

# The Pythagorean Theorem

## Learning Goals

- I know the three types of angle in a triangle
- I know the rule that links the three sides of a right angled triangle

Sep 26-09:46

## Activity

On 1cm grid paper, draw the three squares in each set. Label the squares with the set number, cut them out and write the area in  $\text{cm}^2$  on each one.

**Set 1** squares with each side length: 3cm, 4cm and 5cm

**Set 2** squares with each side length: 5cm, 12cm and 13cm

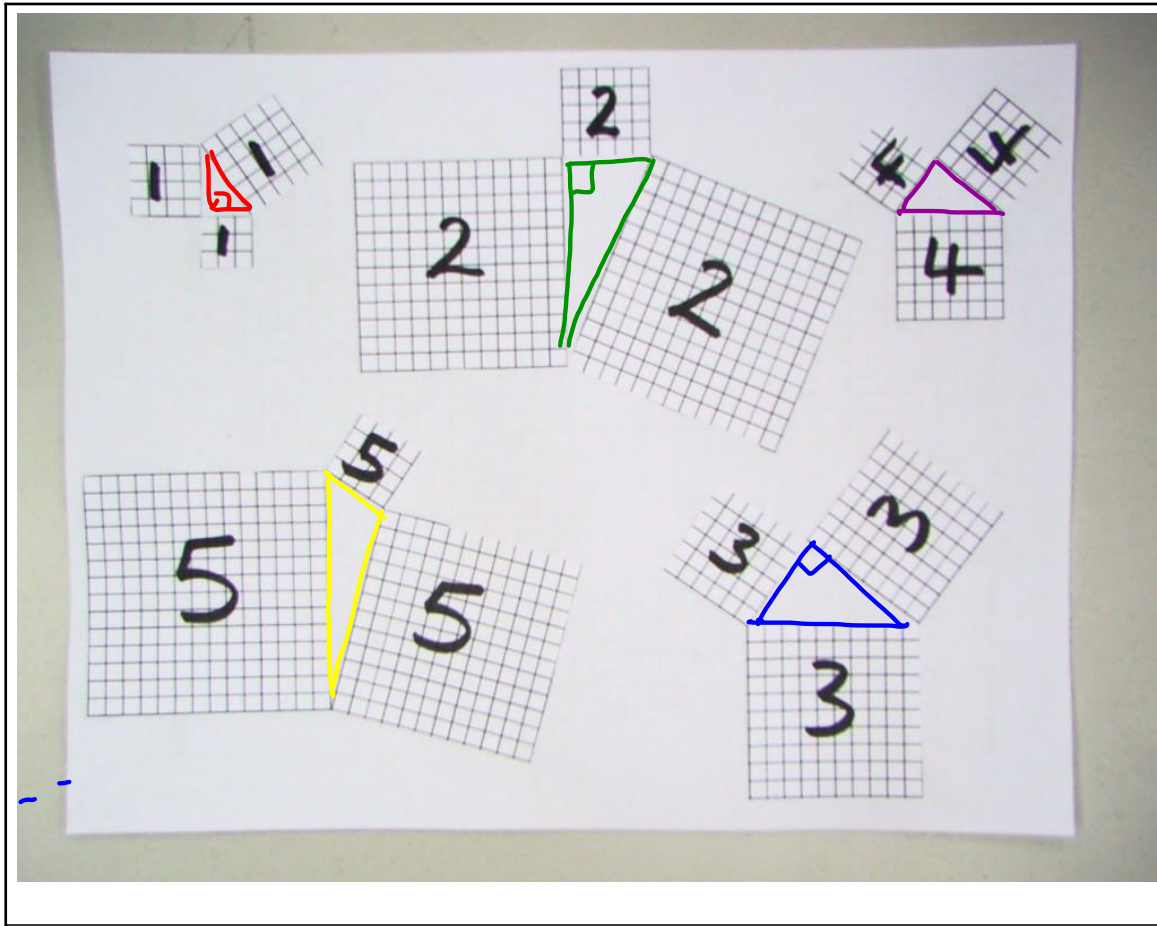
**Set 3** squares with each side length: 6cm, 8cm and 10cm

**Set 4** squares with each side length: 4cm, 5cm and 6cm

**Set 5** squares with each side length: 4cm, 12cm and 14cm

Arrange the squares in each set to form a triangle. One side of each square forms one side of a triangle. Do any of these triangles look like right angled triangles? Which ones?

Sep 26-10:00



Oct 1-4:35 PM

Complete the table based on your observations of the five triangles.

Set	Side lengths (cm)			Area of Squares (cm <sup>2</sup> )			Type of Triangle (right, acute or obtuse)
1	3	4	5	9	16	25	RIGHT
2	5	12	13	25	144	169	RIGHT
3	6	8	10	36	64	100	RIGHT
4	4	5	6	16	25	36	ACUTE
5	4	12	14	16	144	196	OBTUSE

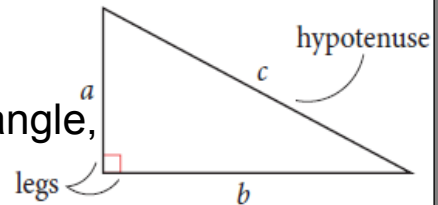
Look for a pattern in your results. Compare the areas of the squares on the sides of each triangle. Write a sentence to describe the relationship.

Look at the last two triangles. Does this relationship hold true for these triangles? How are these two triangles different from the first three?

In a right triangle the two shorter sides are called **legs**. The **hypotenuse** is the side opposite the right angle; it is the longest side.

The **Pythagorean Theorem** states that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the legs.

**Legs**: the two shorter sides of a right triangle, the sides adjacent to the right angle.



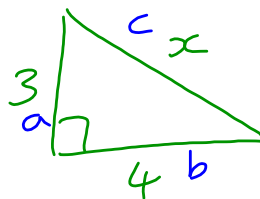
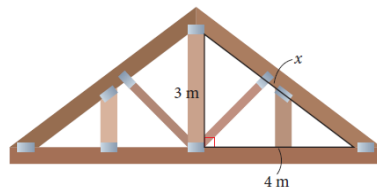
**Hypotenuse**: the longest side of a right triangle, the side opposite the right angle.

**Pythagorean theorem**: the square of the hypotenuse is equal to the sum of the squares of the legs, for a right triangle with legs  $a$  and  $b$  and hypotenuse  $c$ ,  $c^2 = a^2 + b^2$

Sep 26-10:29

#### Find the Length of a Roof Truss

Find the length of a slanting side of this roof truss.



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

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

$$x^2 = 3^2 + 4^2$$

$$x^2 = 9 + 16$$

$$x^2 = 25$$

$$x = \sqrt{25}$$

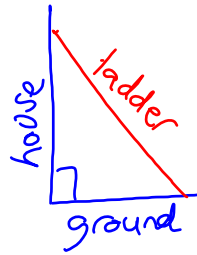
$$x = 5 \text{ m}$$

When we get 3 whole numbers that satisfy the Pythagorean theorem these are called Pythagorean Triples

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**Find How High a Ladder Will Reach**

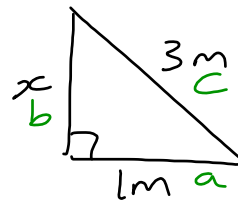
Nirmala is planning to wash the windows on her house. She rests a 3-m-long ladder against the side of the house. The foot of the ladder is 1 m from the house. How high up the house will the ladder reach? Round your answer to the nearest hundredth of a metre.



To undo  $x^2$   
use the SQUARE  
ROOT button



⇒ The ladder  
will reach up to  
a height of 2.82m



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

$$3^2 = 1^2 + x^2$$

$$9 = 1 + x^2$$

$$9 - 1 = x^2$$

$$8 = x^2$$

$$\sqrt{8} = x$$

$$2.82 = x$$

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To find the HYPOTENUSE (longest):

1. Square them
2. **Add** them
3. Find the square root

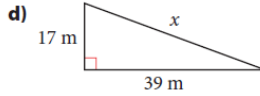
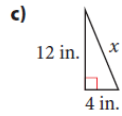
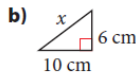
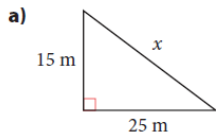
To find a "LEG" (short):

1. Square them
2. **Subtract** them
3. Find the square root

Nov 8-1:18 PM

### Questions

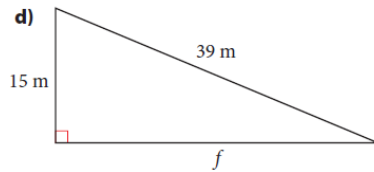
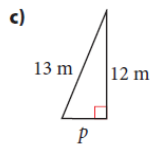
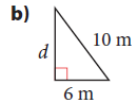
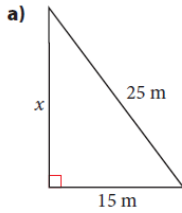
2. Find the length of the hypotenuse to the nearest tenth of a unit.



7. A television is described as a 20" television if the screen has a diagonal length of 20".



3. Find the length of the indicated side to the nearest tenth of a metre.

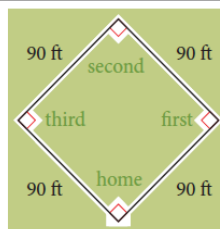


a) If the screen of a 20" flat-screen television has a height of 12", what is the width?

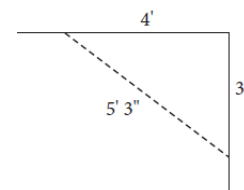
b) If a new 55" plasma television screen has a height of 35", what is the width of the screen?

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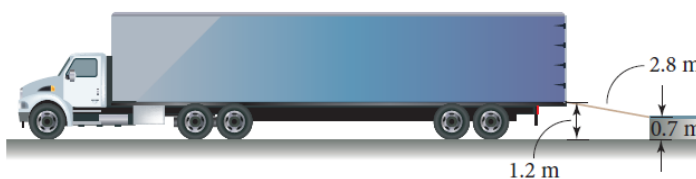
10. Natalya is playing baseball. She catches a ground ball at third base. The player on the opposing team is running toward first base. How far does Natalya have to throw the ball to throw the runner out?



11. Sue and Greg are laying new laminate flooring in their living room. To check that the walls are square, Sue makes marks 3' from the corner along one wall and 4' from the same corner along the other wall. She measures the distance between the marks to be 5' 3". Do the walls in this corner meet at right angles? How do you know?



15. A loading ramp is 2.8 m long. One end rests on a loading dock 0.7 m above the ground, and the other end leads into the back of a tractor trailer 1.2 m above the ground. Find the horizontal distance between the back of the truck and the loading dock, to the nearest tenth of a metre.



Sep 26-10:47