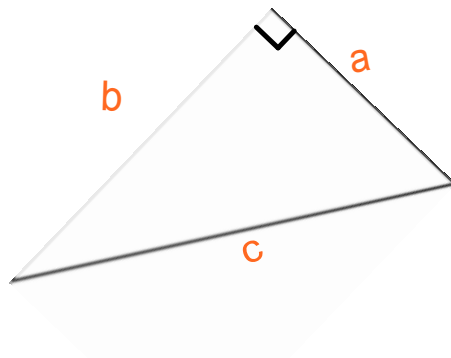
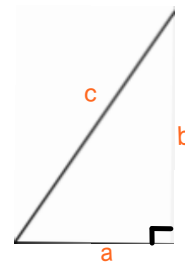
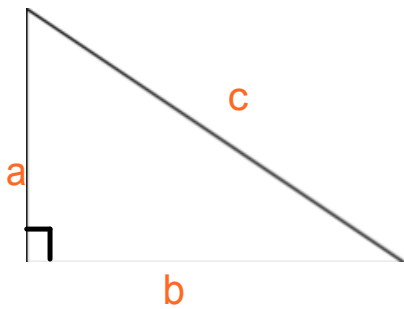


Applying Pythagorean Theorem

Pythagoras was born in the late 6th century BC on the island of Samos. He was a Greek philosopher and religious leader who was responsible for important developments in mathematics, astronomy and the theory of music. Pythagoras is famous also for the fact that he allegedly paid for his first student. Frustrated that no one would listen to his learning, he decided to "buy" a student.

It is believed that the Egyptians and other ancient cultures used a 3-4-5 rule in construction. In Egypt, Pythagoras studied with the engineers, known as "rope stretchers", who built the pyramids. They had a rope with 12 evenly spaced knots. If the rope was pegged to the ground in the dimensions 3-4-5, a right triangle would result. This enabled them to lay the foundations of their buildings accurately.

Right Triangles



All right angle triangles are labelled the same way

- the side opposite the right angle is called the **hypotenuse** It is always labelled "c"
- the other two sides are labelled "b" for base and "a" for altitude

In any right-angle triangle, the square of the hypotenuse is equal to the sum of the squares on the other two sides.

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

Some number groups are known as Pythagorean triplets or triads.

They can be used to make up the sides of a right angle triangle

ie: 3, 4, 5

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

$$3^2 + 4^2 = 5^2$$

$$9 + 16 = 25$$

$$25 = 25$$

ie: 2, 6, 10

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

$$2^2 + 6^2 = 10^2$$

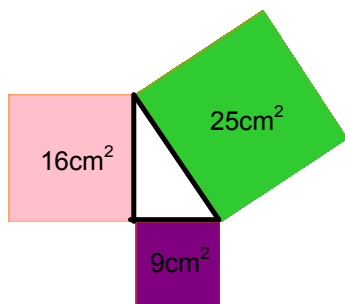
$$4 + 36 = 100$$

$$40 \neq 100$$

\therefore 2, 6, 10 is not a triplet

This would not be a right angle triangle

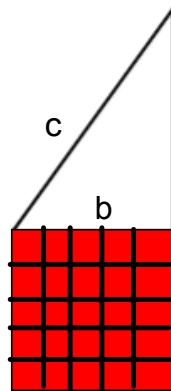
We can use the Pythagorean Theorem with area



The area of a square drawn on the hypotenuse is equal to the sum of the areas of the squares drawn on the other two sides.

Whole Area of a + Whole Area of b = Whole Area of c

To find the side length of a right angle triangle → you find the square root of the area.

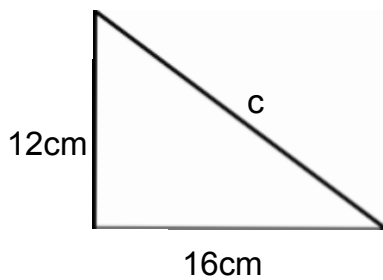


a Area = 25cm^2

The length of side b = $\sqrt{\quad} = 5$
 $b = 5$

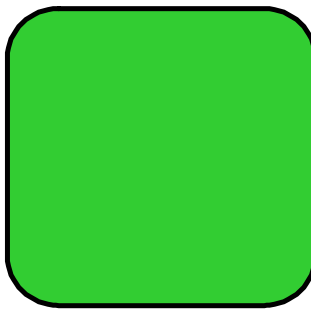
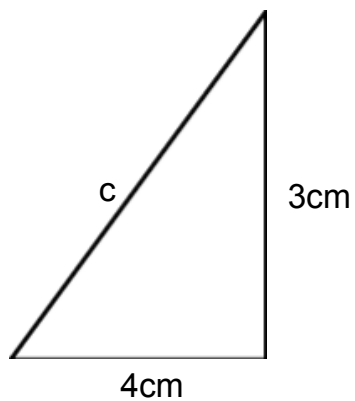
Finding Missing Measurements of side lengths using the Pythagorean Theorem

a)



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 12^2 + 16^2 &= c^2 \\ 144 + 256 &= c^2 \\ 400 &= c^2 \\ \sqrt{400} &= c \\ 20 &= c \end{aligned}$$

b)



Using Pythagorean Theorem find the hypotenuse...

- i) $a = 7\text{cm}$, $b = 6\text{cm}$
- ii) $a = 2.5\text{m}$, $b = 4.1\text{m}$

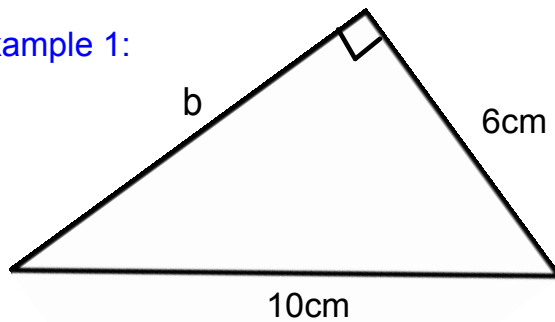
If you have to find a or b, then you go backwards and do the opposite - you subtract

$$c^2 - b^2 = a^2$$

or

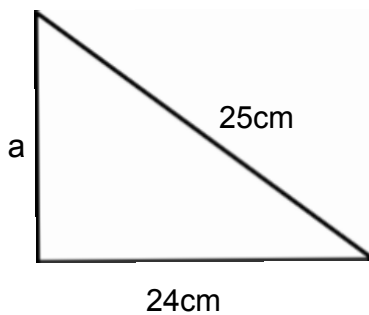
$$c^2 - a^2 = b^2$$

Example 1:



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

Example 2:



$$\begin{aligned}c^2 - b^2 &= a^2 \\25^2 - 24^2 &= a^2 \\625 - 576 &= a^2 \\49 &= a^2 \\\sqrt{49} &= a \\7 &= a\end{aligned}$$

Try these...

- i) $a = 5\text{m}$, $c = 12\text{m}$, find b
- ii) $b = 6.8\text{cm}$, $c = 9.7\text{m}$, find a

Book Work... Page 34 - #'s 3, 4, 5, 6, 7, 8, 9, 13

Worksheets 14 - 17

Book Work... Page 43 - #'s 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

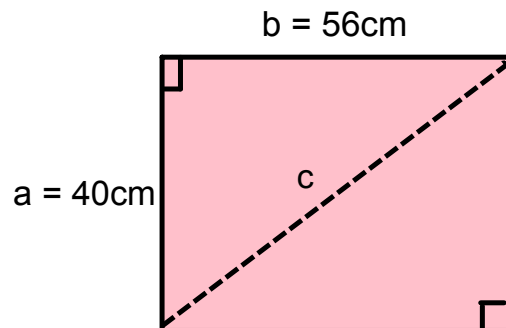
Remember Pythagorean Theorem

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

This can be used to solve story problems that involve right angle triangles

Example 1:

The size of a tv screen is the length of its diagonal. A tv screen is 56cm wide and 40cm high. Calculate the length of its diagonal to the nearest centimeter.

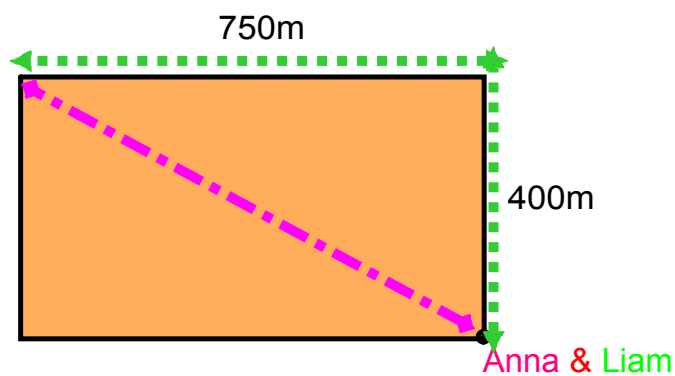


$$\begin{aligned} a^2 + b^2 &= c^2 \\ 40^2 + 56^2 &= c^2 \\ 1600 + 3136 &= c^2 \\ 4736 &= c^2 \\ \sqrt{4736} &= c \\ 69 &= c \end{aligned}$$

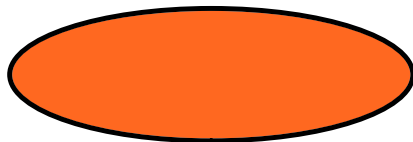
Example #2:

Anna & Liam are on a hike. They come to a corner of a rectangular field that measures 750m by 400m. Anna decides to take a shortcut and walk diagonally across the field. Liam walks around two sides of the field.

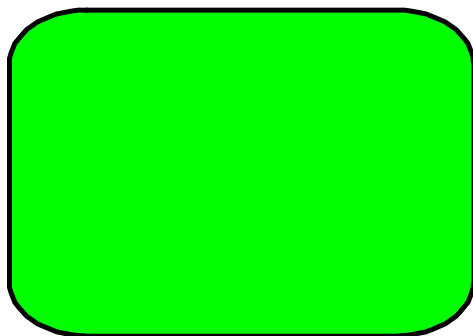
- a) Who walks farther?
- b) How much farther does that person walk?



Liam:



Anna:



a)

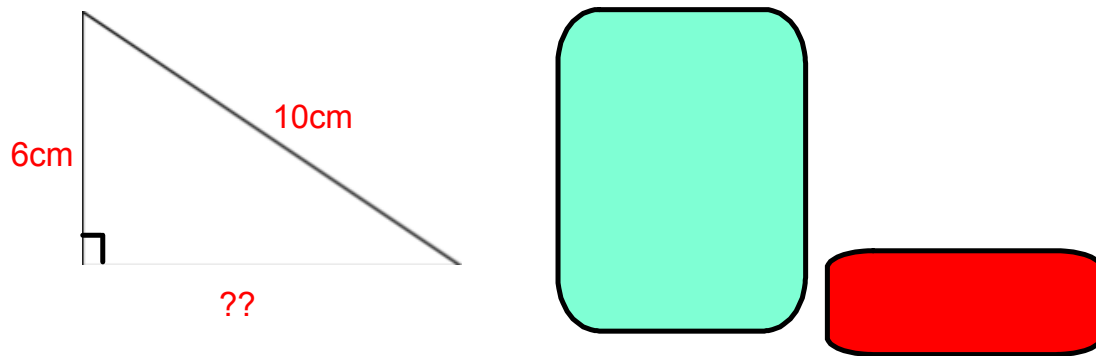


b)



Example #3:

In the $\triangle RST$, calculate the length of RS to the nearest millimeter



Worksheets 19 & 20

Book work: page 49 - #'s 6, 7, 8, 9, 10, 11, 12, 13, 16, 17