

# Lesson 11-11: Circles in the Coordinate Plane

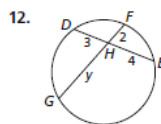
## AGENDA:

- Check & Review Homework 11-10
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- Lesson Notes & Guided Practice
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## HOMWORK:

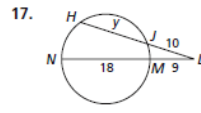
- p. 802-804 #10-12,14,20,28, 30-31, 33, 34, 35, 39

p. 796-797: #,17-22,25, 27

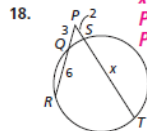


$y = 6; DE = 7; FG = 8$

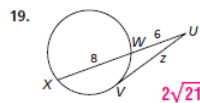
and the length of each secant segment.



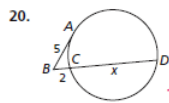
$y = 14.3; HL = 24.3; NL = 27$



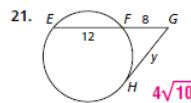
$x = 11.5; PT = 13.5; PR = 9$



$2\sqrt{21}$



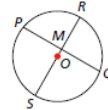
10.5



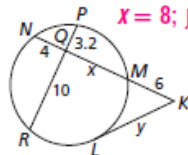
$4\sqrt{10}$

Use the diagram for Exercises 22 and 23.

22.  $M$  is the midpoint of  $PQ$ .  $RM = 10$  cm, and  $PQ = 24$  cm.
  - a. Find  $MS$ . **14.4 cm**
  - b. Find the diameter of  $\odot O$ . **24.4 cm**
23.  $M$  is the midpoint of  $PQ$ . The diameter of  $\odot O$  is 13 in., and  $RM = 4$  in.



25.  $x = 8; y = 6\sqrt{3}$



27. Solution B is incorrect.

$10(4) = x^2$  is correct

not  $6(4) = x^2$

25.  $x = 8; y = 6\sqrt{3}$

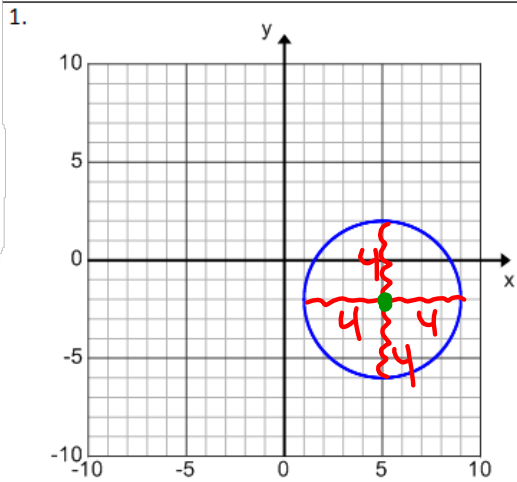
$WO = WD$   
 $(18)(6) = (y)(y)$   
 $108 = y^2$   
 $\sqrt{108} = y$   
 $\oplus 4\sqrt{3} = y$

$P \cdot P = P \cdot P$   
 $(PQ)(QR) = (NQ)(QM)$   
 $(3.2)(10) = (4)(x)$   
 $32 = 4x$   
 $8 = x$

19.

$WO = WO$   
 $(XU)(WU) = (VU)(VU)$   
 $(14)(6) = (z)(z)$   
 $\oplus \sqrt{84} = \sqrt{z^2}$   
 $2\sqrt{4}\sqrt{21}$

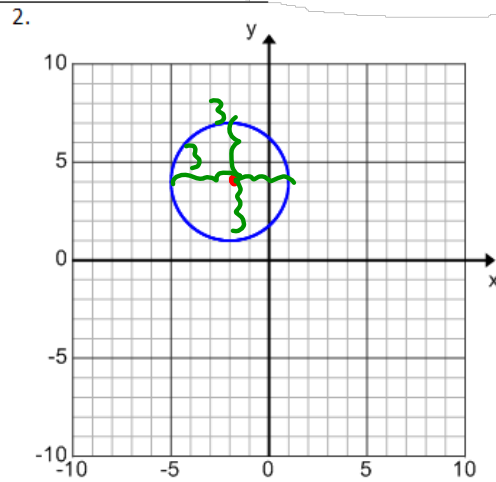
In graphs 1-3 below, the equation of the circle is given. Read the graph to find the center and radius of each circle. Compare this information with the equation. Can you write the equation for the circle in graph #4?



Equation:  $(x-5)^2 + (y+2)^2 = 16$

Center: (5, -2)

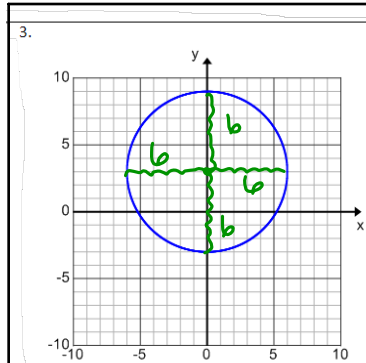
Radius: 4



Equation:  $(x+2)^2 + (y-4)^2 = 9$

Center: (-2, 4)

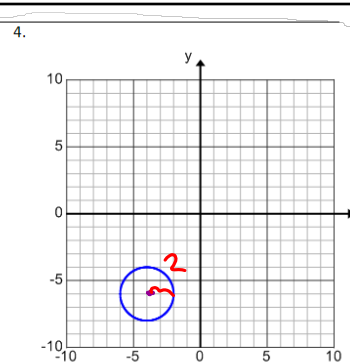
Radius: 3



Equation:  $x^2 + (y-3)^2 = 36$

Center: (0, 3)

Radius: 6



Equation:  $(x+4)^2 + (y+6)^2 = 4$

Center: (-4, -6)

Radius: 2

Can you generate an equation for a circle with a center at  $(h, k)$  with a radius of  $r$ ?

$(x-h)^2 + (y-k)^2 = r^2$   
  
 $(x_2 - x_1)^2 + (y_2 - y_1)^2 = d^2$   
 $a^2 + b^2 = c^2$

**Equation of a Circle**

The equation of a circle with center  $(h, k)$  and radius  $r$  is  $(x - h)^2 + (y - k)^2 = r^2$ .

**OPPOSITE SIGNS IN EQUATION**

**WRITING THE EQUATION OF A CIRCLE** – Write the following equation for the circle given...

Given Center & Radius:  $(x - 4)^2 + (y - (-2))^2 = 3^2$

A)  $\odot A$  with center  $(4, -2)$  and radius 3

$$(x - 4)^2 + (y + 2)^2 = 3^2$$

$$(x - 4)^2 + (y + 2)^2 = 9$$

B)  $\odot P$  with center  $P(0, -3)$  and radius 8

$$(x - 0)^2 + (y - (-3))^2 = 8^2$$

$$x^2 + (y + 3)^2 = 64$$

Given Center & a Point on the Circle:

C)  $\odot B$  that passes through  $(3, 3)$  and has center  $(2, -1)$

The equation of a circle with center  $(h, k)$  and radius  $r$  is  $(x - h)^2 + (y - k)^2 = r^2$ .

**NEED  $r$**

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(2 - 3)^2 + (-1 - 3)^2}$$

$$= \sqrt{(-1)^2 + (-4)^2} = \sqrt{1 + 16} = \sqrt{17}$$

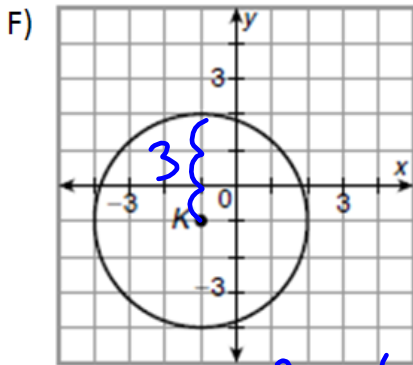
$$(x - 2)^2 + (y + 1)^2 = (\sqrt{17})^2$$

$$(x - 2)^2 + (y + 1)^2 = 17$$

Given the Graph of a Circle:

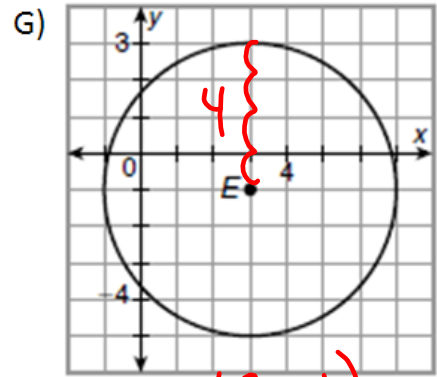
The equation of a circle with center  $(h, k)$  and radius  $r$  is  $(x - h)^2 + (y - k)^2 = r^2$ .

Write the equation of each circle.



Center:  $(-1, -1)$   
radius: 3

$$(x+1)^2 + (y+1)^2 = 9$$



Center:  $(3, -1)$   
radius: 4

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

$$(x-3)^2 + (y+1)^2 = 16$$

√ ↘ ← SIGNS

**FINDING THE RADIUS AND CENTER FROM AN EQUATION OF A CIRCLE**

State the radius and center of the following circles:

A)  $(x+3)^2 + (y-5)^2 = 16 = r$

CENTER  $(-3, 5)$

$r = 4$

B)  $x^2 + (y+3)^2 = 36 = r$

CENTER  $(0, -3)$

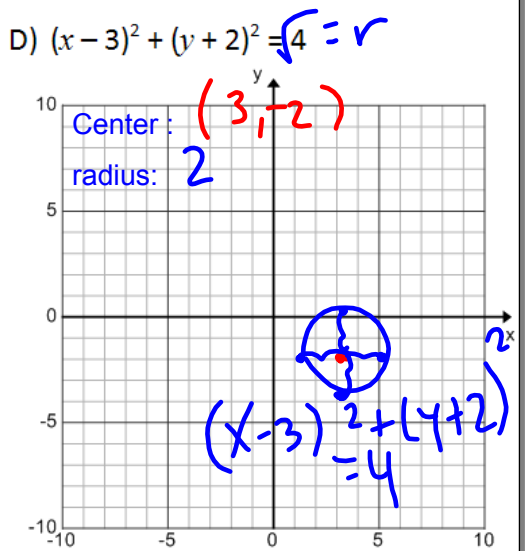
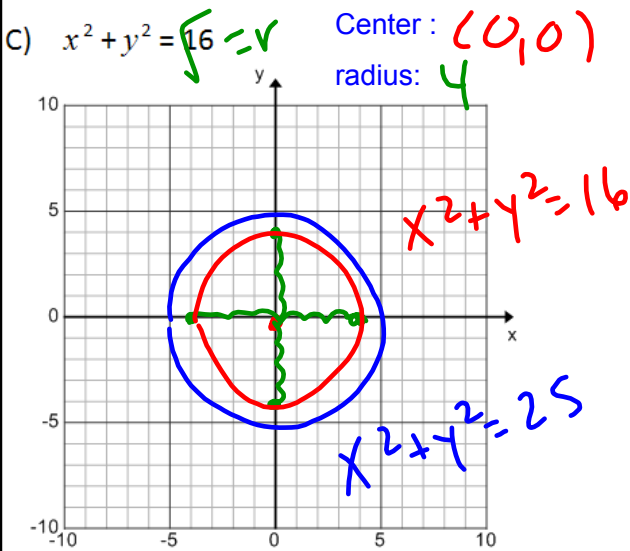
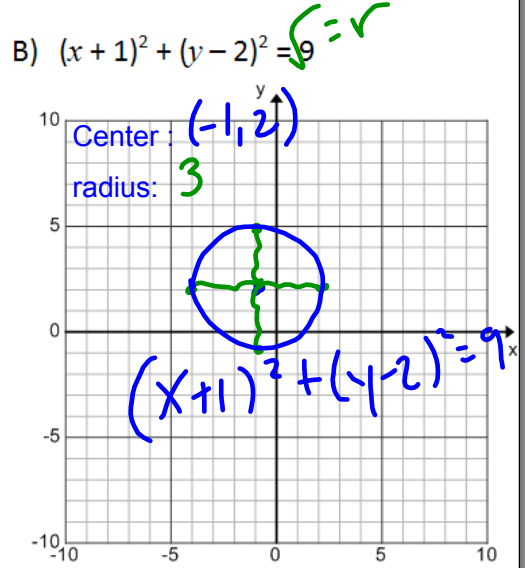
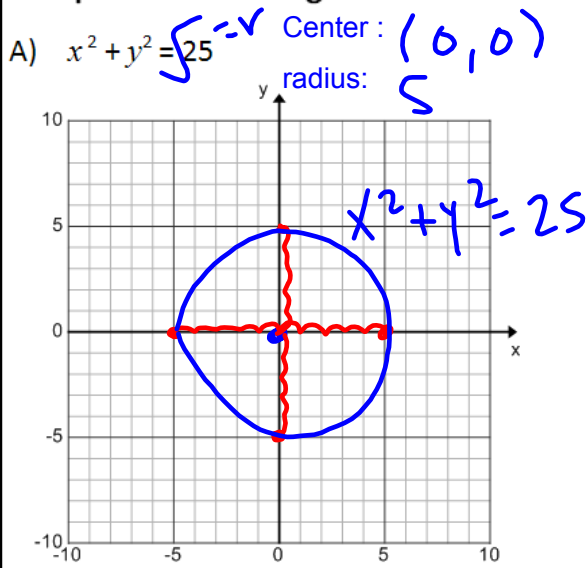
$6 = r$

- a) C  $(-3, 5)$   $r = 4$
- b) C  $(3, -5)$   $r = 4$
- ~~c) C  $(-3, 5)$   $r = 16$~~
- ~~d) C  $(3, -5)$   $r = 16$~~

**GRAPHING A CIRCLE**

The equation of a circle with center  $(h, k)$  and radius  $r$  is  $(x - h)^2 + (y - k)^2 = r^2$ .

Graph the following circles from their equations:



The equation of a circle with center  $(h, k)$  and radius  $r$  is  $(x - h)^2 + (y - k)^2 = r^2$ .

**REGENTS PRACTICE**

1) What are the center and radius of a circle whose equation is  $(x - A)^2 + (y - B)^2 = C$ ?  
 [1] center =  $(A, B)$ ; radius =  $C$   
 [2] center =  $(-A, -B)$ ; radius =  $C$   
 [3] center =  $(A, B)$ ; radius =  $\sqrt{C}$   
 [4] center =  $(-A, -B)$ ; radius =  $\sqrt{C}$

2) The equation of a circle is  $x^2 + (y - 7)^2 = 16$ . What are the center and radius of the circle?  
 [1] center =  $(0, 7)$ ; radius = 4  
 [2] center =  $(0, 7)$ ; radius = 16  
 [3] center =  $(0, -7)$ ; radius = 4  
 [4] center =  $(0, -7)$ ; radius = 16

3) The equation of a circle is  $x^2 + (y - 7)^2 = 16$ . What are the center and radius of the circle?  
 (1) center =  $(0, 7)$ ; radius = 4  
 (2) center =  $(0, 7)$ ; radius = 16  
 (3) center =  $(0, -7)$ ; radius = 4  
 (4) center =  $(0, -7)$ ; radius = 16

3) The equation of a circle is  $(x - 2)^2 + (y + 4)^2 = 4$ . Which diagram is the graph of the circle?

**PUTTING IT ALL TOGETHER**

\*Graphic Organizer\*

**Circle Equation → Graph:**  $(x - h)^2 + (y - k)^2 = r^2$

1. **Determine the center and Plot**

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2. **Determine the radius, r**

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3. **Count r- 4 times and plot 4 points**

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4. **Connect points with ARCs and label**

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**Given Diameter Endpoints → Equation or Graph**

1. Calculate center using **midpoint** formula
2. Calculate radius using **distance** formula w/center & pt
3. Equation: Plug in center and radius  
Graph: Plot center, count r to plot 4 pts, connect pts w/arcs

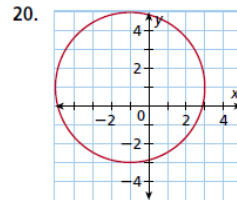
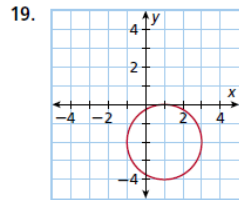
Write the equation of each circle.

10.  $\odot R$  with center  $R(-12, -10)$  and radius 8
11.  $\odot S$  with center  $S(1.5, -2.5)$  and radius  $\sqrt{3}$
12.  $\odot C$  that passes through  $(2, 2)$  and that has center  $C(1, 1)$
13.  $\odot D$  that passes through  $(-5, 1)$  and that has center  $D(1, -2)$

**Multi-Step** Graph each equation.

14.  $x^2 + (y - 2)^2 = 9$
15.  $(x + 1)^2 - y^2 = 16$

**xy Algebra** Write the equation of each circle.



28. Consider the circle whose equation is  $(x - 4)^2 + (y + 6)^2 = 25$ . Write, in point-slope form, the equation of the line tangent to the circle at  $(1, -10)$ .

Find the center and radius of each circle.

30.  $(x - 2)^2 + (y + 3)^2 = 81$
31.  $x^2 + (y + 15)^2 = 25$

Find the area and circumference of each circle. Express your answer in terms of  $\pi$ .

33. circle with equation  $(x + 2)^2 + (y - 7)^2 = 9$
34. circle with equation  $(x - 8)^2 + (y + 5)^2 = 7$
35. circle with center  $(-1, 3)$  that passes through  $(2, -1)$
39.  $\odot A$  has a diameter with endpoints  $(-3, -2)$  and  $(5, -2)$ . Write the equation of  $\odot A$ .