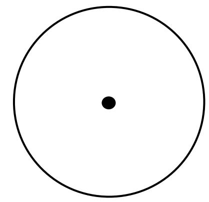
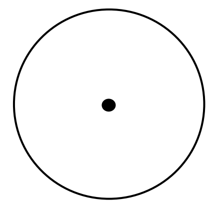
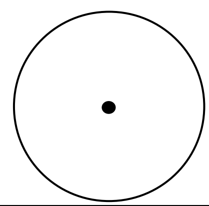
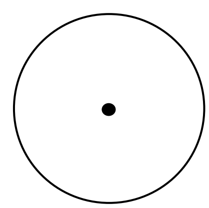
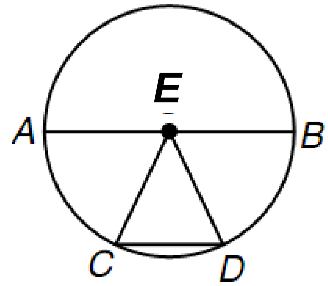
9.1 Circles and Circumference

Targets	○ I can identify and use parts of circles. ○ I can solve problems involving the circumference of a circle.

	Term/ Concept	Definition/Example	Picture
Instruction (Vocabulary)	**Term/ Concept**	**Definition/Example**	**Picture**
	Circle	○ A **circle** is the set of all points in a plane that are ___________________ from a given point called the _______________.	
	Radius	○ A **radius** of a circle is any segment whose endpoints are the ____________ and a ___________ on the circle. ○ The lengths of all radii in a circle are __________, so all radii are ______________________.	
	Chord	○ A **chord** of a circle is any segment whose endpoints are _________________________.	
	Diameter	○ A **diameter** of a circle is a ___________ that passes through the ___________ of the circle. ○ The **diameter** of a circle is _________ as long as any **radius**. ○ Any **radius** of a circle is _________ as long as any **diameter**.	

Instruction

Example 1: Refer to the circle shown at the right.



a. Name the circle.

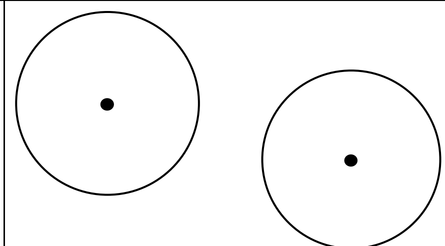
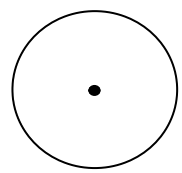
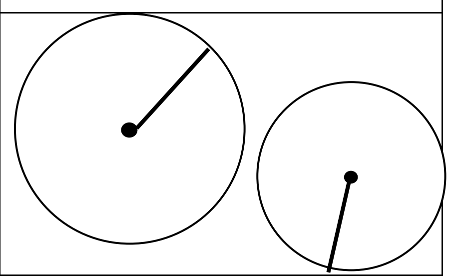
b. Name all the radii of the circle.

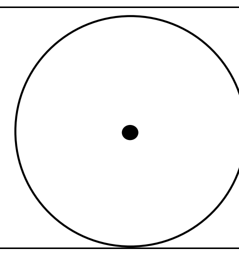
c. Name all the chords of the circle.

d. Name all the diameters of the circle.

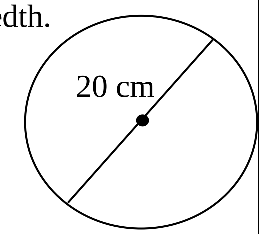
e. If *AB* is 8 millimeters, find *ED*.

f. f. If *EC* is 6 centimeters, find *AB*.

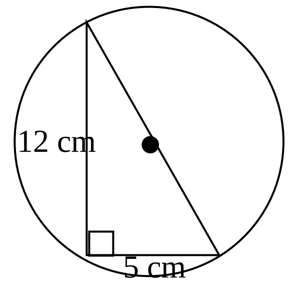
Instruction (Vocabulary)	Term/ Concept	Definition/Example	Picture
	Congruent Circles	Two circles are congruent if and only if they have ____________________ ________________	
	Concentric Circles	Concentric circles are coplanar circles with the same ________________	
	Similar Circles	All circles are ____________________	

Instruction	Term/ Concept	Definition/Example	Picture
	Circumference	The **<u>circumference</u>** of a circle is the _________________________ the circle.	

***Example 2*:**
Find the circumference of the circle shown below. Write the exact answer and the answer rounded to the nearest hundredth.



Example 3:
Find the exact circumference of the circle below.



Example 4:
A circle has a circumference of 85 meters.

a. Find the diameter of the circle

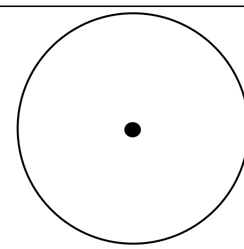
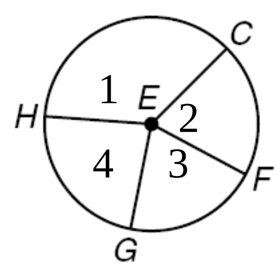
b. Find the radius of the circle.

9.2 Angles and Arcs

Targets

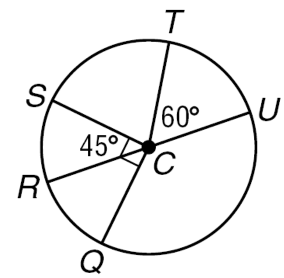
- I can recognize major arcs, minor arcs, semicircles, and central angles and their measures.
- I can find arc length.

Instruction (Vocabulary)

Term/ Concept	Definition/Example	Picture
Central Angle	○ A **central angle** of a circle is an angle whose ____________ is at the ___________ of the circle and whose ___________ are ____________. ○ The sum of the measures of the central angles of a circle with no interior points in common is _____. $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 =$	 

Instruction

Example 1:
Refer to the figure at the right to find each angle measure.
$\overline{RU}$ is a diameter.

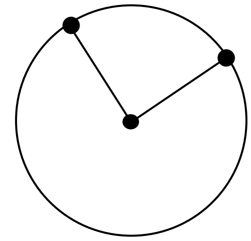


a. $m\angle RCQ =$ ____________

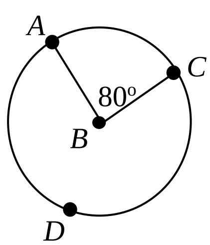
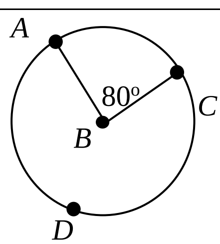
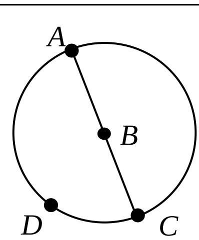
b. $m\angle SCT =$ ____________ c. $m\angle SCU =$ ____________

d. $m\angle QCT =$ ____________ e. $m\angle QCU =$ ____________

Instruction

Term/ Concept	Definition/Example	Picture
An Arc and Arc Measure	○ A central angle separates a circle into two parts, each of which is an **arc**. ○ The **measure of each arc** is related to the measure of its central angle.	

ARCS of a CIRCLE

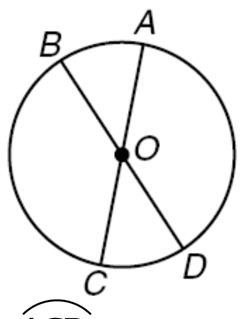
Type of Arcs	Example	Named By:	Arc Degree Measure Equals:
Minor Arc		○ the letters of the two endpoints	○ the measure of the central angle and is less than 180°
Major Arc		○ the letters of the two endpoints and another point on the arc	○ 360 minus the measure of the minor arc and is greater than 180°
Semicircle		○ the letters of the two endpoints and another point on the arc	

- In the same or in congruent circles, **two arcs are congruent** if and only if their **corresponding central angles are congruent**.

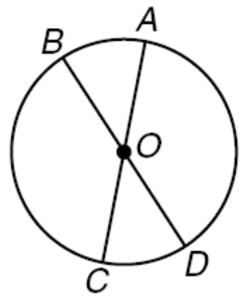
Instruction

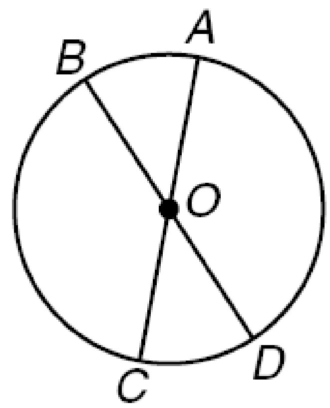
Example 2:
In circle *O*, $m\angle BOA = 41$. Find each of the following measures.
$\overline{AC}$ and $\overline{BD}$ are diameters.

a. $m\overset{\frown}{BA} =$ ___________

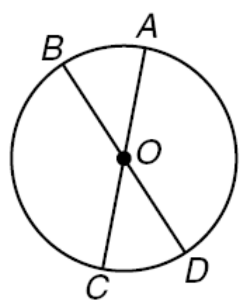


b. $m\overset{\frown}{BC} =$ ___________

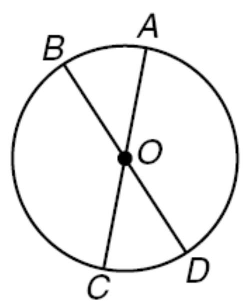




c. $m\overset{\frown}{ACB} =$ ____________

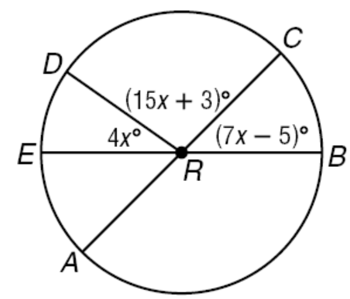


d. $m\overset{\frown}{BCD} =$ ___________



Your Turn

Example 3:
In circle *R*, $\overline{AC}$ and $\overline{EB}$ are diameters.
Find each measure.



a. $m\angle ERD =$ ________

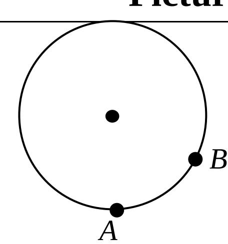
b. $m\angle BRC =$ ________

c. $m\angle ARE =$ ________

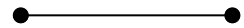
d. $m\angle CRD =$ ________

e. $m\angle ARB =$ ________

f. $m\angle BRD =$ ________

Term/ Concept	Definition/Example	Picture
Arc Length	○ Another way to measure an arc is by its length. An arc is part of the circle, so the length of an arc is a part of the ______________________.	 The distance on the circle from *A* to *B* is the length of $\overset{\frown}{AB}$.

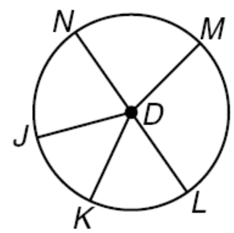
- **<u>Segment length</u>** is the distance along a line between two points.
- **<u>Arc length</u>** is a distance along a curve that you can actually follow or draw with a pencil.



Instruction

Example 4:

The radius of circle *D* is 9 cm. Find the length of each arc for the given angle measure. Round to 2 decimal places. $\overline{NL}$ is a diameter.



a. $\overset{\frown}{LM}$ if $m\angle LDM = 100^o$

b. $\overset{\frown}{KL}$ if $m\angle KDL = 60^o$

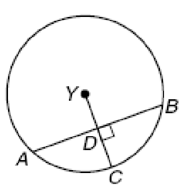
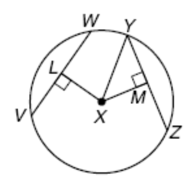
c. $\overset{\frown}{KM}$ if $m\angle KDM = 160^o$

<u>9.3 Arcs and Chords</u>

Targets

- I can recognize and use relationships between arcs and chords.
- I can recognize and use relationships between chords and diameters.

Instruction (Vocabulary)

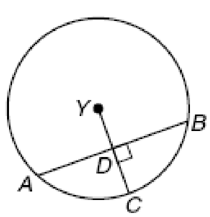
Term/ Concept		Picture
Theorem 10.3: Perpendicular diameters and chords	In a circle, if a diameter (or radius) is perpendicular to a chord then it ______________ the ____________ and its __________.	
Theorem 10.4: Congruent chords	In a circle, two chords are congruent if and only if they are ______________ from the ________________.	

Instruction

Example 1:

The radius of circle *Y* is 34, *AB* = 60, and $m\overset{\frown}{AC} = 71$.

Find each measure:



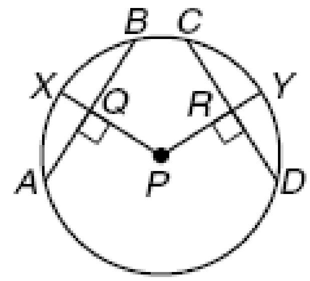
a. $m\overset{\frown}{BC}$ =

b. *AD* = c. *BD* =

d. *YD* = e. *DC* =

Example 2:

In circle P, $CD = 24$, $\overline{PQ} \cong \overline{PR}$, and the $m\overset{\frown}{CY}$ is 45.
Find each measure:



a. $AQ =$

b. $RC =$

c. $QB =$

d. $AB =$

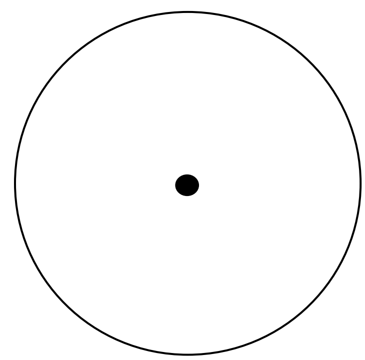
e. $m\overset{\frown}{DY} =$

f. $m\overset{\frown}{AX} =$

g. $m\overset{\frown}{CD} =$

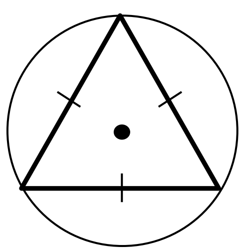
h. $m\overset{\frown}{XB} =$

Instruction

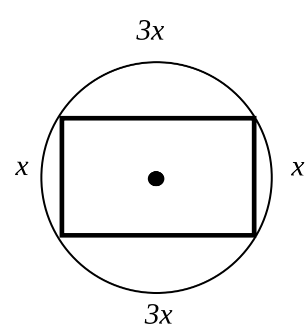
Term/ Concept		**Picture**
Inscribed Polygon	A polygon is inscribed if all the ______________ lie on the circle	
Circumscribed	A circle is circumscribed about a polygon if it contains all the ________________ of the polygon.	

Example 3:
Determine the measure of each arc on the circle circumscribed about each polygon:

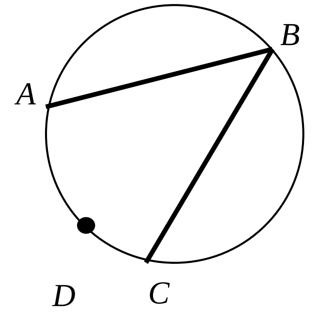
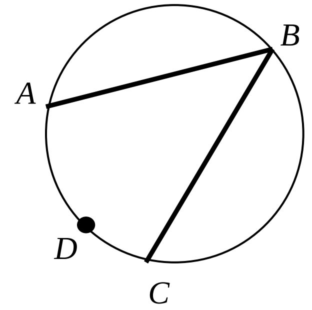
a.

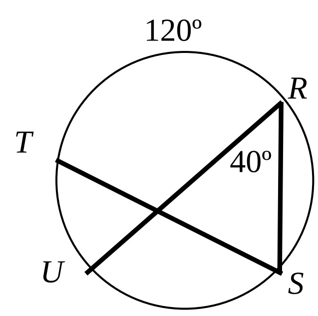
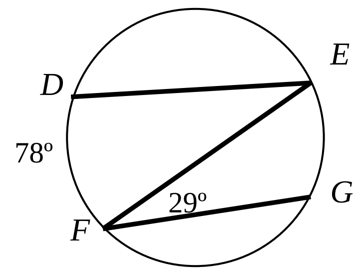


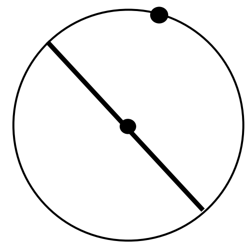
b.



9.4 Inscribed Angles

Targets	○ I can find the measures of inscribed angles ○ I can find measures of angles of inscribed triangles and quadrilaterals		
Instruction	**Term/ Concept**		**Picture**
	Inscribed Angle	An angle that has its ____________ on the circle and its sides contained in _____________ of the circle.	
	Inscribed Angle Theorem	If an angle is inscribed in a circle, then the measure of the angle equals ______________ the measure of its intercepted arc (or the measure of the intercepted arc is ____________ the measure of the intercepted angle)	

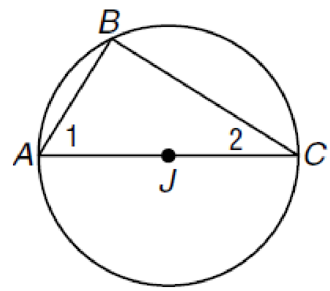
	Example 1: Find each measure. a. $m\angle RST$ b. $m\overset{\frown}{SU}$ 
	Your turn: Find each measure: a. $m\angle DEF$ *b.* $m\overset{\frown}{EG}$ 

Instruction	Term/ Concept	Definition/Example	Picture
	Angles inscribed in a semicircle	If an inscribed angle intercepts a semicircle, then the angle is a ______________________	

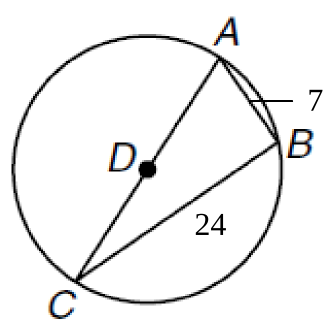
Example 2:
If $m\angle 1 = 3x - 9$ and $m\angle 2 = 2x + 4$, find

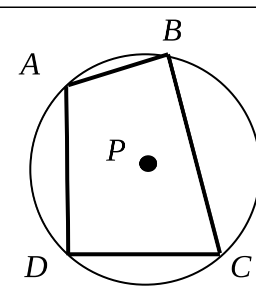
a. $m\angle 1$ b. $m\angle 2$

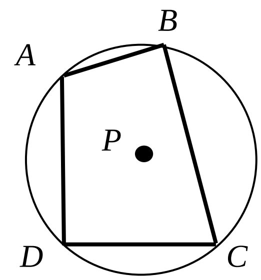
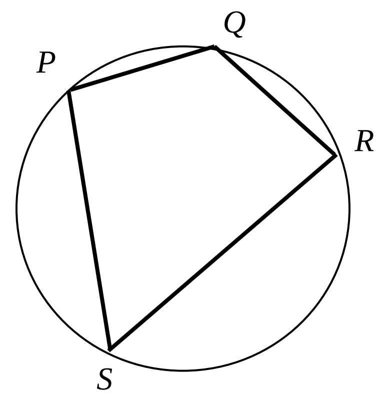
c. $m\overset{\frown}{AB}$ d. $m\overset{\frown}{BC}$



Example 3:
Find CD.



Vocabulary	Term/ Concept	Definition/Example	Picture
	Inscribed Quadrilateral Theorem	If a quadrilateral is inscribed in a circle, then its opposite angles are _________________	

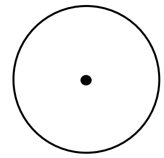
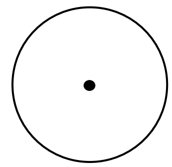
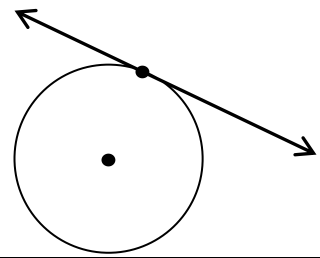
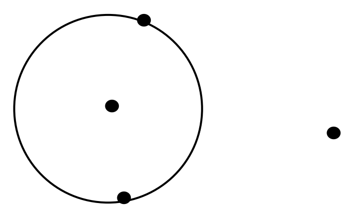
	Example 4: Quardirilateral $ABCD$ is inscribed in circle P. If $m\angle B = 60$ and $m\angle C = 70$ find $m\angle A$ and $m\angle D$. 
	Example 4: Find the angle measures in the quadrilateral if $m\angle P = 5x + 20$, $m\angle Q = 10x$ and $m\angle R = 7x - 8$ 

9.5 Tangents

Targets

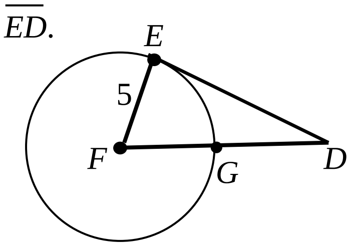
- I can use properties of tangents
- I can solve problems involving circumscribed polygons.

Instruction (Vocabulary)

Term/ Concept	Definition/Example	Picture
Tangent	A ______________ that intersects a circle at exactly _______________.	
Point of Tangency	The ______________ at which a tangent line _____________________ the circle.	
Radius-Tangent Theorem	If a line is drawn ______________ to a circle, then it is __________________ to the ________________ drawn to the point of tangency.	
Congruent Tangents Theorem	If two segments from the same _______________ point are _______________ to a circle, then they are ___________________.	

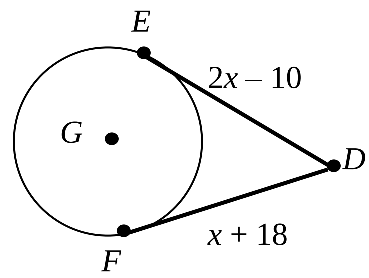
Example 1:

$\overline{ED}$ is tangent to circle F at point E. If DG = 8, Find the length of $\overline{ED}$.

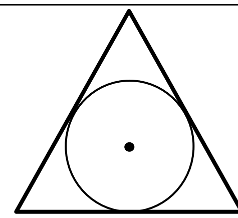
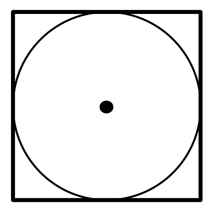


Example 2:

$\overline{ED}$ and $\overline{FD}$ are tangent to circle G. Find x.

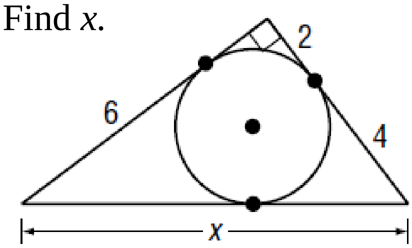


Vocabulary

Term/ Concept	Definition/Example	Picture
Circumscribed Polygons	A polygon is circumscribed about a circle if the ______________ of the polygon are all _______________ to the circle.	 

Example 3:

Find x.



Targets

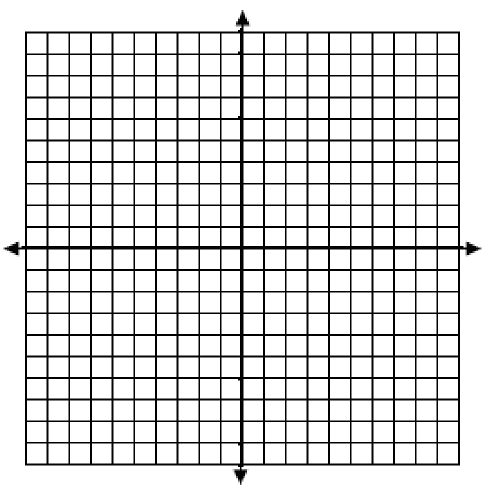
<u>9.6 Equations of Circles</u>

- I can write the equation of a circle.
- I can graph a circle on the coordinate plane.

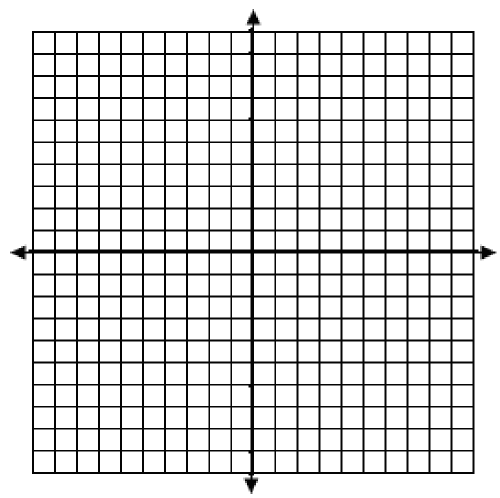
Instruction

Term/ Concept	Definition/Example	Picture
Standard Equation of a Circle	• An equation for a circle with a ____________ at the point ________ and a ___________ of ____ units is	

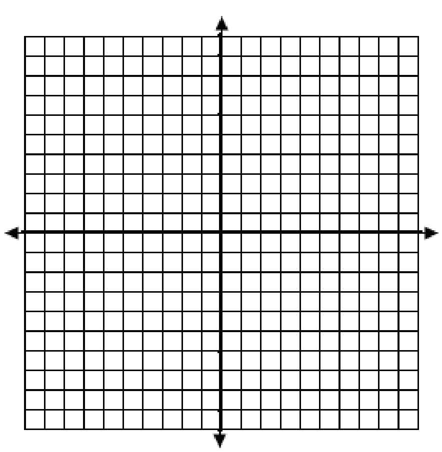
Example 1:
Write the equation of a circle whose center is at (-2, 4) and has a radius of 5. Then graph the circle.



Example 2:
Write the equation of a circle whose center is at (3, 0) and has a diameter of 8. Then graph the circle.



Your Turn:
Write the equation of a circle whose center is at (0, 2) and has a radius of 6. Then graph the circle.



Example 3:
For each of the following equations, identify the **<u>center</u>** and **<u>radius</u>** of the circle.

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

a. $(x - 5)^2 + (y - 9)^2 = 81$

center: ________ radius: ___________

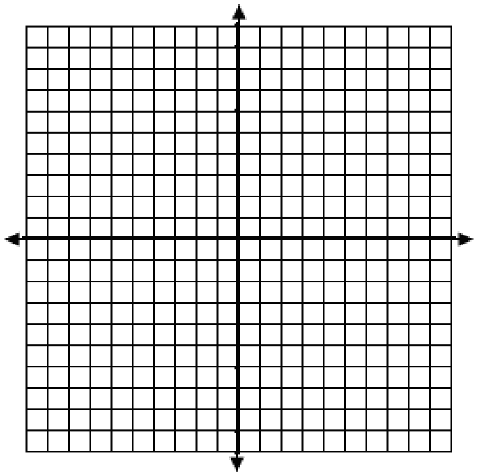
b. $(x + 7)^2 + (y - 1)^2 = 100$

center: ________ radius: ___________

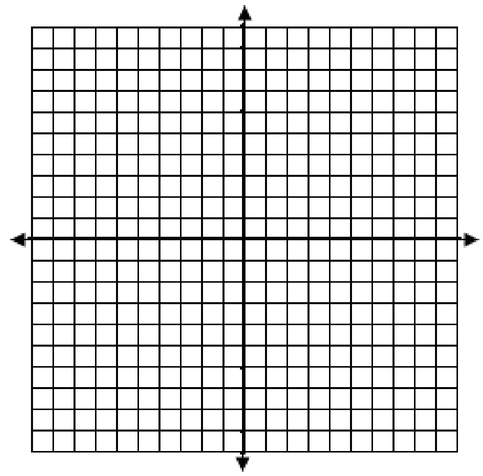
c. $x^2 + (y - 4)^2 = 49$

center: ________ radius: ___________

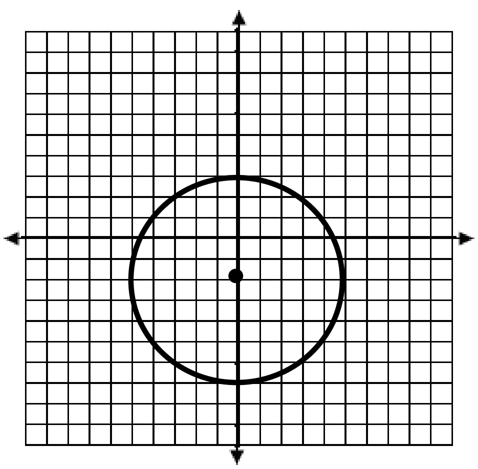
Example 4:
Graph the circle whose equation is
$(x + 1)^2 + (y - 4)^2 = 9$



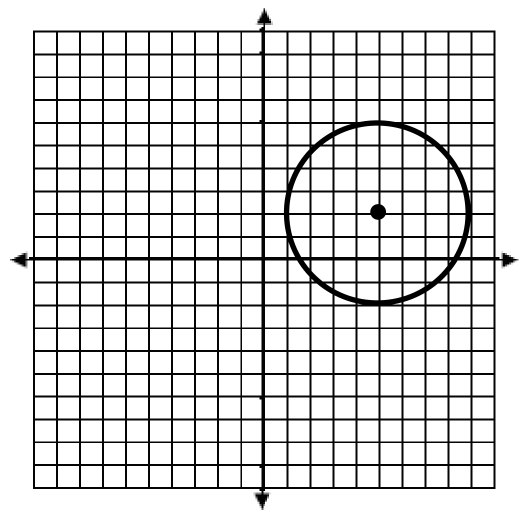
Your Turn:
Graph the circle whose equation is
$(x - 3)^2 + y^2 = 25$



Example 5:
Write the equation of the circle graphed below.



Your turn:
Write the equation of the circle graphed below.



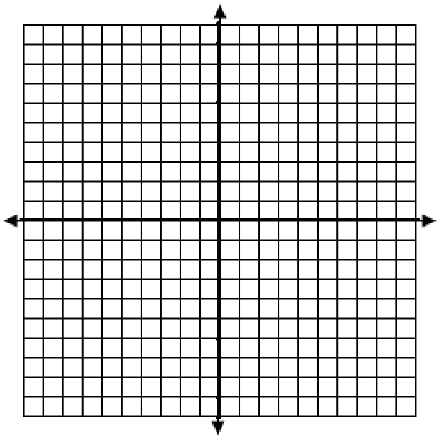
Example 6:
Find the circumference of the circle that has the following equation.

$(x + 4)^2 + (y - 10)^2 = 81$

Your Turn:
Find the circumference of the circle that has the following equation.

$x^2 + (y + 7)^2 = 400$

Example 7:
Write an equation of the circle whose diameter has an endpoint at (-1, 1) and a center at (3, 1). You may use the graph below to help you visualize the problem.



Your turn:
Write an equation of the circle whose diameter has endpoints at (-5, 1) and (1, 5). You may use the graph below to help you visualize the problem.