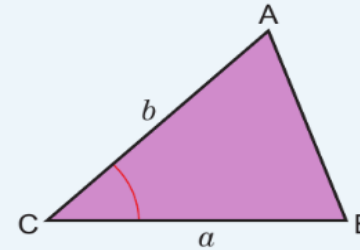


Higher unit 13 More Trigonometry

Key point 4

The **area** of this triangle = $\frac{1}{2}ab \sin C$.
 a is the side opposite angle A.
 b is the side opposite angle B.



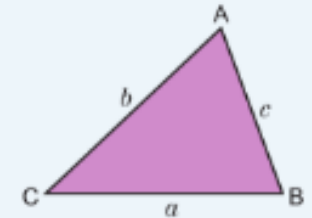
Key point 5

The **sine rule** can be used in any triangle.

- $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ Use this to calculate an unknown side.
- $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ Use this to calculate an unknown angle.

To use the sine rule you need to know one angle and the opposite side. Then:

- if you know another angle, you can work out the length of its opposite side
- if you know another side, you can work out the size of its opposite angle.



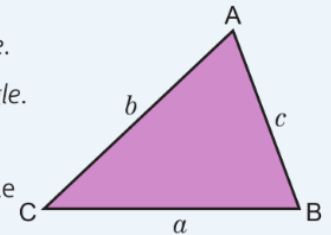
Key point 6

The **cosine rule** can be used in any triangle.

- $a^2 = b^2 + c^2 - 2bc \cos A$ Use this to calculate an unknown side.
- $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ Use this to calculate an unknown angle.

You can use the cosine rule to find:

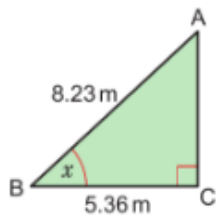
- the length of a side if you know two sides and the included angle
- an unknown angle if you know all three sides.



Example 1

In this diagram, the measurements are correct to 3 significant figures.

- Find the upper and lower bounds for the value of x , to 3 decimal places.
- Give the value of x to a suitable level of accuracy.



a AB: upper bound = 8.235 m, lower bound = 8.225 m

BC: upper bound = 5.365 m, lower bound = 5.355 m

The upper bound for $\cos x = \frac{5.365}{8.225}$
 $= 0.6522796353$

So $x = 49.286^\circ$ (3 d.p.)

The lower bound for $\cos x = \frac{5.355}{8.235}$
 $= 0.6502732240$

So $x = 49.438^\circ$ (3 d.p.)

So the upper bound for x is 49.438° and the lower bound is 49.286°

b $49.438^\circ = 49.4$ (1 d.p.)

$= 49^\circ$ (nearest degree)

$x = 49^\circ$ (to the nearest degree)

Round to the nearest degree they both give the same value.

Find the upper and lower bounds of the lengths of AB and BC.

The upper bound of a fraction
 $= \frac{\text{upper bound of the numerator}}{\text{lower bound of the denominator}}$
 Write down all the figures in your calculator display.

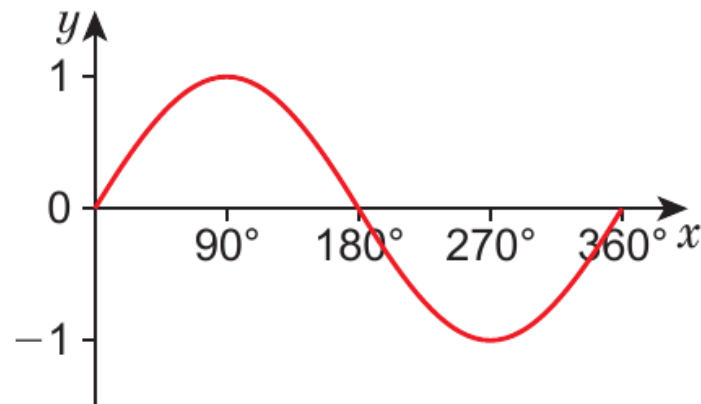
Use \cos^{-1} on your calculator.

The lower bound of a fraction
 $= \frac{\text{lower bound of the numerator}}{\text{upper bound of the denominator}}$

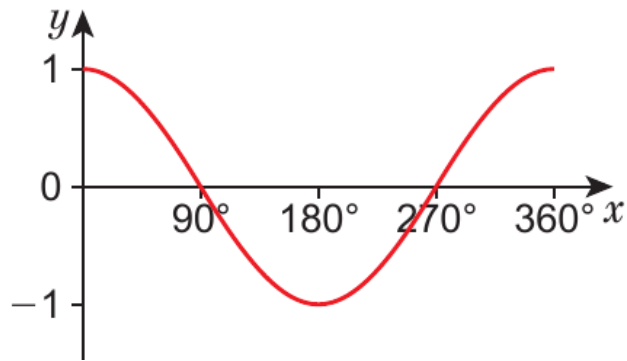
You could write the answer as $49.286^\circ \leq x < 49.438^\circ$

Round the upper and lower bounds to 1 d.p. Do they both give the same value?

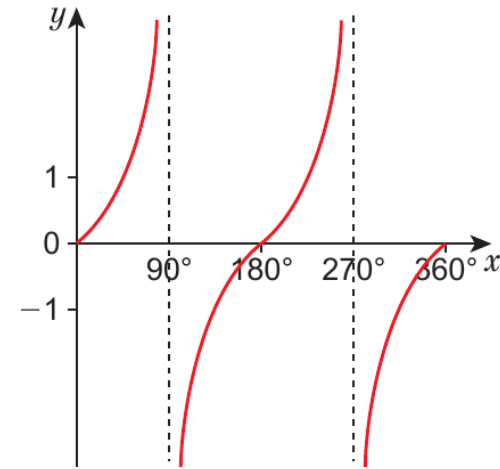
The **sine** graph repeats every 360° in both directions.



The **cosine** graph repeats every 360° in both directions.



The **tangent** graph repeats every 180° in both directions.



Key point 11

The graph of $y = f(x) + a$ is the translation of the graph of $y = f(x)$ by $\begin{pmatrix} 0 \\ a \end{pmatrix}$.

Key point 12

The graph of $y = f(x + a)$ is the translation of the graph of $y = f(x)$ by $\begin{pmatrix} -a \\ 0 \end{pmatrix}$.

Key point 13

The graph of $y = af(x)$ is a vertical stretch of the graph of $y = f(x)$, with scale factor a , parallel to the y -axis.

Key point 14

The graph of $y = f(ax)$ is a horizontal stretch of the graph of $y = f(x)$, with scale factor $\frac{1}{a}$, parallel to the x -axis.