

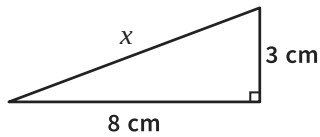
Fix it 1 Trig or Pythagoras?

Pythagoras · ANSWERS

Only sides, with no angle given or wanted: Pythagoras. An angle given or wanted: trigonometry.

EXAMPLE

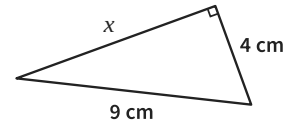
Find x . Trig or Pythagoras?



1. No angle is given, and none is wanted.
2. Two sides known, the third wanted.
3. Only sides: Pythagoras.

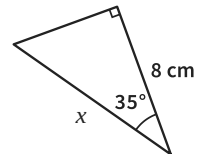
YOUR TURN

- 1 Find x . Trig or Pythagoras?



Pythagoras: only sides

- 2 Find x . Trig or Pythagoras?



Trig: an angle is given

- 3 A garden is a rectangle 10 m by 3 m. A path runs straight across it from corner to corner. Trig or Pythagoras to find its length?

Pythagoras: only sides

Check: Pythagoras uses three sides and no angle: two you know, one you want.

The Maths Habit

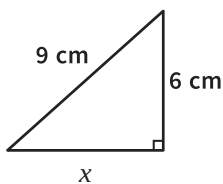
Fix it 2 Which side is the hypotenuse?

Pythagoras · ANSWERS

The hypotenuse, c , is opposite the right angle: the one side that does not touch it. Is x the hypotenuse, or a shorter side?

EXAMPLE

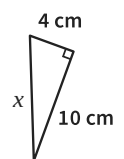
Which side is the hypotenuse?



1. Find the right angle.
2. The hypotenuse is opposite it: the side that does not touch it. It is 9 cm.
3. x touches the right angle, so x is a shorter side.

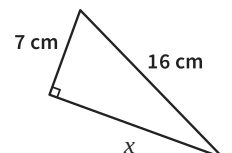
YOUR TURN

- 1 Which side is the hypotenuse?



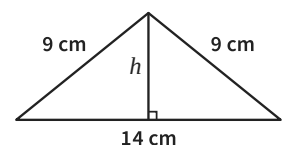
x is the hypotenuse

- 2 Which side is the hypotenuse?



16 cm: x is a shorter side

- 3 The height h cuts the isosceles triangle into two halves. In each half, which side is the hypotenuse?



9 cm: h is a shorter side

Check: The hypotenuse is always the longest side.

The Maths Habit

Fix it 3 Square the two sides you know

Pythagoras · ANSWERS

Squaring a number is multiplying it by itself: $7^2 = 7 \times 7 = 49$, not 7×2 . Square the two sides you know.

EXAMPLE

Square the two sides you know: 14 cm and 3 cm.

- $14^2 = 14 \times 14 = 196$
- $3^2 = 3 \times 3 = 9$
- Not $14 \times 2 = 28$: squaring is not doubling.

YOUR TURN

- 1 Square the two sides you know: 13 cm and 4 cm.

169 and 16

- 2 Square the two sides you know: 4.5 cm and 12 cm.

20.25 and 144

- 3 Square the two sides you know: 1.1 m and 0.6 m.

1.21 and 0.36

Check: Square root each answer on your calculator. You get the side back.

The Maths Habit

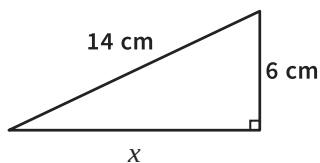
Fix it 4 Add or subtract

Pythagoras · ANSWERS

Finding the hypotenuse: add the squares, $c^2 = a^2 + b^2$. Finding a shorter side: subtract, the hypotenuse squared take away the other square, $x^2 = c^2 - b^2$.

EXAMPLE

$14^2 = 196$ and $6^2 = 36$. Find x^2 .

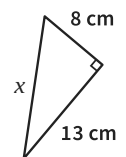


- x is not the hypotenuse: subtract.
- $x^2 = 14^2 - 6^2$
- $x^2 = 196 - 36 = 160$

YOUR TURN

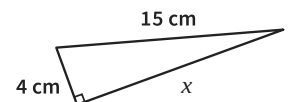
- 1 $8^2 = 64$ and $13^2 = 169$. Find x^2 .

$$x^2 = \underline{64 + 169 = 233}$$



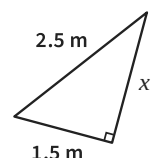
- 2 $15^2 = 225$ and $4^2 = 16$. Find x^2 .

$$x^2 = \underline{225 - 16 = 209}$$



- 3 $2.5^2 = 6.25$ and $1.5^2 = 2.25$. Find x^2 .

$$x^2 = \underline{6.25 - 2.25 = 4}$$



Check: Finding the hypotenuse, x^2 is bigger than both squares. Finding a shorter side, it is smaller than c^2 .

The Maths Habit

Fix it 5 Square root

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x^2 is not the answer. Square root it to find x : if $x^2 = 81$, then $x = \sqrt{81} = 9$.

EXAMPLE

$x^2 = 160$. Find x .

1. x^2 is not the answer: square root it.
2. $x = \sqrt{160}$
3. $x = 12.649\dots$ cm. Keep it all for now.

YOUR TURN

- 1 $x^2 = 289$. Find x .

$$x = \underline{\quad 17 \quad}$$

- 2 $x^2 = 6.76$. Find x .

$$x = \underline{\quad 2.6 \quad}$$

- 3 $x^2 = 233$. Find x . Do not round yet.

$$x = \underline{\quad 15.264\dots \quad}$$

Check: Square your answer. You get x^2 back.

The Maths Habit

Fix it 6 Round as asked

Pythagoras · ANSWERS

Look at the next digit after the last one you keep. 5 or more: round up. Less than 5: leave it. Keep a 0 at the end: 6.97... is 7.0 to 1 decimal place.

EXAMPLE

$x = 12.649\dots$ cm. Give x to 1 decimal place.

1. 1 decimal place: keep one digit after the point.
2. The next digit is 4: less than 5, so leave it.
3. $x = 12.6$ cm

YOUR TURN

- 1 $x = 15.264\dots$ cm. Give x to 1 decimal place.

$$x = \underline{\quad 15.3 \text{ cm} \quad}$$

- 2 $x = 12.961\dots$ cm. Give x to 1 decimal place.

$$x = \underline{\quad 13.0 \text{ cm} \quad}$$

- 3 $x = 102.415\dots$ m. Give x to 3 significant figures.

$$x = \underline{\quad 102 \text{ m} \quad}$$

Check: Your answer has just the places the question asks for, and is the nearest to the full answer.

The Maths Habit

The hypotenuse is the longest side: longer than each of the other two, but shorter than the two added together. A shorter side is shorter than the hypotenuse.

EXAMPLE

The shorter sides are 9 cm and 12 cm.
Ana finds the hypotenuse is 7.9 cm.
Does it make sense?

1. The hypotenuse is the longest side.
2. 7.9 cm is shorter than 12 cm: no.
3. Ana subtracted. $c^2 = 81 + 144 = 225$,
so $c = 15$ cm.

YOUR TURN

- 1 The hypotenuse is 20 cm and one side is 11 cm. Leo finds the other side is 22.8 cm. Does it make sense?

No: it must be under 20 cm

- 2 The shorter sides are 3.5 m and 12 m. Jo finds the hypotenuse is 12.5 m. Does it make sense?

Yes: longer than 12 m

- 3 The shorter sides are 6 cm and 7 cm. Max finds the hypotenuse is 85 cm. Does it make sense?

No: it must be under $6 + 7 = 13$ cm

Check: Square your answer. It matches x^2 in your working.

The Maths Habit