Mountain Biking Evan was biking on a trail. A map of the trail is shown. His brother timed his ride from point *A* to point *B*.

B(7, 9.5)

A(3, 4)

C(7, 4)

hypotenuse

legs

5.5

4

Race ya!

1. What do the blue and red lines on the graph represent?

_____

_____

_____

2. What type of triangle is formed by the lines?

Right △

3. How can you find the length of $\overline{AC}$ and $\overline{BC}$ without counting the number of units?
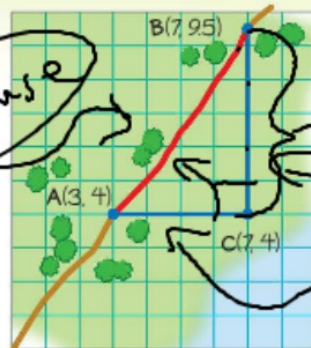
   Sample answer: subtract the *x*-coordinates

   and subtract the *y*-coordinates

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

4. What are the lengths of the two blue lines?

   $AC =$ [4] units $BC =$ [5.5] units

5. Write an equation using the Pythagorean Theorem that you can use to find the length of $\overline{AB}$.

   $4^2 + 5.5^2 = c^2$

a. _____ **3.2**

a. _____

Got It? Do this problem to find out.
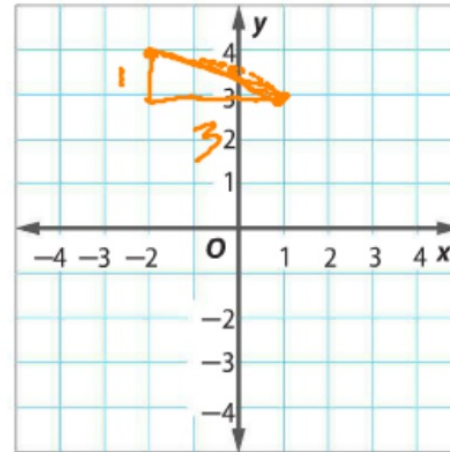
a. $(1, 3), (-2, 4)$

$1^2 + 3^2 = c^2$

$10 = c^2$

$c = \sqrt{10}$

necessary.

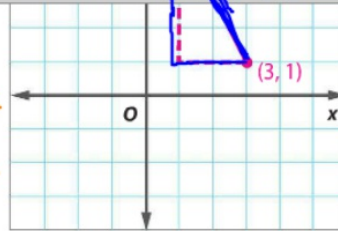$(d)^2 = \left(\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}\right)^2$ Distance Formula

$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

hyp

leg

leg

4.5 units

(3, 1)

O   x

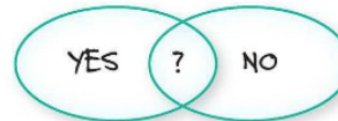$x_2 - x_1 = .5 - 2.5 = -2$

$x_2 - y_1 = 4 - 3.5 = .5$

x_1, y_1

2. On a park map, the ranger station is located at (2.5, 3.5) and the nature center is located at (0.5, 4). Each unit in the map is equal to 0.5 mile. What is the approximate distance between the ranger station and the nature center? (Examples 2 and 3) **1.0 mi**

legs²   legs²

$(x_2 - x_1)^2 + (y_2 - y_1)^2$

a^2 b^2

$(-2)^2 + (.5)^2$

$y_2 + .25$

$x_2 = 4.25$

$c = \sqrt{4.25 \cdot 25}$

≈ 2.06

$(2) \times .5$

hypotenuse

3. ⓔ **Building on the Essential Question** How can you use the Pythagorean Theorem to find the distance between two points on the coordinate plane?

Sample answer: After you plot the points, draw a right triangle. Use the Pythagorean Theorem to find the length of the hypotenuse which is the distance between the two points.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

YES   ?   NO

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Student Review : Off ● On

1. Graph the ordered pairs (1, 5) and (3, 1). Then find the distance between the points. Round to the nearest tenth if necessary. (Example 1)

   4.5 units
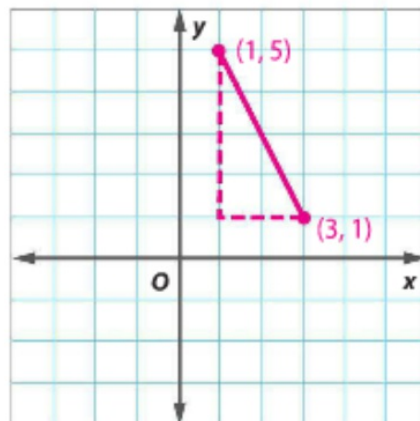
2. On a park map, the ranger station is located at (2.5, 3.5) and the nature center is located at (0.5, 4). Each unit in the map is equal to 0.5 mile. What is the approximate distance between the ranger station and the nature center? (Examples 2 and 3) **1.0 mi**

3. **(e)** **Building on the Essential Question** How can you use the Pythagorean Theorem to find the distance between two points on the coordinate plane?

   Sample answer: After you plot the points, draw a right triangle. Use the Pythagorean Theorem to find the length of the hypotenuse which is the distance between the two points.
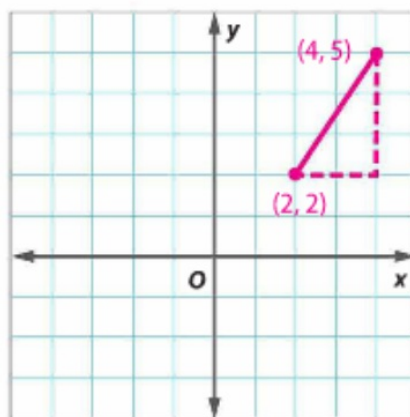
Rate Yourself!

Are you ready to
Shade the sectio

YES   ?

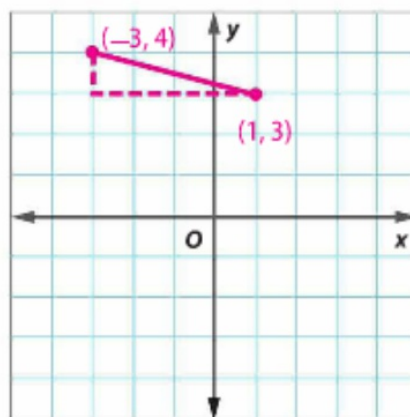**For more help, go o**
access a Personal Tu

Graph each pair of ordered pairs. Then find the distance between the points. Round to the nearest tenth if necessary. (Example 1)

1. (4, 5), (2, 2) **3.6 units**

2. (−3, 4), (1, 3) **4.1 units**

3 (2.5, −1), (−3.5, −5)

7.2 units
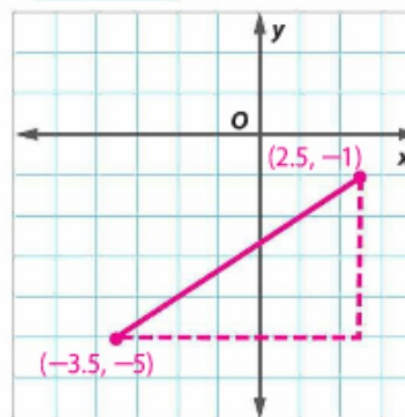
Show your work.

4. A ferry sets sail from an island located at (4, 12) on a map. Its destination is Ferry Landing B at (6, 2). How far will the ferry travel if each unit on the grid is 0.5 mile? (Example 2) **about 5.1 mi**

4. A ferry sets sail from an island located at (4, 12) on a map. Its destination is Ferry Landing *B* at (6, 2). How far will the ferry travel if each unit on the grid is 0.5 mile? (Example 2) **about 5.1 mi**

Use the Distance Formula to find the distance between each pair of points. Round to the nearest tenth if necessary. (Example 3)

5 $C(-5, -3), D(-4, -2)$

1.4 units

6. $Y(3.5, 1), Z(-4, 2.5)$

7.6 units

7. $K\left(8\frac{1}{2}, 12\right), L\left(-6\frac{3}{4}, 7\frac{1}{2}\right)$

15.9 units

8. Chicago, Illinois, has a longitude of 88°W and a latitude of 42°N. Indianapolis, Indiana, is located at 86°W and 40°N. At this longitude/latitude, each degree is about 53 miles. Find the distance between Chicago and Indianapolis. **about 150 mi**

88° W   86° W

Chicago, IL   42° N

?

Indianapolis, IN   40° N

9. CCSS **Multiple Representations** Points $A(-2, 1)$, $B(-2, 6)$, and $C(1, 3)$ are the vertices of a triangle.

a. **Graphs** Graph the points $A(-2, 1)$, $B(-2, 6)$ and $C(1, 3)$.

b. **Words** Explain how to find the length of segment BC.

Sample answer: Use the Distance Formula and the points

$(-2, 6)$ and $(1, 3)$.

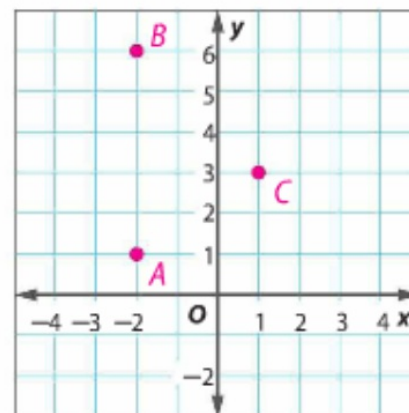c. **Numbers** Find the length of each side of $\triangle ABC$. Round to the nearest tenth if necessary.

$AC \approx$ **3.6 units**

$AB =$ **5 units**

$BC \approx$ **4.2 units**

d. **Numbers** What is the perimeter of $\triangle ABC$? Use the values from part c.

perimeter $=$ **12.8 units**

10. **CCSS** **Use Math Tools** Layla needs to find the distance between the points $A(-2.4, 3.7)$ and $B(4.5, -1.4)$. Suggest a tool she could use to find the length. Then find the length. Explain your reasoning.

    Sample answer: Calculator; it will be most helpful when squaring and finding the square root involving decimals; about 8.6 units.

11. **CCSS** **Persevere with Problems** Apply what you have learned about distance on the coordinate plane to write the coordinates of two possible endpoints of a line segment that is neither horizontal nor vertical and has a length of 5 units.

    Sample answer: (1, 2) and (4, 6)

12. **CCSS** **Reason Inductively** Compare the steps to find the distance between two points on the coordinate plane by first using the Pythagorean Theorem and then using the Distance Formula.

    Sample answer: To use the Pythagorean Theorem, connect the points to form a right triangle. Then use the Pythagorean Theorem to find the length of the hypotenuse. To use the Distance Formula, replace (x_1, y_1) and (x_2, y_2) in the formula with the coordinates of the two endpoints and simplify.