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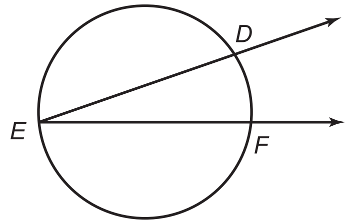
Study Guide

Inscribed Angles

An **inscribed angle** of a circle is an angle whose vertex is on the circle and whose sides contain chords of the circle. We say that $\angle DEF$ *intercepts* $\widehat{DF}$. The following theorems involve inscribed angles.

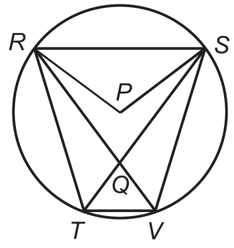


- If an angle is inscribed in a circle, then the measure of the angle equals one-half the measure of its intercepted arc.
- If inscribed angles of a circle or congruent circles intercept the same arc or congruent arcs, then the angles are congruent.
- If an inscribed angle of a circle intercepts a semicircle, then the angle is a right angle.

Example: In the circle above, find $m\angle DEF$ if $m\widehat{DF} = 28$.

Since $\angle DEF$ is an inscribed angle,
$m\angle DEF = \frac{1}{2} m\widehat{DF} = \frac{1}{2}(28)$ or 14.

In $\odot P$, $\overline{RS} \parallel \overline{TV}$.



1. Name the intercepted arc for $\angle RTS$.

2. Name an inscribed angle.

3. Is $\angle RQS$ an inscribed angle?

In $\odot P$, $m\widehat{SV} = 86$ and $m\angle RPS = 110$. Find each measure.

4. $m\angle PRS$ **5.** $m\widehat{RT}$ **6.** $m\angle RVT$ **7.** $m\angle SVT$

8. $m\angle TQV$ **9.** $m\angle RQT$ **10.** $m\angle QRT$ **11.** $m\widehat{RS}$

Study Guide

Tangents to a Circle

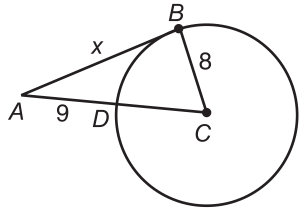
A **tangent** is a line in the plane of a circle that intersects the circle in exactly one point. Three important theorems involving tangents are the following.

- In a plane, if a line is a tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.
- In a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is a tangent of the circle.
- If two segments from the same exterior point are tangent to a circle, then they are congruent.

Example: Find the value of x if $\overline{AB}$ is tangent to $\odot C$.

Tangent $\overline{AB}$ is perpendicular to radius $\overline{BC}$.
Also, $AC = AD + BC = 17$.

$$(AB)^2 + (BC)^2 = (AC)^2$$
$$x^2 + 8^2 = 17^2$$
$$x^2 + 64 = 289$$
$$x^2 = 225$$
$$x = 15$$



For each ⊙C, find the value of x. Assume segments that appear to be tangent are tangent.

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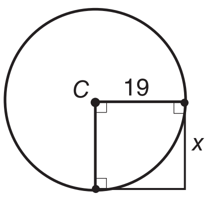

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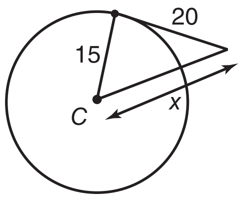

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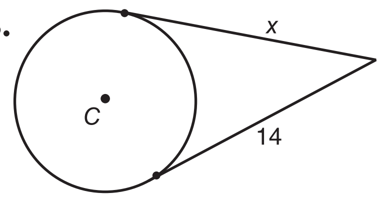

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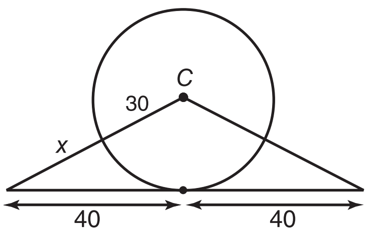

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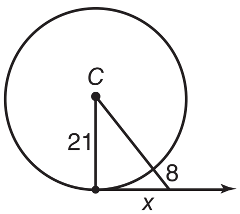

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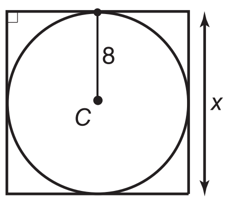

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Study Guide

Secant Angles

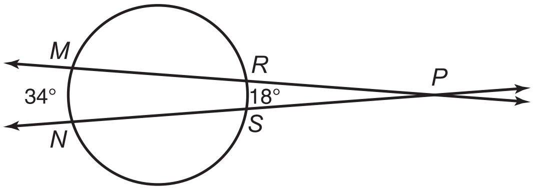
A line that intersects a circle in exactly two points is called a **secant** of the circle. You can find the measures of angles formed by secants and tangents by using the following theorems.

- If a secant angle has its vertex inside a circle, then its degree measure is one-half the sum of the degree measures of the arcs intercepted by the angle and its vertical angle.
- If a secant angle has its vertex outside a circle, then its degree measure is one-half the difference of the degree measures of the intercepted arcs.

Example: Find the measure of $\angle MPN$.

You can use the last theorem above.

$$m\angle MPN = \frac{1}{2}(m\overset{\frown}{MN} - m\overset{\frown}{RS})$$
$$= \frac{1}{2}(34 - 18)$$
$$= \frac{1}{2}(16) \text{ or } 8$$



Find the measure of each numbered angle.

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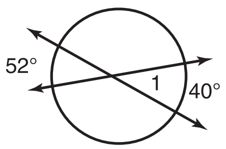

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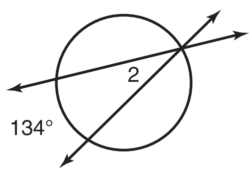

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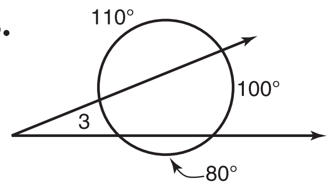

In each circle, find the value of x.

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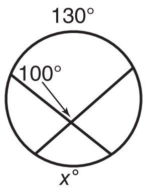

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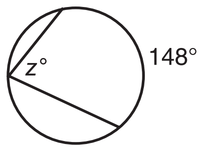

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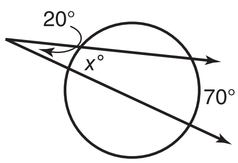

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Study Guide

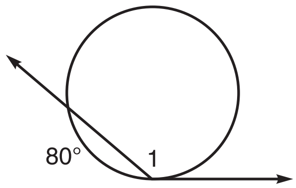
Secant-Tangent Angles

You can find the measures of angles formed by secants and tangents by using the following theorems.

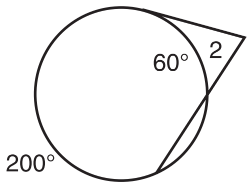
- If a secant-tangent angle has its vertex outside a circle, then its degree measure is one-half the difference of the degree measures of the intercepted arcs.
- If a secant-tangent angle has its vertex on a circle, then its degree measure is one-half the degree measure of the intercepted arc.
- The degree measure of a tangent-tangent angle is one-half the difference of the degree measures of the intercepted arcs.

Find the measure of each angle. Assume segments that appear to be tangent are tangent.

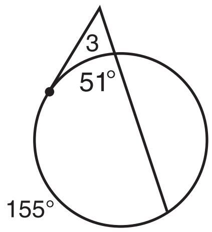
1. $m\angle 1$



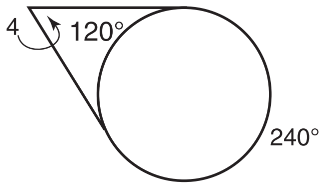
2. $m\angle 2$



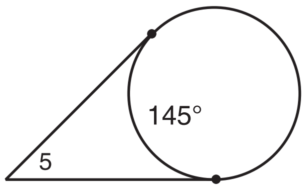
3. $m\angle 3$



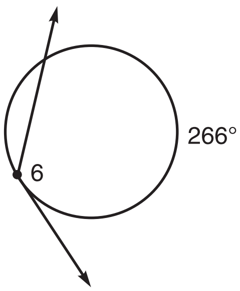
4. $m\angle 4$



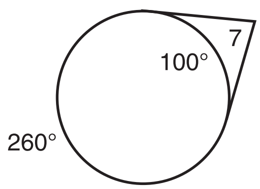
5. $m\angle 5$



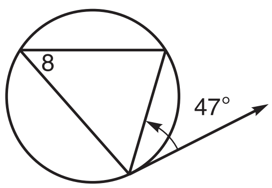
6. $m\angle 6$



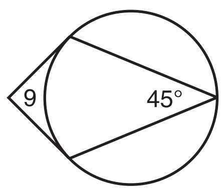
7. $m\angle 7$



8. $m\angle 8$



9. $m\angle 9$



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Study Guide

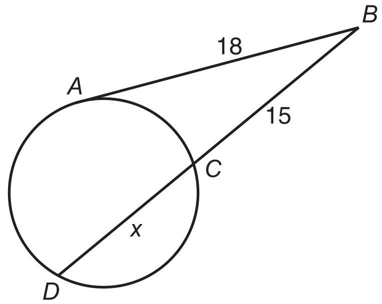
Segment Measures

The following theorems can be used to find the measure of special segments in a circle.

- If two chords of a circle intersect, then the products of the measures of the segments of the chords are equal.
- If two secant segments are drawn to a circle from an exterior point, then the product of the measures of one secant segment and its external secant segment is equal to the product of the measures of the other secant segment and its external secant segment.
- If a tangent segment and a secant segment are drawn to a circle from an exterior point, then the square of the measure of the tangent segment is equal to the product of the measures of the secant segment and its external secant segment.

Example: Find the value of x to the nearest tenth.

$$\begin{aligned} (AB)^2 &= BD \cdot BC & \textit{Theorem 9–16} \\ (18)^2 &= (15 + x) \cdot 15 \\ 324 &= 15x + 225 \\ 99 &= 15x \\ 6.6 &= x \end{aligned}$$



Find the value of x to the nearest tenth. Assume segments that appear to be tangent are tangent.

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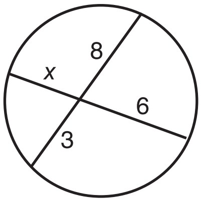

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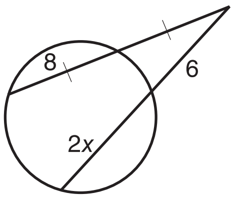

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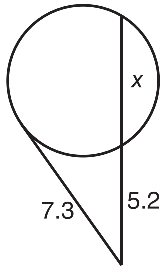

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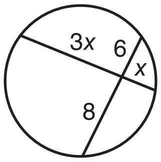

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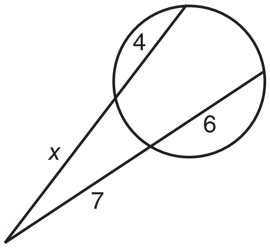

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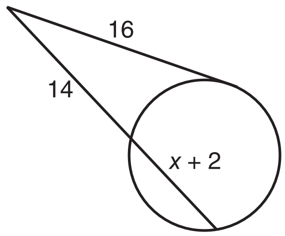

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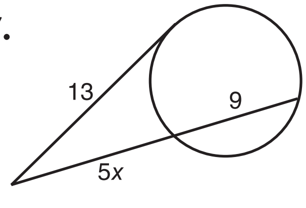

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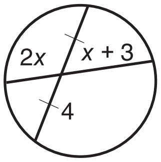

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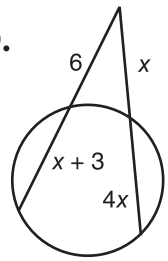

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Study Guide

Equations of Circles

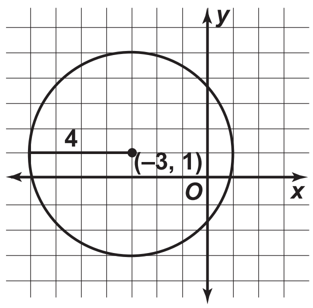
The general equation for a circle is derived from using the distance formula given the coordinates of the center of the circle and the measure of its radius. An equation for a circle with center (h, k) and a radius of r units is $(x - h)^2 + (y - k)^2 = r^2$.

Example: Graph the circle whose equation is $(x + 3)^2 + (y - 1)^2 = 16$.

$(x - h)^2 + (y - k)^2 = r^2$ *General Equation*

$(x - (-3))^2 + (y - 1)^2 = (\sqrt{16})^2$ *Substitution*

Therefore, $h = {}^{-}3$, $k = 1$, and $r = \sqrt{16} = 4$.
The center is at $({}^{-}3, 1)$ and the radius is 4 units.



Find the coordinates of the center and the measure of the radius for each circle whose equation is given.

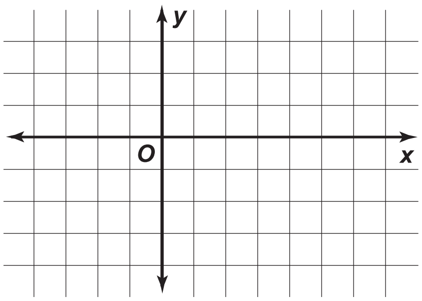
1. $(x - 7.2)^2 + (y + 3.4)^2 = 14.44$

2. $\left(x + \frac{1}{2}\right)^2 + (y - 2)^2 = \frac{16}{25}$

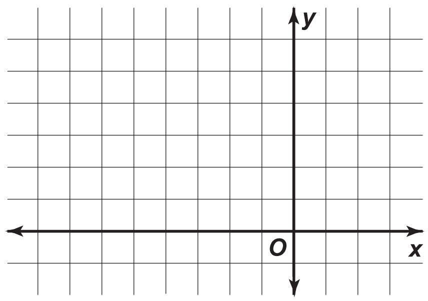
3. $(x - 6)^2 + (y - 3)^2 - 25 = 0$

Graph each circle whose equation is given. Label the center and measure of the radius on each graph.

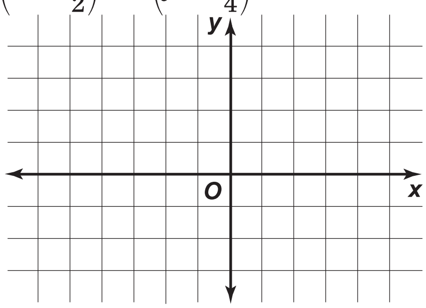
4. $(x - 2.5)^2 + (y + 1)^2 = 12.25$



5. $(x + 3)^2 + (y - 4)^2 - 2.25 = 0$



6. $\left(x - \frac{1}{2}\right)^2 + \left(y - \frac{3}{4}\right)^2 = 1$



7. $x^2 + (y - 2)^2 = 9$