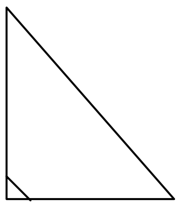
Worksheets

Activity 1

Label the diagram with the words in the box.

angle length side



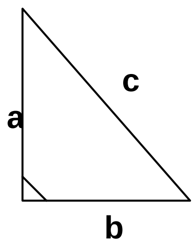
1 ______→

2 ______↗ ←-----------→ 3 _______

Pythagoras was a Greek philosopher who lived more than 2,500 years ago. He is best remembered for a theory of how to work out the length of a side of a triangle if you know the length of the other two sides.

Activity 2

Read the text about Pythagoras' theorem.



Have a look at the triangle above. This kind of triangle is called a right-angled triangle because the angle on the inside of sides a & b is 90°. Now, imagine you know the length of side **a** and the length of side **b** but you don't know the length of side **c**. Is it possible to calculate the length of side **c** without measuring it?

The answer is 'Yes'. And, the way you do this is by using Pythagoras' theorem. If you draw a square on each of the sides of the triangle, you should notice something. What is it? The area of the two smaller squares add up to the area of the bigger square.
So $\mathbf{a}^2 + \mathbf{b}^2 = \mathbf{c}^2$.

This is Pythagoras' theorem. As this is always true, it is now possible for us to calculate the length of side **c**. To do this, we take the answer and find the square root. The square root is the number that when multiplied by the same number gives you a particular number - in this situation the total area of the square on side **c**. So, for example, the square root of 9 is 3 (3 x 3 = 9).

Why is Pythagoras' theorem useful? Well, imagine you a designing a building and you want to cut a piece of wood to use as a support for a wall. You know the height of the wall (10 metres) and you know the length of the floor space (8 metres). With these two measurements you can calculate the length you need to cut the piece of wood: $10^2 + 8^2 = \mathbf{c}^2$.
So, $\mathbf{c} = \sqrt{}\mathbf{c}^2$.

Of course, one of the problems with the theorem is that it only works with right-angled triangles, so if one of the angles isn't 90° then it won't work. However, as long as the triangle is a right-angled one, then you can use the same equation to calculate the length of any of the sides as long as you have the measurement of two of the sides. For example, if side **b** = 4 and side **c** = 6 then the equation will be:

$\mathbf{a}^2 + 4^2 = 6^2$.
So $\mathbf{a}^2 + 16 = 36$.

To work out $\mathbf{a}^2$ you can change the equation to:

$\mathbf{c}^2 - \mathbf{b}^2 = \mathbf{a}^2$
or $36 - 16 = \mathbf{a}^2$

- Are these sentences true or false?

  1 You can only calculate the length of side **c** when you know the length of the other two sides.
  2 The area of the two smaller squares will always be smaller than the area of the big square.
  3 When the length of side **b** is 4 metres, then the area of the square is 16 metres.
  4 When the area of the square **c** is 12, then the length of side **c** is 3.
  5 Pythagoras' theorem works with all types of triangle.
  6 In the equation $\mathbf{a}^2 + 16 = 36$, the $\mathbf{a}^2 = 20$.

Activity 3

Read the short text and then try and solve the problems.

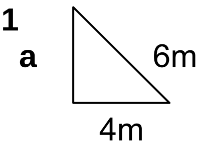
One of the problems with square roots is that it can be difficult to work them out. When the number is small, we often know the answer from our multiplication tables. So 3 x 3 = 9 and the square root of 25 is 5. But what happens when the numbers are bigger and we don't have a calculator or computer to help us? Don't worry, because what you can do is estimate, or guess, the number. Let's take the sum that we gave to our builders in activity 2.

$10^2 + 8^2 = \mathbf{c}^2$.
So, $\mathbf{c} = \sqrt{\mathbf{c}^2}$.

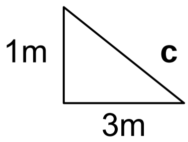
Well, $10^2 = 100$ and $8^2 = 64$, so the total area of the two squares is 164. To work out the length of side **c** we now need to find the square root of 164. Well, we know that 13 x 13 is 169, so the answer will be just a little less than 13*. The best thing to do is to tell our builders to cut the piece of wood to 13 metres and then just cut a tiny bit off when they are fitting it.

* In fact the answer is 12.8.

Work in groups and calculate the answers to these problems. Remember, estimate the square root as near as you can, but don't worry about being exact.

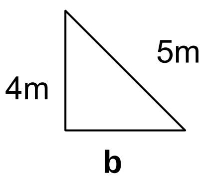
1


What does **a** equal?
a 3.5m **b** 4.5m **c** 5m

2


What does **c** equal?
a 3.15m **b** 3.5m **c** 4m

3 $6^2 + 8^2 = \mathbf{c}^2$.
What does **c** equal?

4


What does **b** equal?