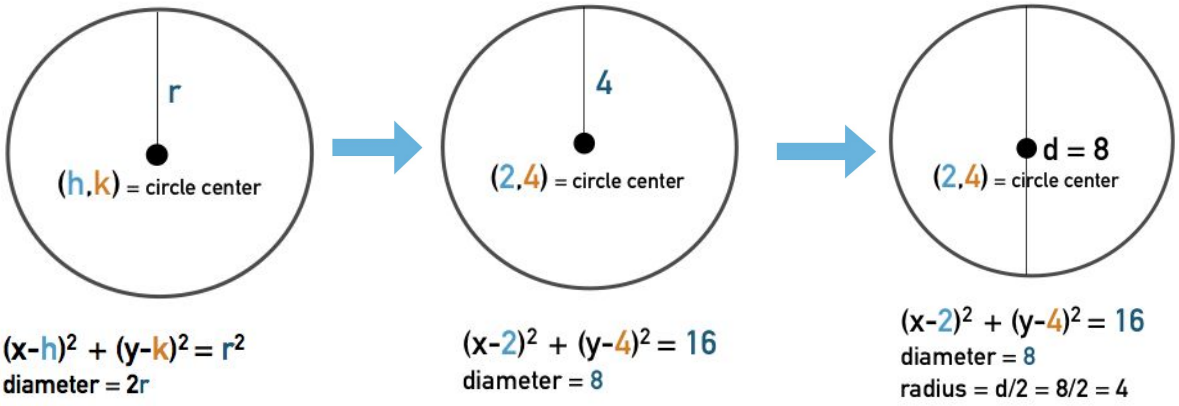
G12 Topic Breakdown
SOL - Geometry
Written by Nicole D'Onofrio

Identify the center, radius, and diameter of a circle given the standard **equation of a circle**.



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

$(x-2)^2 + (y-4)^2 = 16$
diameter = 8

$(x-2)^2 + (y-4)^2 = 16$
diameter = 8
radius = d/2 = 8/2 = 4

Given the equation of a circle in standard form, identify the coordinates of the center and find the radius of the circle.

Practice One:

A circle has a radius of 12 and a center located at (-2,5)…

Equation of the circle: $(x+2)^2 + (y-5)^2 = 144$

*Note that -2 changes the - to a + in the first part of the equation

Practice Two:

A circle has a radius of 5 and a center located at (3,-6)…

Equation of the circle: $(x-3)^2 + (y+6)^2 = 25$

*Note that -6 changes the - to a + in the second part of the equation

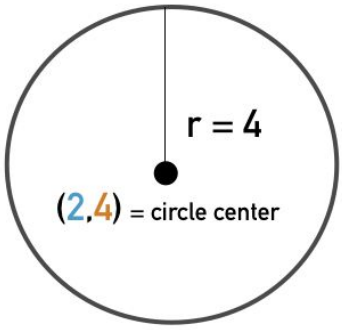
Practice Three:

A circle has a radius of 1 and a center located at (1,0)…

Equation of the circle: $(x-1)^2 + (y-0)^2 = 1$ or $(x-1)^2 + y^2 = 1$

*Note that the radius squared is still 1 and the 0 can be dropped from the equation

Given the coordinates of the center and radius of the circle, **identify a point on the circle**.



1. Find the equation
   $(x-2)^2 + (y-4)^2 = 16$

2. Plug in the answer choices (x for x-value/y for y-value)
   A) (2,2)
   B) (6,0)
   C) (3,9)

Ex. $(2-2)^2 + (2-4)^2 = 0 + 4 = 4$
4 does not equal 16
Ex. $(3-2)^2 + (0-4)^2 = 1 + 16 = 17$
17 does not equal 16
Ex. $(2-2)^2 + (0-4)^2 = 0 + 16 = 16$
16 equals the radius squared!

If the center of a circle is located at (-7,13) and has a radius of 9, what could be a possible point on the circle?

1. Find the equation
   $(x+7)^2 + (y-13)^2 = 81$
2. Find an x value and y value that make the equation equal to 81
3. x = 2 / y = 13
   $(2+7)^2 + (13-13)^2 = 81$
   $(9)^2 + (0)^2 = 81$
   $81 + 0 = 81$
   $81 = 81$

How to choose an x and y value?

1. Find the square root of the radius
   $\sqrt{81} = 9$
2. One of the parenthesis will equal the square root of the radius and the other parenthesis will equal 0.

$(x + 7) = 9$ $\quad 81 + 0 = 81$
$(2 + 7) = 9$ $\quad 9^2 + 0 = 81$

Use the distance formula to find the radius of a circle, given the center and one other point.

Circle Center = (6,7)
Point on a Circle = (8, 12)

[The difference between the 2 points = the radius]

Distance Formula:

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

Given the coordinates of the endpoints of a diameter, find the equation of the circle.

Distance Formula:

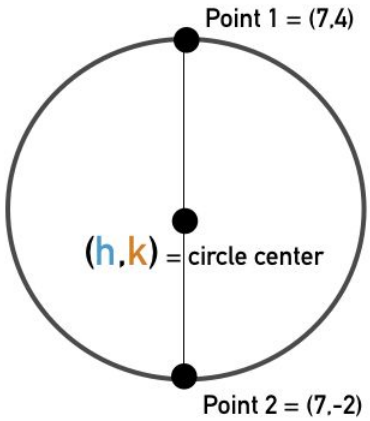
distance $= \sqrt{((8-6)^2 + (7 - 12)^2)}$

$d = \sqrt{(2^2 + -5^2)}$

$d = \sqrt{(4 + 25)}$

$d = \sqrt{29}$

$r = \sqrt{29}$



Distance Formula:

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

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

$d = \sqrt{((7-7)^2 + (-2 - 4)^2)}$

$d = \sqrt{(0^2 + (-6)^2)}$

$d = \sqrt{36}$

$d = 6$

$r = (1/2)d = 3$

Find the equation of the circle by plugging in the radius and center:

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

$(x-7)^2 + (y-1)^2 = 9$

The center of the circle is located at (7,1). This is calculated by finding the middle coordinate between the two given points.

x-value

$(x1 + x2)/2 = (7 + 7)/2 = 7$

y-value

$(y1 + y2)/2 = (4 + -2)/2 = 1$

Recognize that the equation of a circle of given center and radius is derived using the Pythagorean Theorem.

Pythagorean Theorem

$a^2 + b^2 = c^2$

Equation of a Circle

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

Pythagorean Theorem

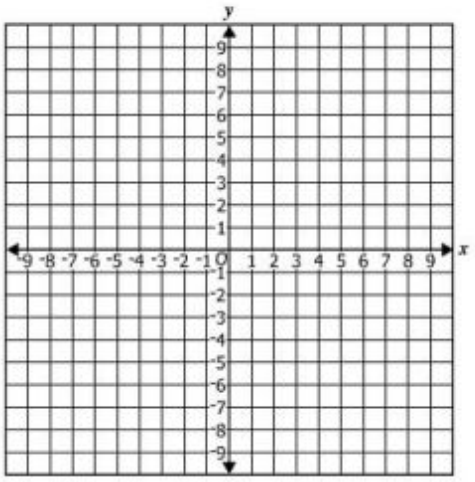
$3^2 + 4^2 = 5^2$

Equation of a Circle

$(x-3)^2 + (y-4)^2 = 25$

Complete the following practice problems:

Plot the center of the circle defined by the equation $(x+4)^2+(y-5)^2=3^2$.



Which point lies on the circle represented by the equation $(x-1)^2+(y-3)^2=7^2$?

- **A** $(-1, 4)$
- **B** $(0, 7)$
- **C** $(1, 3)$
- **D** $(8, 3)$

A circle has a center at $(4, -7)$ and a radius of 4 units. Create the equation of this circle.

The Equation of the Circle

			=	

$(x - 4)$	$(x + 4)$
$(x - 4)^2$	$(x + 4)^2$
$(y - 7)$	$(y + 7)$
$(y - 7)^2$	$(y + 7)^2$
$+$	$-$
2^2	4^2

Practice Problems

G.12 Review

1. If a circle has the equation $(x+12)^2 + (y-4)^2 = 64$, what is the radius and center of the circle?

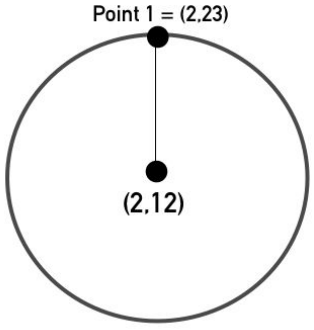
A) Radius = 8; Center = (-12,4)
B) Radius = 64; Center = (12, 4)
C) Radius = 8; Center = (-12, 2)
D) Radius = 64; Center = (12,-4)

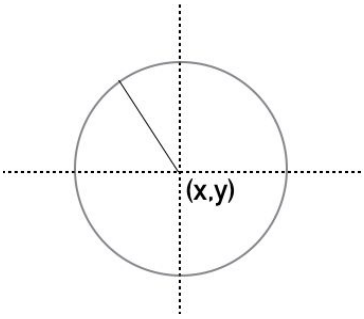
2. A circle with a center at (2, -2) also contains the point (12, 2). Find the radius of the circle.

A) 16
B) $\sqrt{116}$
C) 4
D) $\sqrt{104}$

3. The diameter of a circle falls on the points (4, 7) and (13, 7). Which of the following is the equation of this circle?

A) $(x-17)^2 + (y-14)^2 = 7$
B) $(x-7)^2 + (8.5)^2 = 81$
C) $(x-17)^2 + (y-8)^2 = 9$
D) $(x-8.5)^2 + (y-7)^2 = 9$





4. The circle above shows the center coordinates and a given point on the circle. Which of the following is the radius of the circle?

A) 35
B) 12
C) 11
D) 121

5. The equation of a given circle is $(x+5)^2 + (y-6)^2 = 65$ Which of the following is a possible point on the circle?

A) (-1,13)
B) (5,6)
C) (-5,6)
D) (-1, 5)

6. The circle has a center located at (0,0) and a radius of $\sqrt{18}$. Which of the following could be a point on the circle?

A) (3,18)
B) (2,2)
C) (3,3)
D) (0,0)

7. If a circle has the equation $(x-17)^2 + (y-6)^2 = 169$, what is the radius and center of the circle?

A) Radius = 13; Center = (-17,-6)
B) Radius = -6; Center = (13, 6)
C) Radius = 17; Center = (17, 13)
D) Radius = 13; Center = (17,6)

8. Which of the following represents a circle that has a radius of 11 and a center at (4,8)?

A) $(x-4)^2 + (y-8)^2 = 11$
B) $(x-4)^2 + (y-8)^2 = 121$
C) $(x-8)^2 + (y-4)^2 = 11$
D) $(x-11)^2 + (y-4)^2 = 8$

9. A line is drawn between two points (-4, 2) and (4,2) to form the diameter of a circle. Find the center of this circle.

A) (8,4)
B) (2,4)
C) (-4,4)
D) (0,2)

Answer Key: Practice Problems

G.12 Geometry

1.	A
2.	B
3.	D
4.	C
5.	A
6.	C
7.	D
8.	B
9.	D