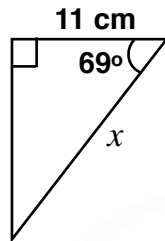


## Finding angles using trigonometry

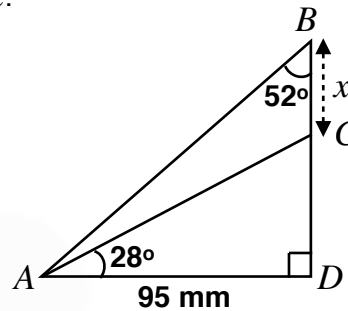
### Starter

1. (Review of last lesson) Calculate the value of  $x$ :

(a)



(b)



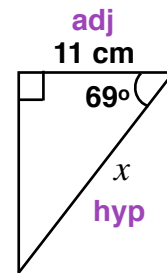
**Working:**

(a) adj and hyp  $\Rightarrow$  cos

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}: \quad \cos 69 = \frac{11}{x}$$

$$x = \frac{11}{\cos 69}$$

$$x = 30.7 \text{ cm (3 s.f.)}$$



(b) **Finding CD:**

opp and adj  $\Rightarrow$  tan

$$\tan \theta = \frac{\text{opp}}{\text{adj}}: \quad \tan 28 = \frac{CD}{95}$$

$$95 \tan 28 = CD$$

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

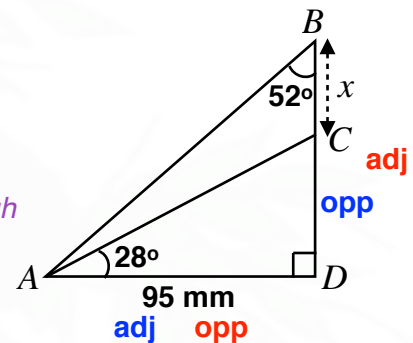
**Finding BD:**

opp and adj  $\Rightarrow$  tan

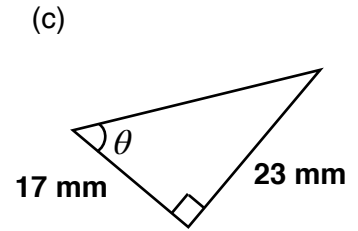
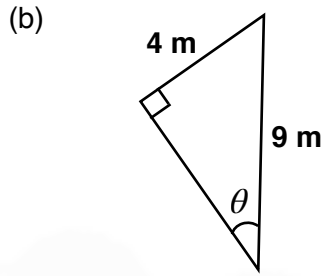
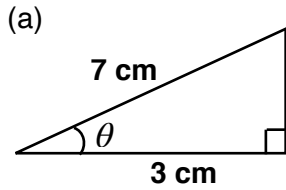
$$\tan \theta = \frac{\text{opp}}{\text{adj}}: \quad \tan 52 = \frac{95}{BD}$$

$$BD = \frac{95}{\tan 52}$$

$$x = BD - BC = \frac{95}{\tan 52} - 95 \tan 28 = 23.7 \text{ mm (3 s.f.)}$$

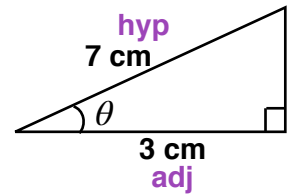


**E.g. 1** Calculate the size of the marked angle to 3 s.f..

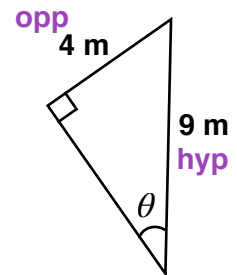


**Working:**

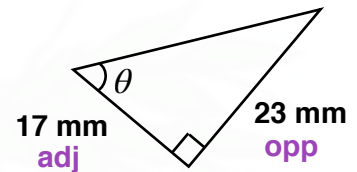
(a) adj and hyp  $\Rightarrow$  cos  
 $\cos \theta = \frac{\text{adj}}{\text{hyp}}: \cos \theta = \frac{3}{7}$   
 $\theta = \cos^{-1} \frac{3}{7}$   
 $\theta = 64.6^\circ$  (3 s.f.)



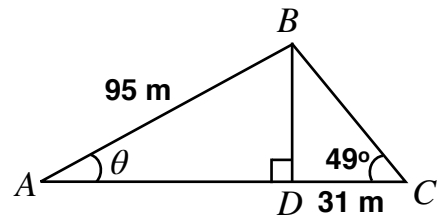
(b) opp and hyp  $\Rightarrow$  sin  
 $\sin \theta = \frac{\text{opp}}{\text{hyp}}: \sin \theta = \frac{4}{9}$   
 $\theta = \sin^{-1} \frac{4}{9}$   
 $\theta = 26.4^\circ$  (3 s.f.)



(c) opp and adj  $\Rightarrow$  tan  
 $\tan \theta = \frac{\text{opp}}{\text{adj}}: \tan \theta = \frac{23}{17}$   
 $\theta = \tan^{-1} \frac{23}{17}$   
 $\theta = 53.5^\circ$  (3 s.f.)



**E.g. 2** Find the size of the marked angle,  $\theta$ , in the diagram.



**Working:** To find  $\theta$ , another side in triangle  $ABD$  is needed.

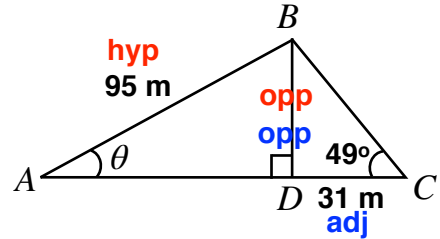
**Finding  $BD$ :**

$$\begin{aligned} \text{opp and adj} &\Rightarrow \tan \\ \tan \theta &= \frac{\text{opp}}{\text{adj}}: & \tan 49 &= \frac{BD}{31} \\ & & 31 \tan 49 &= BD \end{aligned}$$

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

**Finding  $\theta$ :**

$$\begin{aligned} \text{opp and hyp} &\Rightarrow \sin \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}}: & \sin \theta &= \frac{31 \tan 49}{95} \\ & & \theta &= \sin^{-1} \frac{4}{9} \\ & & \theta &= 26.4^\circ \text{ (3 s.f.)} \end{aligned}$$

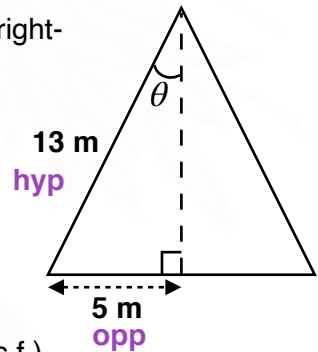


**E.g. 3** An isosceles has sides 13 cm, 13 cm and 10 cm. Find the angle between the sides which are the same length.

**Working:** To calculate half the angle, split the triangle into two right-angled triangles.

$$\begin{aligned} \text{opp and hyp} &\Rightarrow \sin \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}}: & \sin \theta &= \frac{5}{13} \\ & & \theta &= \sin^{-1} \frac{5}{13} \end{aligned}$$

$$\text{The required angle is } 2\theta = 2 \sin^{-1} \frac{5}{13} = 45.2^\circ \text{ (3 s.f.)}$$



**Video:**

[Trigonometry - missing angles](#)

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

**Exercise**

9-1 class textbook:

p324 M10.9 Qu 1-14 Draw all diagrams

A\*-G class textbook:

p289 M10.9 Qu 1-15 Draw all diagrams

9-1 homework book:

p112 M10.9 Qu 1-12 Draw all diagrams

A\*-G homework book:

p82 M10.9 Qu 1-12 Draw all diagrams