THE THEOREM OF PYTHAGORAS

By the end of this set of exercises, you should be able to

(a) solve problems in right-angled triangles using the Theorem of Pythagoras

Squares and Square Roots

Exercise 1

1. Find the value of:

(a) 5^2	(b) 8^2	(c) 10^2	(d) 1^2
(e) $3 \cdot 5^2$	(f) $0 \cdot 3^2$	(g) $25 \cdot 2^2$	(h) 100^2

2. Find the value of:

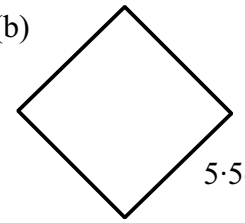
(a) $\sqrt{25}$	(b) $\sqrt{81}$	(c) $\sqrt{100}$	(d) $\sqrt{20 \cdot 25}$
(e) $\sqrt{110 \cdot 25}$	(f) $\sqrt{324}$	(g) $\sqrt{10\,000}$	(h) $\sqrt{1}$

3. Calculate the area of these squares, giving your answers correct to 1 decimal place:

(a)

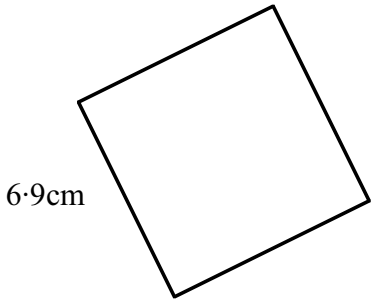
3·2cm

(b)



5·5cm

(c)



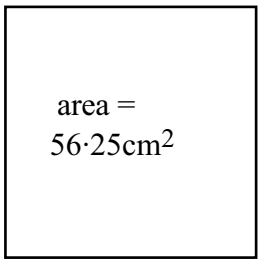
6·9cm

4. Calculate the length of a side in each of these squares:

(a)

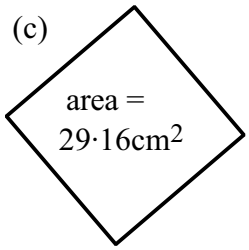
area = $9cm^2$

(b)



area = $56 \cdot 25cm^2$

(c)



area = $29 \cdot 16cm^2$

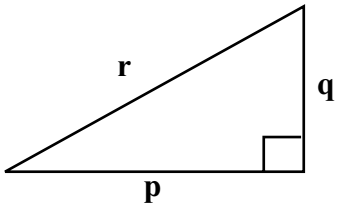
The Theorem of Pythagoras

Exercise 2

1. Use Pythagoras' Theorem to write an equation for each of these triangles:

(the first one has been done for you)

(a)

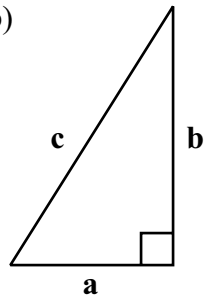


$\mathbf{r^2 = p^2 + q^2}$

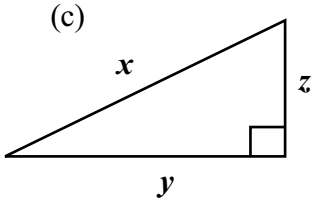
* ***r*** *is the* <u>*longest*</u> *side.*

contd...

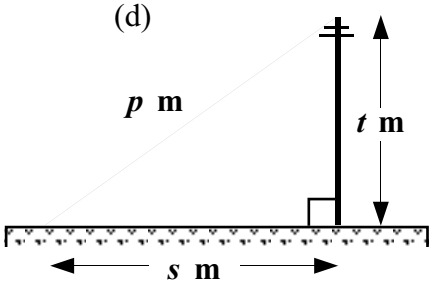
(b)



(c)

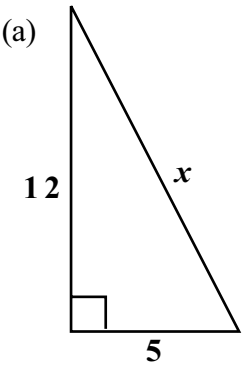


(d)

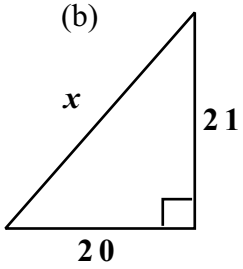


2. Calculate the length of the missing side ***x***. Give your answers correct to one decimal place.

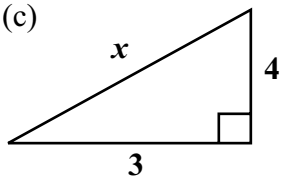
(a)



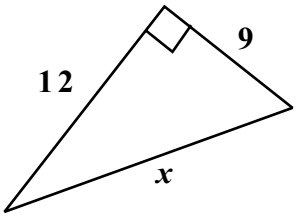
(b)



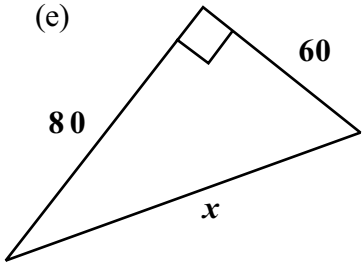
(c)



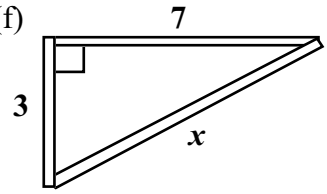
(d)



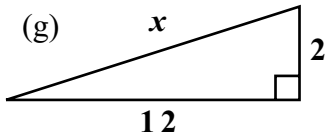
(e)



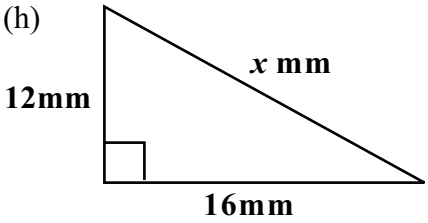
(f)



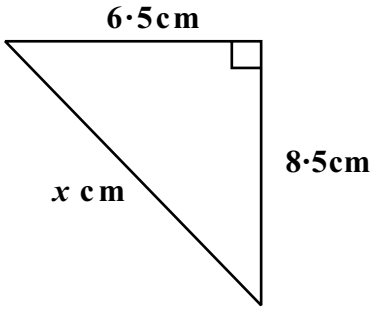
(g)



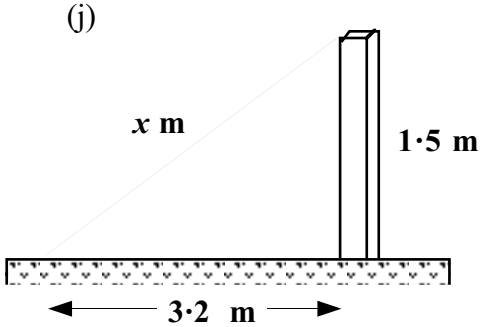
(h)



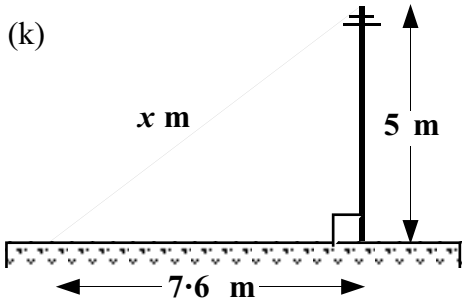
(i)



(j)



(k)

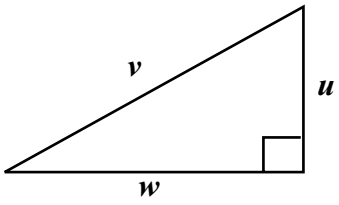


Exercise 3

1. Use Pythagoras' Theorem to write an equation which can be used to calculate the required side in each of the following triangles:

(the first one has been done for you)

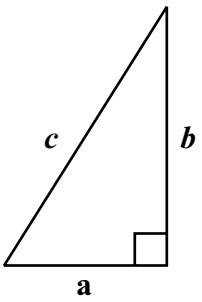
(a)



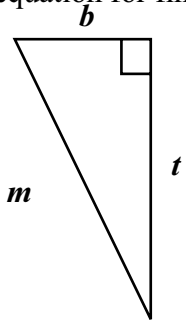
$u^2 = v^2 - w^2$

where u is one of the two shorter sides.

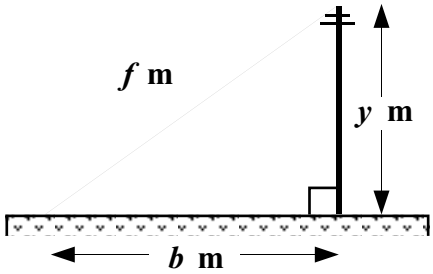
(b) Write an equation for finding a here.



(c) Write an equation for finding b here.

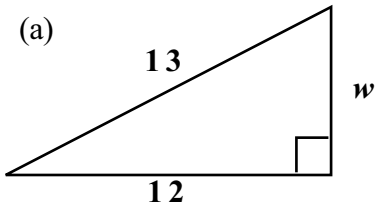


(d) Write an equation for finding y here.

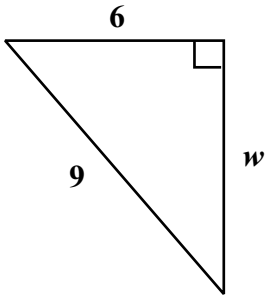


2. Calculate the length of the missing side w, giving your answers correct to one decimal place.

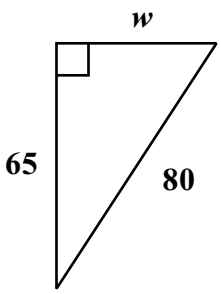
(a)



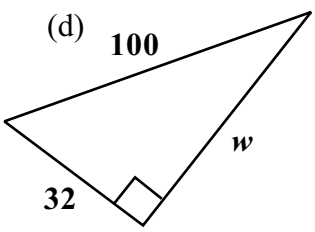
(b)



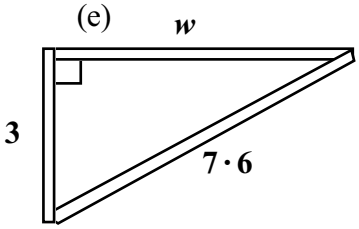
(c)



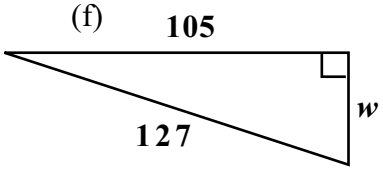
(d)



(e)

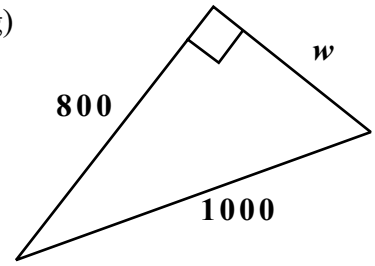


(f)

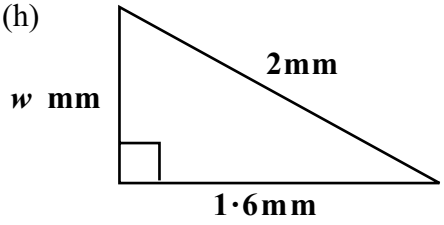


contd...

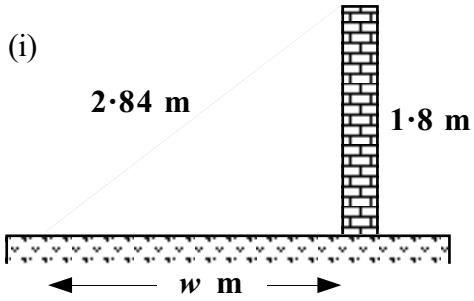
(g)



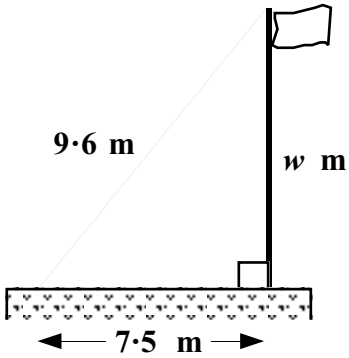
(h)



(i)

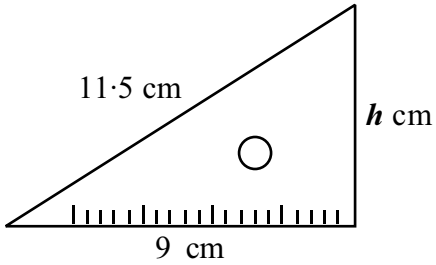


(j)



Exercise 4 In this exercise, give all your answers correct to 1 decimal place.

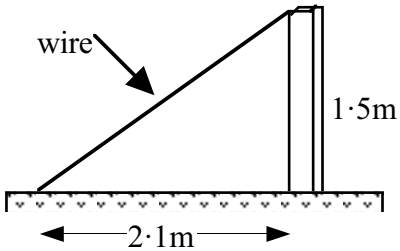
1. Calculate the height of this set square.



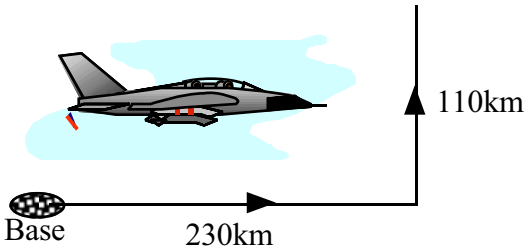
2. A 1·5 metre wooden post is cemented vertically into the ground and requires support until the cement dries.

   Due to marshy conditions, the nearest spot where a peg can be hammered in to hold a supporting wire is 2·1 metres from the post.

   What is the minimum length of wire which will be required?



3.



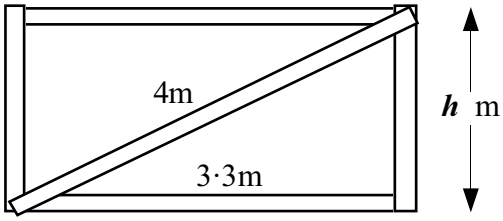
A fighter pilot flies 230 kilometres due East from base.

He then flies 110 kilometres due North.

How far is he now from base?

4. A gate which is 3·3 metres wide has a 4 metre wooden diagonal support.

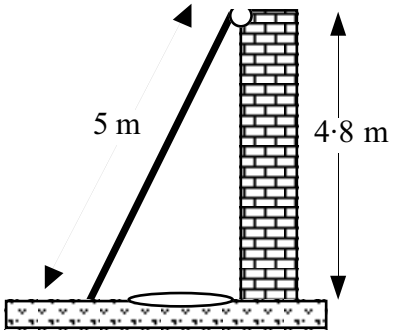
   Calculate the height of the gate?



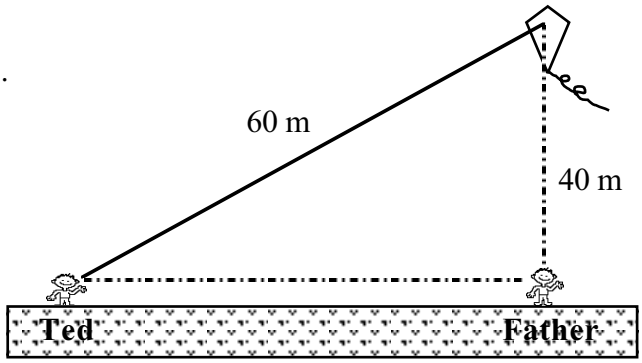
5. In order to rescue a cat who finds herself stuck in a gutter at the top of a 4·8 metre brick wall, the rescuer places his 5 metre ladder against the side of the wall.

   For safety, he has to place the foot of the ladder <u>at least</u> 1 metre from the base of the wall.

   Find how far the base of his ladder is from the the wall and state if it is safe for him to complete the rescue.



6.

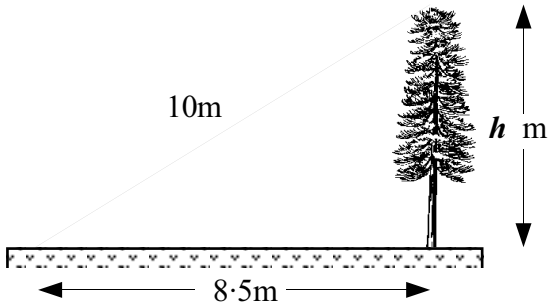


Ted and his father are flying a kite.

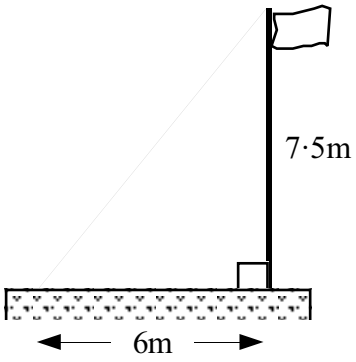
When Ted has let out 60 metres of string the kite is 40 metres above the ground and directly above his father.

How far away from his father is Ted standing?

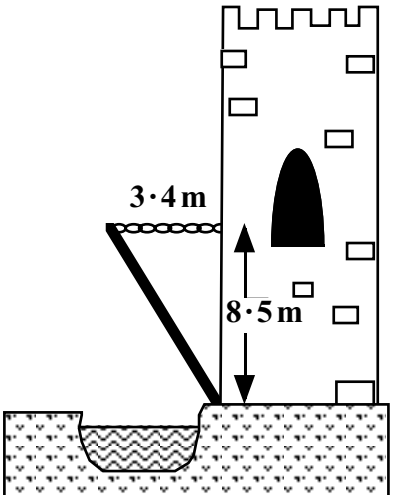
7. Calculate the height of this tree which is supported by a 10 metre rope tied down 8·5 metres from the foot of the tree.



8. What length of cable is needed to secure this flag pole?



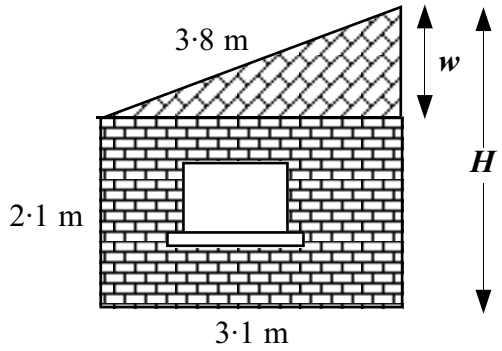
9.



The drawbridge of a castle is supported by a 3·4 metre chain which is attached to a bolt 8·5 metres up the castle wall.

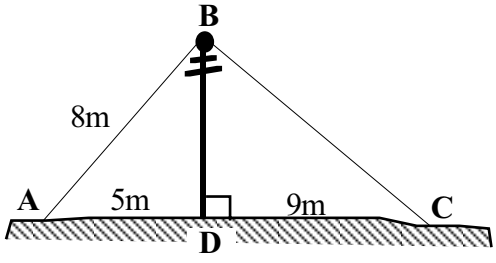
Calculate the length of the drawbridge.

10. The picture shows an end view of a house extension. The top part is made of timber.



(a) Calculate the height (***w*** metres) of the timber part of the extension.
(b) What is the overall height (***H*** metres) of the extension?

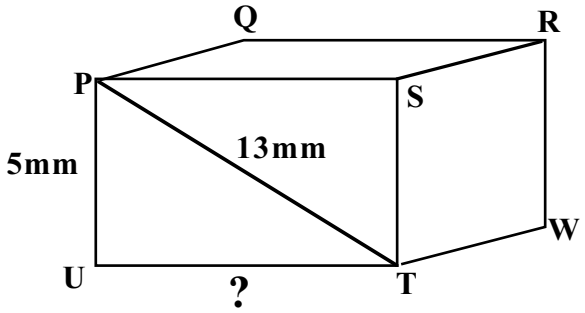
11.



This picture shows a telegraph pole with 2 wires connecting the top of the pole to the ground.

(a) Calculate the height of the telegraph pole.
(b) Use the answer to part (a) to work out the length of wire BC.

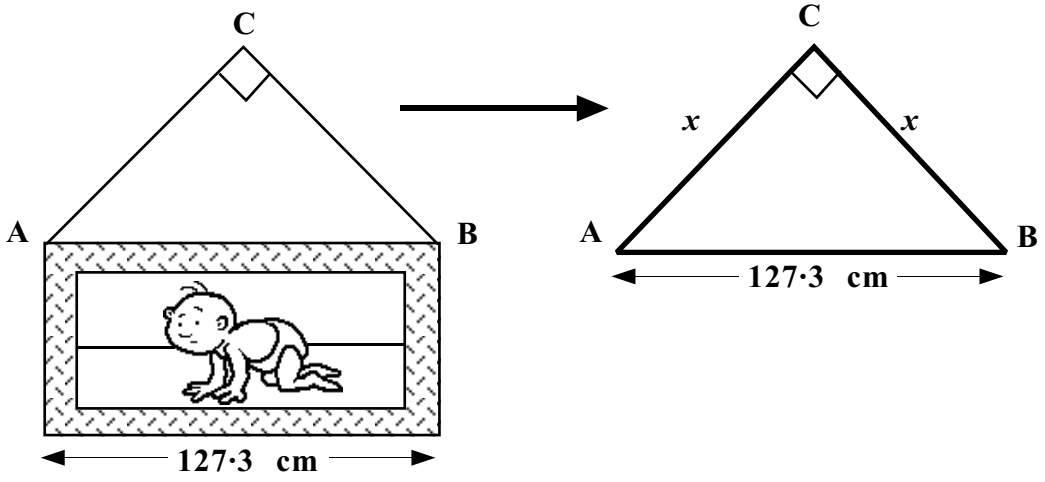
12. PSTU is a rectangular face of this cuboid.
PU = 5mm and PT = 13mm.
Calculate the length of the line UT.



13. HARD!

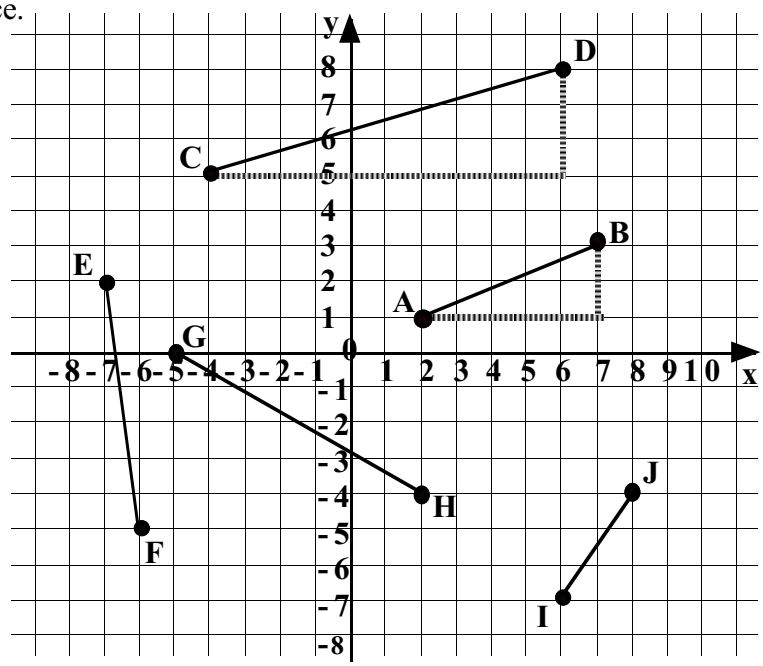
The baby portrait is 127·3 centimetres in length. (Line AB = 127·3 centimetres)

Calculate the length of AC, half of the string used for hanging the picture.



Exercise 5

1. Calculate the lengths of the 5 lines, AB, CD, EF, GH and IJ giving your answer correct to 1 decimal place.



2. Plot these points on a coordinate diagram and calculate the lengths of the lines joining them.

   (a) P(1,2) and Q(9,8)

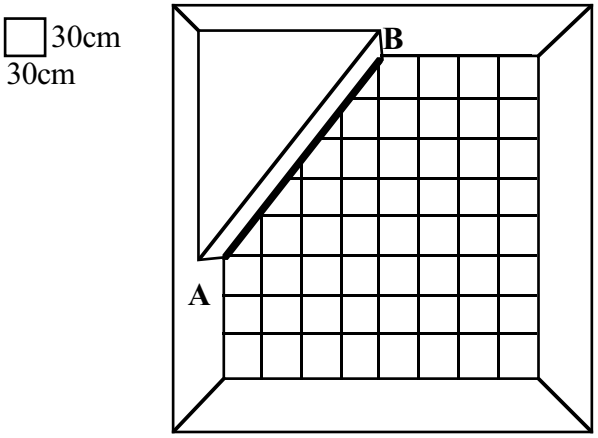
   (b) R(2,–1) and S(–3,11)

3. Part of a tiled bathroom wall is shown.

   A piece of sloping ceiling cuts across the tiles.

   The square tiles measure 30 centimetres by 30 centimetres.

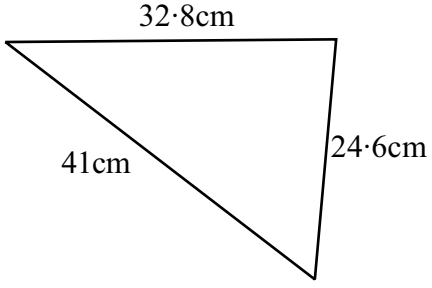
   Calculate the length of the sloping ceiling from **A** to **B**.



4. Charles was asked to draw a triangle with sides 32·8 centimetres, 24·6 centimetres and 41 centimetres.

   He drew a triangle with the correct measurements but sketched it like the one shown below.

   Explain why Charles' triangle should really have had a right angle in it.

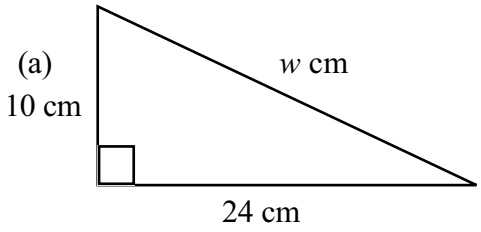


Mathematics 2 (Intermediate 1)

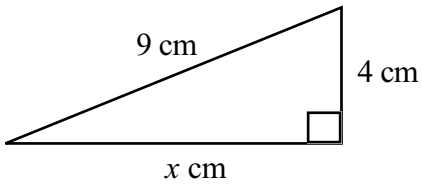
Checkup for The Theorem of Pythagoras

1. Calculate the length of the unknown side, correct to 1 decimal place, in each of these triangles:

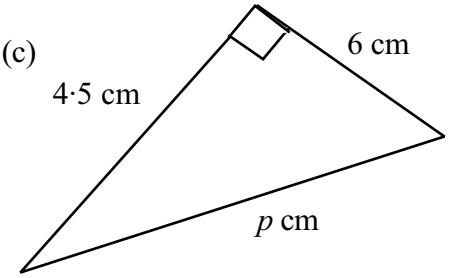
(a)



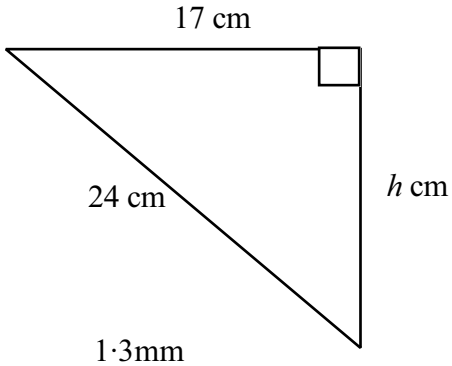
(b)



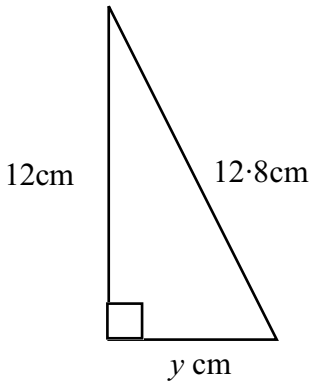
(c)



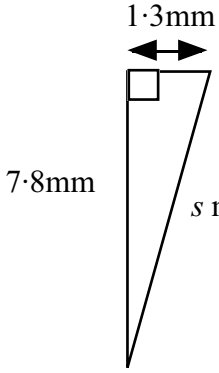
(d)



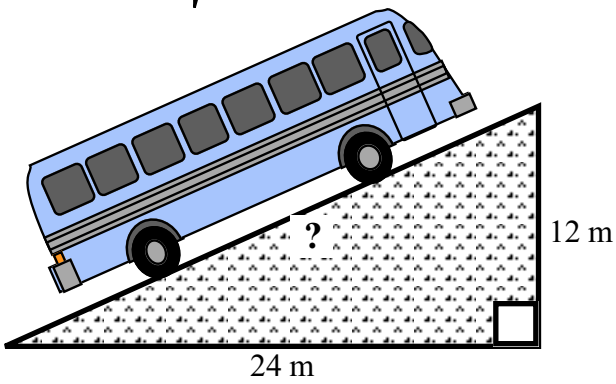
(e)



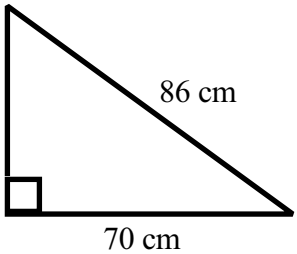
(f)



2. A bus is sitting on a giant ramp.
Find the length of the ramp.



3.

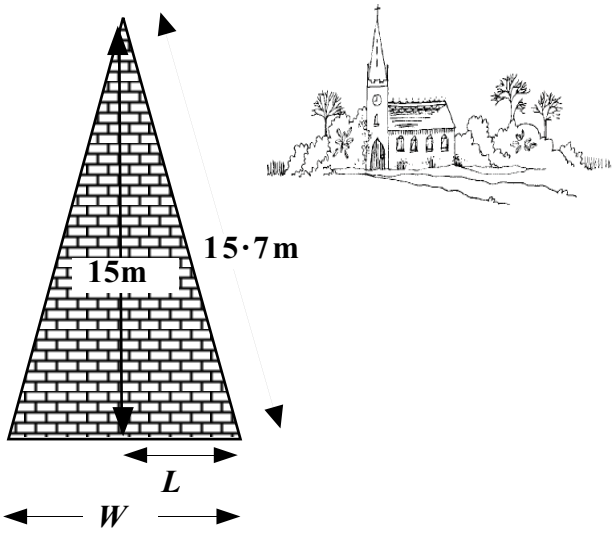


This diagram shows the sail on a model yacht.
Calculate the height of the sail.

4. A church steeple is in the shape of an isosceles triangle. It is 15 metres high and has a sloping edge of 15·7 metres.

   Calculate:

   (a) the length ***L*** (metres).
   (b) the width ***W*** (metres) of the steeple.



5. Plot these points on a coordinate diagram and calculate the lengths of the lines joining them.

   (a) A(1,0) and B(7,8)

   (b) C(–4,–2) and D(–7,–6)