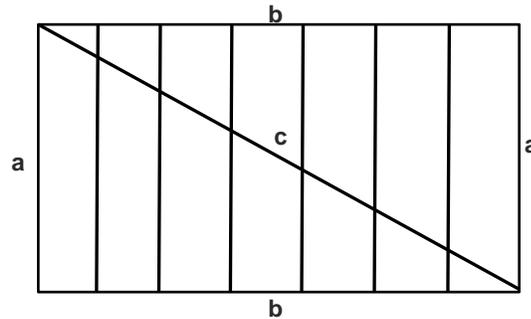
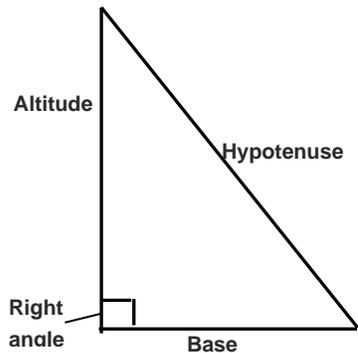


Pythagorean Theorem: Finding the Hypotenuse of a Right Triangle Worksheet



Woodworkers must make sure that the sides, tops, and bottoms of casework are square to each other during assembly. In this sense, square means that the parts are at right angles to each other.

As shown in the figure, a diagonal line drawn on a rectangular surface divides the surface into two triangles. If the sides of the rectangle are truly at right angles to each other, then both triangles will be right triangles. The Pythagorean theorem can be used to determine whether the triangles are right triangles.

The Pythagorean theorem states that in a right triangle, the hypotenuse squared equals the sum of the squares of the two remaining sides. The hypotenuse is the side opposite the right angle. The formula is $a^2 + b^2 = c^2$, where 'a' is the altitude, 'b' is the base, and 'c' is the hypotenuse.

A simplified equation is $c = \sqrt{a^2 + b^2}$

e.g. a triangle with sides 5, 12, 13

$$5^2 + 12^2 = 13^2$$

$$25 + 44 = 169$$

5, 12 13 is a perfect combination and the triangle is a right-angled triangle

e.g. a triangle with sides 7,7,10

$$7^2 + 7^2 = 10^2$$

$$49 + 49 = 98$$

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7, 7, 10 is not a perfect combination and the triangle is not a right-angled triangle because $10^2 = 100$.

Terms

Right Triangle - a triangle with one right (90-degree) angle

Pythagorean Theorem - in a right triangle, the hypotenuse squared = sum of squares of other sides

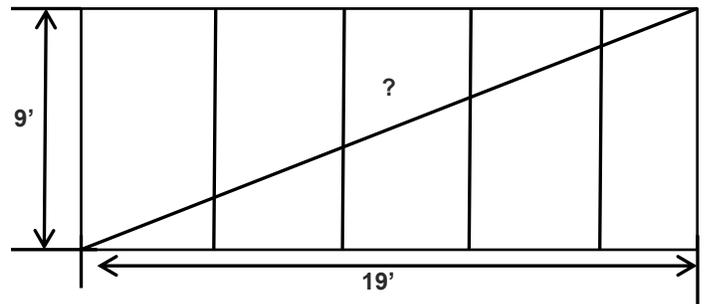
Hypotenuse - the side of a right triangle that is opposite the right angle

Altitude or Leg - the vertical side of a triangle

Base or Leg - the bottom of a triangle

Find the diagonal of a wall that is 9' high and 19' long.

Step 1	The formula is $c = \sqrt{a^2 + b^2}$
Step 2	Insert the known values. $c = \sqrt{9^2 + 19^2}$
Step 3	$c = \sqrt{81 + 361}$
Step 4	$c = \sqrt{442}$
Step 5	$c = 21.0238'$



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Use a calculator to complete the following problems.

1. Find the diagonal of a floor that is 12' long and 14' wide.

- A) 9.2195'
- B) 18.4391'
- C) 27.6586'
- D) 36.8781'

2. Find the diagonal of a wall that is 8' high and 11' long.

- A) 13.6015'
- B) 27.2029"
- C) 40.8044'
- D) 54.4058'

3. If a floor is 15' \times 22', then the diagonal is

- A) 13.3135'.
- B) 19.9703'.
- C) 26.6271'.
- D) 53.2540'.

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You can use the same formula to find the length of a right triangle's leg if you are given measurements for the lengths of the hypotenuse and the other leg. Consider the example below.

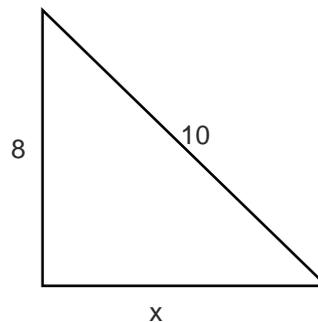
$a = ?$ $b = 6$ $c = 7$	In this right triangle, you are given the measurements for the hypotenuse, c , and one leg, b . The hypotenuse is always opposite the right angle and it is always the longest side of the triangle.
$a^2 + b^2 = c^2$ $a^2 + 6^2 = 7^2$	To find the length of leg a , substitute the known values into the Pythagorean Theorem.
$a^2 + 36 = 49$ $49 - 36 = 13$ $a^2 = 13$ $a \approx 3.6$	Solve for a^2 . Think: what number, when added to 36, gives you 49? Use a calculator to find the square root of 13. The calculator gives an answer of 3.6055, which you can round to 3.6. (Since you are approximating, you use the symbol \approx .)

Which of the following correctly uses the Pythagorean Theorem to find the missing side, x ?

A. $8^2 + 10^2 = x^2$

B. $x + 8 = 10$

C. $x^2 = 8^2 = 10^2$



Pythagorean Theorem in Real Life Worksheet

Uses of Pythagoras' Theorem

You may have heard about Pythagoras's theorem (or the Pythagorean Theorem) in your math class, but what you may fail to realize is that Pythagoras's theorem is used often in real life situations. According to Pythagoras's theorem the sum of the squares of two sides of a right triangle is equal to the square of the hypotenuse. Let one side of the right triangle be a , the other side be b and hypotenuse are given by c . According to Pythagoras's theorem $a^2 + b^2 = c^2$. This is taught in every classroom throughout the world, but what isn't taught is how it can be applied outside of the classroom.

Real Life Applications

- 1) **Road Trip:** Let's say two friends are meeting at a playground. Mary is already at the park, but her friend Bob needs to get there taking the shortest path possible. Bob has two way he can go - he can follow the roads getting to the park - first heading south 3 miles, then heading west four miles. The total distance covered following the roads will be 7 miles. The other way he can get there is by cutting through some open fields and walk directly to the park. If we apply Pythagoras's theorem to calculate the distance you will get:
- 2) **Buying a Suitcase:** Mr. Harry wants to purchase a suitcase. The shopkeeper tells Mr. Harry that he has a 30-inch of suitcase available at present and the height of the suitcase is 18 inches. Calculate the actual length of the suitcase for Mr. Harry using Pythagoras' theorem. It is calculated this way:
- 3) **What Size TV Should You Buy?** Mr. James saw an advertisement of a T.V.in the newspaper where it is mentioned that the T.V. is 16 inches high and 14 inches wide. Calculate the diagonal length of its screen for Mr. James. By using Pythagoras' theorem, it can be calculated as:
- 4) **Finding the Right Sized Computer:** Mary wants to get a computer monitor for her desk, which can hold a 22-inch monitor. She has found a monitor 16 inches wide and 10 inches high. Will the computer fit into Mary's cabin? Use Pythagoras' theorem to find out: