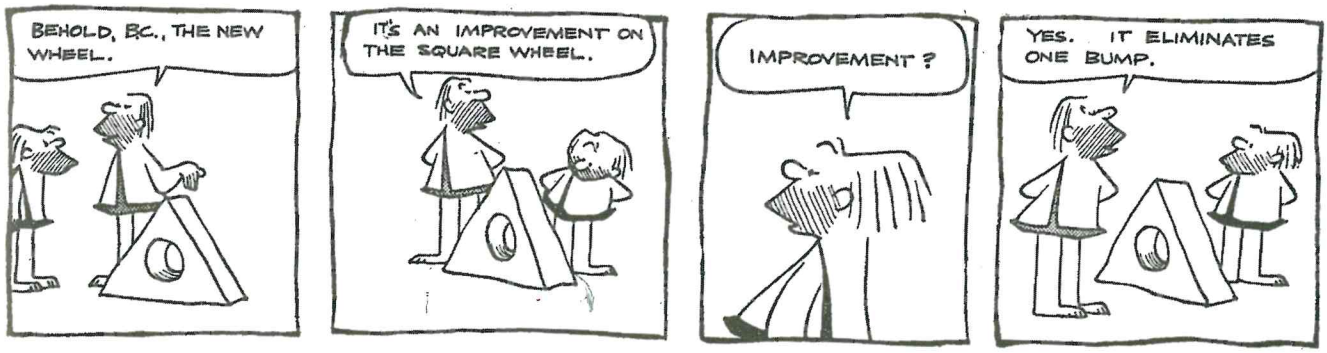
AMY TAN

Unless you walked to school this morning, you arrived on a vehicle with circular wheels.

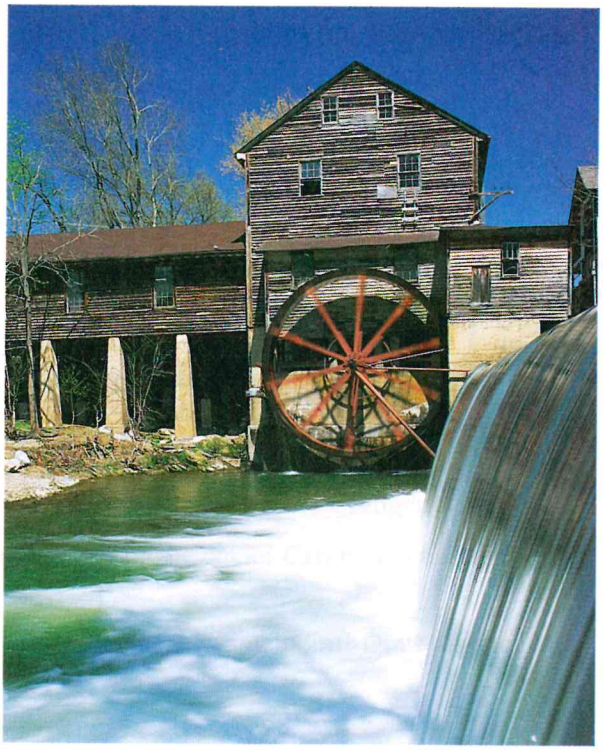
A **circle** is the set of all points in a plane at a given distance (radius) from a given point (center) in the plane. You name a circle by its center. The circle on the bicycle wheel, with center *O*, is called circle *O*. When you see a dot at the center of a circle, you can assume that it represents the center point.

A segment from the center to a point on the edge of the circle is called a **radius.** Its length is also called the radius.

The **diameter** is a line segment containing the center, with its endpoints on the circle. The length of this segment is also called the diameter.



By permission of Johnny Hart and Creators Syndicate, Inc.



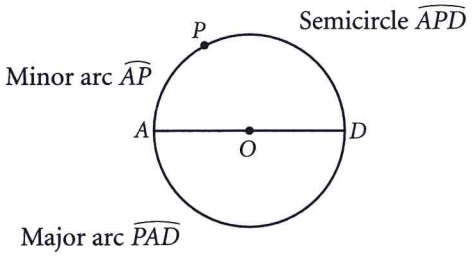
If two or more circles have the same radius, they are **congruent circles.** If two or more coplanar circles share the same center, they are **concentric circles.**

Congruent circles

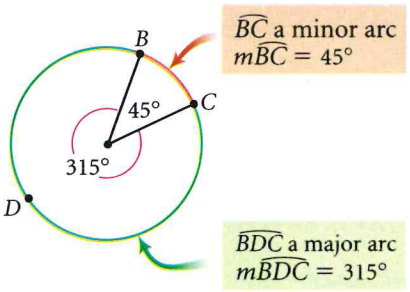
Concentric circles

An **arc of a circle** is two points on the circle and the continuous (unbroken) part of the circle between the two points. The two points are called the **endpoints** of the arc.

You write arc AB as $\overset{\frown}{AB}$ or $\overset{\frown}{BA}$. You classify arcs into three types: semicircles, minor arcs, and major arcs. A **semicircle** is an arc of a circle whose endpoints are the endpoints of a diameter. A **minor arc** is an arc of a circle that is smaller than a semicircle. A **major arc** is an arc of a circle that is larger than a semicircle. You can name minor arcs with the letters of the two endpoints. For semicircles and major arcs, you need three points to make clear which arc you mean—the first and last letters are the endpoints and the middle letter is any other point on the arc.



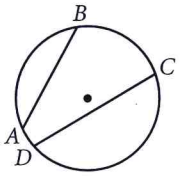
Arcs have a degree measure, just as angles do. A full circle has an arc measure of 360°, a semicircle has an arc measure of 180°, and so on. You find the **arc measure** by measuring the **central angle,** the angle with its vertex at the center of the circle, and sides passing through the endpoints of the arc.

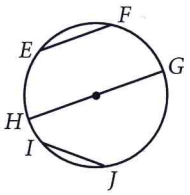


Investigation
Defining Circle Terms

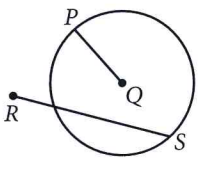
Step 1 | Write a good definition of each boldfaced term. Discuss your definitions with others in your group. Agree on a common set of definitions as a class and add them to your definition list. In your notebook, draw and label a figure to illustrate each definition.

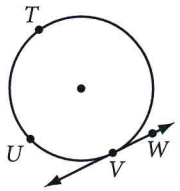
Chord





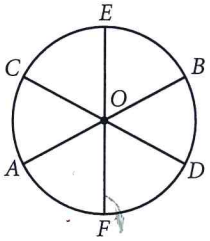
Chords:
$\overline{AB}$, $\overline{CD}$, $\overline{EF}$, $\overline{GH}$, and $\overline{IJ}$



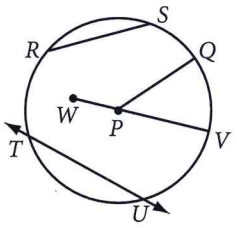


Not chords:
$\overline{PQ}$, $\overline{RS}$, $\overline{TU}$, and $\overleftrightarrow{VW}$

Diameter

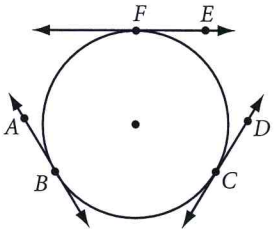


Diameters:
$\overline{AB}$, $\overline{CD}$, and $\overline{EF}$

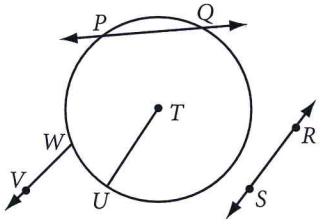


Not diameters:
$\overline{PQ}$, $\overline{RS}$, $\overline{TU}$, and $\overline{VW}$

Tangent



Tangents:
$\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$



Not tangents:
$\overleftrightarrow{PQ}$, $\overleftrightarrow{RS}$, $\overline{TU}$, and $\overline{VW}$

Note: You can say $\overleftrightarrow{AB}$ is a tangent, or you can say $\overleftrightarrow{AB}$ is tangent to circle O. The point where the tangent touches the circle is called the **point of tangency.**

Step 2 | Can a chord of a circle also be a diameter of the circle? Can it be a tangent? Explain why or why not.

Step 3 | Can two circles be tangent to the same line at the same point? Draw a sketch and explain.