

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Standard Form

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



Remember the
Standard and
General Form of
Circles?



General Form

$$Ax^2 + By^2 + Cx + Dy + E = 0$$



Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Write the standard form of a circle with a center of (2,1) and a diameter of 16.

1. Divide diameter by 2 to find radius
2. Substitute into Standard Form

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

center (2,1)
h, k

$$\text{radius} = \frac{16}{2} = 8$$

opposite

$$(x - 2)^2 + (y - 1)^2 = 64$$

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Write the standard form of a circle with a center of $(-3,4)$ and a diameter of 10.

1. Divide diameter by 2 to find radius
2. Substitute into Standard Form

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

$$r = 5$$

center $(-3, 4)$

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



What if you are only given coordinates of the diameter?

- Remember! we need
- ✓ 1. Center *midpoint formula*
 - ✓ 2. Radius *distance formula*



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For Center and Length of Radius

Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

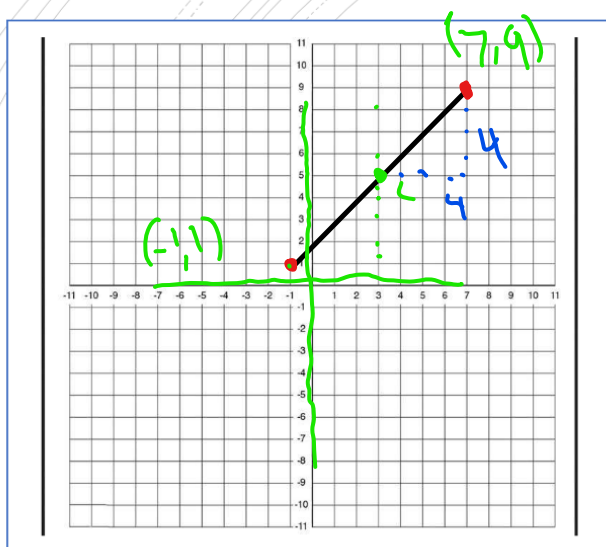
Distance Formula

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

Pythagorean Theorem $c = \sqrt{a^2 + b^2}$

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.



Find the equation of the circle with endpoints of the diameter at $(-1, 1)$ and $(7, 9)$.

1. Center (What point is in the "middle" of those endpoints?)

$$\left(\frac{-1+7}{2} = \frac{6}{2} = 3, \frac{1+9}{2} = \frac{10}{2} = 5 \right) = (3, 5)$$

2. Radius (What is the "distance" from the center to one of those endpoints?)

$$R = \sqrt{4^2 + 4^2}$$

$$= \sqrt{16 + 16}$$

$$r = \sqrt{32}$$

$$r^2 = (\sqrt{32})^2 = 32$$

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

$$(x-3)^2 + (y-5)^2 = 32$$

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Find the equation of the circle with endpoints of the diameter at (3, 5) and (-2, -6).

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

$$\frac{5 + (-6)}{2} = -\frac{1}{2}$$

Center (midpoint formula)
 $(\frac{1}{2}, -\frac{1}{2})$

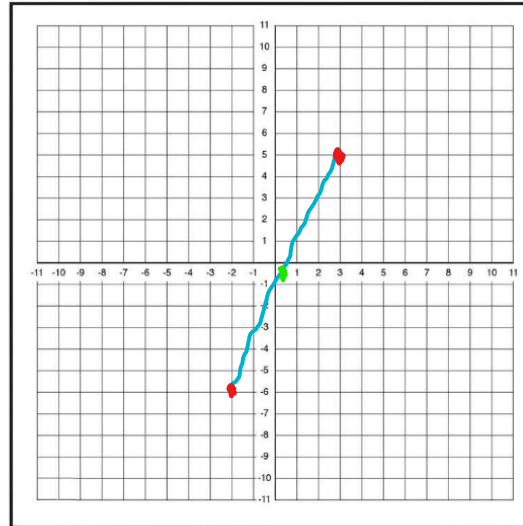
Radius (distance formula)

$$\text{diameter} = \sqrt{(-5)^2 + (-11)^2}$$

$$\approx \sqrt{25 + 121}$$

$$\approx \sqrt{146} \approx 12.1$$

$$r = 6.05$$

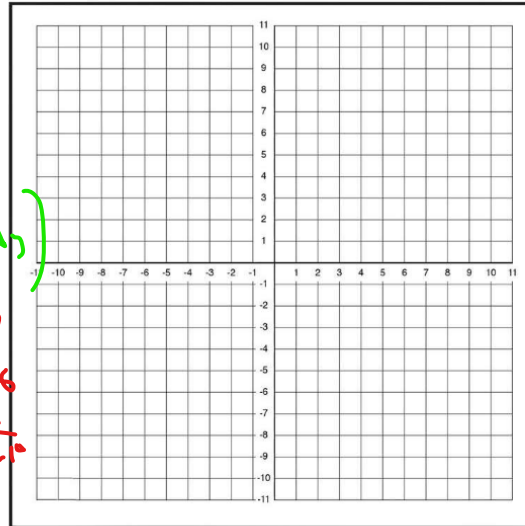
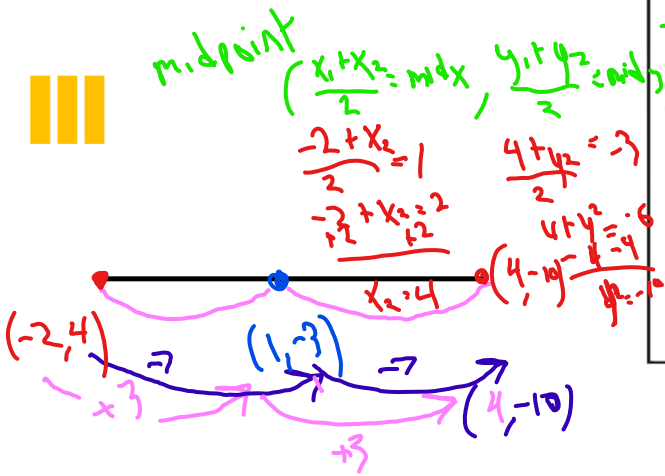


$$(x - \frac{1}{2})^2 + (y + \frac{1}{2})^2 = (6.05)^2$$

$$(x - \frac{1}{2})^2 + (y + \frac{1}{2})^2 = 36.6$$

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Find the endpoint of the diameter of a circle with the other endpoint $(-2, 4)$ and a center $(1, -3)$.



$(4, -10)$

algebra will work OR drawing!!

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.



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

Find the equation of the circle with center $(-7, 3)$ and passes through $(4, -1)$.

- ① center $(-7, 3)$
- ② radius

↳ Distance Formula

$$r = \sqrt{(11)^2 + (-4)^2}$$

$$r = \sqrt{121 + 16}$$

$$= \sqrt{137}$$

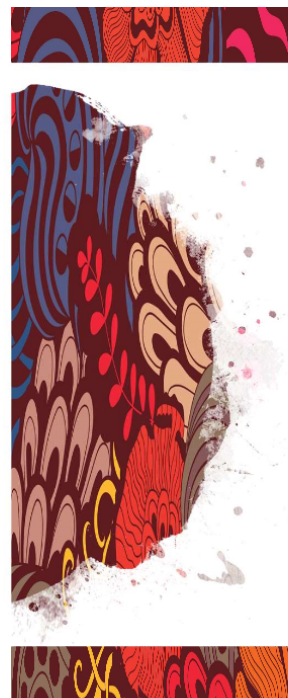
$$(x+7)^2 + (y-3)^2 = 137$$

Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Find the equation of the circle with center $(1, 0)$ and passes through $(5, -2)$.

$$\begin{aligned} \text{Center } (1, 0) \\ r &= \sqrt{4^2 + (-2)^2} \\ &= \sqrt{16 + 4} \\ &= \sqrt{20} \end{aligned}$$

$$(x-1)^2 + y^2 = 20$$



Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Bringing it all back aROUND to make a Circle Equation

- 1) $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
- If a circle has center at $(-1, 2)$ and a point on the circle at $(-5, 5)$ what is the standard form equation of the circle?

$$r = \sqrt{(-4)^2 + (3)^2}$$

$$= \sqrt{16 + 9}$$

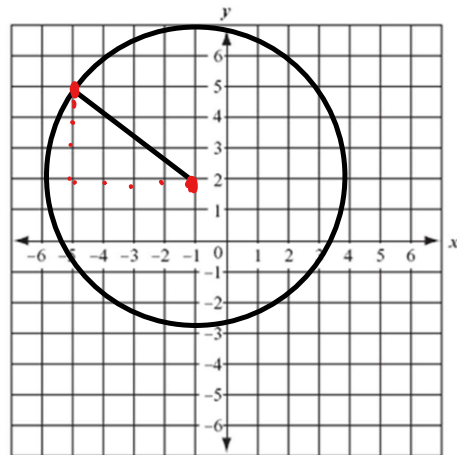
$$= \sqrt{25}$$

$$= 5$$

- Graph it.

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

$$(x+1)^2 + (y-2)^2 = 25$$



Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Bringing it all back aROUND to make a Circle Equation

- If a circle has diameter with endpoints at $(7, -2)$ and $(-1, 4)$ what is the standard form equation of the circle?

Center
↳ midpoint

$$\left(\frac{7+(-1)}{2} = 3, \frac{-2+4}{2} = 1 \right)$$

$$\begin{array}{c} (3, 1) \\ h \quad k \end{array}$$

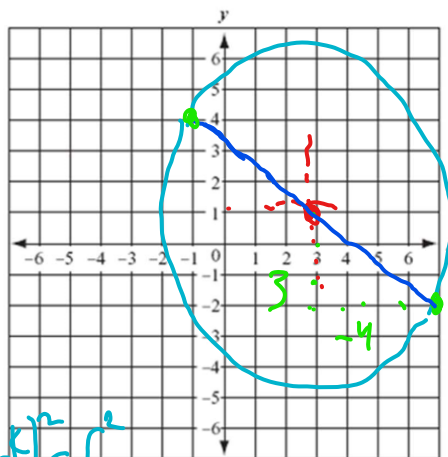
- Graph it.

Radius
↳ distance

$$\begin{aligned} r &= \sqrt{(3-7)^2 + (1-(-2))^2} \\ &= \sqrt{(-4)^2 + (3)^2} \\ &= \sqrt{16+9} = \sqrt{25} = 5 \end{aligned}$$

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

$$(x-3)^2 + (y-1)^2 = 25$$



Learning Target: I can use distance and midpoint formula to determine the equation of a circle.

Bringing it all back aROUND to make a Circle Equation

- If a circle has diameter with endpoints at $(10, 5)$ and $(-6, -7)$, is the point $(-8, 1)$ on the circle?

$$\textcircled{1} (x-h)^2 + (y-k)^2 = r^2$$

$$\text{mdpt } \left(\frac{10+(-6)}{2} = 2, \frac{5+(-7)}{2} = -1 \right)$$

center $(2, -1)$

$$r = \sqrt{(8)^2 + (6)^2}$$

$$= \sqrt{64 + 36}$$

$$= \sqrt{100}$$

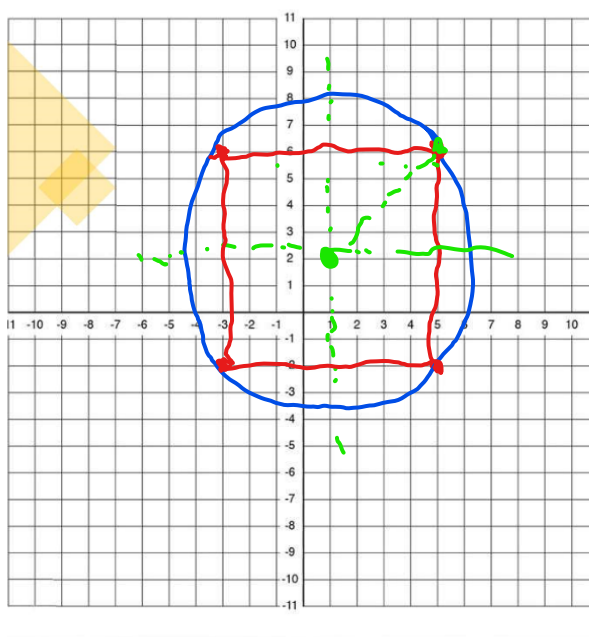
$$r = 10$$

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

left = right + \checkmark

$$\begin{array}{l} (-8-2)^2 + (1+1)^2 \\ (-10)^2 + (2)^2 \\ 100 + 4 \\ 104 \neq 100 \end{array}$$

Not on circle!



Challenge! Inscribed Square

A square has been inscribed in a circle. The coordinates of the square are $(5, -2)$, $(-3, -2)$, $(-3, 6)$, and $(5, 6)$. Write the standard form of the circle.

- How will you find the center and length of radius?

$$\text{center } (1, 2)$$

$$\begin{aligned} r &= \sqrt{4^2 + 4^2} \\ &= \sqrt{16 + 16} \\ &= \sqrt{32} \end{aligned}$$

$$(x-1)^2 + (y-2)^2 = 32$$

pg 40 #3

*prove it has 4 Rt angles ✓

$$AB \quad \frac{7-6}{3-9} = \frac{1}{-6} > \perp \checkmark$$

$$BC \quad \frac{-1-7}{4-1} = \frac{-8}{3} > \perp \checkmark$$

$$CD \quad \frac{-2+1}{-4-4} = \frac{-1}{-8} = \frac{1}{8} > \perp \checkmark$$

$$DA \quad \frac{6-2}{-5-4} = \frac{4}{-9} > \perp \checkmark$$

$$AB \quad \frac{1}{-6} > \perp \checkmark$$

↓

⊥ lines

↓

Compare slopes

Look for
Opp. rec.

p.42-43 Quiz Review
p.44-45 Review

cover
on video
& tutoring

p.46-47 - Solo