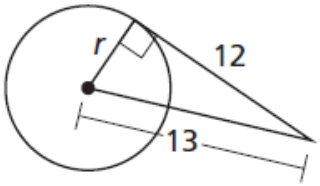
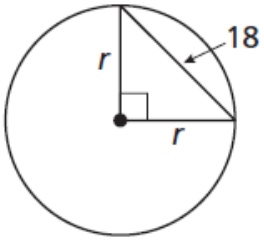
Find the radius of the circle.

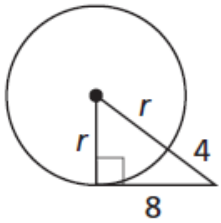
1.



2.



3.



The sum of the lengths of any two **sides** of a **triangle** is greater than the length of the third **side**. If you take the **three sides** of a **triangle** and add them in pairs, the sum is greater than (not equal to) the third **side**. If that is not true, then it is not possible to construct a **triangle** with the **given side** lengths.

4. $\frac{11}{5}$, $\frac{7}{2}$, and $\frac{19}{5}$

5. 4, 4, and 6

6. 10, 20, and 30

Essential Question

What are the definitions of the lines and segments that intersect a circle?

Work with a partner. The drawing at the right shows five lines or segments that intersect a circle. Use the relationships shown to write a definition for each type of line or segment. Then use the Internet or some other resource to verify your definitions.

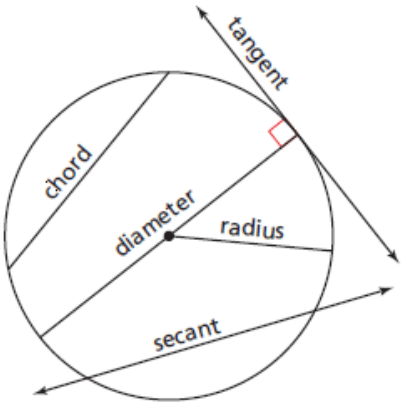
Chord:

Secant:

Tangent:

Radius:

Diameter:



Work with a partner. Use two pencils, a piece of string, and a piece of paper.

a. Tie the two ends of the piece of string loosely around the two pencils.

b. Anchor one pencil on the paper at the center of the circle. Use the other pencil to draw a circle around the anchor point while using slight pressure to keep the string taut. Do not let the string wind around either pencil.

c. Explain how the distance between the two pencil points as you draw the circle is related to two of the lines or line segments you defined in Exploration 1.

Core Concept

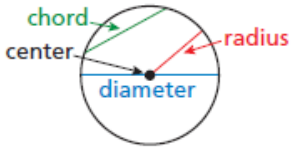
Lines and Segments That Intersect Circles

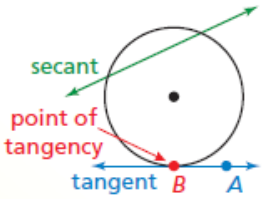
A segment whose endpoints are the center and any point on a circle is a **radius**.

A **chord** is a segment whose endpoints are on a circle. A **diameter** is a chord that contains the center of the circle.

A **secant** is a line that intersects a circle in two points.

A **tangent** is a line in the plane of a circle that intersects the circle in exactly one point, the **point of tangency**. The *tangent ray* $\overrightarrow{AB}$ and the *tangent segment* $\overline{AB}$ are also called tangents.





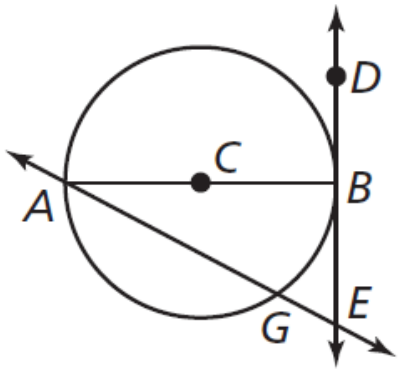
Tell whether the line, ray, or segment is best described as a *radius*, *chord*, *diameter*, *secant*, or *tangent* of $\odot C$.

a. $\overline{AC}$

b. $\overline{AB}$

c. $\overrightarrow{DE}$

d. $\overleftrightarrow{AE}$



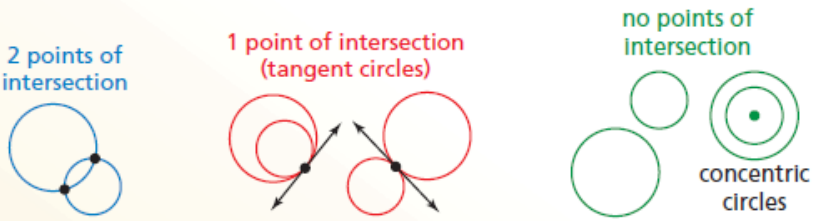
1. In Example 1, what word best describes $\overline{AG}$? $\overline{CB}$?

2. In Example 1, name a tangent and a tangent segment.

Core Concept

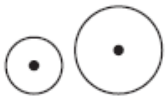
Coplanar Circles and Common Tangents

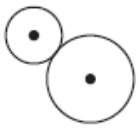
In a plane, two circles can intersect in two points, one point, or no points. Coplanar circles that intersect in one point are called **tangent circles**. Coplanar circles that have a common center are called **concentric circles**.

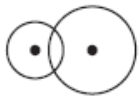


A line or segment that is tangent to two coplanar circles is called a **common tangent**. A *common internal tangent* intersects the segment that joins the centers of the two circles. A *common external tangent* does not intersect the segment that joins the centers of the two circles.

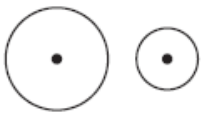
Tell how many common tangents the circles have and draw them. Use blue to indicate common external tangents and red to indicate common internal tangents.

a. 

b. 

c. 

Tell how many common tangents the circles have and draw them. State whether the tangents are external tangents or internal tangents.

3. 

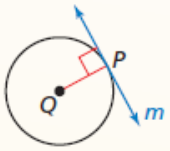
4. 

5. 

Theorems

Theorem 10.1 Tangent Line to Circle Theorem

In a plane, a line is tangent to a circle if and only if the line is perpendicular to a radius of the circle at its endpoint on the circle.

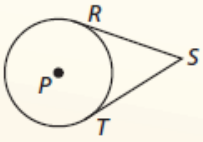


Line m is tangent to $\odot Q$ if and only if $m \perp \overline{QP}$.

Proof Ex. 47, p. 536

Theorem 10.2 External Tangent Congruence Theorem

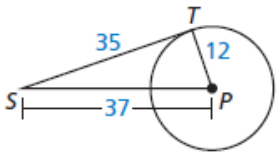
Tangent segments from a common external point are congruent.



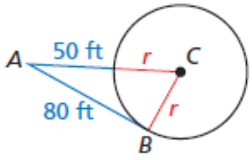
If $\overline{SR}$ and $\overline{ST}$ are tangent segments, then $\overline{SR} \cong \overline{ST}$.

Proof Ex. 46, p. 536

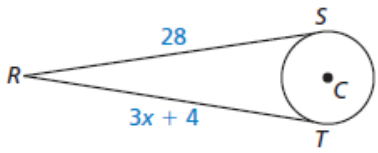
Is $\overline{ST}$ tangent to $\odot P$?



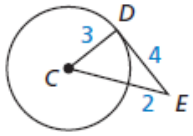
In the diagram, point *B* is a point of tangency. Find the radius *r* of $\odot C$.



$\overline{RS}$ is tangent to $\odot C$ at S, and $\overline{RT}$ is tangent to $\odot C$ at T. Find the value of x.

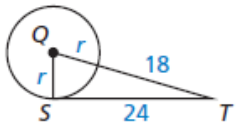


6. Is $\overline{DE}$ tangent to $\odot C$?



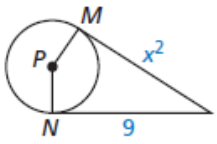
7. $\overline{ST}$ is tangent to $\odot Q$.

Find the radius of $\odot Q$.



8. Points *M* and *N* are points of tangency.

Find the value(s) of *x*.



• **Exit Ticket:** Draw a figure like the one in Example 4.
When CB = 8 centimeters and AB = 12 centimeters, what is AC?