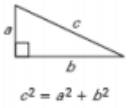
Pythagorean Theorem

Pythagorean Triple When a right Δ has sides that are all whole #'s

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.



You may find it helpful to memorize the basic Pythagorean triples, shown in **bold**, for standardized tests.

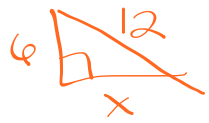
COMMON PYTHAGOREAN TRIPLES AND SOME OF THEIR MULTIPLES

3, 4, 5	**5, 12, 13**	**8, 15, 17**	**7, 24, 25**
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
30, 40, 50	50, 120, 130	80, 150, 170	70, 240, 250
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 face triple by the same factor.

Samples:

1. The hypotenuse of a right triangle has length 12. One leg has length 6. What is the length of the other leg?



$6^2 + x^2 = 12^2$

$36 + x^2 = 144$

$\sqrt{x^2} = \sqrt{108}$ $6\sqrt{3}$

2. A triangle has side lengths of 16, 48, and 50. Is the triangle a right triangle? Explain.

Not Rt Δ $16^2 + 48^2 \neq 50^2$

$2560 \neq 2500$

3. Find a third whole number such that the three numbers form a pythagorean triple:

20, 21 **14,48**

$x^2 + 20^2 = 21^2$

$x^2 + 400 = 441$

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

$x = 6.403..$

Hyp

$20^2 + 21^2 = c^2$

$\sqrt{841} = \sqrt{c^2}$

$29 = c$

10.1 Pythagorean Theorem and its converse

Goal

- Use the Converse of the Pythagorean Theorem to determine if a triangle is a right triangle.

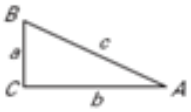
c^2 on Left ∇

Converse of the Pythagorean Theorem: If c^2 ___ $a^2 + b^2$, then $\triangle ABC$ is a ___ triangle.

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

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

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



Applying Converse of the Pythagorean Theorem

Tell whether the triangle formed with the given sides is acute, obtuse, or right. If a triangle can't be formed write No triangle.

1. 5, 12, 13 — $\triangle$✓ — $13^2 ? 5^2 + 12^2$ — $169 = 169$ — Right $\triangle$

2. $\sqrt{8}$, 4, 6 — 2.83 — $\triangle$✓ — obtuse $\triangle$ — $6^2 ? 4^2 + \sqrt{8}^2$ — $36 \quad 16 + 8$ — $36 > 24$

3. 20, 21, 28 — $\triangle$✓ — $28^2 \quad 20^2 + 21^2$ — $784 < 841$ — Acute $\triangle$

4. 15, 36, 39

5. $\sqrt{13}$, 10, 12

6. 14, 48, 50

7. 10, 12, 30 — No $\triangle$

8. 16, 30, 34

9. 18, 34, 45

Geometric Mean:

What is the geometric mean of 6 and 15?

Summary