Warm-up

Find the midpoint of a segment going from (24,3) to (27,33)

Objectives

Use the Distance to find the distance between two points.

Distance Formula:

The distance between two points $(x_1, y_1), (x_2, y_2)$ can be found using the formula:

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

Steps:

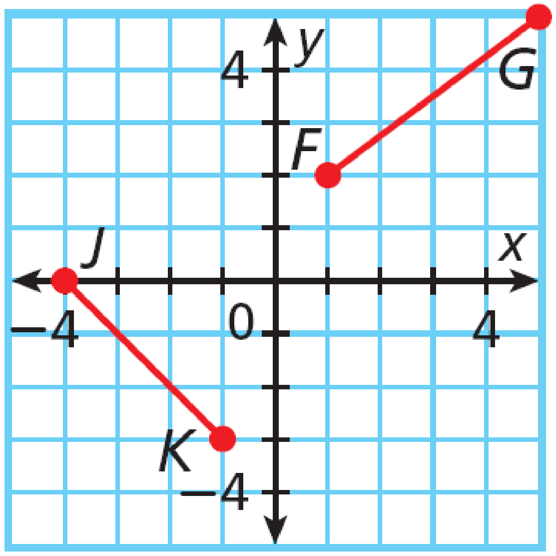
1. Label the points $(x_1, y_1), (x_2, y_2)$
2. Write the formula
3. Plug the points into the formula
4. Simplify

Example 3: Using the Distance Formula

Find *JK*.

Step 1 Find the coordinates of each point.

F(1, 2), *G*(5, 5), *J*(–4, 0), *K*(–1, –3)



Example 3 Continued

Step 2 Use the Distance Formula.

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

$$JK = \sqrt{[(-1 - (-4))]^2 + (-3 - 0)^2}$$

$$= \sqrt{3^2 + (-3)^2}$$

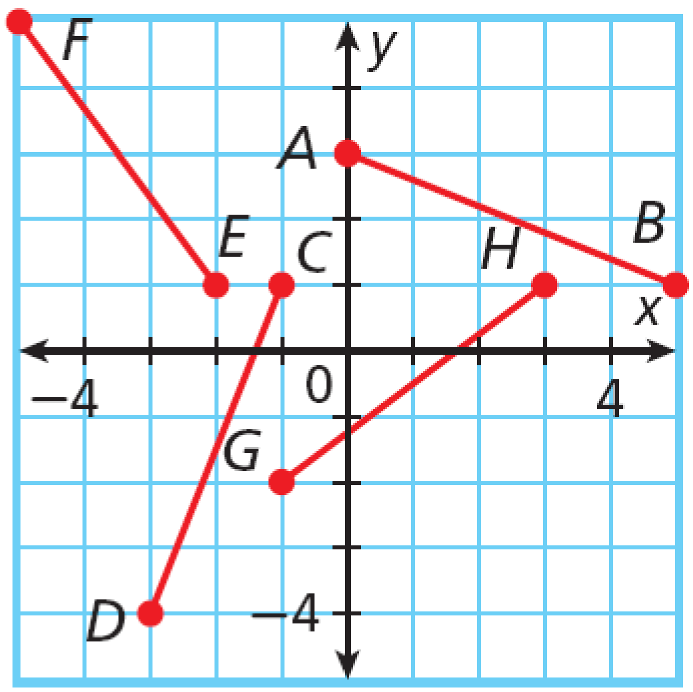
$$= \sqrt{18} = 3\sqrt{2}$$

Check It Out! Example 3

Find *EF* and *GH*. Then determine if $\overline{EF} \cong \overline{GH}$.

Step 1 Find the coordinates of each point.

E(–2, 1), *F*(–5, 5), *G*(–1, –2), *H*(3, 1)



Check It Out! Example 3 Continued

Step 2 Use the Distance Formula.

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

$$EF = \sqrt{[-5 - (-2)]^2 + (5 - 1)^2}$$

$$= \sqrt{(-3)^2 + 4^2}$$

$$= \sqrt{25} = 5$$

$$GH = \sqrt{[3 - (-1)]^2 + [1 - (-2)]^2}$$

$$= \sqrt{4^2 + 3^2}$$

$$= \sqrt{25} = 5$$

Since $EF = GH$, $\overline{EF} \cong \overline{GH}$.

In a right triangle, the two sides that form the right angle are the **legs**.

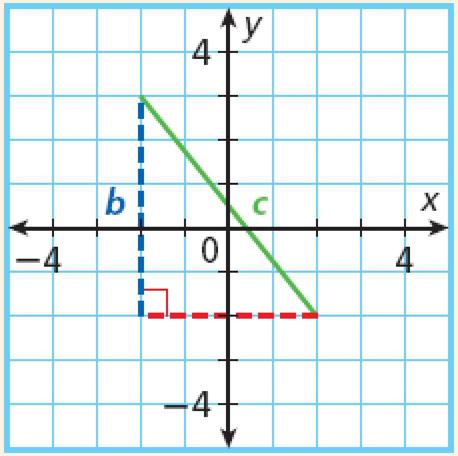
The side across from the right angle that stretches from one leg to the other is the **hypotenuse**.

In the diagram, ***a*** and ***b*** are the lengths of the shorter sides, or legs, of the right triangle. The longest side is called the hypotenuse and has length ***c***.

Theorem 1-6-1 Pythagorean Theorem

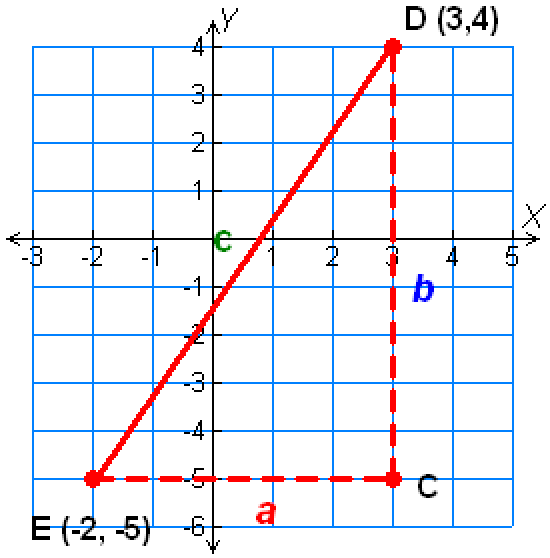
In a right triangle, the sum of the squares of the lengths of the *legs* is equal to the square of the length of the *hypotenuse*.

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



Example 4: Finding Distances in the Coordinate Plane

Use the Distance Formula and the Pythagorean Theorem to find the distance, to the nearest tenth, from *D*(3, 4) to *E*(–2, –5).



Example 4 Continued

Method 1

Use the Distance Formula. Substitute the values for the coordinates of ***D*** and ***E*** into the Distance Formula.

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

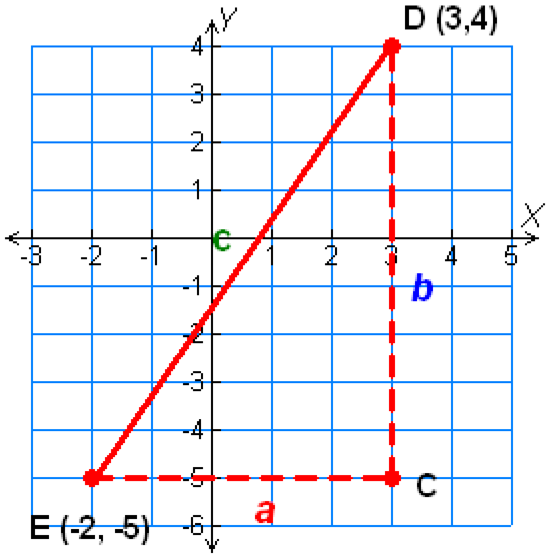
$$= \sqrt{[(-2) - 3]^2 + [(-5) - 4]^2}$$

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

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

$$= \sqrt{106}$$

$$\approx 10.3$$



Example 4 Continued

Method 2

Use the Pythagorean Theorem. Count the units for sides ***a*** and ***b***.

$a = 5$ and $b = 9$.

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

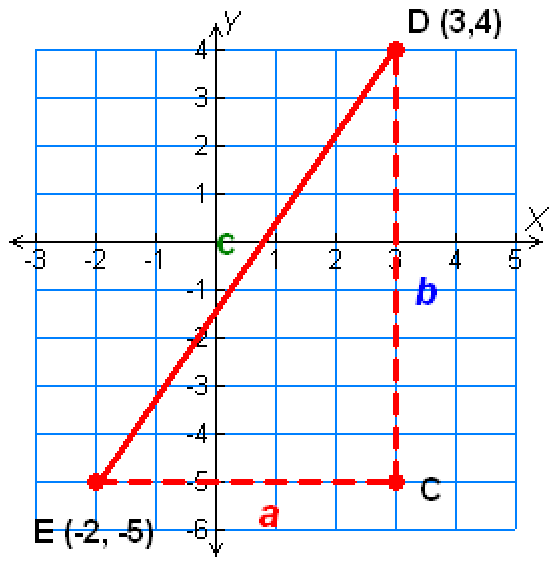
$= 5^2 + 9^2$

$= 25 + 81$

$= 106$

$c = \sqrt{106}$

$c = 10.3$



Check It Out! Example 4a

Use the Distance Formula and the Pythagorean Theorem to find the distance, to the nearest tenth, from *R* to *S*.

***R*(3, 2) and *S*(–3, –1)**

Method 1

Use the Distance Formula. Substitute the values for the coordinates of ***R*** and ***S*** into the Distance Formula.

Check It Out! Example 4a Continued

Use the Distance Formula and the Pythagorean Theorem to find the distance, to the nearest tenth, from *R* to *S*.

***R*(3, 2) and *S*(–3, –1)**

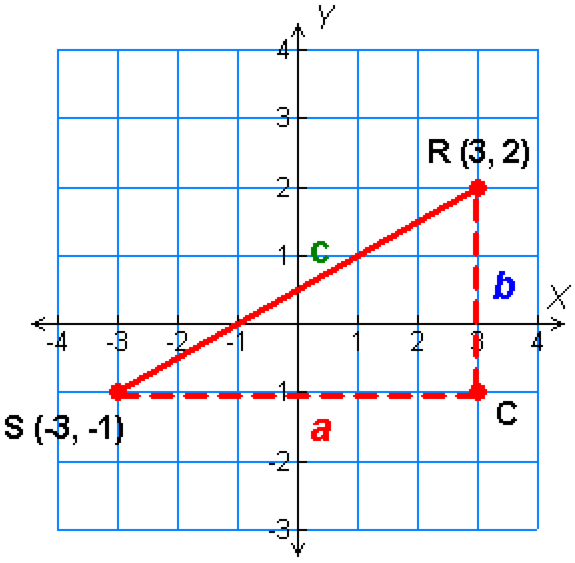
$$RS = \sqrt{(-3-3)^2 + (-1-2)^2}$$

$$= \sqrt{(-6)^2 + (-3)^2}$$

$$= \sqrt{45}$$

$$= 3\sqrt{5}$$

$$\approx 6.7$$



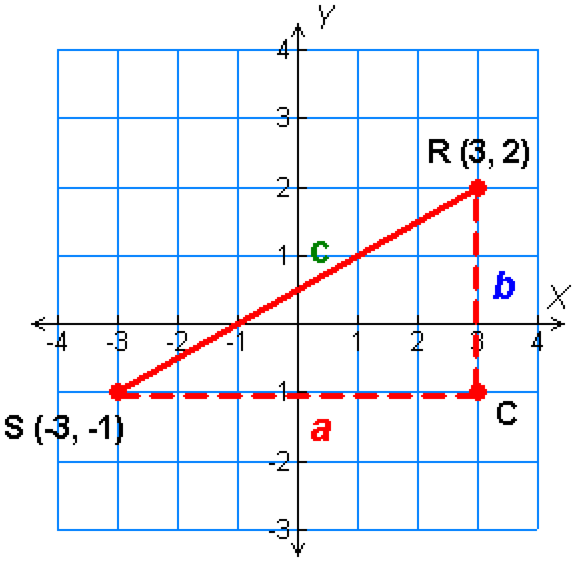
Check It Out! Example 4a Continued

Method 2

Use the Pythagorean Theorem. Count the units for sides ***a*** and ***b***.

$a = 6$ and $b = 3$.

$$c^2 = a^2 + b^2$$
$$= 6^2 + 3^2$$
$$= 36 + 9$$
$$= 45$$
$$c = \sqrt{45}$$
$$c \approx 6.7$$



Check It Out! Example 4b

Use the Distance Formula and the Pythagorean Theorem to find the distance, to the nearest tenth, from *R* to *S*.

***R*(–4, 5) and *S*(2, –1)**

Method 1

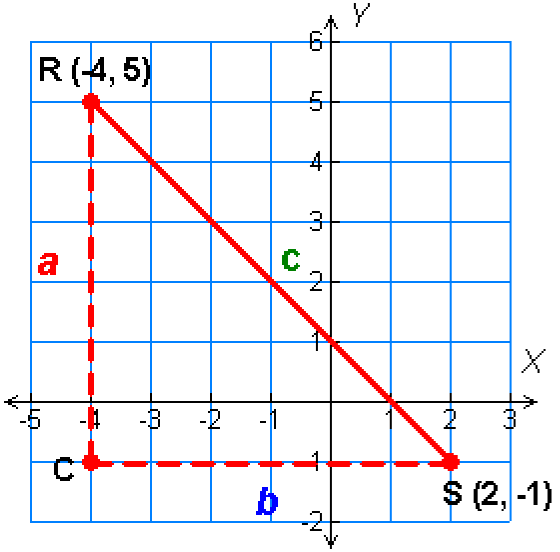
Use the Distance Formula. Substitute the values for the coordinates of ***R*** and ***S*** into the Distance Formula.

Check It Out! Example 4b Continued

Use the Distance Formula and the Pythagorean Theorem to find the distance, to the nearest tenth, from *R* to *S*.

***R*(–4, 5) and *S*(2, –1)**

$$RS = \sqrt{[2-(-4)]^2 + (-1-5)^2}$$
$$= \sqrt{6^2 + (-6)^2}$$
$$= \sqrt{72}$$
$$= 6\sqrt{2}$$
$$\approx 8.5$$



Check It Out! Example 4b Continued

Method 2

Use the Pythagorean Theorem. Count the units for sides ***a*** and ***b***.

$a = 6$ and $b = 6$.

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

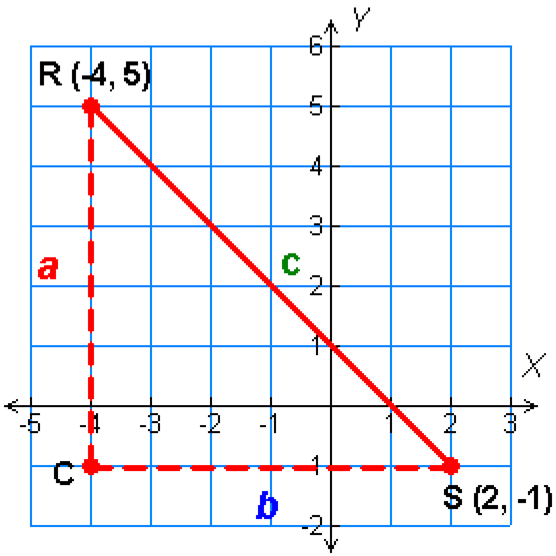
$= 6^2 + 6^2$

$= 36 + 36$

$= 72$

$c = \sqrt{72}$

$c \approx 8.5$



In-Class Work

Page 47 #6, 7, 16, 17