WelTec/Whitireia Mathematics Series

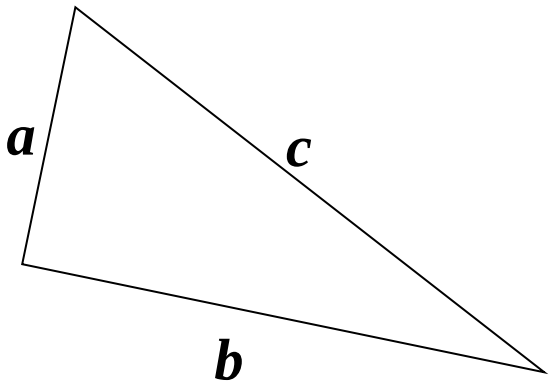
Advanced Pythagoras

You should have a reasonably good idea of Pythagoras Theorem from the 'Pythagoras Basics' sheet. If not have a look at it now.

This hand-out is to get you using Pythagoras Theorem to solve trade related problems. It lets you find any of the side lengths of a **right angled triangle** if you know the other two.

Finding the longest side

In any right angled triangle the area of the square on the longest side equals the sum of the squares on the two shorter sides.



In symbols, this is:

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

So, square rooting both sides gives:

$$c = \sqrt{a^2 + b^2}$$

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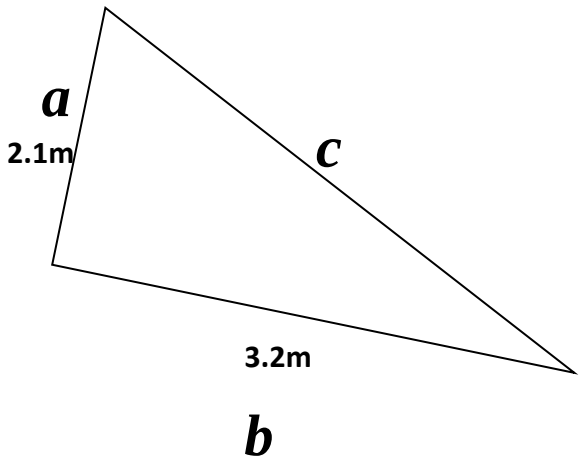
Example 1

Find the length of the longest side



a = 2.1 m
b = 3.4 m

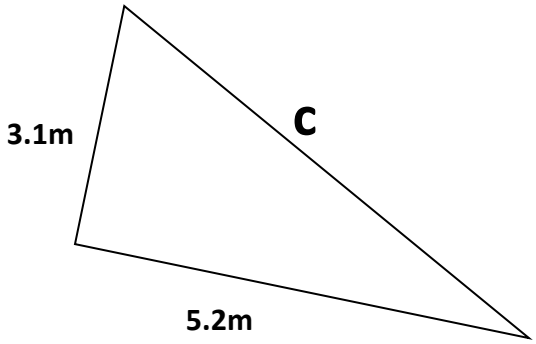
$$c = \sqrt{a^2 + b^2}$$

$$c = \sqrt{2.1^2 + 3.4^2}$$
$$c = \sqrt{4.41 + 11.56}$$

So, $c = \sqrt{15.97}$
= 3.996 m

Question 1

Find the length of the longest side of this right angled triangle



a = 3.1 m

b = 5.2 m

$c = \sqrt{a^2 + b^2}$

$c = \sqrt{\_\_\_\_^2 + \_\_\_\_^2}$

$c = \sqrt{\_\_\_\_ + \_\_\_\_}$

So, $c = \sqrt{\_\_\_\_\_}$

= _____ m

Answer

$c = \sqrt{a^2 + b^2}$

$c = \sqrt{3.1^2 + 5.2^2}$

$c = \sqrt{9.61 + 27.04}$

So, $c = \sqrt{36.65}$

= 6.054 m

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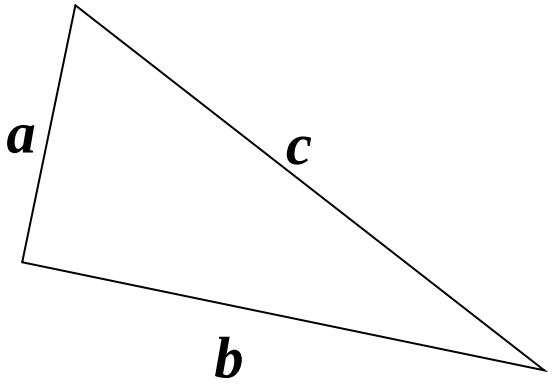
Finding a shorter side (Part One)

In any right angled triangle the area of the square on one of the shorter sides equals the area of the square on the longest side minus the area on the other shorter side.



In symbols, this is:

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

So, square rooting both sides gives:

$$a = \sqrt{c^2 - b^2}$$

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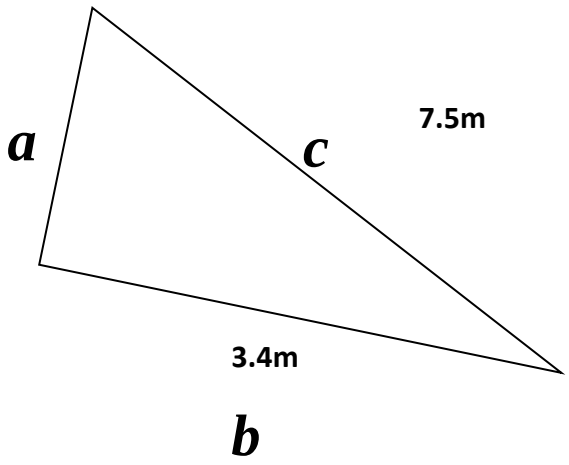
Example 2

Find the length of ***a***



c = 7.5 m
b = 3.4 m

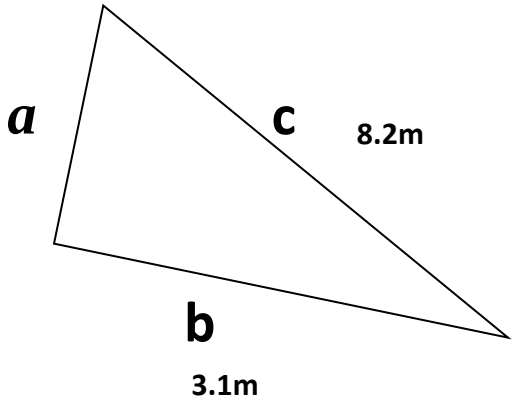
$$a = \sqrt{c^2 - b^2}$$

$$a = \sqrt{7.5^2 - 3.4^2}$$
$$a = \sqrt{56.25 + 11.56}$$

So, $a = \sqrt{44.69}$
= 6.685 m

Question 2

Find the length of side a of this right angled triangle



c = 8.2 m

b = 3.1 m

$a = \sqrt{c^2 - b^2}$

$a = \sqrt{\_\_\_\_\_^2 - \_\_\_\_\_^2}$

$a = \sqrt{\_\_\_\_\_ - \_\_\_\_\_}$

So, $a = \sqrt{\_\_\_\_\_}$

= _____ m

Answer

$a = \sqrt{c^2 - b^2}$

$a = \sqrt{8.2^2 - 3.1^2}$

$a = \sqrt{67.24 - 9.61}$

So, $a = \sqrt{57.63}$

= 7.591 m

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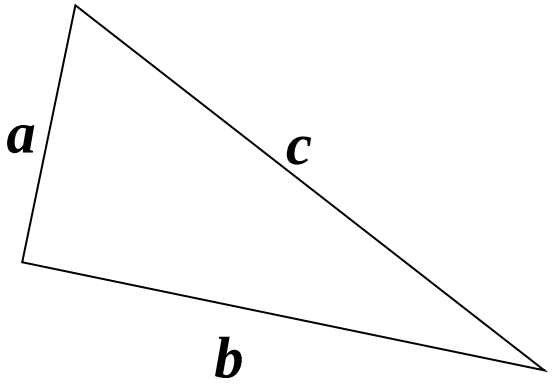
Finding a shorter side (Part Two)

In any right angled triangle the area of the square on one of the shorter sides equals the area of the square on the longest side minus the area on the other shorter side.



In symbols, this is:

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

So, square rooting both sides gives:

$$b = \sqrt{c^2 - a^2}$$

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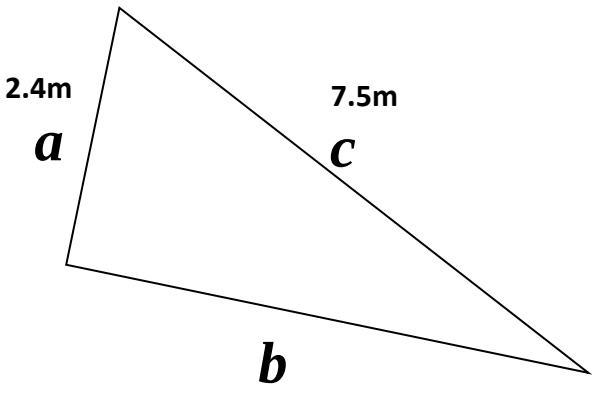
Example 3

Find the length of ***b***



c = 7.5 m
a = 3.4 m

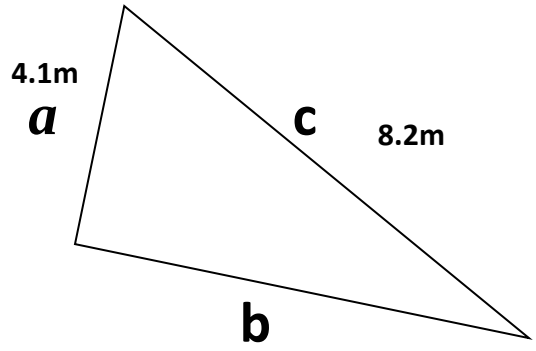
$$b = \sqrt{c^2 - a^2}$$

$$a = \sqrt{7.5^2 - 2.4^2}$$
$$a = \sqrt{56.25 + 5.76}$$

So, $a = \sqrt{50.49}$
= 7.106 m

Question 3

Find the length of side ***b*** of this right angled triangle



c = 8.2 m

b = 3.1 m

$a = \sqrt{c^2 - b^2}$

$a = \sqrt{\_\_\_\_\_^2 - \_\_\_\_\_^2}$

$a = \sqrt{\_\_\_\_\_ - \_\_\_\_\_}$

So, $a = \sqrt{\_\_\_\_\_}$

= _____ m

Answer

$b = \sqrt{c^2 - a^2}$

$b = \sqrt{8.2^2 - 4.1^2}$

$b = \sqrt{67.24 - 16.81}$

So, $b = \sqrt{50.43}$

= 7.101 m

If you would like to know more about Pythagoras contact the Learning Commons.

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