## Maths

## Understanding and Using Trigonometry

Trigonometry is a method of calculating the length of the sides of a right angled triangle. The trigonometrical ratios are sine, cosine, and tangent. These are shortened to sin, cos and tan. You can find the sine, cosine or tangent of any angle on your calculator. You will need to know the following formulas:

Sine $=$ Opposite side $\div$ Hypotenuse
Cosine $=$ Adjacent side $\div$ Hypotenuse
Tangent $=$ Opposite $\div$ Adjacent

## Example 1

Use trigonometry to find the hypoteneuse in the triangle below. You have been given the opposite side and the angle.


Cover up the information you have, and the information you are trying to find in the working triangles below.


Construction


Trigonometry


MP

Use sine because there are three circles in the sine triangle.

Now that you have decided to use the sine ratio, you can use this working triangle to work out the hypoteneuse.

Cover up the H because you are trying to find the hypotenuse.


This means that you have to divide the opposite by the sine of $17^{\circ}$

$$
\begin{aligned}
\text { Hyp } & =O p p \div \sin 17^{\circ} \\
& =9 m \div 0.292 \\
& =30.822 \mathrm{~m}
\end{aligned}
$$

## Question1

Use trigonometry to find the hypoteneuse of the triangle below.


## Answer



Use sine because there are three circles in the sine triangle.

$$
\begin{aligned}
\text { Hyp }= & \text { Opp } \div \sin 27^{\circ} \\
& =8 \mathrm{~m} \div 0.454 \\
& =17.621 \mathrm{~m}
\end{aligned}
$$

## Question 2



## Answer



Use sine because there are three circles in the sine triangle.

$$
\begin{aligned}
\mathrm{Hyp}= & \text { Opp } \div \sin 48^{\circ} \\
& =12 \mathrm{~m} \div 0.743 \\
& =16.151 \mathrm{~m}
\end{aligned}
$$

## Example 2

Use trigonometry to find the length of the hypoteneuse in the triangle below. You have been given the adjacent side and the angle.


Adjacent
9 m


Cover up the information you have, and the information you are trying to find in the working triangles below.

Use cosine because there are three circles in the cosine triangle.

Cover up the H because you are trying to find the hypoteneuse.


This means that you have to divide the adjacent by the cosine of $17^{\circ}$

$$
\begin{aligned}
\mathrm{Hyp} & =\text { Adj } \div \cos 17^{\circ} \\
& =9 \mathrm{~m} \div 0.956 \\
& =9.414 \mathrm{~m}
\end{aligned}
$$

## Question 3

Use trigonometry to find the hypoteneuse in the triangle below.


Answer


Use cosine because there are three circles in the sine triangle.

$$
\begin{aligned}
\text { Hyp }= & \operatorname{Adj} \div \sin 37^{\circ} \\
& =8 \mathrm{~m} \div 0.602 \\
& =13.289 \mathrm{~m}
\end{aligned}
$$

## Question 4

Use trigonometry to find the hypoteneuse in the triangle below.


Adjacent 12 m


## Answer



Use sine because there are three circles in the sine triangle.

$$
\begin{aligned}
\text { Hyp }= & \text { Adj } \div \sin 29^{\circ} \\
& =12 \mathrm{~m} \div 0.485 \\
& =24.742 \mathrm{~m}
\end{aligned}
$$

## Example 3

Use trigonometry to find the opposite side in the triangle below. You have been given the adjacent side and an angle.


Cover up the information you have, and the information you are trying to find in the working triangles above.

Use tangent because there are three circles in the tangentriangle.

Cover up the O because you are trying to find the opposite.


This means that you have to multiply the adjacent by the tangent of $17^{\circ}$

$$
\begin{aligned}
\text { Opp } & =\operatorname{Adj} x \tan 17^{\circ} \\
& =9 \mathrm{~m} \times \tan 17^{\circ} \\
& =2.752 \mathrm{~m}
\end{aligned}
$$

## Question 5

Find the opposite side in the triangle below.



## Answer



Use cosine because there are three circles in the sine triangle.

$$
\begin{aligned}
\operatorname{Hyp}= & \operatorname{Adj} x \tan 17^{\circ} \\
& =8 \mathrm{~m} \times 0.306 \\
& =2.448 \mathrm{~m}
\end{aligned}
$$

## Question 6

Find the opposite side in the triangle below.


Answer


Use cosine because there are three circles in the sine triangle.

$$
\begin{aligned}
\text { Hyp }= & \text { Adj } x \tan 38^{\circ} \\
& =12 \mathrm{~m} \times 0.781 \\
& =9.372 \mathrm{~m}
\end{aligned}
$$

