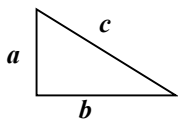


Right triangles are very common in building construction. There is a formula that is very useful for finding lengths in right triangles and for verifying that a triangle is a right triangle. The formula is part of the Pythagorean Theorem.

Pythagorean Theorem: In any right triangle, the sum of the squares of the lengths of both legs is equal to the length of the hypotenuse squared.



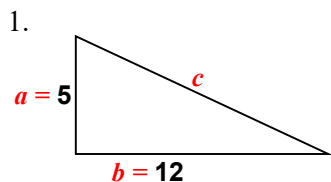
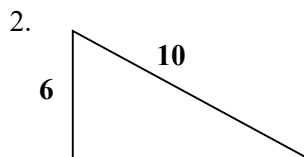
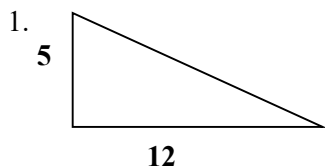
In the diagram on the left, the right triangle has legs represented with lengths a and b. The hypotenuse has length of c. The formula relating the lengths is the following:

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

Steps to Find Missing Lengths Using the Pythagorean Theorem

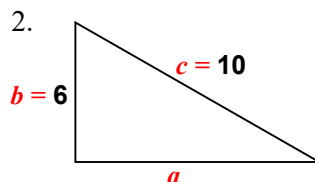
1. Write out original problem
2. Draw a picture of the problem using a right triangle in your drawing.
3. Put given dimensions on the right triangle and label sides, a, b and c if needed.
4. Write the formula for the Pythagorean Theorem, $a^2 + b^2 = c^2$.
5. Substitute known dimensions using ()'s.
6. Solve the equation by using steps to solve quadratic equations with the square root property.

Examples: Find the missing lengths



$$\begin{aligned} a^2 + b^2 &= c^2 \\ (5)^2 + (12)^2 &= c^2 \\ 25 + 144 &= c^2 \\ 169 &= c^2 \\ c^2 &= 169 \\ \sqrt{c^2} &= \pm \sqrt{169} \\ x &= \pm 13 \end{aligned}$$

We are finding a length, so we only need the positive value. Final answer is 13.



$$\begin{aligned} a^2 + b^2 &= c^2 \\ (6)^2 + b^2 &= (10)^2 \\ 36 + b^2 &= 100 \\ 36 - 36 + b^2 &= 100 - 36 \\ b^2 &= 64 \\ \sqrt{b^2} &= \pm \sqrt{64} \\ x &= \pm 8 \end{aligned}$$

We are finding a length, so we only need the positive value. Final answer is 8.