

# 11.1 Distance & Midpoint

Name: \_\_\_\_\_

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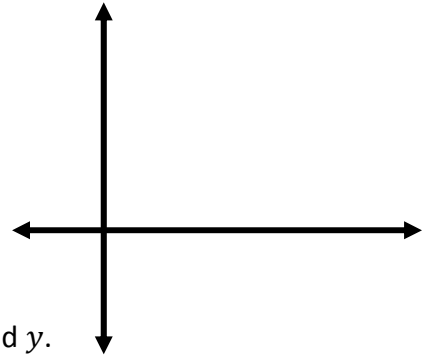
Write your questions and thoughts here!

## RECALL:

Pythagorean Theorem:

*Deriving the formula for distance:*

1. Plot two points and label them  $A$  and  $B$ .
2. Connect the two points with a segment.
3. Draw a right triangle by using the segment as the hypotenuse.
4. Label the legs  $a$  and  $b$  (across from the angles  $A$  and  $B$ ).
5. Write the distance  $a$  and  $b$  in terms of  $x$  and  $y$ .
6. Set up the Pythagorean Theorem and solve for the length of the segment.



## Distance Between Two Points

Given points  $(x_1, y_1)$  and  $(x_2, y_2)$ , the distance between them is:

$$d =$$

**Find the distance between the given points:**

1.  $(2, -2)$  and  $(-1, 4)$

2.  $(-3, -1)$  and  $(5, -4)$



## Midpoint Between Two Points

Given points  $(x_1, y_1)$  and  $(x_2, y_2)$ , the **midpoint** (middle) between them is:

$$M \left( \text{---}, \text{---} \right)$$

# 11.1 – Distance & Midpoint

Write your questions and thoughts here!



**Find the midpoint between the given points:**

3.  $(-3, 10)$  and  $(-5, 1)$

4.  $(3, -7)$  and  $(-7, 9)$

**Perpendicular Bisector:**

What is it?

## Steps for Finding the Perpendicular Bisector

- Step 1 • Find the midpoint of the segment.
- Step 2 • Calculate the slope ( $m$ ) of the original segment.
- Step 3 • Take the \_\_\_\_\_ ( ) to get the \_\_\_\_\_ of the perpendicular bisector.
- Step 4 • Use point-slope form:
- Step 5 • Solve for  $y$ .



**Find the equation of the line that is a perpendicular bisector between the given points:**

5.  $(-5, 6)$  and  $(1, 8)$

6.  $(1, 4)$  and  $(6, -6)$

## 11.1 Practice - Distance and Midpoint

Find the distance between each pair of points. Round your answer to the nearest tenth, if necessary.

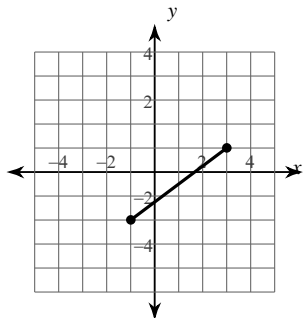
1)  $(13, 12), (1, -4)$

2)  $(6, 4), (-2, 6)$

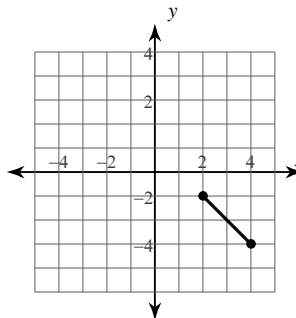
3)  $(9, -6), (-1, 1)$

4)  $(3, 13), (-4, 12)$

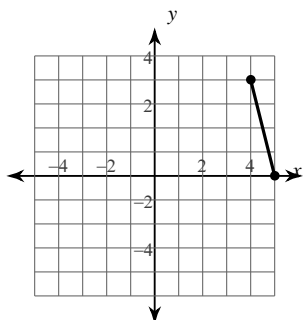
5)



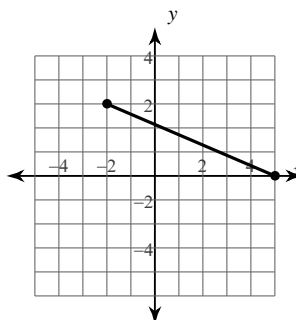
6)



7)



8)



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

9)  $(4, 2), (5, -7)$

10)  $(-3, -7), (-6, -5)$

11)  $(-6, -2), (-3, -5)$

12)  $(1, -3), (-1, -6)$

**Find the equation of the perpendicular bisector between the two given points.**

13)  $(0, 4), (-6, 6)$

14)  $(4, -6), (6, 0)$

15)  $(-2, 4), (-6, 2)$

16)  $(4, 3), (-4, -5)$

## Answers to 11.1 Practice - Distance and Midpoint

1) 20

2) 8.2

3) 12.2

4) 7.1

5) 5

6) 2.8

7) 4.1

8) 7.6

9)  $(4.5, -2.5)$

10)  $(-4.5, -6)$

11)  $(-4.5, -3.5)$

12)  $(0, -4.5)$

13)  $y = 3x + 14$

14)  $y = -\frac{1}{3} + 4$

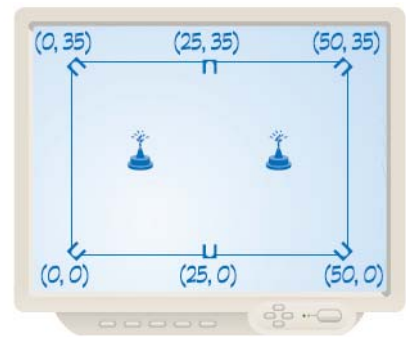
15)  $y = -2x - 5$

16)  $y = -x - 1$

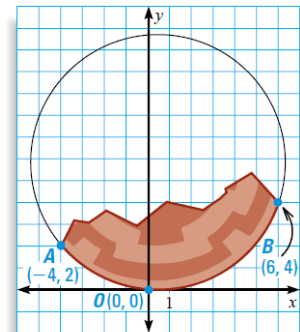
# 11.1 Application and Extension

- Find the **distance** between  $(23, -5)$  and  $(-17, 5)$ .
- If a segment's midpoint is  $(-7, 3)$  and one endpoint is  $(-13, -9)$ , find the other endpoint. (*Hint: set up an equation with your known values and variables for the unknown*).
- Adam's city planner has called and needs help designing a city park. The park will have six entrances and the planner wants two fountains located in the park so that they each fountain is equidistant from four of the six entrances. On the diagram to the right, each entrance is labeled with a coordinate point.

- Calculate the coordinate points of both fountains (show your work).
- What is the distance between the two fountains (show your work).



- Hagan was behind pace in his math class and as a punishment, his dad made him dig holes in his back yard and then fill them in. While digging one of these holes, Hagan found what appeared to be part of an ancient Roman dish. He wanted to calculate its original diameter, so he laid it out on a coordinate grid and marked three points along the edge of the dish (see picture to the right). Each unit in the coordinate plane represents 1 inch.)



These three points can be used to calculate where the center of the dish would be by using perpendicular bisectors (see picture to the right). Help Hagan determine the **diameter** of the dish.

