12.3 Distance Between Two Points

Common Core Standards

8.G.8

Apply the Pythagorean Theorem to find the distance between two points in a coordinate system,

Tell whether each triangle with the given side lengths is a right triangle.

1. 36 cm, 48 cm, 60 cm Right

$36^2 + 48^2 = 60^2$

$1296 + 2304 = 3600$

$3600 = 3600$ ✓

2. 12 ft, 35 ft, 37 ft Right

$12^2 + 35^2 = 37^2$

$144 + 1225 = 1369$

$1369 = 1369$ ✓

3. 60.5 ft, 63 ft, 87.5 ft Not a right triangle

$60.5^2 + 63^2 = 87.5^2$

$3660.25 + 3969 = 7656.25$

$7629.25 \neq 7656.25$

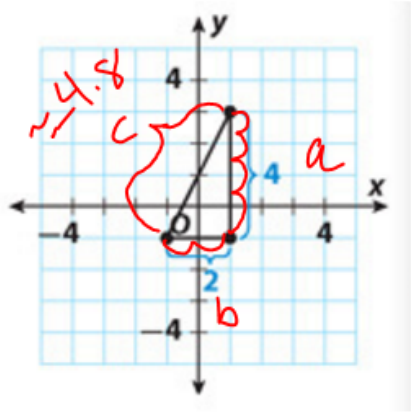
12.3 Distance Between Two Points

Common Core Standards

8.G.8

Apply the Pythagorean Theorem to find the distance between two points in a coordinate system,

The figure shows a right triangle. Approximate the length of the hypotenuse to the nearest tenth using a calculator.



STEP 1 Find the length of each leg.

The length of the vertical leg is 4 units.

The length of the horizontal leg is 2 units.

STEP 2 Let $a = 4$ and $b = 2$. Let c represent the length of the hypotenuse. Use the Pythagorean Theorem to find c.

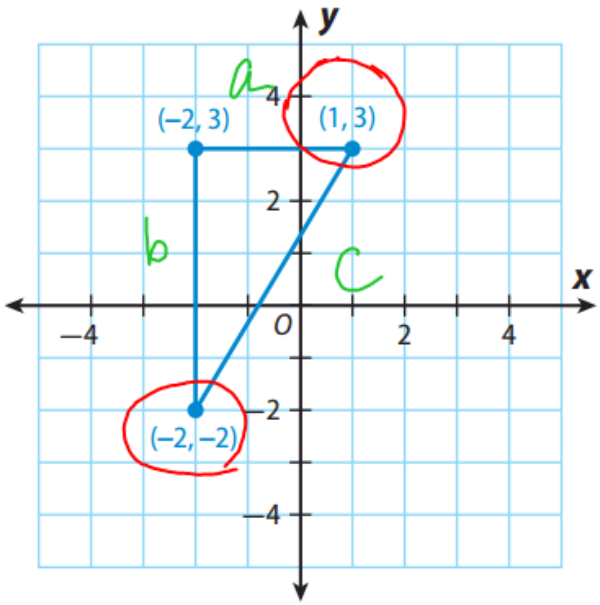
$$4^2 + 2^2 = c^2$$

$$16 + 4 = c^2$$

$$\sqrt{20} = \sqrt{c^2}$$

$$4.8 \approx c$$

The figure shows a right triangle. Approximate the length of the hypotenuse to the nearest tenth using a calculator.



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

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

$= \sqrt{3^2 + 5^2}$

$= \sqrt{9 + 25}$

$= \sqrt{34}$ $\quad d \approx 5.8$

$3^2 + 5^2 = c^2$

$9 + 25 = c^2$

$\sqrt{34} = \sqrt{c^2}$ ★

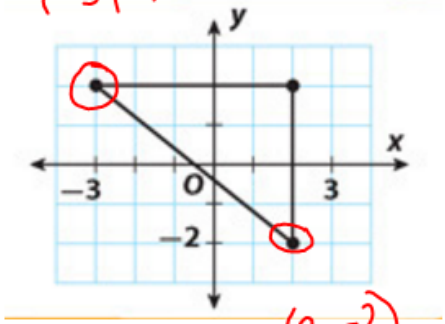
$5.8 \approx c$

The Distance Formula

In a coordinate plane, the distance d between 2 points (x_1, y_1) and (x_2, y_2) is

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

1. Approximate the length of the hypotenuse to the nearest tenth using a calculator.



$x_2\ y_2$

$(-3, 2)$

$(2, -2)$

$x_1\ y_1$

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

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

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

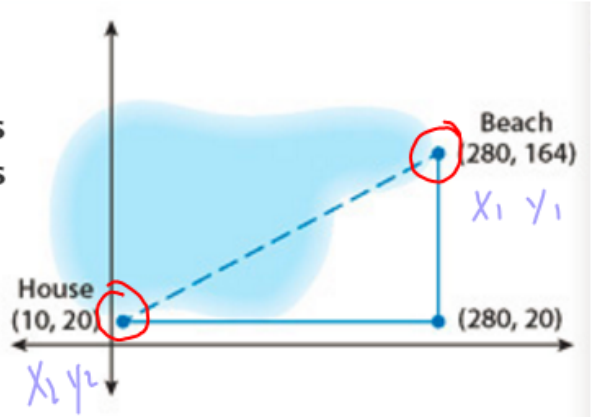
$$= \sqrt{25 + 16}$$

$$= \sqrt{41}$$

$$d \approx 6.4$$

Francesca wants to find the distance between her house on one side of a lake and the beach on the other side. She marks off a third point forming a right triangle, as shown. The distances in the diagram are measured in meters.

Use the Pythagorean Theorem to find the straight-line distance from Francesca's house to the beach.



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

$$= \sqrt{(10-280)^2+(20-164)^2}$$

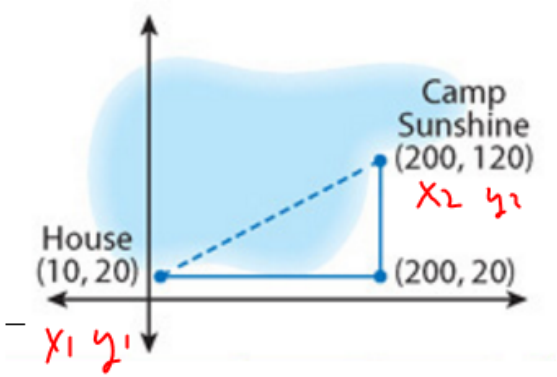
$$= \sqrt{(-270)^2+(-144)^2}$$

$$= \sqrt{72900+20736}$$

$$= \sqrt{93636}$$

$$d = 306 \text{ m}$$

4. Camp Sunshine is also on the lake. Use the Pythagorean Theorem to find the distance between Francesca's house and Camp Sunshine to the nearest tenth of a meter.



x_2 y_2

x_1 y_1

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

$$= \sqrt{(200 - 10)^2 + (120 - 20)^2}$$

$$= \sqrt{190^2 + 100^2}$$

$$= \sqrt{36100 + 10000}$$

$$= \sqrt{46100}$$

$$= 214.7 \text{ meters}$$

GP 1-3 p390

IP 5-8 p391

#8 - Find distance 3 times