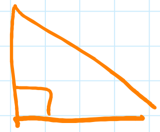
9.1 Pythagorean Theorem

Monday, January 23, 2017 2:59 PM

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



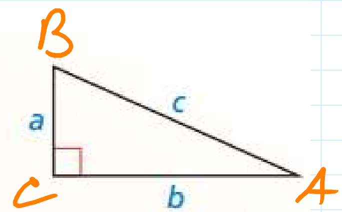
What You Will Learn

- Use the Pythagorean Theorem.
- Use the Converse of the Pythagorean Theorem.
- Classify triangles.

Theorem 9.1 Pythagorean Theorem

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

Proof Explorations 1 and 2, p. 463; Ex. 39, p. 484

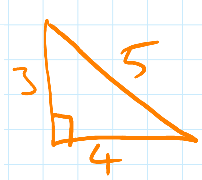


$c^2 = a^2 + b^2$

A **Pythagorean triple** is a set of three positive integers a, b, and c that satisfy the equation $c^2 = a^2 + b^2$.

Common Pythagorean Triples and Some of Their Multiples

3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50



3, 4, 5	**5, 12, 13**	**8, 15, 17**	**7, 24, 25**
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
$3x$, $4x$, $5x$	$5x$, $12x$, $13x$	$8x$, $15x$, $17x$	$7x$, $24x$, $25x$

The most common Pythagorean triples are in bold. The other triples are the result of multiplying each integer in a bold-faced triple by the same factor.

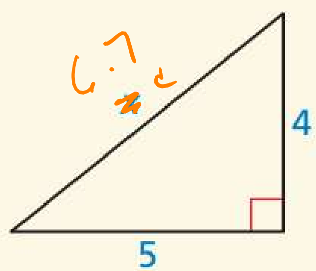
4

$3^2+4^2=5^2$

$9+16=25$

$25=25$

Find the value of x. Then tell whether the side lengths form a Pythagorean triple.



Not P.T.

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

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

$16+25=c^2$

$\sqrt{41}=\sqrt{c^2}$

$\sqrt{41}=c$

$6.7 \approx c$

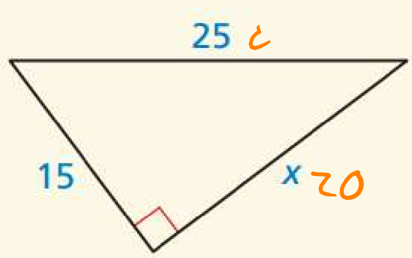
$\sqrt{4^2+5^2}=\sqrt{c^2}$

$\sqrt{4^2+5^2}=c$

$\sqrt{16+25}$

$\sqrt{41}=c$

Find the value of x. Then tell whether the side lengths form a Pythagorean triple.



P.T.

$15^2+20^2=25^2$

$225+400=625$

$625=625$

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

$15^2+x^2=25^2$

$\cancel{225}+x^2=625$

$\cancel{-225} \quad -225$

$\sqrt{x^2}=\sqrt{400}$

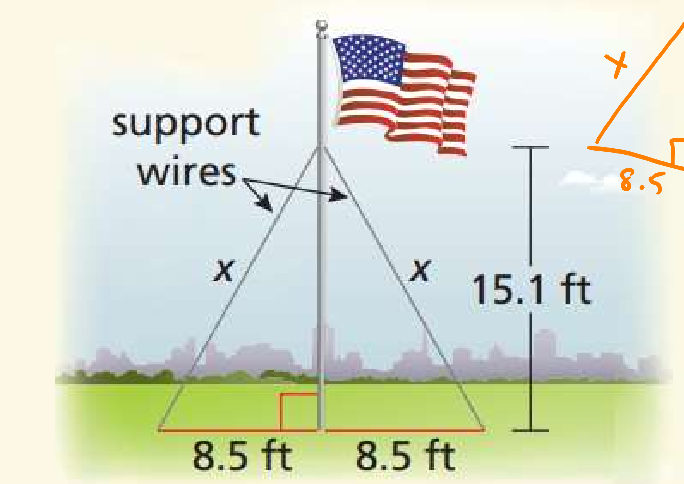
$x=\sqrt{400}$

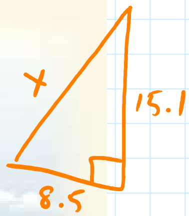
$x=20$

$\sqrt{15^2+x^2}=\sqrt{25^2}$

$625 = 625$

The flagpole shown is supported by two wires. Use the Pythagorean Theorem to approximate the length of each wire.





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

$15.1^2+8.5^2=x^2$

$228.01+72.25=x^2$

$\sqrt{300.26}=\sqrt{\cancel{x^2}}$

$\sqrt{300.26}=x$

$17.33\approx x$

~~$17\approx x$~~

17.328~~558~~

17.328

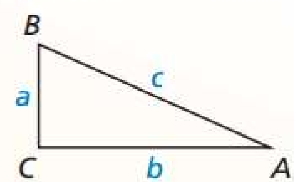
17.33

17.3

Theorem 9.2 Converse of the Pythagorean Theorem

If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

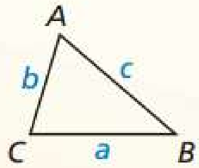
If $c^2 = a^2 + b^2$, then $\triangle ABC$ is a right triangle.



Theorem 9.3 Pythagorean Inequalities Theorem

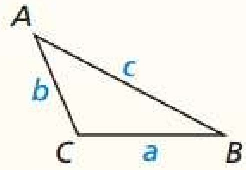
For any $\triangle ABC$, where c is the length of the longest side, the following statements are true.

If $c^2 < a^2 + b^2$, then $\triangle ABC$ is acute.



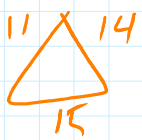
$c^2 < a^2 + b^2$

If $c^2 > a^2 + b^2$, then $\triangle ABC$ is obtuse.



$c^2 > a^2 + b^2$

Verify that segments with lengths of 14 meters, 15 meters, and 11 meters form a triangle. Is the triangle *acute*, *right*, or *obtuse*?



$11 + 14 > 15$

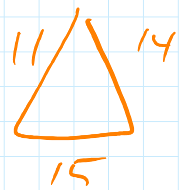
$25 > 15$ ✓

$14 + 15 > 11$

$29 > 11$ ✓

$15 + 11 > 14$

$26 > 14$ ✓



Acute

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

$11^2 + 14^2 = 15^2$

$121 + 196 = 225$

Not Rt $\rightarrow 317 \neq 225$

$317 > 225$

$a^2 + b^2 > c^2$

$\therefore$ Acute

Practice *sec 9.1* **pg. 468:**

1-3A, 5-9EO, 15-27EOO