

Pythagorean Theorem
Word problems 2

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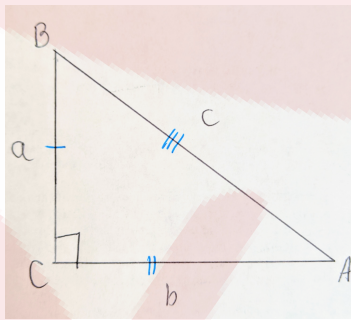
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Pythagorean Theorem

The Pythagorean Theorem of Theorem of Pythagorus is a theorem or rule that related the lengths of the sides of a right angled triangle. First some definitions. A right angled triangle is a traingle with one 90° angle. The side opposite the 90° angle is called the *hypontenuse*, h . Let's choose one of the other angles in the triangle and label it as θ . The side beside the angle θ is called the *adjacent* side, a . The side opposite the angle θ is called the *opposite* side, o . There is a relationship between the three sides of a right angled triangle called the *Theorem of Pythagorus*.

Pythagorean Theorem



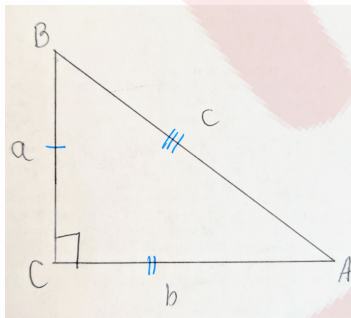
Pythagorean Theorem

$$c^2 = a^2 + b^2 \quad (1)$$

Let's have a look at an example to see the application of the Theorem of Pythagorus.

Example

For the following triangle, where $a = 4cm$ and $b = 3cm$ find the missing side using the theorem of Pythagorus.



Solution: The side we are looking for is opposite the right angle, or the hypotenuse. By the theorem of Pythagorus in equation (1), we have,

$$\begin{aligned} c^2 &= a^2 + b^2 \\ &= 4^2 + 3^2 \\ &= 16 + 9 \\ &= 25 \\ \therefore c &= \sqrt{25} \\ c &= 5cm \end{aligned}$$

Therefore, the length of the missing side, or the hypotenuse, is $5cm$.

Exercises

1. A 35 foot ladder is leaning against the side of a building and is positioned such that the base of the ladder is 21 feet from the base of the building. How far above the ground is the point where the ladder touches the building?
2. If an equilateral triangle has a height of 8m, find the length of each side.
3. Two cyclists start from the same location. One cyclist travels due north and the other due east, at the same speed. Find the speed of each in miles per hour if after two hours they are $17miles^2$ apart.
4. Two sides of a right triangle are 8" and 12".
 - a) Find the area of the triangle if 8" and 12" are legs.
 - b) Find the area of the triangle if 8" and 12" are a leg and hypotenuse, respectively.
5. The area of a square is $81cm^2$. Find the perimeter of the square.
6. An isosceles triangle has congruent sides of 20cm. The base is 10cm. What is the area of the triangle?
7. A baseball diamond is a square that is 90' on each side. If a player throws the ball from the second base to home, how far will the ball travel?
8. Jill's front door is 42" wide and 84" tall. She purchased a circular table that is 96 inches in diameter. Will the table fit through the front door?
9. The bottom of a ladder must be placed 3 feet from the wall. The ladder is 12 feet long. How far above the ground does the ladder touch the wall?