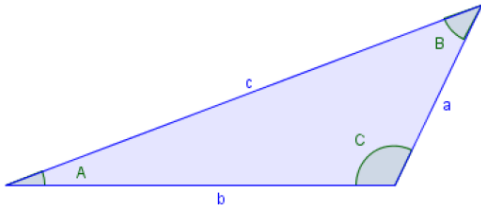
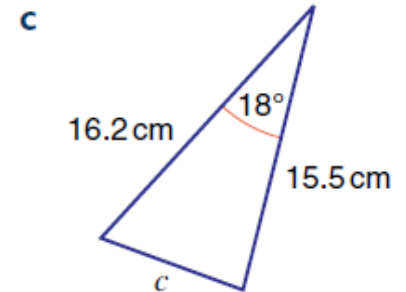
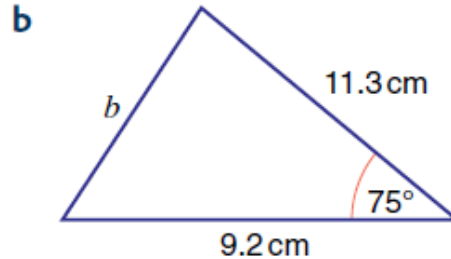
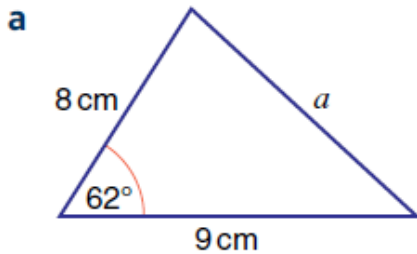


## Trigonometry: Cosine Rule

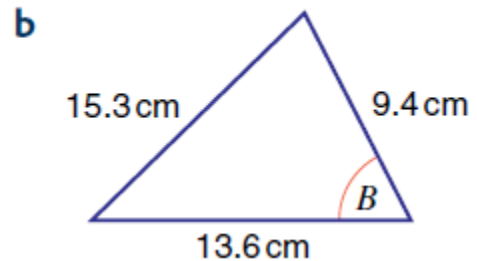
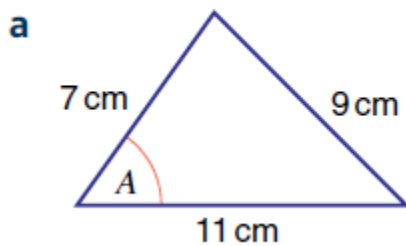


$$a^2 = b^2 + c^2 - 2bc \cos A$$

1 Calculate the length of the sides marked with letters in these triangles.

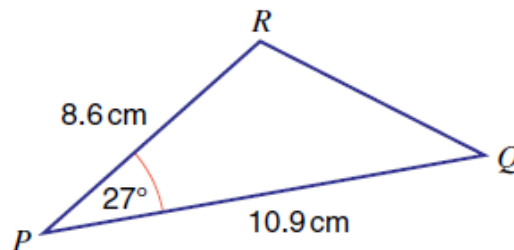


2 Calculate the size of each of the angles marked with a letter in these triangles.



3.

Work out the perimeter of triangle *PQR*.

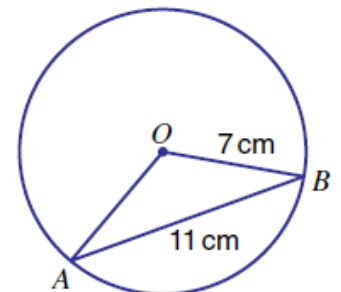


4.

*AB* is a chord of a circle with centre *O*.

The radius of the circle is 7 cm and the length of the chord is 11 cm.

Calculate the size of angle *AOB*.



5.

Mark walks 12 miles due East.

David sets off from the same place and walks 10 miles south-west.

How far apart are they? *Draw a diagram to help you.*

## Trigonometry: Cosine Rule SOLUTIONS

1.  
a)  $a^2 = 8^2 + 9^2 - 2(8)(9) \cos 62 \Rightarrow a = 8.80 \text{ cm to 2 d.p.}$   
b)  $b^2 = 11.3^2 + 9.2^2 - 2(11.3)(9.2) \cos 75 \Rightarrow b = 12.59 \text{ cm to 2 d.p.}$   
c)  $c^2 = 16.2^2 + 15.5^2 - 2(16.2)(15.5) \cos 18 \Rightarrow c = 5.01 \text{ cm to 2 d.p.}$

2.  
a)  $9^2 = 7^2 + 11^2 - 2(7)(11) \cos A \Rightarrow \cos A = \frac{7^2 + 11^2 - 9^2}{2(7)(11)} \Rightarrow A = 54.7^\circ \text{ to 1 d.p.}$   
b)  $15.3^2 = 9.4^2 + 13.6^2 - 2(9.4)(13.6) \cos B \Rightarrow \cos B = \frac{9.4^2 + 13.6^2 - 15.3^2}{2(9.4)(13.6)}$   
 $\Rightarrow B = 81.2^\circ \text{ to 1 d.p.}$

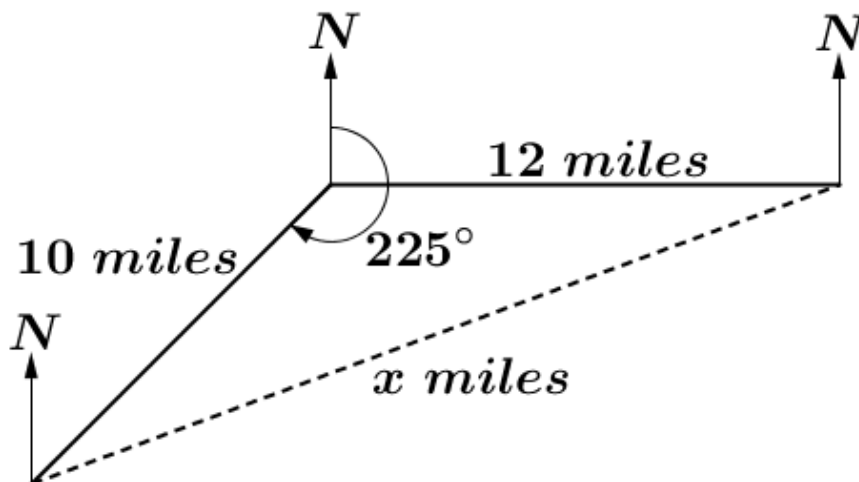
3.  
First, calculating side  $RQ$  (call it  $x$ ):  
 $x^2 = 8.6^2 + 10.9^2 - 2(8.6)(10.9) \cos 27 \Rightarrow x = 5.07 \text{ cm to 2 d.p.}$

Therefore the perimeter is:  
 $8.6 + 10.9 + 5.07 = 24.57 \text{ cm to 2 d.p.}$

4.  
Since triangle  $AOB$  is isosceles ( $OA$  and  $OB$  are radii of the circle):  
 $11^2 = 7^2 + 7^2 - 2(7)(7) \cos \theta$

$$\cos \theta = \frac{7^2 + 7^2 - 11^2}{2(7)(7)} \Rightarrow \theta = 103.6^\circ \text{ to 1 d.p.}$$

5.  
First, drawing a diagram:



Note that if the bearing is  $225^\circ$ , the angle within the triangle must be  $225 - 90 = 135^\circ$ .

$$x^2 = 10^2 + 12^2 - 2(10)(12) \cos 135 \Rightarrow x = 20.34 \text{ miles to 2 d.p.}$$