Lesson 7.5:

Using the Pythagorean Theorem

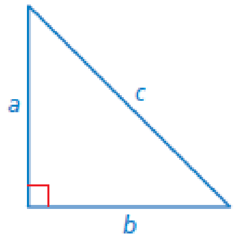
Essential Question

In what other ways can you use the Pythagorean Theorem?

Key Ideas

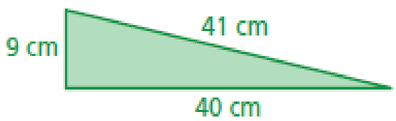
Converse of the Pythagorean Theorem

If the equation $a^2 + b^2 = c^2$ is true for the side lengths of a triangle, then the triangle is a right triangle.



Tell whether each triangle is a right triangle.

a.



$9^2 + 40^2 = 41^2$

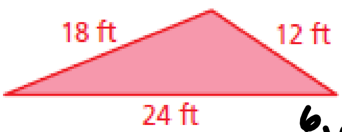
$\underbrace{81 + 1600}$ =

$1681 = 1681$

$\boxed{\text{Yes}}$

$$\begin{array}{r} 41 \\ \times 41 \\ \hline 41 \\ +1640 \\ \hline 1681 \end{array}$$

b.



$18^2 + 12^2 = 24^2$

$\underbrace{324 + 144}$ =

$468 = 576$

$\boxed{\text{No}}$

$$\begin{array}{r} 18 \\ \times 18 \\ \hline 144 \\ +180 \\ \hline 324 \end{array}$$

$$\begin{array}{r} 24 \\ \times 24 \\ \hline 96 \\ +480 \\ \hline 576 \end{array}$$

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

1. 28 in., 21 in., 20 in.

c

$$\begin{array}{r} 21 \\ \times 21 \\ \hline 21 \\ 420 \\ \hline 441 \end{array} \qquad \begin{array}{r} 28 \\ \times 28 \\ \hline 224 \\ +560 \\ \hline 784 \end{array}$$

$441 + 400 = 784$

$\boxed{\text{No}}$

2. 1.25 mm, 1 mm, 0.75 mm

$1\frac{1}{4} = \frac{5}{4}$ c $\frac{3}{4}$

$1^2 + \left(\frac{3}{4}\right)^2 = \left(\frac{5}{4}\right)^2$

$1 + \frac{9}{16} = \frac{25}{16}$

$\frac{16}{16} + \frac{9}{16} = \frac{25}{16}$

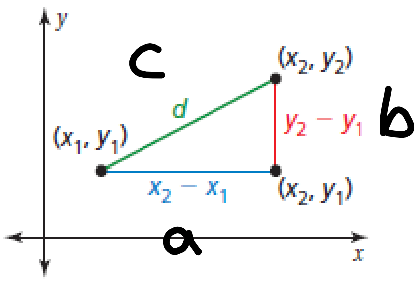
$\boxed{\text{Yes}}$

Key Idea

Distance Formula

The distance d between any two points (x_1, y_1) and (x_2, y_2) is given by the formula

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



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

$c = \sqrt{a^2 + b^2}$

(x_2, y_2) (x_1, y_1)

Find the distance between (1, 5) and (−4, −2).

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

$$d=\sqrt{5^2+7^2}$$

$$d=\sqrt{25+49}$$

$$d=\sqrt{74}$$

Not a perfect square, leave as is

Find the distance between the two points.

3. (0, 0), (4, 5)

$$\sqrt{(4-0)^2+(5-0)^2}$$

$$\sqrt{16+25}$$

$$\boxed{\sqrt{41}}$$

4. (7, −3), (9, 6)

$$\sqrt{(9-7)^2+(6+3)^2}$$

$$\sqrt{2^2+9^2}$$

$$\sqrt{4+81}$$

$$\boxed{\sqrt{85}}$$

5. (−2, −3), (−5, 1)

$$\sqrt{[-2-(-5)]^2+[-3-1]^2}$$

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

$$\sqrt{9+16}$$

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