7.5 Applying the Pythagorean Theorem

Learning Targets

- Understand the Converse of the Pythagorean Theorem
- Identify Right Triangles (TEST to Check!)

- Understand the Distance Formula
- Find the Distance Between Two Points
- Solve Real-Life Questions

The Pythagorean Theorem

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

For any RIGHT Triangle, the sum of the squares of the legs is equal to the square of the hypotenuse.

(IF you have a right triangle,
you can use the pythagorean theorem)

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.

a.

$24^2 + 36^2 \stackrel{?}{=} 42^2$

$576 + 1296 = 1764$

$1872 \neq 1764$

c

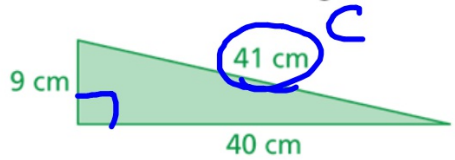
Not a Right Triangle

(IF the pythagorean theorem works, then it must be a right triangle)

Identify a Right Triangle

Tell whether each triangle is a right triangle.

a.



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

$81 + 1600 = 1681$

$1681 = 1681$

Yes! ✓

b.

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

$324 + 144 = 576$

$468 \neq 576$

No

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

$\sqrt{19}, \quad 6, \quad \sqrt{17},$

$\sqrt{16} \quad \sqrt{25} \qquad \sqrt{16} \quad \sqrt{25}$

$4 \quad 5 \qquad 4 \quad 5$

c

Which lengths are the legs?
Which length is the hypotenuse?

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

$(\sqrt{19})^2 + (\sqrt{17})^2 = 6^2$

$19 + 17 = 36$

$36 = 36$ ✓

Yes

The Distance Formula

The distance d between any two points

(x_1, y_1) and (x_2, y_2) is found using the formula

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

Find the Distance Between Two Points

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

$x_1, y_1 \quad x_2 \; y_2$

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

Write the distance formula.

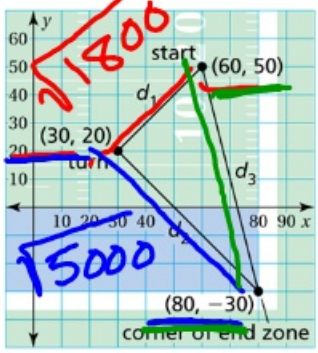
$$d = \sqrt{(-4-1)^2 + (-2-5)^2}$$

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

$$d = \sqrt{25 + 49} = \sqrt{74}$$

Real-Life Application

TEST QUESTION!



You design a football play in which a player runs down the field, makes a 90° turn, and runs to the corner of the end zone. Your friend runs the play as shown. Did your friend make a 90° turn? Each unit of the grid represents 10 feet.

Use the distance formula to find the lengths of the three sides.

$d_1 = \sqrt{(60-30)^2 + (50-20)^2}$

$= \sqrt{30^2+30^2} = \sqrt{900+900} = \sqrt{1800}$

Use the converse of the Pythagorean Theorem to determine if the side lengths form a right triangle.

$d_2 = \sqrt{(80-30)^2 + (-30-20)^2}$

$= \sqrt{(50)^2+(-50)^2} = \sqrt{2500+2500}$

$= \sqrt{5000}$

$d_3 = \sqrt{(60-80)^2 + (50-(-30))^2}$

$= \sqrt{(-20)^2+(80)^2} = \sqrt{400+6400}$

$= \sqrt{6800}$

$\sqrt{1800}$
$\sqrt{5000}$
$\sqrt{6800}$

$\left(\sqrt{1800}\right)^2 + \left(\sqrt{5000}\right)^2 = \left(\sqrt{6800}\right)^2$

$1800 + 5000 = 6800$

$6800 = 6800$ ✓

Yes

Homework

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