



Finding trigonometric ratios of angles

Year 8 About 70 minutes Calculator allowed 45 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
Write $\frac{24}{40}$ in its simplest form. Write $\frac{9}{16}$ as a decimal.

Answer

Answer

- A3** Last lesson [1 mark] **A4** From chapter 12 [1 mark]
For angle x in a right-angled triangle, the opposite is 9 cm and the hypotenuse is 12 cm. Work out opposite $\div$ hypotenuse. A car travels 150 km in 2.5 hours. Work out its average speed.

Answer

Answer

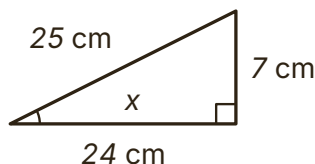
B Example, then your turn

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

EXAMPLE 1

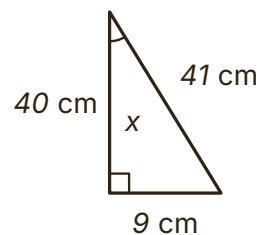
For the angle marked x , write $\sin x$, $\cos x$ and $\tan x$ as fractions.



Not drawn accurately

Hint $\sin = \frac{\text{opp}}{\text{hyp}}$, $\cos = \frac{\text{adj}}{\text{hyp}}$, $\tan = \frac{\text{opp}}{\text{adj}}$ (SOH CAH TOA).

- B1** For the angle marked x , write $\sin x$, $\cos x$ and $\tan x$ as fractions. [3 marks]

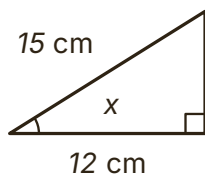


Not drawn accurately

Answer $\sin x = \dots$ $\cos x = \dots$ $\tan x = \dots$

EXAMPLE 2

Two sides are given for angle x . Which ratio do they give: $\sin x$, $\cos x$ or $\tan x$? Work it out as a decimal.

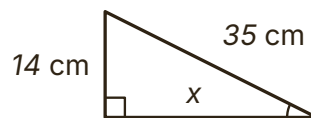


Not drawn accurately

Hint The 12 cm side touches x and the right angle, so it is the adjacent. Adjacent and hypotenuse: CAH.

B2 Two sides are given for angle x . [2 marks]

Which ratio do they give: $\sin x$, $\cos x$ or $\tan x$? Work it out as a decimal.

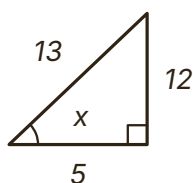


Not drawn accurately

Answer $x = \dots\dots$

EXAMPLE 3

For an angle x in a right-angled triangle, $\cos x = \frac{5}{13}$. Sketch the triangle and work out $\sin x$ and $\tan x$ as fractions.



Not drawn accurately

Hint $\cos = \frac{\text{adj}}{\text{hyp}}$, so draw the adjacent as 5 and the hypotenuse as 13. Then use Pythagoras' theorem.

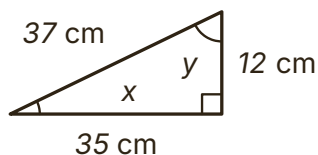
B3 For an angle x in a right-angled triangle, $\sin x = \frac{33}{65}$. [3 marks]

Sketch the triangle and work out $\cos x$ and $\tan x$ as fractions.

Answer $\cos x = \dots\dots$ $\tan x = \dots\dots$

EXAMPLE 4

Write down $\sin x$, $\cos y$, $\tan x$ and $\tan y$. What do you notice?



Not drawn accurately

Hint The side opposite x is the side adjacent to y .

B4 Angles x and y are in the same right-angled triangle. [2 marks]

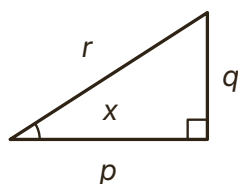
$\sin x = \frac{8}{17}$ and $\tan x = \frac{8}{15}$.
Write down $\cos y$ and $\tan y$.

Answer $\cos y = \dots\dots$ $\tan y = \dots\dots$

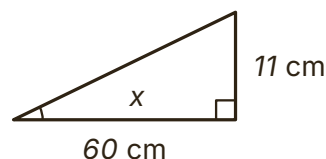
C Practice

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- C1** The sides of this triangle are p , q and r . Write $\sin x$, $\cos x$ and $\tan x$ using these letters. [3 marks]



- C2** Work out the length of the hypotenuse. Then write $\cos x$ as a fraction. [3 marks]

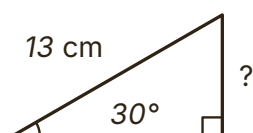


Not drawn accurately

Answer $\sin x = \dots$ $\cos x = \dots$ $\tan x = \dots$

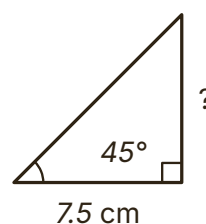
Answer hyp = $\dots$ cm $\cos x = \dots$

- C3** $\sin 30^\circ = \frac{1}{2}$. Use this to work out the side marked ?. [2 marks]



Not drawn accurately

- C4** $\tan 45^\circ = 1$. Use this to work out the side marked ?. Give a reason. [2 marks]



Not drawn accurately

Answer $\dots\dots$ cm

Answer $\dots\dots$ cm

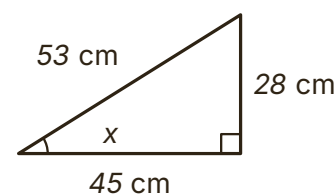
D Exam-style questions

GCSE Foundation

- D1** Mia says, "For angle x , $\sin x = \frac{28}{45}$, because sine is the opposite over the adjacent." [2 marks]

Is Mia correct? Give the correct value of $\sin x$.

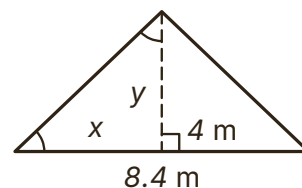
Answer $\sin x = \dots\dots$



Not drawn accurately

D2 The diagram shows the end of a roof. It is 8.4 m wide and 4 m high in the middle. The dashed line is the line of symmetry.

- (a) Work out the length of one sloping side of the roof. [2 marks]



Answer

Not drawn accurately

- (b) Work out $\sin x$ and $\cos x$. Give each answer correct to 3 decimal places. [2 marks]

Answer $\sin x = \dots$ $\cos x = \dots$

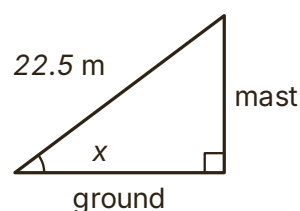
- (c) Write down $\cos y$. Give a reason for your answer. [1 mark]

Answer $\cos y = \dots$

Total for D2: 5 marks

D3 A rope 22.5 m long goes from the top of a vertical mast to a point on level ground. The rope makes angle x with the ground, and $\sin x = 0.6$.

- (a) Work out the height of the mast. [2 marks]



Answer

Not drawn accurately

- (b) Work out how far the rope is fixed from the foot of the mast. [2 marks]

Answer

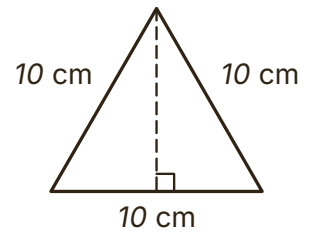
- (c) Write $\tan x$ as a fraction in its simplest form. [1 mark]

Answer

Total for D3: 5 marks

D4 You are told that $\cos 60^\circ = \frac{1}{2}$. An equilateral triangle has sides of 10 cm. It is cut along its line of symmetry into two right-angled triangles.

- (a) Explain why one angle of each right-angled triangle is 60° . Then use $\cos 60^\circ = \frac{1}{2}$ to show that the shortest side of each right-angled triangle is 5 cm. [2 marks]



- (b) Work out the height of the equilateral triangle. Give your answer correct to 1 decimal place. [2 marks]

Answer

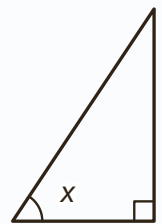
Total for D4: 4 marks

E Extension

Stretch

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

- E1** In this right-angled triangle, $\tan x = 1.875$. The perimeter of the triangle is 60 cm. Work out the area of the triangle. [5 marks]



Answer cm^2

Extension hints

Cover these with paper. Uncover one at a time.

- E1 Hint 1** Write 1.875 as a fraction: $\tan x = \frac{15}{8}$. Call the sides $15k$ and $8k$.
- Hint 2** The hypotenuse is $\sqrt{(15k)^2 + (8k)^2} = 17k$, so the perimeter is $8k + 15k + 17k = 40k = 60$.
- Hint 3** $k = 1.5$: the shorter sides are 12 cm and 22.5 cm, so the area is $\frac{1}{2} \times 12 \times 22.5 = 135 \text{ cm}^2$.

How did it go?

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

I can write sine, cosine and tangent of an angle as fractions of the sides. ☐ ☐ ☐

I can choose which ratio two given sides make. ☐ ☐ ☐

I can go from one ratio back to the triangle and find the other ratios. ☐ ☐ ☐