

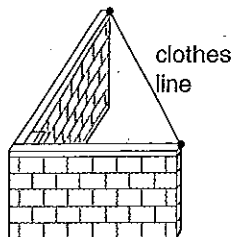
Investigating Pythagoras' Theorem I

Student Name	Class	Score
Parent Signature	Date	

3:01 | Investigating Right-angled Triangles

Outcome MS 4.1

One part of a garden is fenced by two walls at right-angles to each other. One wall is 8 m long, and the other is 15 m long.

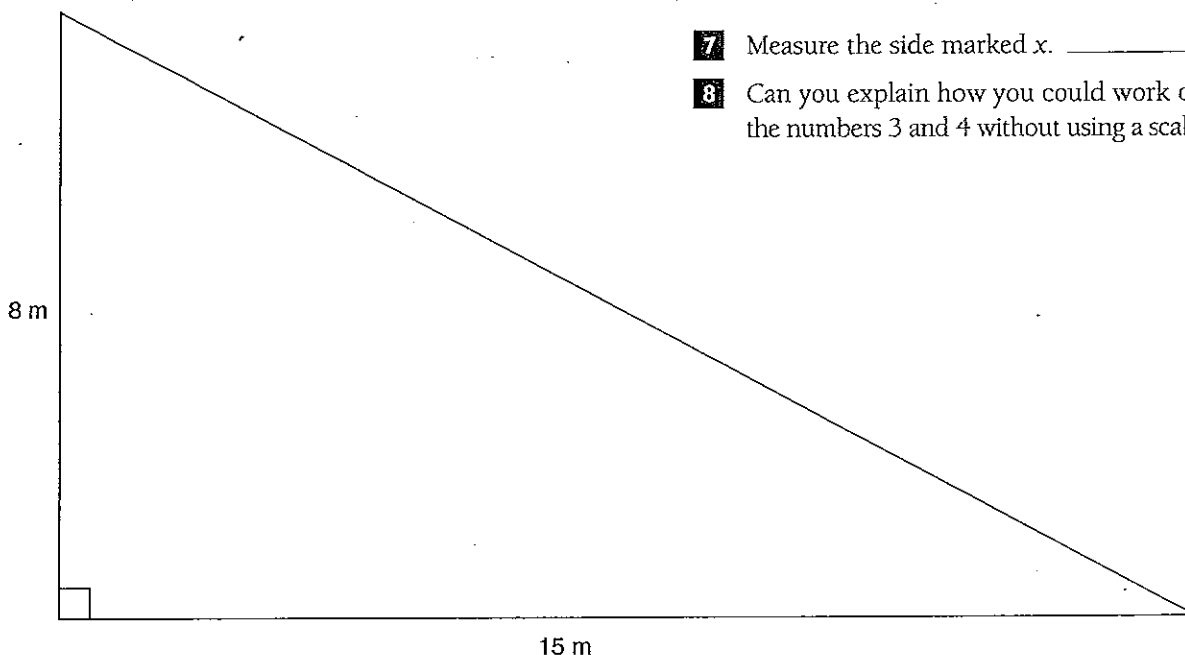


The owner wants to run a clothesline from the end of one wall to the end of the other.

1 Will the line be longer than 15 m? Why?

2 Take a guess at how long it might be.

To estimate how long the line will be, the owner draws a scale diagram. The scale is 1 m = 1 cm. Here is the scale diagram—it shows a right-angled triangle with the two shorter sides measuring 8 cm and 15 cm.



3 Measure the third side of the triangle. What length, in centimetres, do you get?

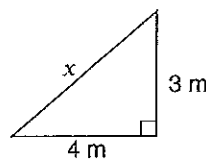
What length in metres does this represent?

4 Do you think the line will need to be longer than the estimate the owner gets from the scale diagram? Explain.

5 Mathematicians can calculate this length exactly without drawing a scale diagram. Investigate.

Hint: How do you get the number 289 from working out 8^2 and 15^2 ? Calculate $\sqrt{289}$.

6 Make an exact scale drawing of a right-angled triangle with sides 4 cm and 3 cm.



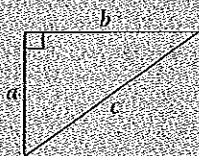
7 Measure the side marked x .

8 Can you explain how you could work out x from the numbers 3 and 4 without using a scale drawing?

3:02 | Using Pythagoras' Theorem: Calculating the Hypotenuse (Part I)

Outcome MS 4.1

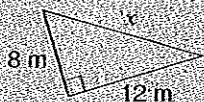
In this diagram of a right-angled triangle, the two sides at right-angles are marked a and b . The hypotenuse (side opposite the right-angle) is labelled c .



Theorem of Pythagoras:

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

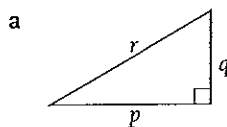
Example: Calculate the length of the side marked x .

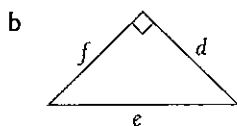


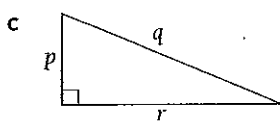
Answer:

$$\begin{aligned} x^2 &= 8^2 + 12^2 \\ &= 64 + 144 \\ &= 208 \\ x &= \sqrt{208} = 14.42 \text{ m (4 sig. fig.)} \end{aligned}$$

1 Write down the Pythagoras relationship for each of these triangles.



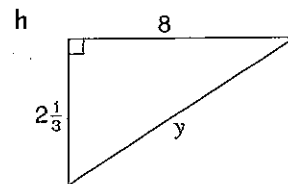
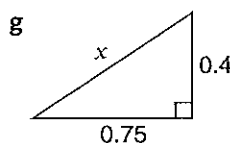
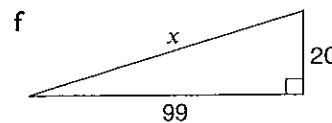
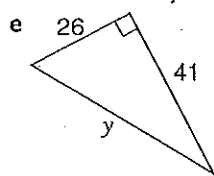
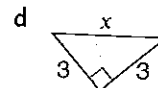
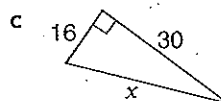
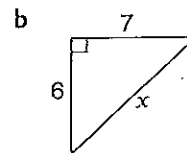
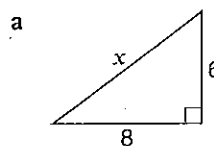




2 Here is some working that has been written down from a right-angled triangle using Pythagoras. In each case finish off the working. You'll need to use your calculator and the \sqrt{x} key.

$$\begin{aligned} \text{a } c^2 &= 7^2 + 24^2 & \text{b } c^2 &= 5^2 + 9^2 \\ c^2 &= 49 + 576 & c^2 &= 625 \\ c &= \underline{\hspace{2cm}} & \text{c } c^2 &= 11^2 + 13^2 \end{aligned}$$

3 Use the theorem of Pythagoras to calculate the length of the unknown marked side in each right-angled triangle. All measurements are in centimetres. If the answers do not work out to be whole numbers, round them to one decimal place.

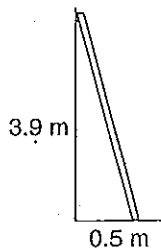


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3:02 | Using Pythagoras' Theorem; Calculating the Hypotenuse (Part 2 — Applications)

Outcome MS 4.1

- 1** A length of particle board has been placed against a wall on an angle to prevent it from falling over. It reaches 3.9 m up the wall, and the bottom of the particle board resting on the floor is 0.5 m from the wall. Use Pythagoras to calculate the length of the particle board.



- 2** A pole-vaulter has left a pole standing against the wall of the changing rooms in a stadium. The pole reaches 3.6 m up the wall and rests at a point which is 0.4 m from the base of the wall.

a Draw a diagram to represent this information.

- b Calculate the length, in metres, of the pole (correct to 3 dec. pl.).

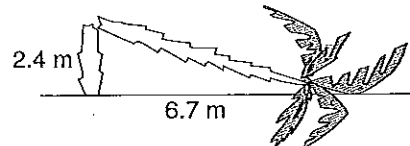
- 3** A rectangular room in a library measures 6 m by 10 m. What is the length, diagonally, from one corner to the opposite corner?

- 4** A ramp runs in a straight line from a point which is 6.51 m from a building to a point on the building which is 1.28 m above the ground.

a Draw a diagram to represent this information.

- b Use Pythagoras to calculate the length of the ramp (correct to 2 dec. pl.).

- 5** A coconut palm has blown over after a tropical cyclone. The top part snapped off at a point 2.4 m off the ground and is resting on the ground at a point which is 6.7 m from the base of the palm.



Use Pythagoras to calculate the height of the palm before it was blown over.

- 6** A rectangular soccer field measures 60 m by 110 m. Derek wants to walk from one corner to the opposite corner.

a How far, to the nearest metre, will he travel if he walks diagonally in a straight line across the field?

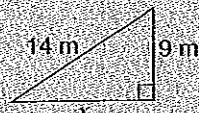
b How many metres shorter is this compared with walking along the two sides? _____

3:03 | Using Pythagoras' Theorem: Calculating One of the Short Sides

Outcome MS 4.1

Pythagoras can also be used to calculate one of the two shorter (or perpendicular) sides (a side which is not the hypotenuse). This involves subtracting.

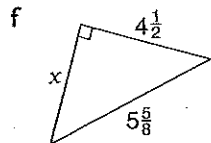
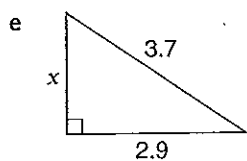
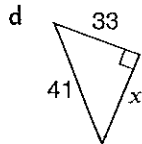
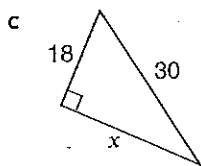
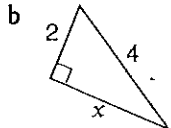
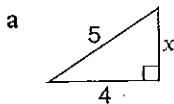
Example: Calculate the length of the side marked x .



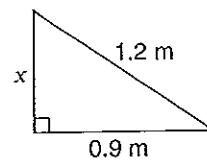
Answer:

$$\begin{aligned} x^2 + 9^2 &= 14^2 \\ x^2 + 81 &= 196 \\ x^2 &= 196 - 81 \\ x^2 &= 115 \\ x &= \sqrt{115} = 10.72 \text{ m (4 sig. fig.)} \end{aligned}$$

1 Use the theorem of Pythagoras to calculate the length of the unknown marked side in each right-angled triangle. All measurements are in centimetres. If the answers do not work out to be whole numbers, round them to one decimal place.



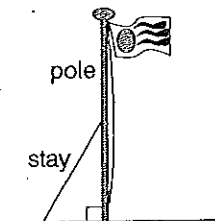
2 Here is a student's working when they were calculating x in this diagram.



$$\begin{aligned} x + (0.9)^2 &= (1.2)^2 \\ x + 0.81 &= 1.44 \\ x &= 1.44 - 0.81 \\ x &= 0.63 \end{aligned}$$

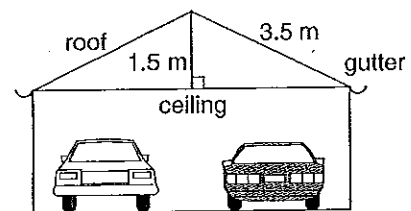
- Explain what the mistake is in the working.
- Calculate the correct answer.

3 A flag pole is supported by a stay which is 3.7 m long. The stay is attached to the ground at a point which is 1.4 m from the base of the pole.



- Draw a right-angled triangle, with measurements on two sides and x on the third side, to represent this information.
- Calculate how far up the pole the stay is fastened.

4 The top of a garage roof is 1.5 m above the ceiling. The distance from the top of the roof to each gutter is 3.5 m.



Calculate the width of the garage.

Investigating Pythagoras' Theorem 3

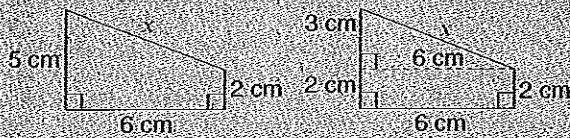
Student Name	Class	Score
Parent Signature	Date	

3:04 Miscellaneous Exercises Involving Pythagoras' Theorem

Outcome MS 4.1

Right-angled triangles can be identified in some shapes and then Pythagoras can be used to calculate side lengths.

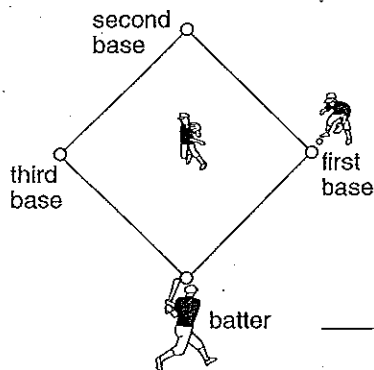
Example: Calculate the length marked x in this trapezium.



Answer: A right-angled triangle appears when the dashed line is added to the diagram.

$$\begin{aligned} x^2 &= 6^2 + 3^2 \\ &= 36 + 9 \\ &= 45 \\ x &= \sqrt{45} \\ &= 6.71 \text{ cm} \end{aligned}$$

- 1** A softball 'diamond' is actually square, with each side measuring 27 m. Estimate the distance from the batter to the player at second base.

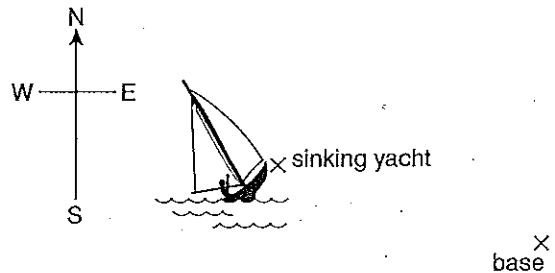


- 2** To protect against damage from an oncoming storm, Lucy runs some masking tape diagonally across a window from the bottom left corner to the top right corner. She uses 2.8 m of tape. The window is 1.6 m long. Explain, using a diagram and some calculations, how she could calculate the height of the window.

- 3** Here is some information about a kiwi-fruit orchard.
- It is rectangular.
 - One side measures 28 m.
 - The distance between opposite corners is 35 m.
- a Draw a diagram to represent this information.

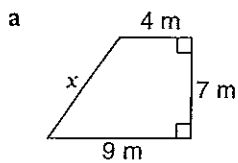
- b Calculate the length of the shelter belt needed to completely enclose the orchard.

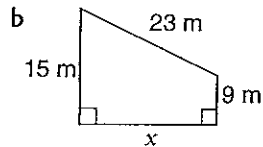
- 4** A 'search and rescue' team travels in a straight line by boat to a sinking yacht at a point 7 km north and 24 km west of their base.



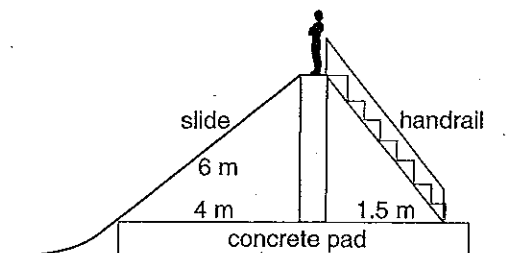
- a Draw a right-angled triangle with measurements on two sides to represent this information.
- b Use Pythagoras to calculate the distance from the base to the yacht.
- c If the team returns to base with the survivors, how far do they travel altogether? _____

- 5 Calculate the length of the side marked x in each diagram. Write each answer correct to two decimal places.





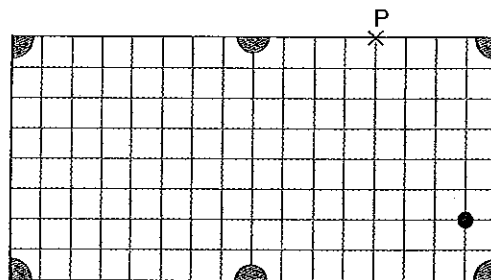
- 6 The diagram shows some steps with a handrail leading up to the top of a children's slide.



- a Calculate the height of the top of the slide above the concrete pad.

- b Calculate the length of the handrail.

- 7 The diagram shows a snooker table. It measures 4 m by 2 m, so each unit on the square grid represents 0.25 m.



A person hits the ball (marked by the dot) firmly towards point P, where it bounces symmetrically off the cushion. It continues in this way until it reaches one of the six holes.

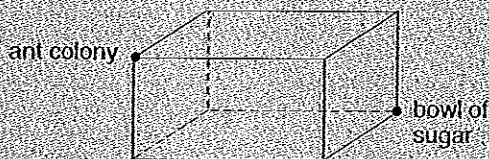
- a Add the path of the ball to the diagram.
- b Use Pythagoras to calculate the *total* distance (in units) travelled by the ball.

- c How far does the ball travel in metres?



The Ants and the Sugar Bowl

A room in a house measures 6 m by 3 m. The height of the room is 2 m.



Some ants have discovered a bowl of sugar on the floor in one corner of the room. The entrance to their colony is in the roof at the opposite corner.

- What is the least distance they will have to travel along the roof, floor and/or walls from the colony to the bowl of sugar?



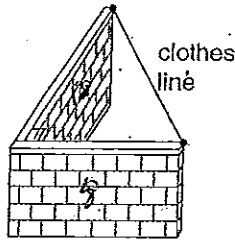
Investigating Pythagoras' Theorem I

Student Name	Nancy Le	Class	yr 8	Score
Parent Signature		Date	28/5/07	

3:01 Investigating Right-angled Triangles

Outcome MS 4.1

One part of a garden is fenced by two walls at right-angles to each other. One wall is 8 m long, and the other is 15 m long.



The owner wants to run a clothesline from the end of one wall to the end of the other.

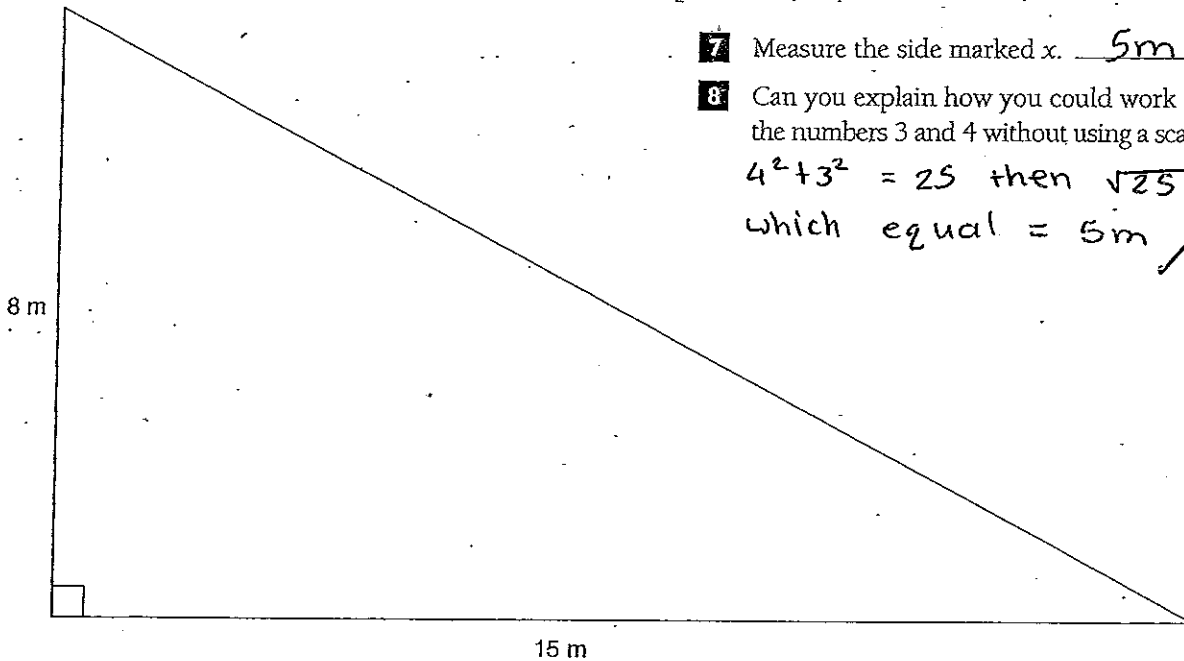
1 Will the line be longer than 15 m? Why?

Yes because the hypotenuse is always longer.

2 Take a guess at how long it might be.

17

To estimate how long the line will be, the owner draws a scale diagram. The scale is 1 m = 1 cm. Here is the scale diagram—it shows a right-angled triangle with the two shorter sides measuring 8 cm and 15 cm.



3 Measure the third side of the triangle. What length, in centimetres, do you get?

289 cm

What length in metres does this represent?

17m

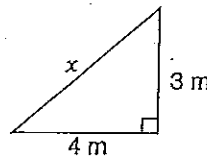
4 Do you think the line will need to be longer than the estimate the owner gets from the scale diagram? Explain.

Yes No because the owner said the line is to be longer than 15m the line is only 2m away.

5 Mathematicians can calculate this length exactly without drawing a scale diagram. Investigate.

Hint: How do you get the number 289 from working out 8^2 and 15^2 ? Calculate $\sqrt{289}$. In their minds they calculate $8^2 + 15^2 = 289$ the $\sqrt{289}$ which will equal to 17

6 Make an exact scale drawing of a right-angled triangle with sides 4 cm and 3 cm.



7 Measure the side marked x. 5m

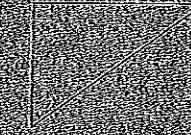
8 Can you explain how you could work out x from the numbers 3 and 4 without using a scale drawing?

$4^2 + 3^2 = 25$ then $\sqrt{25}$ which equal = 5m

3:02 | Using Pythagoras' Theorem: Calculating the Hypotenuse (Part 1)

Outcome MS 4.1

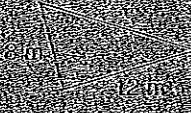
In this diagram of a right-angled triangle, the two sides at right angles are marked a and b . The hypotenuse (side opposite the right angle) is labelled c .



Theorem of Pythagoras

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

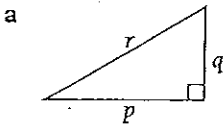
Example: Calculate the length of the side marked x .



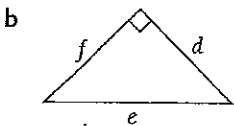
Answer:

$$\begin{aligned} x^2 &= 8^2 + 6^2 \\ x^2 &= 64 + 36 \\ x^2 &= 100 \\ x &= \sqrt{100} = 10 \text{ m} \end{aligned}$$

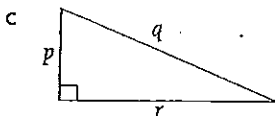
Write down the Pythagoras relationship for each of these triangles.



$$r^2 = q^2 + p^2 \quad \checkmark$$



$$e^2 = f^2 + d^2 \quad \checkmark$$



$$q^2 = p^2 + r^2 \quad \checkmark$$

Here is some working that has been written down from a right-angled triangle using Pythagoras. In each case finish off the working. You'll need to use your calculator and the \sqrt{x} key.

a $c^2 = 7^2 + 24^2$

$$c^2 = 49 + 576$$

$$c^2 = 625 \quad \checkmark$$

$$c = \underline{25}$$

b $c^2 = 5^2 + 9^2$

$$c^2 = 25 + 81 \quad \checkmark$$

$$c^2 = 106$$

$$c = 10.29563014$$

$$c = 10.3 \text{ (1 dec)}$$

c $c^2 = 11^2 + 13^2$

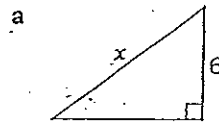
$$c^2 = 221 + 169 \quad \checkmark$$

$$c = 290$$

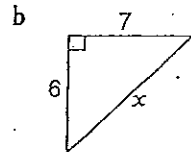
$$c = 14.45683229$$

$$c = 14.5 \text{ (1 dec)}$$

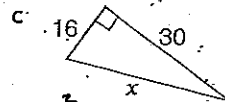
Use the theorem of Pythagoras to calculate the length of the unknown marked side in each right-angled triangle. All measurements are in centimetres. If the answers do not work out to be whole numbers, round them to one decimal place.



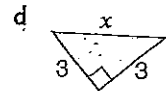
$$\begin{aligned} x^2 &= 6^2 + 8^2 \\ x^2 &= 36 + 64 \quad \checkmark \\ x^2 &= 100 \\ x &= 10 \text{ cm} \quad \checkmark \end{aligned}$$



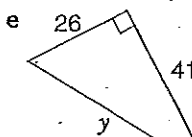
$$\begin{aligned} x^2 &= 6^2 + 7^2 \\ x^2 &= 36 + 49 \quad \checkmark \\ x^2 &= 85 \\ x &= 9.2 \text{ cm} \quad \checkmark \end{aligned}$$



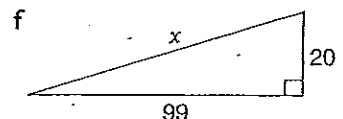
$$\begin{aligned} x^2 &= 16^2 + 30^2 \\ x^2 &= 256 + 900 \quad \checkmark \\ x^2 &= 1156 \\ x &= 34 \text{ cm} \quad \checkmark \end{aligned}$$



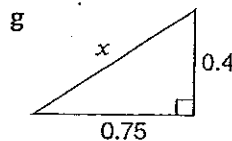
$$\begin{aligned} x^2 &= 3^2 + 3^2 \\ x^2 &= 9 + 9 \quad \checkmark \\ x^2 &= 18 \\ x &= 4.2 \text{ cm} \quad \checkmark \end{aligned}$$



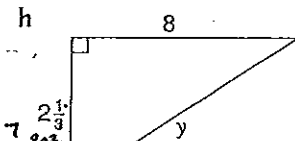
$$\begin{aligned} y^2 &= 26^2 + 41^2 \\ y^2 &= 676 + 1681 \quad \checkmark \\ y^2 &= 2357 \\ y &= 48.5 \text{ cm} \quad \checkmark \end{aligned}$$



$$\begin{aligned} x^2 &= 99^2 + 20^2 \\ x^2 &= 9801 + 400 \quad \checkmark \\ x^2 &= 10201 \\ x &= 101 \text{ cm} \quad \checkmark \end{aligned}$$



$$\begin{aligned} x^2 &= 0.4^2 + 0.75^2 \\ x^2 &= 0.16 + 0.5625 \quad \checkmark \\ x^2 &= 0.7225 \\ x &= 0.8 \text{ cm} \quad \checkmark \end{aligned}$$



$$\begin{aligned} y^2 &= 7^2 + 8^2 \\ y^2 &= 49 + 64 \quad \checkmark \\ y^2 &= 113 \\ y &= 10.6 \text{ cm} \quad \checkmark \end{aligned}$$

$2\frac{1}{3} = \frac{7}{3}$
Try again!

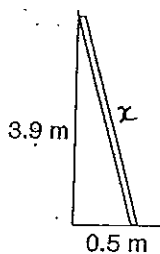
Investigating Pythagoras' Theorem 2

Student Name Nancy Le	Class yr 8	Score
Parent Signature	Date 25/5/07	

3:02 | Using Pythagoras' Theorem: Calculating the Hypotenuse (Part 2 — Applications)

Outcome MS 4.1

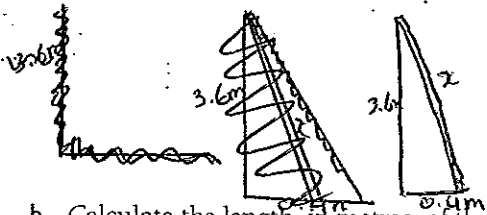
- 1** A length of particle board has been placed against a wall on an angle to prevent it from falling over. It reaches 3.9 m up the wall, and the bottom of the particle board resting on the floor is 0.5 m from the wall. Use Pythagoras to calculate the length of the particle board.



$$\begin{aligned} x^2 &= 3.9^2 + 0.5^2 \\ x &= 15.21 + 0.25 \\ x &= 15.46 \\ x &= 3.93192065 \\ x &= 3.9 \text{ (1 decimal place)} \end{aligned}$$

- 2** A pole-vaulter has left a pole standing against the wall of the changing rooms in a stadium. The pole reaches 3.6 m up the wall and rests at a point which is 0.4 m from the base of the wall.

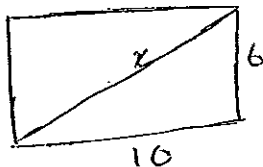
a Draw a diagram to represent this information.



- b Calculate the length, in metres, of the pole (correct to 3 dec. pl.).

$$\begin{aligned} x^2 &= 3.6^2 + 0.4^2 \\ x^2 &= 12.96 + 0.16 \\ x^2 &= 13.12 \\ x &= 3.622 \text{ m} \end{aligned}$$

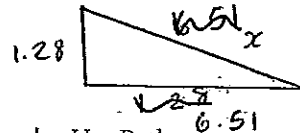
- 3** A rectangular room in a library measures 6 m by 10 m. What is the length, diagonally, from one corner to the opposite corner?



$$\begin{aligned} x^2 &= 6^2 + 10^2 \\ x^2 &= 36 + 100 \\ x^2 &= 136 \\ x &= 11.66190379 \\ x &= 11.7 \text{ (1 dec)} \end{aligned}$$

- 4** A ramp runs in a straight line from a point which is 6.51 m from a building to a point on the building which is 1.28 m above the ground.

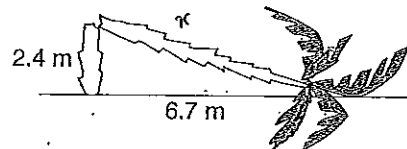
a Draw a diagram to represent this information.



- b Use Pythagoras to calculate the length of the ramp (correct to 2 dec. pl.).

$$\begin{aligned} x^2 &= 1.28^2 + 6.51^2 \\ x^2 &= 1.6384 + 42.3801 \\ x^2 &= 6.63 \end{aligned}$$

- 5** A coconut palm has blown over after a tropical cyclone. The top part snapped off at a point 2.4 m off the ground and is resting on the ground at a point which is 6.7 m from the base of the palm.



Use Pythagoras to calculate the height of the palm before it was blown over.

$$\begin{aligned} x^2 &= 2.4^2 + 6.7^2 \\ x^2 &= 5.76 + 44.89 \\ x^2 &= 50.65 \\ x &= 7.116881339 \\ x &= 7.1 \text{ (1 dec)} \end{aligned}$$

- 6** A rectangular soccer field measures 60 m by 110 m. Derek wants to walk from one corner to the opposite corner.

a How far, to the nearest metre, will he travel if he walks diagonally in a straight line across the field?

$$\begin{aligned} &125.2996409 \text{ m} \\ &125.3 \text{ m (1 dec)} \end{aligned}$$

b How many metres shorter is this compared with walking along the two sides? 75.7 m

3:03 | Using Pythagoras' Theorem: Calculating One of the Short Sides

Outcome MS 4.1

Pythagoras can also be used to calculate one of the two shorter (or perpendicular) sides (a side which is not the hypotenuse). This involves subtracting.

Example: Calculate the length of the side marked x .



Answer:

$$4^2 + 0.8^2 = 4.4^2$$

$$16 + 0.64 = 19.36$$

$$16 + 0.64 - 16 = 19.36 - 16$$

$$0.64 = 3.36$$

$$0.64 \div 0.64 = 3.36 \div 0.64$$

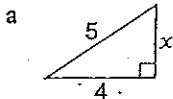
$$1 = 5.25$$

$$\sqrt{1} = \sqrt{5.25}$$

$$1 = 2.291287857$$

$$1 = 2.29 \text{ m (2 sig fig)}$$

1 Use the theorem of Pythagoras to calculate the length of the unknown marked side in each right-angled triangle. All measurements are in centimetres. If the answers do not work out to be whole numbers, round them to one decimal place.

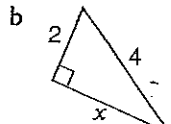


$$5^2 = 4^2 + x^2$$

$$25 = 16 + x^2$$

$$x^2 = 9$$

$$x = 3 \text{ cm}$$



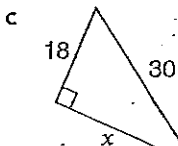
$$4^2 = 2^2 + x^2$$

$$16 = 4 + x^2$$

$$x^2 = 12$$

$$x = 3.464101615$$

$$x = 3.5 \text{ cm}$$

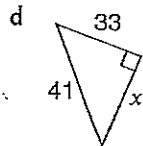


$$30^2 = 18^2 + x^2$$

$$900 = 324 + x^2$$

$$x^2 = 576$$

$$x = 24 \text{ cm}$$



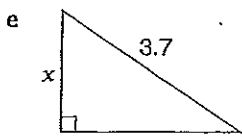
$$41^2 = 33^2 + x^2$$

$$1681 = 1089 + x^2$$

$$x^2 = 592$$

$$x = 24.33105012$$

$$x = 24.3 \text{ cm}$$

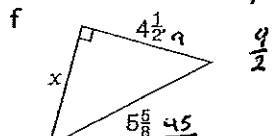


$$3.7^2 = x^2 + 2.9^2$$

$$13.69 = x^2 + 8.41$$

$$x^2 = 5.28$$

$$x = 2.3 \text{ cm}$$



$$4.5^2 = x^2 + 3.5^2$$

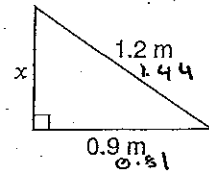
$$20.25 = x^2 + 12.25$$

$$x^2 = 8$$

$$x = 2.828427125$$

$$x = 2.8 \text{ cm}$$

2 Here is a student's working when they were calculating x in this diagram.



$$x + (0.9)^2 = (1.2)^2$$

$$x + 0.81 = 1.44$$

$$x = 1.44 - 0.81$$

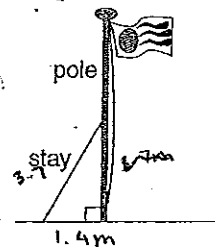
$$x = 0.63$$

- a Explain what the mistake is in the working.
She forgot to $\sqrt{\quad}$ it.
- b Calculate the correct answer.

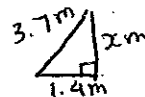
$$0.793725393$$

$$0.8 \text{ m (1 dec)}$$

3 A flag pole is supported by a stay which is 3.7 m long. The stay is attached to the ground at a point which is 1.4 m from the base of the pole.

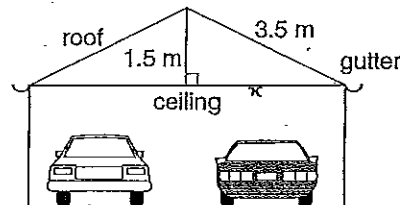


- a Draw a right-angled triangle, with measurements on two sides and x on the third side, to represent this information.



- b Calculate how far up the pole the stay is fastened.
- $$3.7^2 = 1.4^2 + x^2$$
- $$13.69 = 1.96 + x^2$$
- $$x^2 = 11.73$$
- $$x = 3.424905758 \text{ m}$$
- $$x = 3.4 \text{ m (1 dec)}$$

4 The top of a garage roof is 1.5 m above the ceiling. The distance from the top of the roof to each gutter is 3.5 m.



Calculate the width of the garage.

$$3.5^2 = 1.5^2 + x^2$$

$$12.25 = 2.25 + x^2$$

$$x^2 = 10$$

$$x = \sqrt{10} = 3.16 \text{ m}$$

The width of the garage is 10m.

$$2 \times 3.16 = 6.32 \text{ m}$$

Investigating Pythagoras' Theorem 3

Student Name	Nancy Le	Class	yr 8	Score
Parent Signature		Date	28/5/07	

3:04 | Miscellaneous Exercises Involving Pythagoras' Theorem

Outcome MS 4.1

Right-angled triangles can be identified in some shapes and then Pythagoras can be used to calculate side lengths.

Example: Calculate the length marked x in this trapezium.

Answer: A right-angled triangle appears when the dashed line is added to the diagram.

$$x^2 = 3^2 + 6^2$$

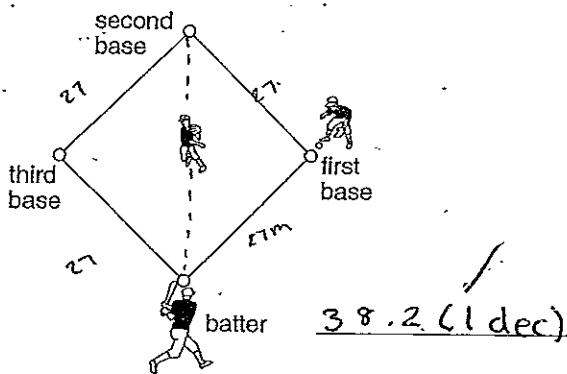
$$x^2 = 9 + 36$$

$$x^2 = 45$$

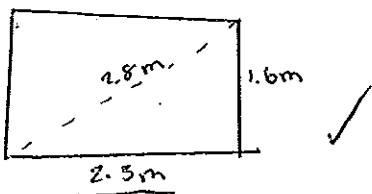
$$x = \sqrt{45}$$

$$x = 6.71 \text{ cm}$$

1 A softball 'diamond' is actually square, with each side measuring 27 m. Estimate the distance from the batter to the player at second base.

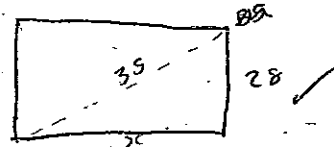


2 To protect against damage from an oncoming storm, Lucy runs some masking tape diagonally across a window from the bottom left corner to the top right corner. She uses 2.8 m of tape. The window is 1.6 m long. Explain, using a diagram and some calculations, how she could calculate the height of the window.



3 Here is some information about a kiwi-fruit orchard.

- It is rectangular.
 - One side measures 28 m.
 - The distance between opposite corners is 35 m.
- a Draw a diagram to represent this information.



b Calculate the length of the shelter belt needed to completely enclose the orchard.

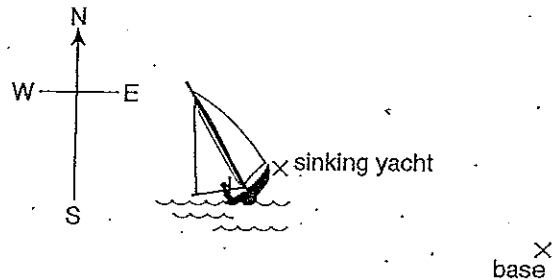
$$35^2 = 28^2 + x^2$$

$$1225 - 784$$

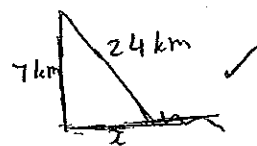
$$x^2 = 441$$

$$x = 21$$

4 A 'search and rescue' team travels in a straight line by boat to a sinking yacht at a point 7 km north and 24 km west of their base.



a Draw a right-angled triangle with measurements on two sides to represent this information.



b Use Pythagoras to calculate the distance from the base to the yacht.

$$24^2 = 7^2 + x^2$$

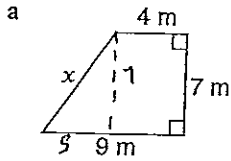
$$576 - 49$$

$$x^2 = 527$$

$$x = 23 \text{ km (1 dec)}$$

c If the team returns to base with the survivors, how far do they travel altogether? 54 km

- 5 Calculate the length of the side marked x in each diagram. Write each answer correct to two decimal places.

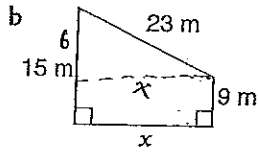


$$x^2 = 7^2 + 1^2 - 5^2$$

$$x^2 = 49 + 1 - 25$$

$$x^2 = 25 \quad x = 5.0 \text{ m}$$

$$x = 5.0 \text{ m (1 dec)}$$



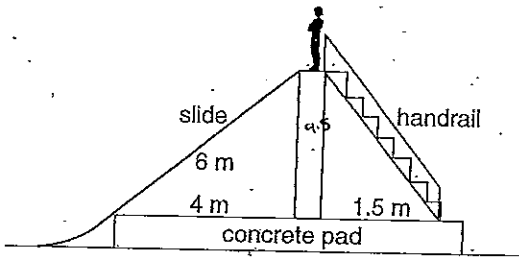
$$23^2 = 6^2 + x^2$$

$$529 - 36$$

$$x^2 = 493$$

$$x = 22.2 \text{ m}$$

- 6 The diagram shows some steps with a handrail leading up to the top of a children's slide.



- a Calculate the height of the top of the slide above the concrete pad.

$$6^2 = 4^2 + x^2$$

$$36 - 16$$

$$x^2 = 20$$

$$x = 4.5 \text{ m (1 dec)}$$

- b Calculate the length of the handrail.

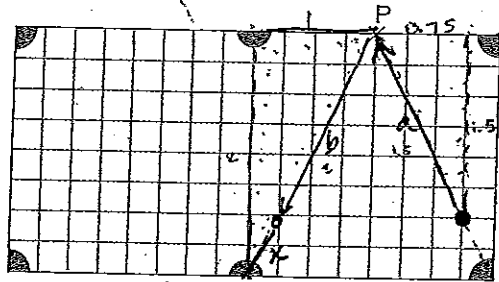
$$x^2 = 1.5^2 + 4.5^2$$

$$x^2 = 2.25 + 20.25$$

$$x^2 = 22.5$$

$$x = 4.7 \text{ m (1 dec)}$$

- 7 The diagram shows a snooker table. It measures 4 m by 2 m, so each unit on the square grid represents 0.25 m.



A person hits the ball (marked by the dot) firmly towards point P, where it bounces symmetrically off the cushion. It continues in this way until it reaches one of the six holes.

- a Add the path of the ball to the diagram.
b Use Pythagoras to calculate the total distance (in units) travelled by the ball.

a)

$$x^2 = 0.75^2 + 1.5^2$$

$$x^2 = 0.5625 + 2.25$$

$$x^2 = 2.8125$$

$$x = 1.7 \text{ (1 dec)}$$

b)

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

$$x^2 = 2 + 4$$

$$x = 6$$

$$x = 2.449489743$$

$$x = 2.4 \text{ (1 dec)}$$

$$\therefore \text{Total dist.} = 3.913...$$

$$= 3.9 \text{ m}$$

- c How far does the ball travel in metres?

$$4.7 \text{ m}$$



The Ants and the Sugar Bowl

A room in a house measures 6 m by 3 m. The height of the room is 2 m.

ant colony

bowl of sugar

Some ants have discovered a bowl of sugar on the floor in one corner of the room. The entrance to their colony is in the roof at the opposite corner.

What is the least distance they will have to travel along the roof, floor and/or wall from the colony to the bowl of sugar?