## MATHS AND STATS

## Using Trigonometry

## Calculating unknown angles

If you know the sin, cos or tan of an angle then to find the angle you need to use the inverse functions: $\quad \sin ^{-1}, \cos ^{-1}$ or $\tan ^{-1}$

Example 1.
If
Then

$$
\sin (\theta)=0.6
$$

$$
\begin{aligned}
\theta & =\sin ^{-1}(0.6) \\
& =36.87^{\circ}
\end{aligned}
$$

Use the calculator for this. You will need to use the SHIFT button or the $2^{\text {nd }}$ button to access the small writing above the calculator buttons.

## Example 2.

If

$$
\cos (\theta)=0.25
$$

$$
\begin{aligned}
\theta & =\cos ^{-1}(0.25) \\
& =75.52^{\circ}
\end{aligned}
$$

## Example 3.

If

Then

$$
\begin{aligned}
\tan (\theta) & =4.5 \\
\theta & =\tan ^{-1}(4.5) \\
& =77.47^{\circ}
\end{aligned}
$$

## Recall

$$
\begin{aligned}
& \sin \theta=\frac{\text { opposite }}{\text { hypotenuse }} \\
& \cos \theta=\frac{\text { adjacent }}{\text { hypotenuse }} \\
& \tan \theta=\frac{\text { opposite }}{\text { adjacent }}
\end{aligned}
$$



When you start with a diagram you will need to use the method below

1. Choose which formula to use ( $\sin , \cos$ or $\tan$ ).
2. Substitute in the values you have.
3. Solve using algebra skills.

## Example 4

adjacent $\underbrace{10 \mathrm{~cm} \text { opposite }}_{4 \mathrm{~cm}}$

1. We have the adjacent and the opposite sides so we use

$$
\tan \theta=\frac{\mathrm{opp}}{\mathrm{adj}}
$$

2. Substitute in the values

$$
\tan (\theta)=\frac{4}{10}=0.4
$$

3. Solve $\quad \theta=\tan ^{-1}(0.4)$

$$
=21.80^{\circ}
$$

Answer is $\theta=21.80^{\circ}$

## Example 5



1. We have the side opposite $\theta$ and the hypotenuse so we use

$$
\sin \theta=\frac{\mathrm{opp}}{\mathrm{hyp}}
$$

2. Substitute in the values

$$
\sin (\theta)=\frac{8}{12}
$$

3. Solve

$$
\begin{aligned}
\sin ^{-1}\left(\frac{8}{12}\right) & =41.81 \\
\theta & =41.81^{\circ}
\end{aligned}
$$

NB. This time we left $\frac{8}{12}$ as a fraction. If we converted it to a decimal we would need to either keep lots of decimal places, or round it and loose accuracy. It is easier to leave it as a fraction. The fraction can easily be put into your calculator.

