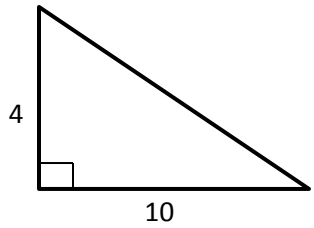
Geometry (G.GPE.B.4) Name: _____

Unit One B: Distance & Midpoint - Coordinate Plane (IC33) Date: _____ Period: _____

Finding Distances: Solve for the missing side of the triangles below.

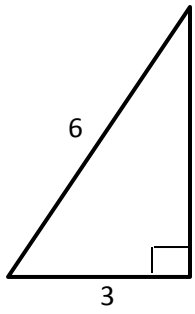
Pythagorean Thm
$a^2 + b^2 = c^2$

1.



$4^2 + 10^2 = c^2$
$16 + 100 = c^2$
$116 = c^2$
$\sqrt{116} = \sqrt{c^2}$
$c = 2\sqrt{29}$

2.



$3^2 + x^2 = 6^2$
$9 + x^2 = 36$
$x^2 = 27$
$x = \sqrt{27}$
$x = 3\sqrt{3}$

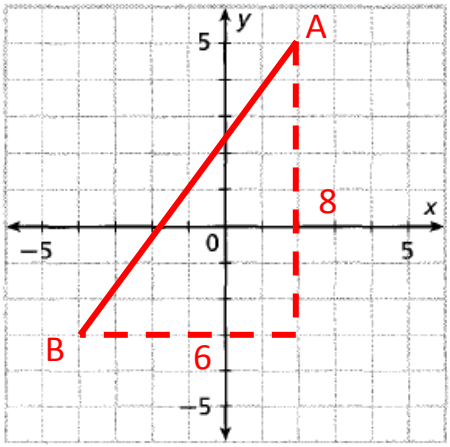
116
2 58
2 29

You can use the Pythagorean Theorem to help you find the distance between the points $A(2, 5)$ and $B(-4, -3)$.

A Plot the points A and B in the coordinate plane at right.

B Draw $\overline{AB}$.

C Draw a vertical line through point A and a horizontal line through point B to create a right triangle. Label the intersection of the vertical line and the horizontal line as point C.



D Each small grid square is 1 unit by 1 unit. Use this fact to find the lengths AC and BC.

$AC =$ 8 $BC =$ 6

E By the Pythagorean Theorem, $AB^2 = AC^2 + BC^2$. Complete the following using the lengths from Step D.

$AB^2 =$ $8^2 + 6^2$

$AB^2 = 64 + 36$

$AB^2 = 100$

AB = 10

REFLECT

1a. Explain how you solved for AB in Step F.

Solved using the Pythagorean Thm.

1b. Can you use the above method to find the distance between any two points in the coordinate plane? Explain.

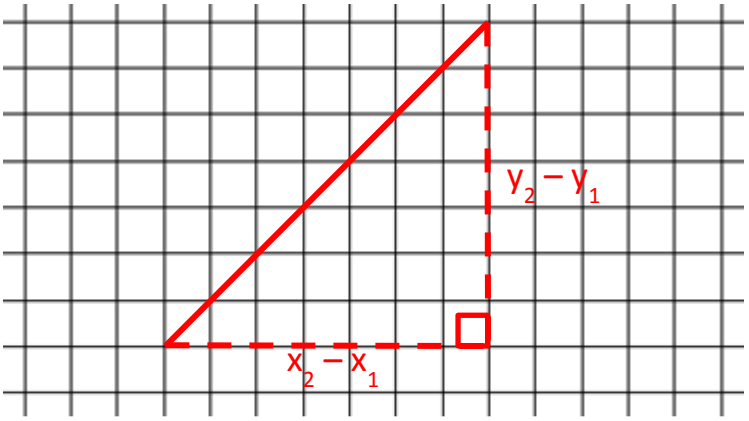
Yes→ you can always draw a vertical and horizontal lines to make a right triangle.

Given: A(x_1, y_1), B(x_2, y_2)

Find: The distance between A and B repeating the process above realizing that the only change is that both ordered pairs are unknown/variables.

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

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



Distance Formula:

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

Processing:

1. Find the distance between (8, -4) and (2, 2).

2.

$$d = \sqrt{(2-8)^2 + (2-(-4))^2}$$

$$d = \sqrt{36 + 36} = \sqrt{72} = \sqrt{36 * 2}$$

$$d = 6\sqrt{2}$$

2. Find the distance between (-1, 2) and (-4, 6).

$$d = \sqrt{(-4-(-1))^2 + (6-2)^2}$$

$$d = \sqrt{9 + 16} = \sqrt{25}$$

$$d = 5$$

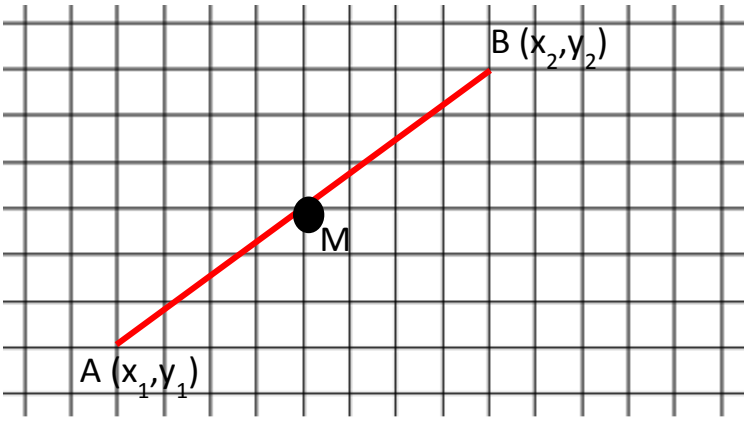
Finding Midpoints:

Given A(x_1, y_1), B(x_2, y_2)

Find: The midpoint of $\overline{AB}$.

$$M_{x-coor} = \frac{x_1 + x_2}{2}$$

$$M_{y-coor} = \frac{y_1 + y_2}{2}$$



Midpoint Formula: $$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Note: The result of this formula is **NOT** a distance or length – it is a **POINT**. *Needs both x and y parts