

# Day 4: Distance and Midpoint

Date \_\_\_\_\_

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## Distance

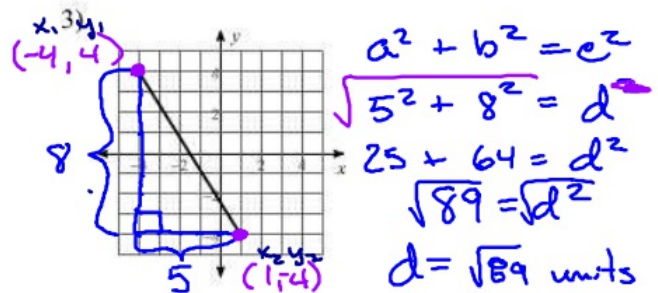
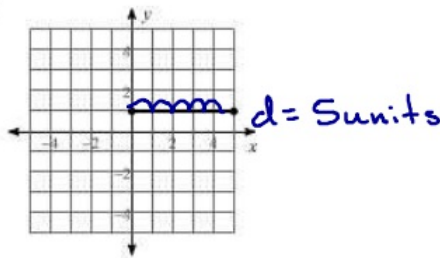
1) Distance Formula is:

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

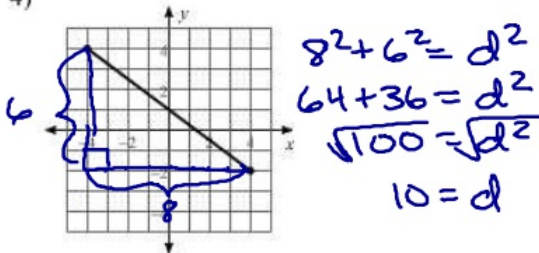
$$a^2 + b^2 = c^2$$

Find the distance between each pair of points.

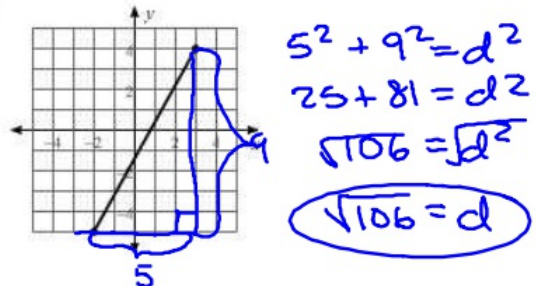
2)



4)



5)



6)  $x_1, y_1, x_2, y_2$   
 $(6, 3), (2, 0)$

$$\begin{aligned} d &= \sqrt{(2-6)^2 + (0-3)^2} \\ &= \sqrt{(-4)^2 + (-3)^2} \\ &= \sqrt{16 + 9} \\ &= \sqrt{25} = 5 \end{aligned}$$

8)  $x_1, y_1, x_2, y_2$   
 $(-6, -7), (2, -4)$

$$\begin{aligned} d &= \sqrt{(2-(-6))^2 + (-4-(-7))^2} \\ &= \sqrt{(8)^2 + (3)^2} \\ &= \sqrt{64 + 9} \\ &= \sqrt{73} \end{aligned}$$

7)  $x_1, y_1, x_2, y_2$   
 $(4, -3), (-8, -6)$

$$\begin{aligned} d &= \sqrt{(-8-4)^2 + (-6-(-3))^2} \\ &= \sqrt{(-12)^2 + (-3)^2} \\ &= \sqrt{144 + 9} \\ d &= \sqrt{153} \end{aligned}$$

9)  $x_1, y_1, x_2, y_2$   
 $(0, 1), (4, -5)$

$$\begin{aligned} d &= \sqrt{(4-0)^2 + (-5-1)^2} \\ &= \sqrt{(4)^2 + (-6)^2} \\ &= \sqrt{16 + 36} \\ &= \sqrt{52} = 2\sqrt{13} \end{aligned}$$

## Midpoint

10) How do you find the midpoint between two points?

11) Midpoint Formula is: Answer: Coordinate Point  $(x_m, y_m)$   

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

Find the midpoint of the line segment with the given endpoints.

12)  $(5, 1), (-2, 6)$   

$$\left( \frac{5 + (-2)}{2}, \frac{1 + 6}{2} \right)$$
  

$$\left( \frac{3}{2}, \frac{7}{2} \right)$$

13)  $(8, -7), (2, 5)$   

$$\left( \frac{8 + 2}{2}, \frac{-7 + 5}{2} \right)$$
  

$$\left( \frac{10}{2}, \frac{-2}{2} \right)$$
  

$$(5, -1)$$

14)  $(-1, -4), (-1, -1)$   

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

$$\left( \frac{-2}{2}, \frac{-5}{2} \right)$$
  

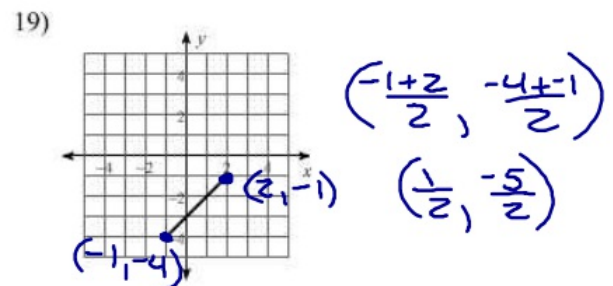
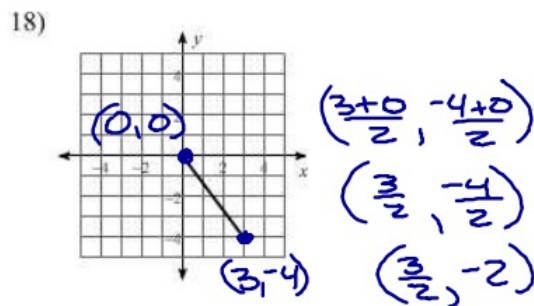
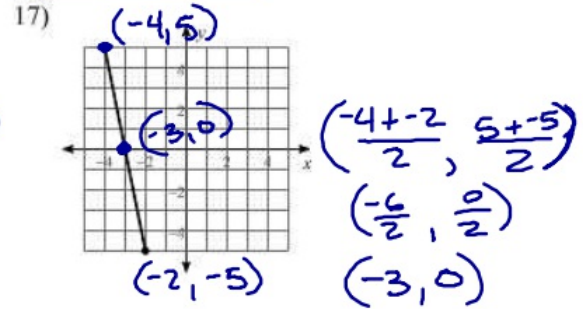
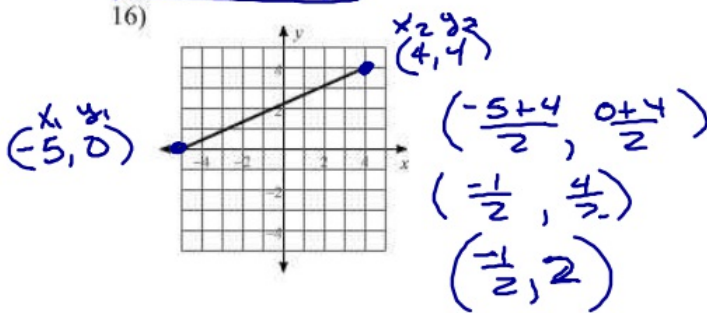
$$(-1, -\frac{5}{2})$$

15)  $(2, -8), (-8, -4)$   

$$\left( \frac{2 + (-8)}{2}, \frac{-8 + (-4)}{2} \right)$$
  

$$\left( \frac{-6}{2}, \frac{-12}{2} \right)$$
  

$$(-3, -6)$$



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

Find the other endpoint of the line segment with the given endpoint and midpoint.

20) Endpoint:  $(-2, 9)$ , midpoint:  $(5, 8)$   $(12, 7)$  21) Endpoint:  $(-5, 4)$ , midpoint:  $(-7, 10)$   $(-9, 16)$

$\left( \frac{-2 + x_2}{2} = 5, \frac{9 + y_2}{2} = 8 \right)$

$(-2 + x_2 = 10, 9 + y_2 = 16)$

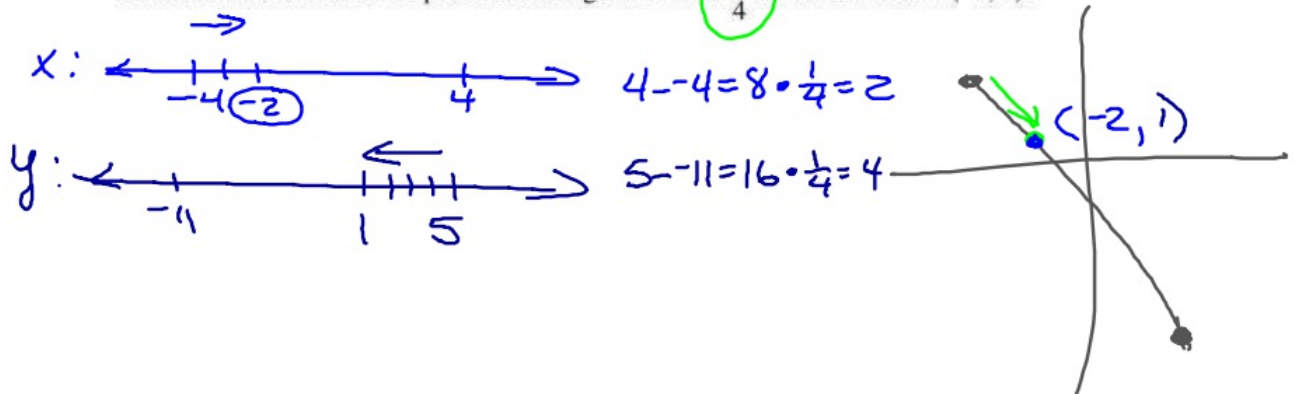
$(x_2 = 12, y_2 = 7)$

22) Endpoint:  $(4, 8)$ , midpoint:  $(2, 10)$   $(0, 12)$  23) Endpoint:  $(1, -10)$ , midpoint:  $(-4, -5)$   $(-9, 0)$

24) Endpoint:  $(1, 2)$ , midpoint:  $(0, -10)$   $(-1, -22)$  25) Endpoint:  $(9, 6)$ , midpoint:  $(-8, 1)$   $(-25, -16)$

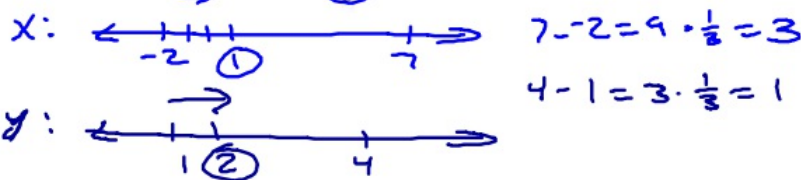
Sometimes we need to find a distance different than the midpoint on a line segment. So, how could we find a distance that is  $\frac{1}{4}$  or  $\frac{1}{3}$  or  $\frac{2}{5}$  the distance from one endpoint?

26) The endpoints of a line segment are  $(-4, 5)$  and  $(4, -11)$ . Find the coordinates of the point on the segment that is  $\frac{1}{4}$  the distance from  $(-4, 5)$ .



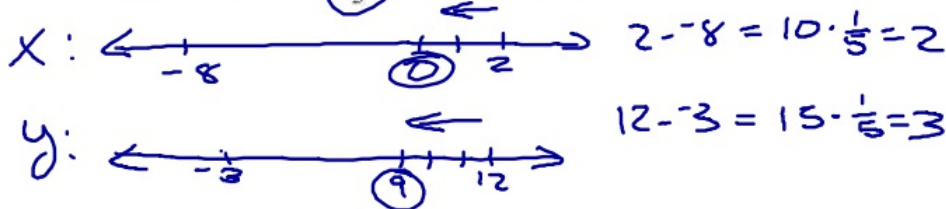
27) The endpoints of a line segment are  $(x_1, y_1)$  and  $(x_2, y_2)$ . (1, 2)

Find the point that is  $\frac{1}{3}$  the distance from  $(x_1, y_1)$ .



28) The endpoints of a line segment are  $(x_1, y_1)$  and  $(x_2, y_2)$ . (0, 9)

Find the point that is  $\frac{1}{5}$  the distance from  $(x_2, y_2)$ .



29) The endpoints of a line segment are  $(x_1, y_1)$  and  $(x_2, y_2)$ . (-10, 3)

Find the point that is  $\frac{1}{4}$  the distance from  $(x_1, y_1)$ .

