

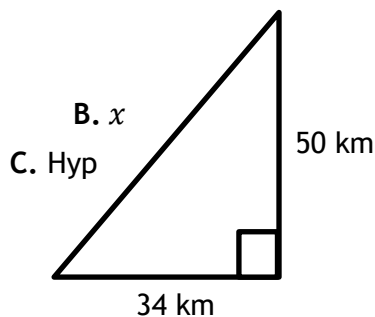
$$\text{Pythagoras Theorem: } a^2 + b^2 = c^2$$

For each question:

- Draw the right-angled triangle and mark on the known lengths from the question.
- Label the unknown side x .
- Identify the **hypotenuse** (opposite the right-angle).
- Is x the hypotenuse? If so, then **add** the other two lengths squared, otherwise **subtract** them.
- Calculate using Pythagoras' theorem. Don't forget to square root [$\sqrt{\quad}$] at the end.

E.g. 1. A car travels 34 km East then 50 km North. How far would it travel if it drove directly back to its starting position?

A. Draw the triangle and label the sides.



D. x is the hypotenuse, so we **add** the two lengths squared

$$\text{E. } x^2 = 34^2 + 50^2$$

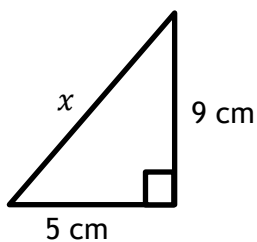
$$x^2 = 1156 + 2500$$

$$x^2 = 3656$$

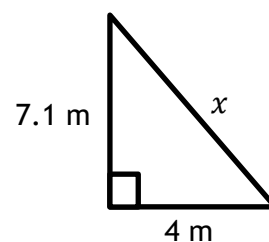
$$\therefore x = \sqrt{3656} = 60.4648 \dots = \mathbf{60.5 \text{ km}}$$

Exercise 1: find the side marked x . Draw out each diagram.

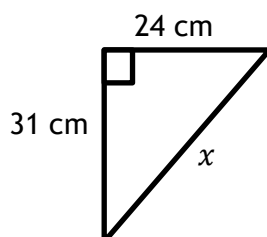
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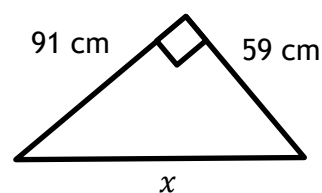
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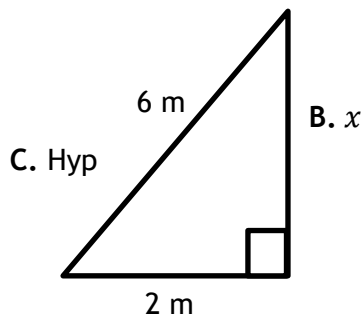


4.



E.g.2. A 6 metre ladder rests against a wall with its base 2 metres from the bottom.
How far up the wall does the ladder reach?

A. Draw the triangle and label the sides.



D. x is not the hypotenuse, so we **subtract** the two lengths

E. $x^2 = 6^2 - 2^2$

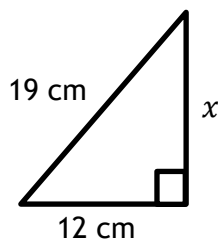
$$x^2 = 36 - 4$$

$$x^2 = 32$$

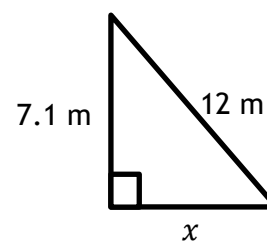
$$\therefore x = \sqrt{32} = 5.6568 \dots = \mathbf{5.66\ m}$$

Exercise 2: find the side marked x . Draw out each diagram.

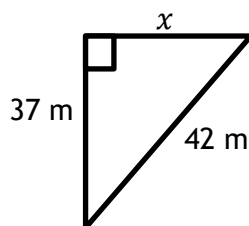
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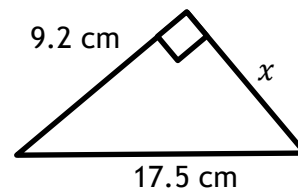
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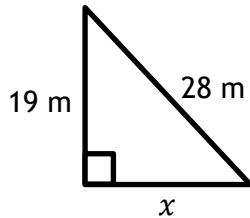
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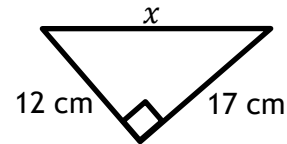
Exercise 3: A mixture.

You need to decide whether to add or subtract by drawing the diagrams and following the steps. Find each unknown side.

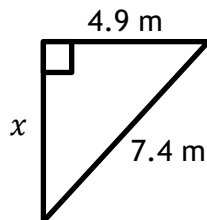
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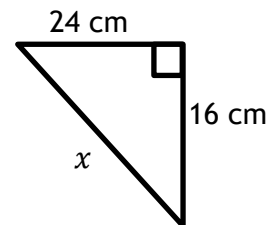
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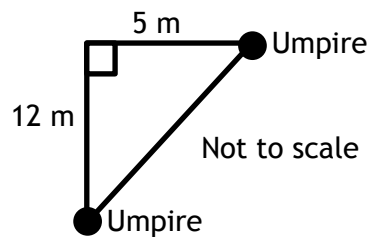
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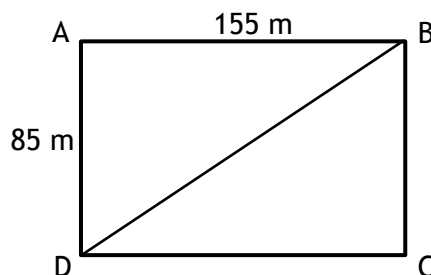
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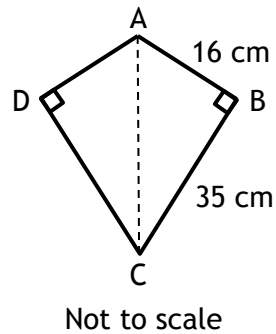
5. In a game two umpires stand at opposite corners of a pitch as shown. How far apart are the two umpires?



6. A rectangular field $ABCD$ is shown. The length of the field, $AB = 155$ m. The width of the field, $AD = 85$ m. Calculate the length of the diagonal BD .



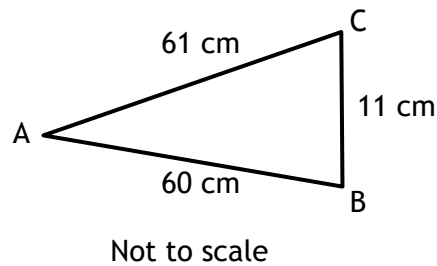
7. The diagram shows a kite $ABCD$. Calculate the length of AC .



8. The sketch shows triangle ABC . $AB = 60$ cm, $AC = 61$ cm and $CB = 11$ cm.

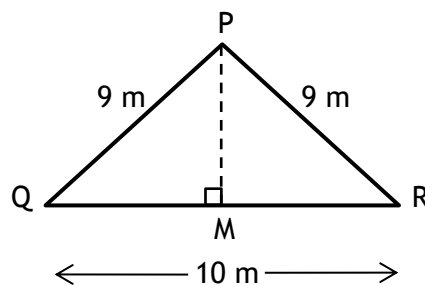
By calculation, show that triangle ABC is a right-angled triangle.

(hint: show that Pythagoras' theorem works)



9. Work out the length, in metres, of PM .

Hence find the area of triangle PQR , correct to 2 decimal places.



10. Find the altitude (height) of an equilateral triangle of side length 12 cm.

Answers:

All answers given to 3 significant figures, or as an exact answer.

Exercise 1:

1. 10.3 cm
2. 8.15 m
3. 39.2 cm
4. 108 cm

Exercise 2:

1. 14.7 cm
2. 9.67 m
3. 19.9 m
4. 14.9 cm

Exercise 3:

1. 20.6 m
2. 20.8 cm
3. 5.55 m
4. 28.8 cm
5. 13 m
6. 177 m
7. 38.4 cm
8. $61^2 = 3721$ cm, $60^2 + 11^2 = 3600 + 121 = 3721$ cm. So, the triangle is right angled.
9. 7.48 m
40.6 m²
10. 10.4 cm