Unit 8, Lesson 11: Finding Distances in the Coordinate Plane

Let's find distances in the coordinate plane.

11.1: Closest Distance

1. Order the following pairs of coordinates from closest to farthest apart. Be prepared to explain your reasoning.
    a. $(2, 4)$ and $(2, 10)$

    b. $(-3, 6)$ and $(5, 6)$

    c. $(-12, -12)$ and $(-12, -1)$

    d. $(7, 0)$ and $(7, -9)$

    e. $(1, -10)$ and $(-4, -10)$

2. Name another pair of coordinates that would be closer together than the first pair on your list.

3. Name another pair of coordinates that would be farther apart than the last pair on your list.
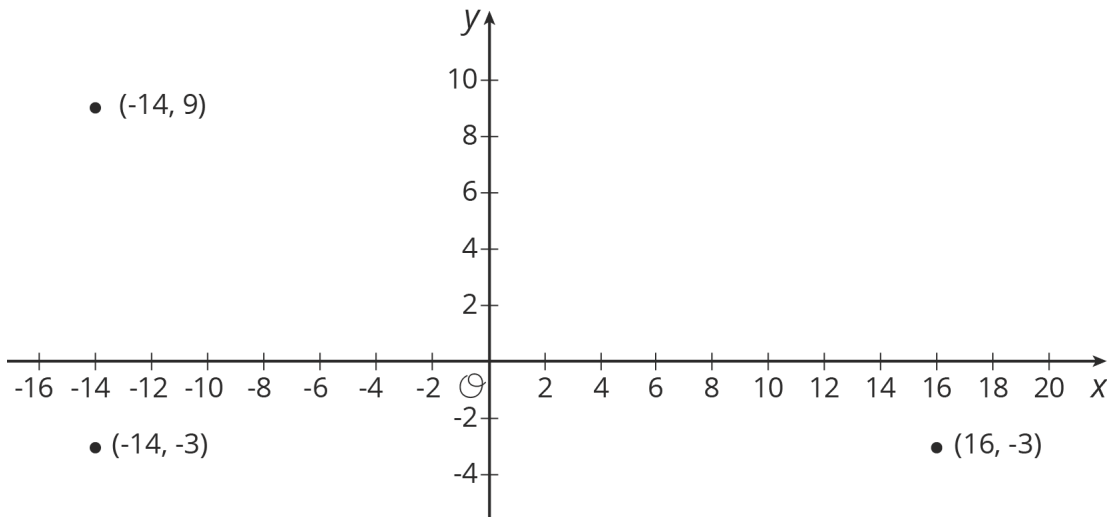
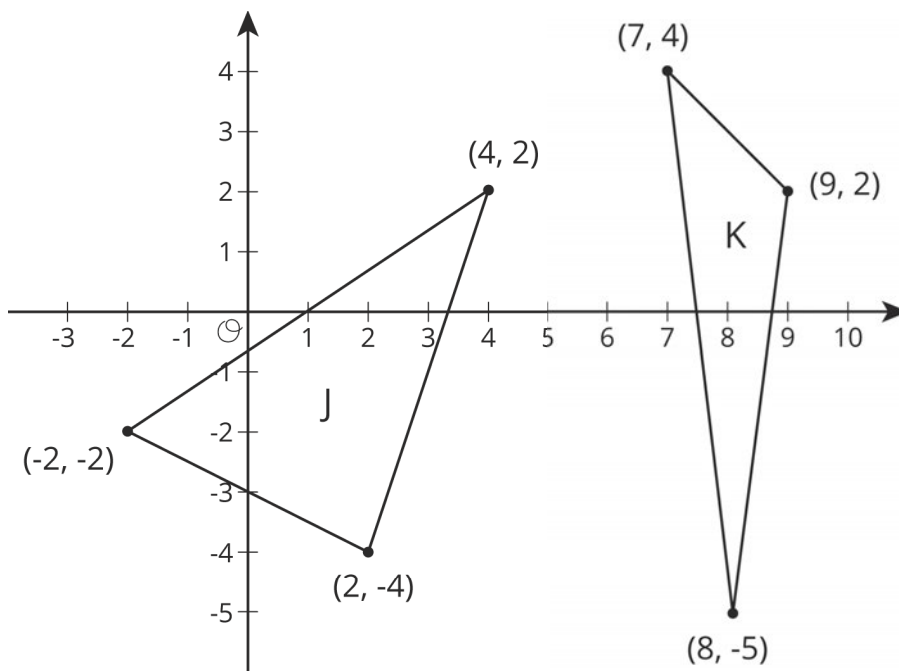NAME   DATE   PERIOD

11.2: How Far Apart?

Find the distances between the three points shown.

11.3: Perimeters with Pythagoras

1. Which figure do you think has the longer perimeter?

2. Select one figure and calculate its perimeter. Your partner will calculate the perimeter of the other. Were you correct about which figure had the longer perimeter?

Are you ready for more?

Quadrilateral $ABCD$ has vertices at $A = (\text{-}5, 1)$, $B = (\text{-}4, 4)$, $C = (2, 2)$, and $D = (1, \text{-}1)$.

1. Use the Pythagorean Theorem to find the lengths of sides AB, BC, CD, and AD.

2. Use the Pythagorean Theorem to find the lengths of the two diagonals, AC and BD.

3. Explain why quadrilateral $ABCD$ is a rectangle.

11.4: Finding the Right Distance

Have each person in your group select one of the sets of coordinate pairs shown here. Then calculate the length of the line segment between those two coordinates. Once the values are calculated, have each person in the group briefly share how they did their calculations.

- $(-3, 1)$ and $(5, 7)$

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

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

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

1. How does the value you found compare to the rest of your group?

2. In your own words, write an explanation to another student for how to find the distance between any two coordinate pairs.
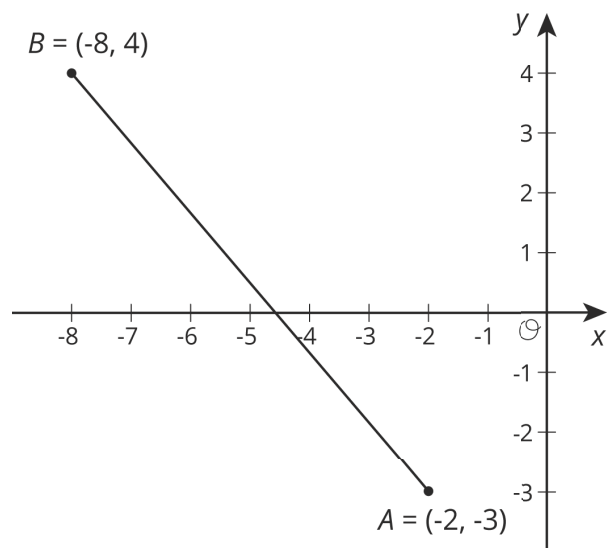
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Lesson 11 Summary

We can use the Pythagorean Theorem to find the distance between any two points on the coordinate plane. For example, if the coordinates of point A are (-2, -3), and the coordinates of point B are (-8, 4), let's find the distance between them. This distance is also the length of line segment AB. It is a good idea to plot the points first.

Think of the distance between A and B, or the length of segment AB, as the hypotenuse of a right triangle. The lengths of the legs can be deduced from the coordinates of the points.
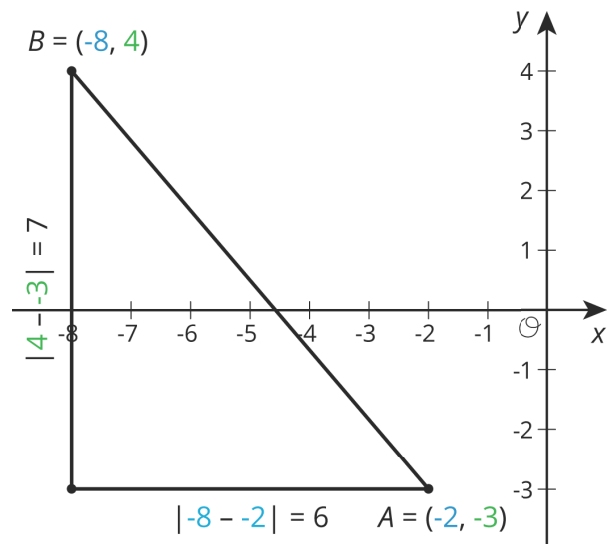
The length of the horizontal leg is 6, which can be seen in the diagram, but it is also the distance between the x-coordinates of A and B since $|-8 - -2| = 6$. The length of the vertical leg is 7, which can be seen in the diagram, but this is also the distance between the y-coordinates of A and B since $|4 - -3| = 7$.

Once the lengths of the legs are known, we use the Pythagorean Theorem to find the length of the hypotenuse, AB, which we can represent with c. Since c is a positive number, there is only one value it can take:

$$6^2 + 7^2 = c^2$$
$$36 + 49 = c^2$$
$$85 = c^2$$
$$\sqrt{85} = c$$

This length is a little longer than 9, since 85 is a little longer than 81. Using a calculator gives a more precise answer, $\sqrt{85} \approx 9.22$.
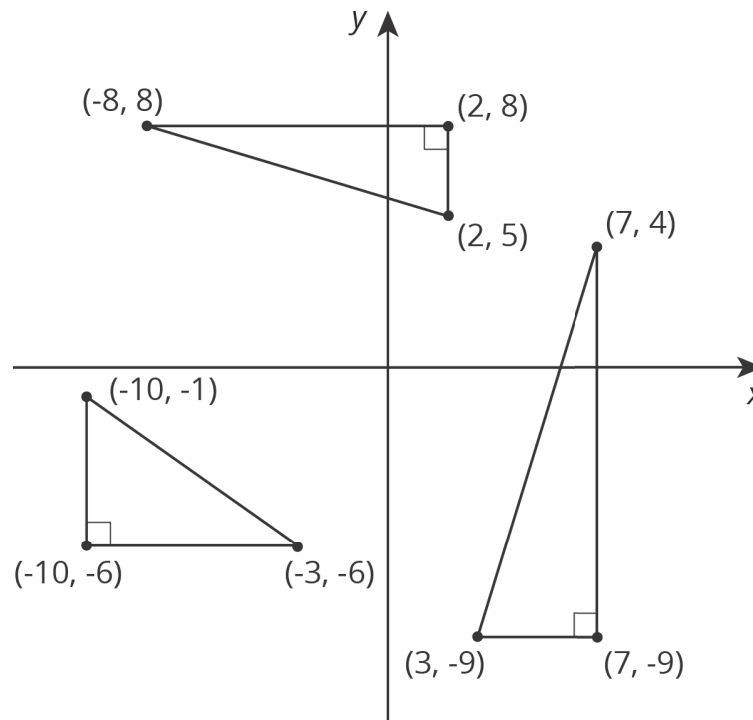
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Unit 8, Lesson 11: Finding Distances in the Coordinate Plane

1. The right triangles are drawn in the coordinate plane, and the coordinates of their vertices are labeled. For each right triangle, label each leg with its length.

2. Find the distance between each pair of points. If you get stuck, try plotting the points on graph paper.

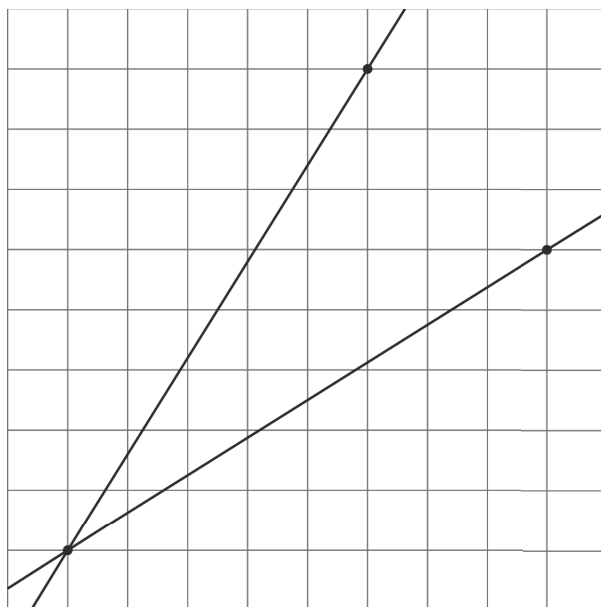a. $M = (0, -11)$ and $P = (0, 2)$

b. $A = (0, 0)$ and $B = (-3, -4)$

c. $C = (8, 0)$ and $D = (0, -6)$

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Which line has a slope of 0.625, and which line has a slope of 1.6? Explain why the slopes of these lines are 0.625 and 1.6.
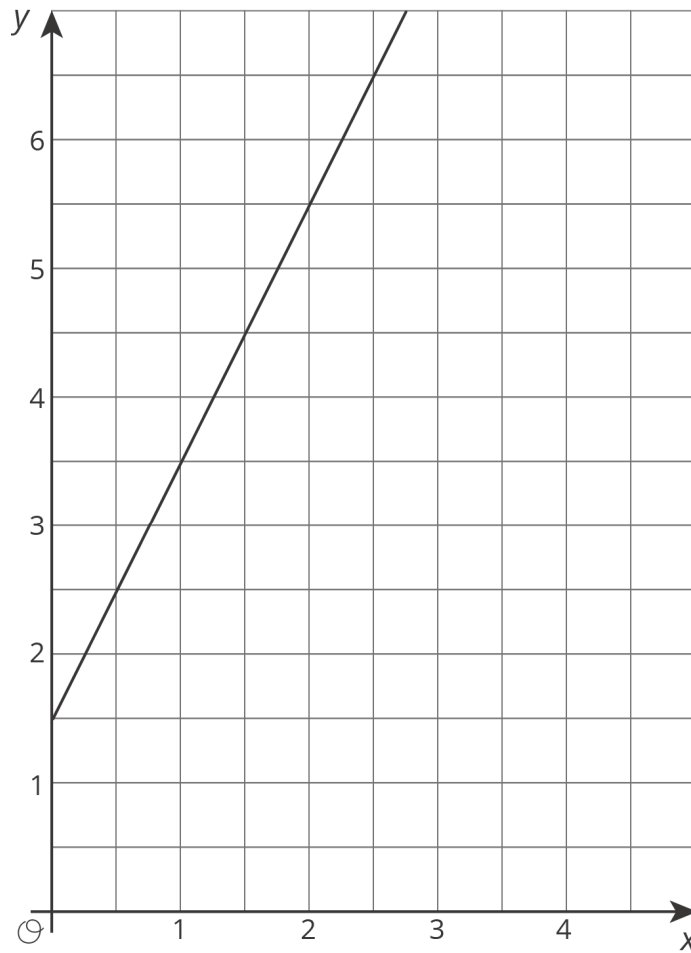

3.   (from Unit 2, Lesson 10)

   4. Write an equation for the graph.

(from Unit 3, Lesson 7)