Name

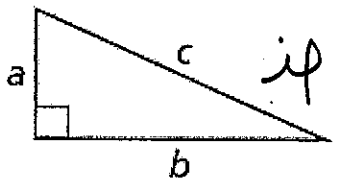
The Pythagorean Theorem

Lesson Objective IWBAT use the Pyth. Thm and its converse, and classify Δs.

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.



if rt. $\Delta \rightarrow a^2+b^2=c^2$

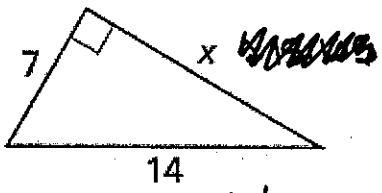
Pythagorean Triple: A Pythagorean Triple is a set of three positive integer (a, b, and c) that satisfy the equation $a^2 + b^2 = c^2$.

↳ no decimals

Common Pythagorean Triples			
3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
st.=2: 6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
⋮	⋮	⋮	⋮
st=x: 3x, 4x, 5x	5x, 12x, 13x	8x, 15x, 17x	7x, 24x, 25x

Example:

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



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

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

$49+x^2=196$

$\sqrt{x^2}=\sqrt{147}$

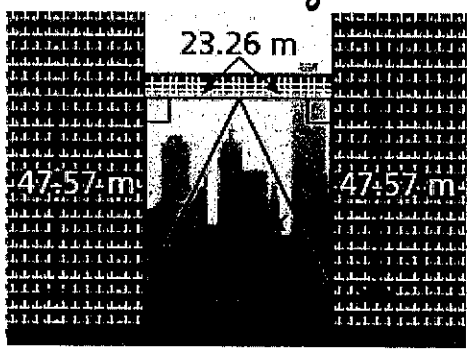
$x=\pm\sqrt{147}$

$x=\sqrt{49\cdot 3}$

$x=7\sqrt{3}\approx 12.12$

Not a triple b/c $7\sqrt{3}$ 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.



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

$x\approx 52.95$ m

Using the CONVERSE of the Pythagoream Theorem

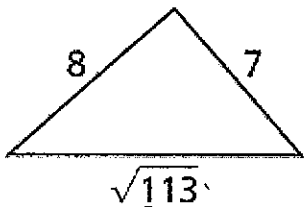
Conditional: If right triangle → $a^2 + b^2 = c^2$

Converse: If $a^2+b^2=c^2$ → rt. Δ

Example:

3. Tell whether each triangle is a right triangle.

a.

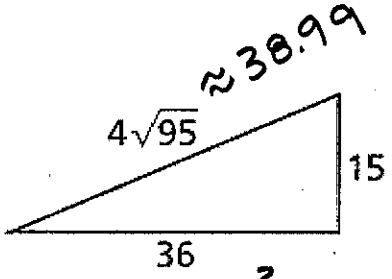


$8^2 + 7^2 \stackrel{?}{=} (\sqrt{113})^2$

$64 + 49 = 113$

$113 = 113$ ✓ yes rt. Δ b/c $a^2+b^2=c^2$

b.



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

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

$= 16(95)$

$1521 \neq 1520$

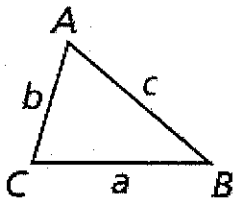
not a rt. Δ

Classifying Triangles

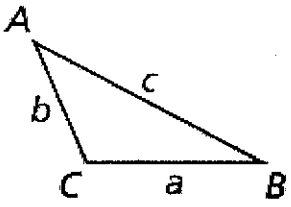
Pythagorean Inequalities Theorem

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 (c)

$4.3 + 5.2 > 6.1$ ✓

$5.2 + 6.1 > 4.3$ ✓

$4.3 + 6.1 > 5.2$ ✓ yes, Δ!

$(4.3)^2 + (5.2)^2 \boxed{?} (6.1)^2$

$18.49 + 27.04 \boxed{?} 37.21$

$45.53 > 37.21$

so the Δ is acute!

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

$3+4>6$ ✓

$3+6>4$ ✓ yes, Δ!

$6+4>3$ ✓

$(3)^2 + (4)^2 \boxed{?} (6)^2$

$9 + 16 \boxed{?} 36$

$25 < 36$

obtuse Δ!