

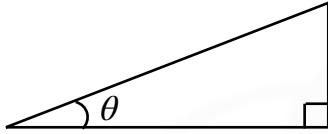
Finding lengths using trigonometry

Starter

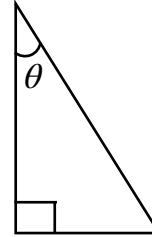
N.B. The Greek letter theta, θ , is often used for unknown angles.

1. Label the sides of these right-angled triangles with **opposite**, **adjacent** and **hypotenuse** according to the marked angle, θ ("theta"):

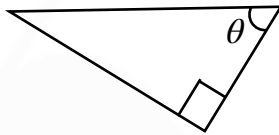
(a)



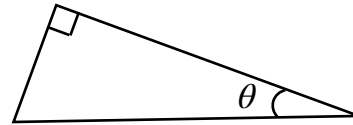
(b)



(c)

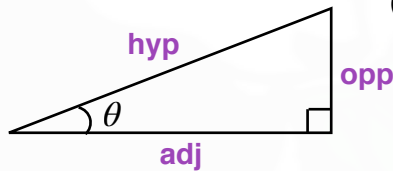


(d)

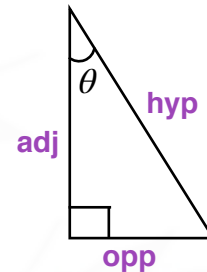


Working:

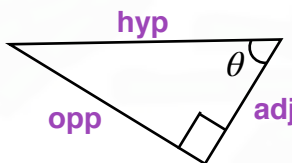
(a)



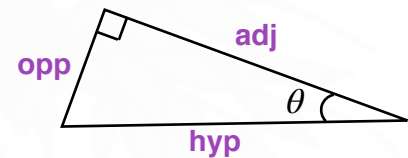
(b)



(c)

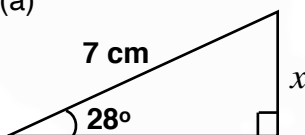


(d)

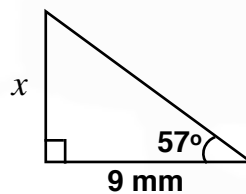


E.g. 1 Calculate the length of the marked side to 3 s.f..

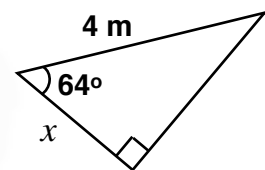
(a)



(b)



(c)



Working:

(a)

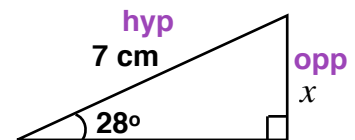
$$\text{opp and hyp} \Rightarrow \sin \theta = \frac{\text{opp}}{\text{hyp}}$$

\Rightarrow

$$\sin 28 = \frac{x}{7}$$

$$7 \sin 28 = x$$

$$x = 3.29 \text{ cm (3 s.f.)}$$



(b)

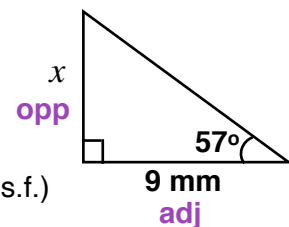
$$\text{opp and adj} \Rightarrow \tan \theta = \frac{\text{opp}}{\text{adj}}$$

\Rightarrow

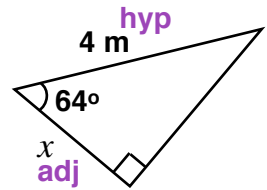
$$\tan 57 = \frac{x}{9}$$

$$9 \tan 57 = x$$

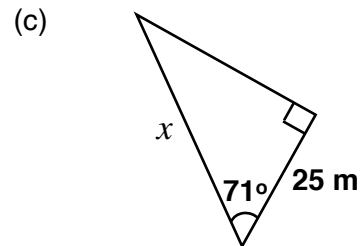
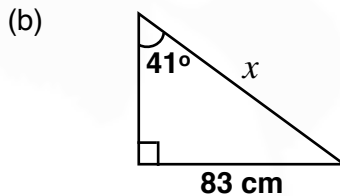
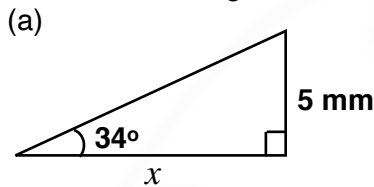
$$x = 13.9 \text{ mm (3 s.f.)}$$



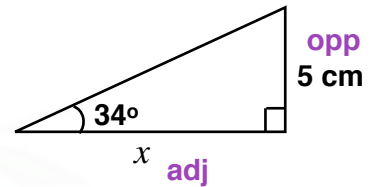
(c) adj and hyp \Rightarrow cos
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}$: $\cos 64 = \frac{x}{4}$
 $4 \cos 64 = x$
 $x = 1.75 \text{ m (3 s.f.)}$



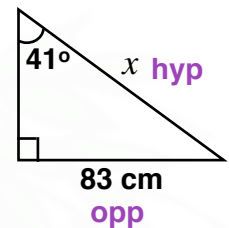
E.g. 2 Calculate the length of the marked side to 3 s.f..



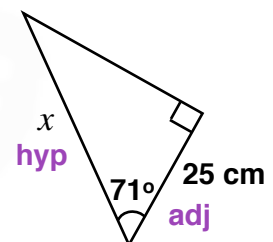
Working: (a) opp and adj \Rightarrow tan
 $\tan \theta = \frac{\text{opp}}{\text{adj}}$: $\tan 34 = \frac{5}{x}$
 $x = \frac{5}{\tan 34}$
 $x = 7.41 \text{ cm (3 s.f.)}$



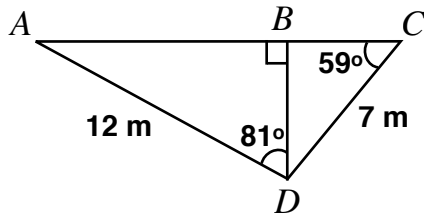
(b) opp and hyp \Rightarrow sin
 $\sin \theta = \frac{\text{opp}}{\text{hyp}}$: $\sin 41 = \frac{83}{x}$
 $x = \frac{83}{\sin 41}$
 $x = 127 \text{ cm (3 s.f.)}$



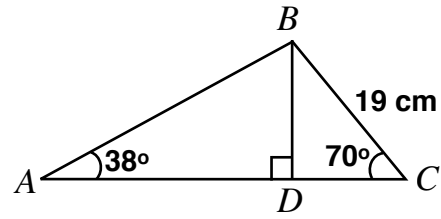
(c) adj and hyp \Rightarrow cos
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}$: $\cos 71 = \frac{25}{x}$
 $x = \frac{25}{\cos 71}$
 $x = 76.8$



E.g. 3 (a) Calculate the length of AC .



(b) Calculate the length of AD .



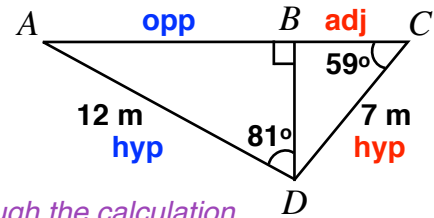
Working:

(a)

Finding AB :

opp and hyp \Rightarrow sin
 $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\Rightarrow \sin 81 = \frac{AB}{12}$
 $12 \sin 81 = AB$



N.B. Do not round half-way through the calculation.

Finding BC :

adj and hyp \Rightarrow cos
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\Rightarrow \cos 59 = \frac{BC}{7}$
 $7 \cos 59 = BC$

N.B. Do not round half-way through the calculation.

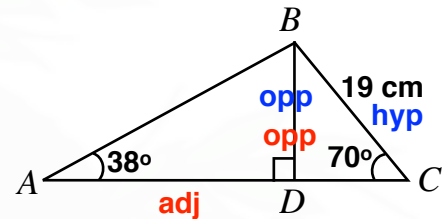
$AC = AB + BC = 12 \sin 81 + 7 \cos 59 = 15.5 \text{ m (3 s.f.)}$

(b)

Finding BD :

opp and hyp \Rightarrow sin
 $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\Rightarrow \sin 70 = \frac{BD}{19}$
 $19 \sin 70 = BD$



N.B. Do not round half-way through the calculation.

Finding AD :

opp and adj \Rightarrow tan
 $\tan \theta = \frac{\text{opp}}{\text{adj}}$

$\Rightarrow \tan 38 = \frac{BD}{AD}$
 $\Rightarrow \tan 38 = \frac{19 \sin 70}{AD}$
 $AD = \frac{19 \sin 70}{\tan 38} = 22.9 \text{ cm (3 s.f.)}$

Video: [Trigonometry - finding sides](#)

[Solutions to Starter and E.g.s](#)

Exercise

- 9-1 class textbook:
- A*-G class textbook:
- 9-1 homework book:
- A*-G homework book:

- p322 M10.8 Qu 1-15 Draw all diagrams
- p286 M10.8 Qu 1-22 odd Draw all diagrams
- p110 M10.8 Qu 1-16 Draw all diagrams
- p81 M10.8 Qu 1-16 Draw all diagrams