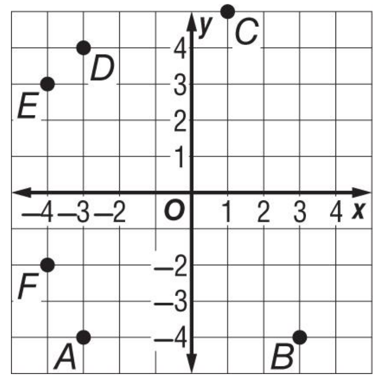
Name: ____ Date: ______________________

Distances on the Coordinate Plane



<u>Warm-up:</u> Find the following distances between the two points.

1) A and B **2) A and D**

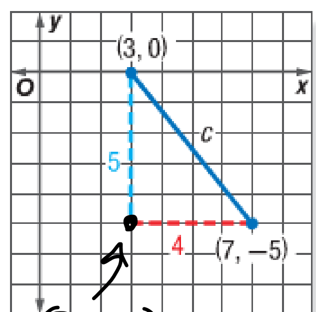
How would you find the distance without the coordinate grid?

Find Distance on the Coordinate Plane

You can use the Pythagorean Theorem to find the distance between two points on the coordinate plane.

Example

1. **Graph the ordered pairs (3, 0) and (7, –5). Then find the distance *c* between the two points. Round to the nearest tenth.**



(3,-5)

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

$5^2+4^2=c^2$

$25+16=c^2$

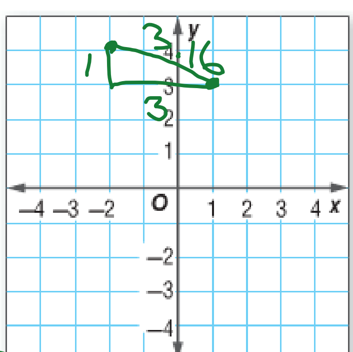
$41=c^2$

$\sqrt{41}=c$

$c \approx 6.4$ units

Got It? Do this problem to find out.

a. (1, 3), (–2, 4)



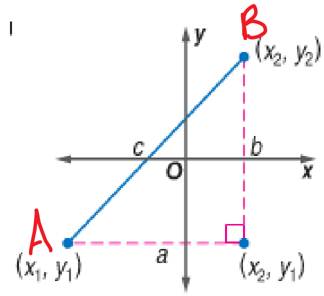
$1^2+3^2=c^2$

$1+9=c^2$

$\sqrt{10}=3.16$

$c=3.2$

Suppose the coordinates of point A are (x_1, y_1) and the coordinates of point B are (x_2, y_2).



A. Fill in the blanks below to show how you can use these coordinates to find a and b.

$a = |x_2 - x_1|$ $\qquad$ $b = |y_2 - y_1|$

The Pythagorean Theorem can also be written $c^2 = a^2 + b^2$. Substitute the values you found for a and b above into this equation to write an expression for c^2 in terms of x_1, y_1, x_2, and y_2.

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

Now write this equation in terms of c, the hypotenuse, or the distance between the two points. Ladies and gentleman, you have just written the **distance formula**!

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

Let's try it out! Find the distance between (-6, -5) and (-1, 4) on the coordinate plane.

(x_1, y_1) $\quad$ (x_2, y_2)

$$d = \sqrt{(-1 + (+6))^2 + (4 + (+5))^2}$$

$$d = \sqrt{(5)^2 + (9)^2}$$

$$d = \sqrt{25 + 81} = \sqrt{106}$$

$$\boxed{d \approx 10.3 \text{ units}}$$

Now you try! Use the distance formula to find the distance between each pair of points. Round to the nearest hundredth if necessary.

A. (–7, 9) and (3, –5)

$d = \sqrt{(3 - -7)^2 + (-5 - 9)^2}$

$d = \sqrt{100 + 196}$

$d = \sqrt{296}$

$d \approx 17.20$

B. (12, –8) and (–4, 1)

$d = \sqrt{(-4 - 12)^2 + (1 - -8)^2}$

$d = \sqrt{256 + 81}$

$d = \sqrt{337}$

$d \approx 18.36$

C. (–7, 5) and (–1, 16)

$d = \sqrt{(-1 - -7)^2 + (16 - 5)^2}$

$d = \sqrt{36 + 121}$

$d = \sqrt{157}$

$d \approx 12.53$