

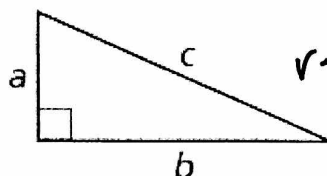
The Pythagorean Theorem

son Objective IWBAT determine if a Δ is a right Δ , acute Δ , or obtuse Δ .

One of the most famous theorems in mathematics is the Pythagorean Theorem, named for the ancient Greek mathematician Pythagoras. This theorem describes the relationship between the side lengths of a right triangle.

The 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.



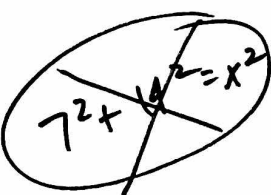
$$\text{rt. } \Delta \rightarrow a^2 + b^2 = c^2$$

Pythagorean Triple: A Pythagorean Triple is a set of three positive integers (a, b, and c) that satisfy the equation $a^2 + b^2 = c^2$.

Common Pythagorean Triples			
3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
6, 8, 10 ($k=2$)	15, 36, 39 ($k=3$)	4, 7.5, 8.5 ($k=\frac{1}{2}$)	$\vdots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$
3x, 4x, 5x	5x, 12x, 13x	8x, 15x, 17x	7x, 24x, 25x

Example:

1. Find the exact value of x. Then tell whether the side lengths form a Pythagorean Triple.

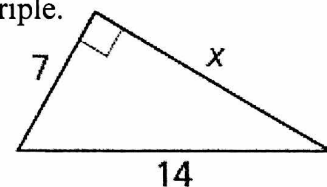


$$7^2 + x^2 = 14^2$$

$$x^2 = 14^2 - 7^2$$

$$x = 7\sqrt{3}$$

Not a Pyth.
Triple since
 $7\sqrt{3}$ is not
an integer.



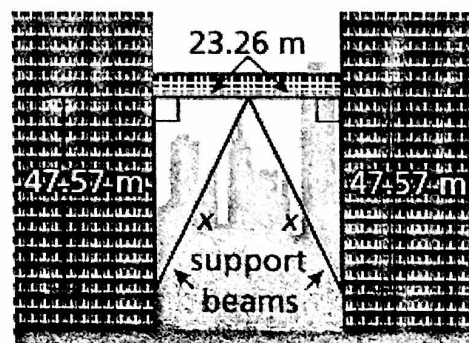
2. The skyscrapers shown are connected by a skywalk with support beams. Use the Pythagorean Theorem to approximate the length of each support beam to the nearest hundredth.

$$23.26^2 + 47.57^2 = x^2$$

$$2803.9325 = x^2$$

$$x \approx 52.95$$

52.95 m



ing the CONVERSE of the Pythagorean Theorem

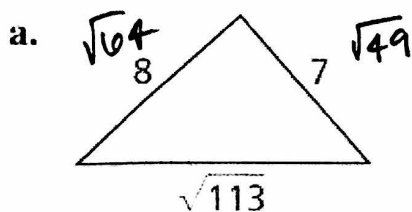
Conditional: If right triangle $\rightarrow a^2 + b^2 = c^2$

Converse: If $a^2 + b^2 = c^2 \rightarrow$ right Δ

* c is longest side

Example:

3. Tell whether each triangle is a right triangle.

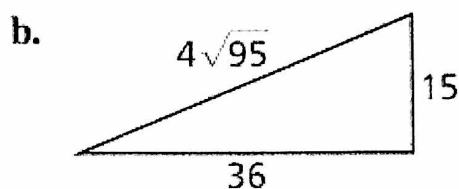


$$8^2 + 7^2 = (\sqrt{113})^2$$

$$64 + 49 = 113$$

$$113 = 113 \checkmark$$

yes, rt. Δ !



$$36^2 + 15^2 = (4\sqrt{95})^2$$

$$1296 + 225 = 4^2(\sqrt{95})^2$$

$$1521 = 16(95)$$

$$1521 \neq 1520 \therefore$$

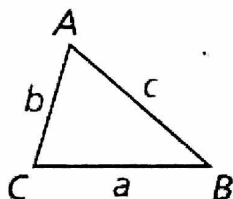
not a rt. Δ

Classifying Triangles

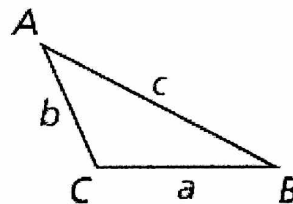
Pythagorean Inequalities Theorem

For any ΔABC , where c is the length of the longest side, the following statements are true:

If $a^2 + b^2 > c^2$, then ΔABC is acute.



If $a^2 + b^2 < c^2$, then ΔABC is obtuse.



Example:

4. What type of triangle (if at all) do the following side lengths make? 4.3 feet, 5.2 feet, 6.1 feet

$$(4.3)^2 + (5.2)^2 \square (6.1)^2$$

$$45.53 > 37.21$$

acute Δ

5. What type of triangle (if at all) do the following side lengths make? 3m, 4m, 6m

$$3^2 + 4^2 \square 6^2$$

$$25 < 36$$

obtuse Δ