

Introduction to trigonometric ratios

Year 8 About 65 minutes Calculator allowed 45 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-introduction-to-trigonometric-ratios/

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark]

Write $\frac{5}{7}$ as a decimal correct to 3 decimal places.

A2 Needed today [1 mark]

Triangle Q is an enlargement of triangle P with scale factor 3. A side of P is 4.5 cm. How long is the matching side of Q ?

Answer

Answer

- A3** Last lesson [1 mark]

A 400 g jar of honey costs £2.60. Work out the cost of 100 g.

A4 From chapter 6 [1 mark]

A right-angled triangle has shorter sides 9 cm and 12 cm. Work out the length of the hypotenuse.

Answer

Answer

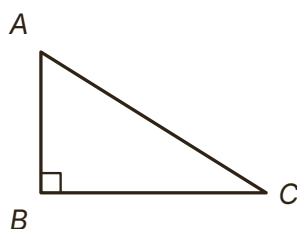
B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

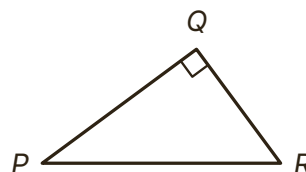
EXAMPLE 1

Triangle ABC has a right angle at B . Write down the opposite side and the adjacent side (a) for angle A , (b) for angle C .



Hint The hypotenuse AC is the same for both angles. The other two sides swap over.

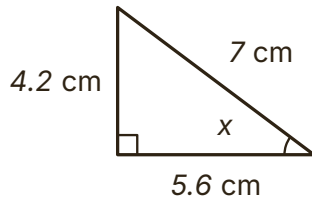
- B2** Triangle PQR has a right angle at Q . Write down the opposite side, then the adjacent side, (a) for angle P , (b) for angle R . [2 marks]



Answer (a) ... , ... (b) ... , ...

EXAMPLE 2

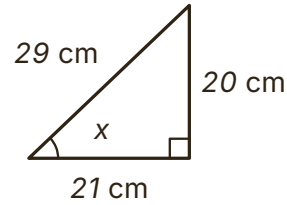
For the angle marked x , work out $\frac{\text{opposite}}{\text{hypotenuse}}$, $\frac{\text{adjacent}}{\text{hypotenuse}}$ and $\frac{\text{opposite}}{\text{adjacent}}$ as decimals.



Hint Name the sides for angle x first: the 4.2 cm side does not touch x , so it is the opposite.

B3 For the angle marked x , work [3 marks]

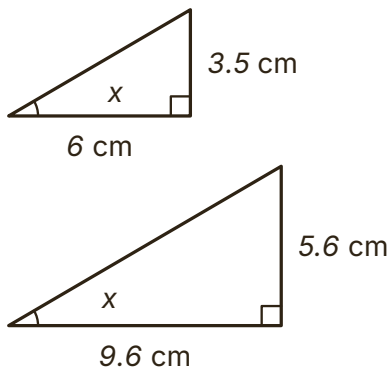
out $\frac{\text{opposite}}{\text{hypotenuse}}$, $\frac{\text{adjacent}}{\text{hypotenuse}}$ and $\frac{\text{opposite}}{\text{adjacent}}$. Give each answer correct to 3 decimal places.



Answer

EXAMPLE 3

Show that $\frac{\text{opposite}}{\text{adjacent}}$ is the same for the angle marked x in both triangles. What does this tell you about the two triangles?

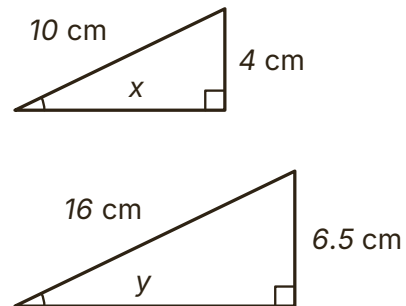


Not drawn accurately

Hint Work out the ratio for each triangle and compare.

B4 Work out $\frac{\text{opposite}}{\text{hypotenuse}}$ for angle [2 marks]

x and for angle y . Are angles x and y equal? Give a reason for your answer.



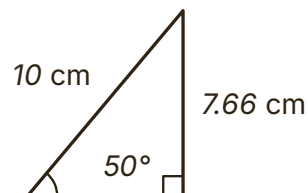
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Answer Equal?

- C1** Use your calculator to find $\sin 38^\circ$, $\cos 38^\circ$ and $\tan 38^\circ$. Give each answer correct to 3 decimal places. [3 marks]

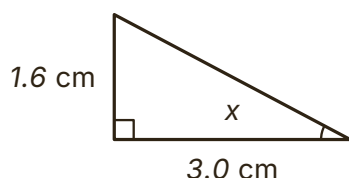
Answer $\sin 38^\circ = \dots$ $\cos 38^\circ = \dots$ $\tan 38^\circ = \dots$

- C2** Work out $\frac{\text{opposite}}{\text{hypotenuse}}$ for the 50° angle, correct to 3 decimal places. Which calculator key, $\sin$, $\cos$ or $\tan$, gives the same value for 50° ? [2 marks]



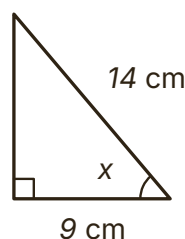
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- C3** Work out the length of the hypotenuse. Then work out $\frac{\text{adjacent}}{\text{hypotenuse}}$ for angle x , correct to 3 decimal places. [3 marks]



Not drawn accurately

- C4** The two sides marked are used in one ratio for angle x . Is it $\sin x$, $\cos x$ or $\tan x$? Give a reason. [2 marks]



Not drawn accurately

Answer hyp = cm ratio =

- C5** Explain why $\frac{\text{opposite}}{\text{hypotenuse}}$ is always less than 1 for any angle in a right-angled triangle, but $\frac{\text{opposite}}{\text{adjacent}}$ can be more than 1. [2 marks]

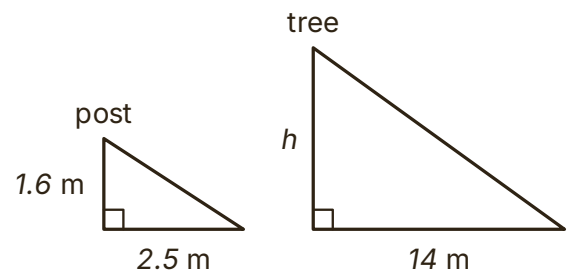
- C6** For an angle in a right-angled triangle, $\frac{\text{opposite}}{\text{adjacent}} = 1$. What can you say about the two shorter sides of the triangle? Work out the size of the angle. [2 marks]

Answer angle =°

D Exam-style questions

D1 At 2 pm a post 1.6 m tall casts a shadow 2.5 m long on level ground. At the same time a tree casts a shadow 14 m long. The sun's rays make the same angle with the ground for both.

- (a) Work out the height, h , of the tree. [3 marks]



Answer

Not drawn accurately

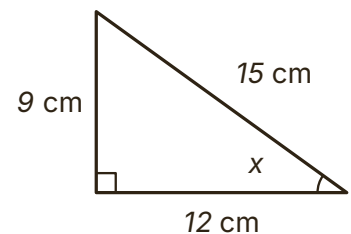
- (b) Later in the day the post's shadow is 2 m long. Work out the length of the tree's shadow at that time. [2 marks]

Answer

Total for D1: 5 marks

D2 Ravi says, "For angle x , the 9 cm side is the adjacent side, because it is next to the right angle." [2 marks]

Is Ravi correct? Explain your answer.



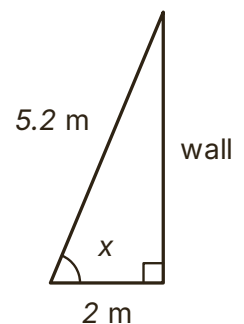
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D3 A ladder 5.2 m long leans against a vertical wall. The foot of the ladder is on level ground, 2 m from the wall. The ladder makes angle x with the ground.

- (a) Work out how far up the wall the ladder reaches. [2 marks]

Answer

- (b) Work out $\frac{\text{opposite}}{\text{adjacent}}$ for angle x . [1 mark]



Not drawn accurately

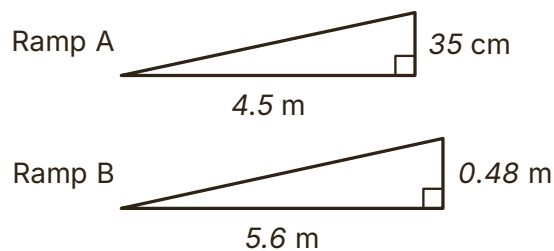
Answer

- (c) A second ladder makes the same angle x with the ground. Its foot is 1.5 m from the wall. Work out how far up the wall it reaches. [2 marks]

Answer

Total for D3: 5 marks

- D4** A builder's rule says a ramp is too steep if $\frac{\text{height it rises}}{\text{horizontal distance}}$ is more than $\frac{1}{12}$. [4 marks]
Ramp A rises 35 cm over a horizontal distance of 4.5 m. Ramp B rises 0.48 m over a horizontal distance of 5.6 m. Show that only one of the ramps is too steep, and say which one.



Answer Too steep: ramp

Not drawn accurately

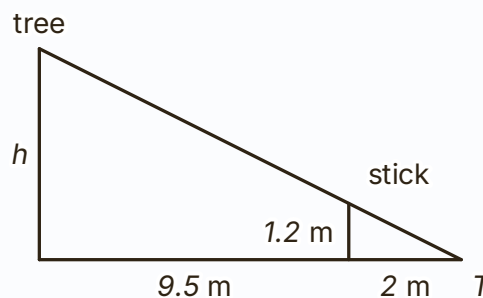
E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** A stick 1.2 m tall stands upright on level ground, 9.5 m from a tree. The tip of the stick's shadow and the tip of the tree's shadow are at the same point, T , which is 2 m from the stick. Work out the height, h , of the tree. [4 marks]

Answer



Not drawn accurately

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The stick and the tree make two right-angled triangles with the same angle at T .
Hint 2 In the small triangle, $\frac{1.2}{2} = 0.6$. The large triangle has its horizontal side $9.5 + 2 = 11.5$ m.
Hint 3 $h = 0.6 \times 11.5 = 6.9$ m.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can name the hypotenuse, opposite and adjacent sides for an angle. ☐ ☐ ☐

I can work out a ratio of two sides as a decimal. ☐ ☐ ☐

I can use the same ratio in similar right-angled triangles to find a side. ☐ ☐ ☐