Trigonometry (SOHCAHTOA)

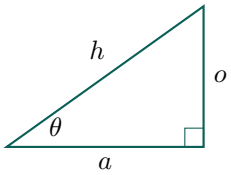
GCSE Mathematics • **Higher Tier** • Grades 6–7 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 68 / 68

Show all your working. Marks are given for correct method as well as the final answer.

1. The angle θ is marked. Name the side labelled h, and the side labelled o. **[2 marks]**



h is opposite the right angle → hypotenuse
o is opposite θ → opposite

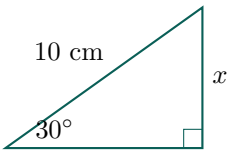
Answer: hypotenuse ; opposite

2. Write down what SOH CAH TOA stands for. **[3 marks]**

S: sin = $\frac{opp}{hyp}$
C: cos = $\frac{adj}{hyp}$
T: tan = $\frac{opp}{adj}$

Answer: sin=O/H, cos=A/H, tan=O/A

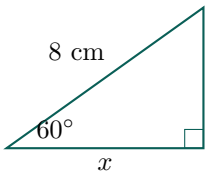
3. Work out x. **[3 marks]**



we have hyp, we want opp → SIN
sin 30 = $\frac{x}{10}$
x = 10 sin 30 = 5

Answer: 5 **cm**

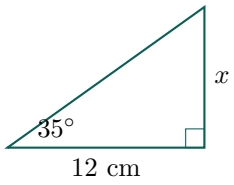
4. Work out x. **[3 marks]**



we have hyp, we want adj → COS
cos 60 = $\frac{x}{8}$
x = 8 cos 60 = 4

Answer: 4 **cm**

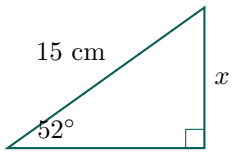
5. Work out x, to 1 decimal place. **[3 marks]**



opp and adj → TAN
tan 35 = $\frac{x}{12}$
x = 12 tan 35 = 8.40...

Answer: 8.4 **cm**

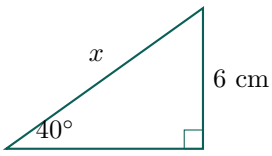
6. Work out x, to 1 decimal place. **[3 marks]**



hyp and opp → SIN
x = 15 sin 52 = 11.82...

Answer: 11.8 **cm**

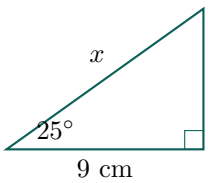
7. Work out x, to 1 decimal place. **[3 marks]**



sin 40 = $\frac{6}{x}$
unknown on the BOTTOM -- divide
x = $\frac{6}{\sin 40}$ = 9.33...

Answer: 9.3 **cm**

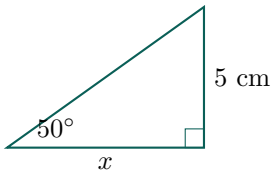
8. Work out x, to 1 decimal place. **[3 marks]**



cos 25 = $\frac{9}{x}$
x = $\frac{9}{\cos 25}$ = 9.93...

Answer: 9.9 **cm**

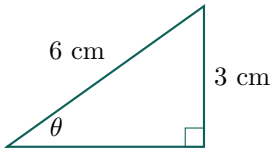
9. Work out x, to 1 decimal place. **[3 marks]**



$\tan 50 = \frac{5}{x}$
$x = \frac{5}{\tan 50} = 4.19...$

Answer: 4.2 **cm**

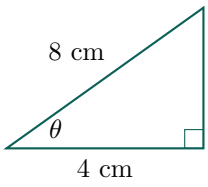
10. Work out the marked angle. **[3 marks]**



opp and hyp → SIN
$\sin\theta = \frac{3}{6} = 0.5$
$\theta = \sin^{-1}(0.5) = 30°$

Answer: 30°

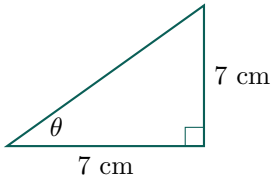
11. Work out the marked angle. **[3 marks]**



adj and hyp → COS
$\cos\theta = 0.5$
$\theta = 60°$

Answer: 60°

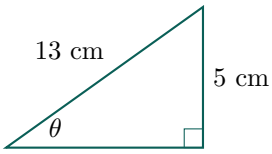
12. Work out the marked angle. **[3 marks]**



opp and adj → TAN
$\tan\theta = 1$
$\theta = 45°$

Answer: 45°

13. Work out the marked angle, to 1 decimal place. **[3 marks]**



$\sin\theta = \frac{5}{13}$
$\theta = 22.61... = 22.6°$

Answer: 22.6°

14. Write down the exact value of $\sin 30°$. **[1 mark]**

learn these -- no calculator

Answer: $\frac{1}{2}$

15. Write down the exact value of $\cos 60°$. **[1 mark]**

same as sin 30°

Answer: $\frac{1}{2}$

16. Write down the exact value of $\tan 45°$. **[1 mark]**

opposite = adjacent

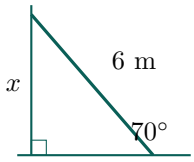
Answer: 1

17. Write down the exact value of $\sin 60°$. **[2 marks]**

from the 30-60-90 triangle

Answer: $\frac{\sqrt{3}}{2}$

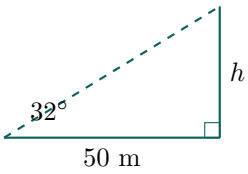
18. A ladder leans against a wall as shown. Work out how far up the wall it reaches, to 1 decimal place. **[3 marks]**



hyp and opp → SIN
$\sin 70 = \frac{x}{6}$
$x = 6 \sin 70 = 5.63...$

Answer: 5.6 **m**

19. From a point 50 m from the base of a tower, the angle of elevation to the top is 32°.



(a) Work out the height h, to 1 d.p. **[3 marks]**

$\tan 32 = \frac{h}{50}$

$h = 50 \tan 32$

$= 31.24... = 31.2$ m

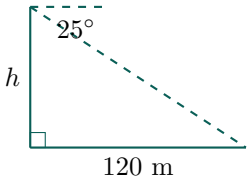
(b) Explain which ratio you used and why. **[2 marks]**

we had the adjacent (50) and wanted the opposite (h)

opp and adj → TAN

Answer: 31.2 m ; tan

20. A boat is 120 m from the foot of a cliff. The angle of depression from the cliff top to the boat is 25°.



(a) Work out the height of the cliff, to 1 d.p. **[3 marks]**

$\tan 25 = \frac{h}{120}$

$h = 120 \tan 25 = 55.95...$

$= 56.0$ m

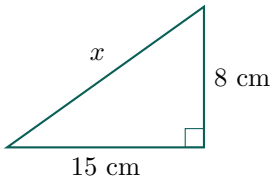
(b) Explain why the angle of elevation from the boat is also 25°. **[2 marks]**

the sea and the dashed horizontal are parallel

alternate angles

Answer: 56.0 m ; alternate angles

21. A right-angled triangle has the two shorter sides shown.



(a) Work out the hypotenuse x. **[3 marks]**

Pythagoras: $64 + 225 = 289$

$x = \sqrt{289} = 17$ cm

(b) Work out the smallest angle, to 1 d.p. **[3 marks]**

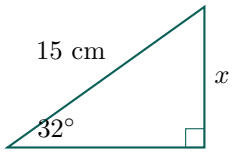
the smallest angle faces the shortest side (8)

$\tan\theta = \frac{8}{15}$

$\theta = 28.07... = 28.1°$

Answer: 17 cm ; 28.1°

22. Work out the length marked x. **[3 marks]**



have H, want O → SOH

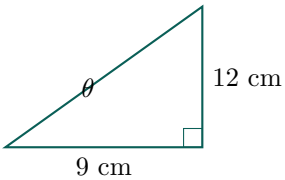
$\sin 32 = x \div 15$

$x = 15 \times \sin 32$

$= 7.949... = 7.95$ cm

Answer: 7.95 **cm**

23. Work out the size of the angle marked θ. **[3 marks]**



have O and A → TOA

$\tan\theta = 12 \div 9$

finding an ANGLE, so use $\tan^{-1}$

$\theta = 53.13... = 53.1°$

Answer: 53.1 °

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