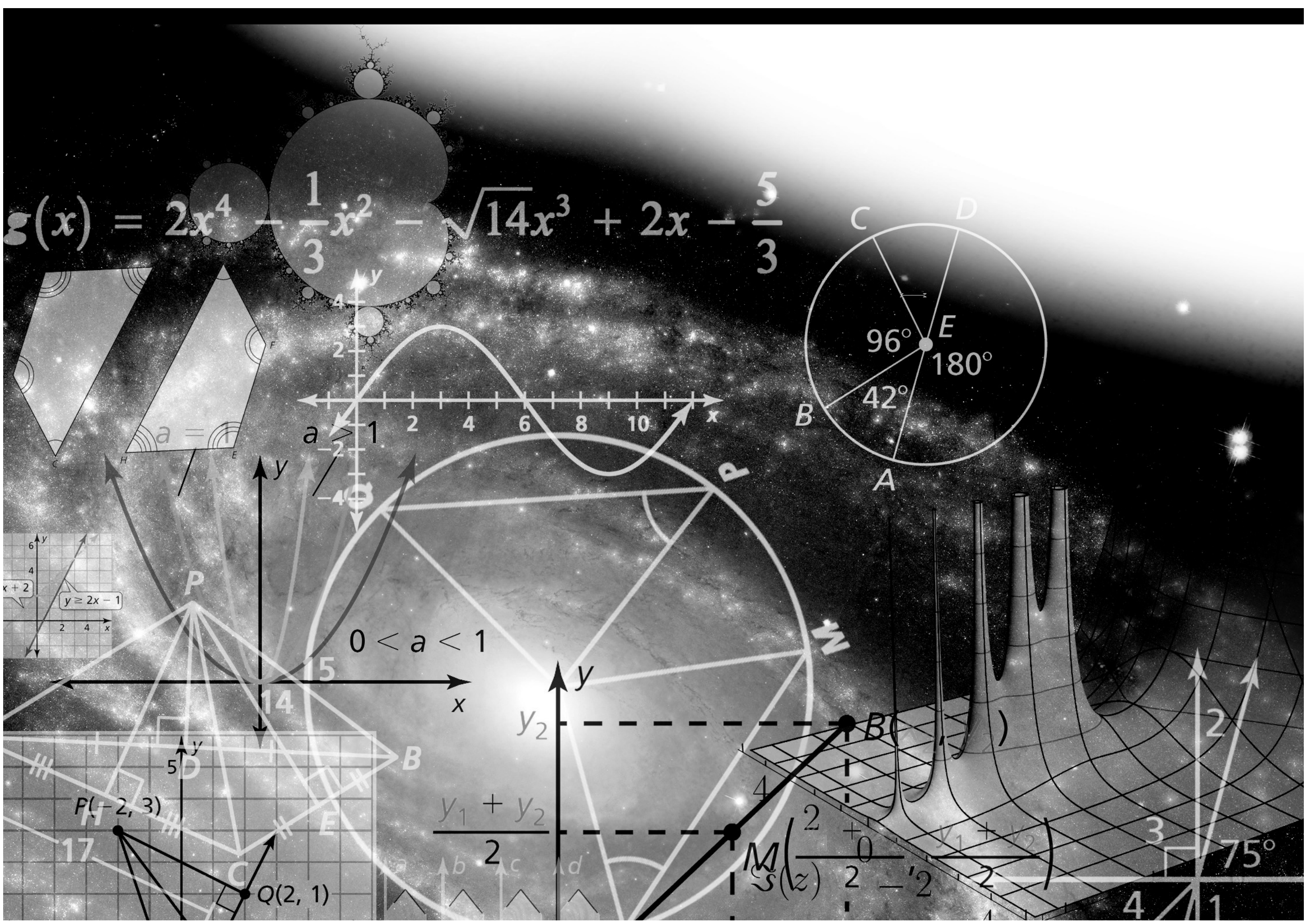
CHAPTER 7

Circles



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Chapter 7 Maintaining Mathematical Proficiency

Find the product.

1. $(x - 4)(x - 9)$

2. $(k + 6)(k - 7)$

3. $(y + 5)(y - 13)$

4. $(2r + 3)(3r + 1)$

5. $(4m - 5)(2 - 3m)$

6. $(7w - 1)(6w + 5)$

Solve the equation by completing the square. Round your answer to the nearest hundredth, if necessary.

7. $x^2 + 6x = 10$

8. $p^2 - 14p = 5$

9. $z^2 + 16z + 7 = 0$

10. $z^2 + 5z - 2 = 0$

11. $x^2 + 2x - 5 = 0$

12. $c^2 - c - 1 = 0$

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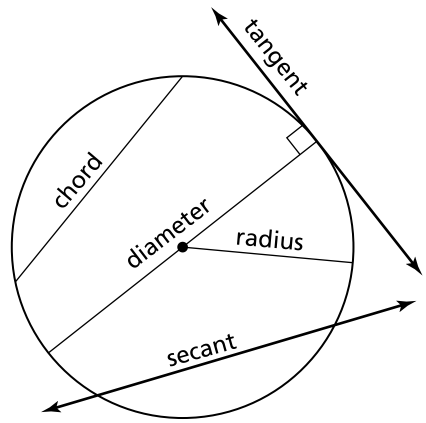
7.1 Lines and Segments That Intersect Circles

For use with Exploration 7.1

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

1 EXPLORATION: Lines and Line Segments That Intersect Circles



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:

7.1 Lines and Segments That Intersect Circles (continued)

2 EXPLORATION: Using String to Draw a Circle

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.

Communicate Your Answer

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

4. Of the five types of lines and segments in Exploration 1, which one is a subset of another? Explain.

5. Explain how to draw a circle with a diameter of 8 inches.

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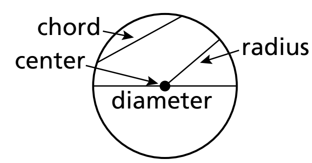
7.1 Practice
For use after Lesson 7.1

Notes:

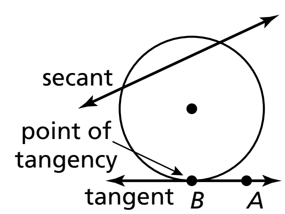
Core Concepts

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.

Notes:

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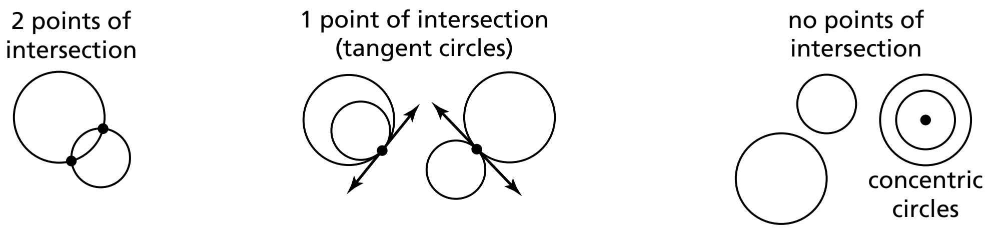
7.1 **Practice (continued)**

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.

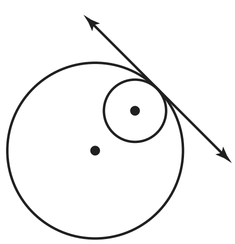
Notes:

Worked-Out Examples

Example #1

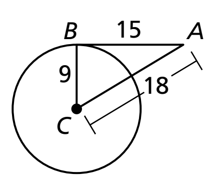
Copy the diagram. Tell how many common tangents the circles have and draw them.

There is 1 common tangent.



Example #2

Tell whether AB is tangent to ⊙C. Explain your reasoning.



Use the Converse of the Pythagorean Theorem.

18^2 ____ $9^2 + 15^2$

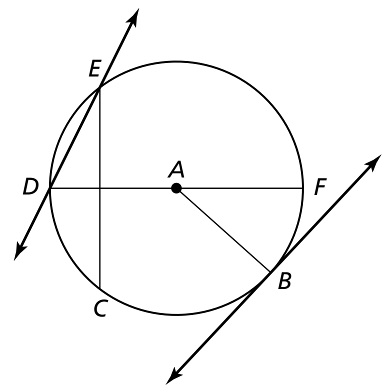
324 ____ $81 + 225$

$324 \neq 306$

$\triangle ABC$ is not a right triangle. Therefore, $\overline{AB}$ is not a tangent segment.

Practice A

In Exercises 1–6, use the diagram.



1. Name two radii.

2. Name a chord.

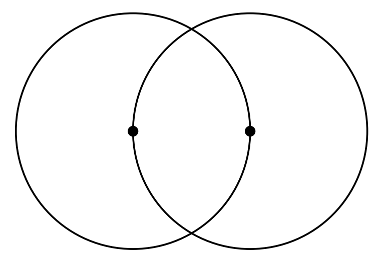
3. Name a diameter.

4. Name a secant.

5. Name a tangent.

6. Name a point of tangency.

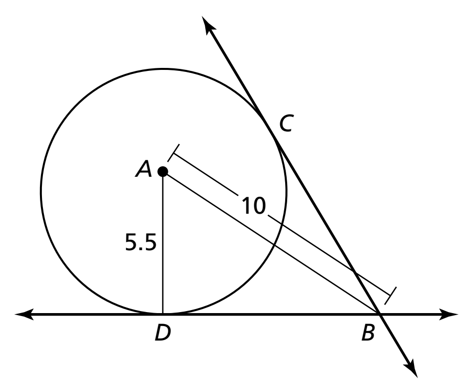
In Exercises 7 and 8, use the diagram.



7. Tell how many common tangents the circles have and draw them.

8. Tell whether each common tangent identified in Exercise 7 is internal or external.

In Exercises 9 and 10, point *D* is a point of tangency.



9. Find BD.

10. Point C is also a point of tangency. If $BC = 4x + 6$, find the value of x to the nearest tenth.

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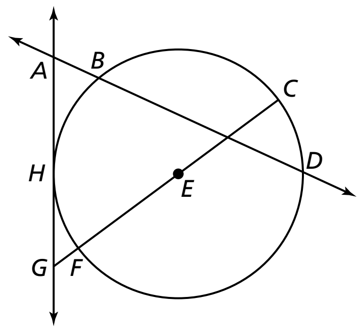
Practice B

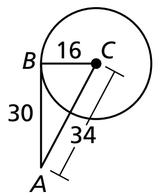
In Exercises 1–5, use the diagram.



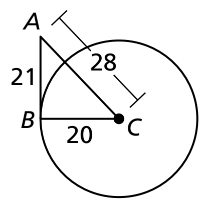
1. Name two radii.
2. Name two chords.
3. Name a diameter.
4. Name a secant.
5. Name a tangent and a point of tangency.

In Exercises 6 and 7, tell whether $\overline{AB}$ is tangent to ⊙*C*. Explain your reasoning.

6.

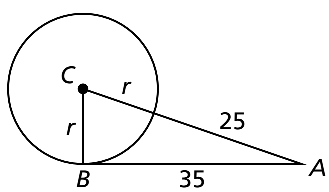


7.

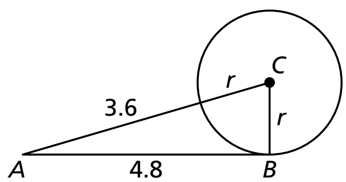


In Exercises 8 and 9, point *B* is a point of tangency. Find the radius *r* of ⊙*C*.

8.

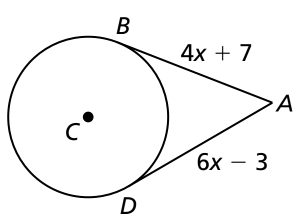


9.

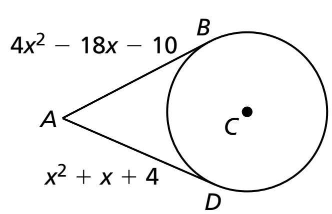


In Exercises 10 and 11, points *B* and *D* are points of tangency. Find the value(s) of *x*.

10.



11.



12. When will two circles have no common tangents? Justify your answer.

13. During a basketball game, you want to pass the ball to either Player A or Player B. You estimate that Player B is about 15 feet from you, as shown.

    a. How far away from you is Player A?

    b. How can you prove that Player A and Player B are the same distance from the basket?