MATHS AND STATS

Using Trigonometry

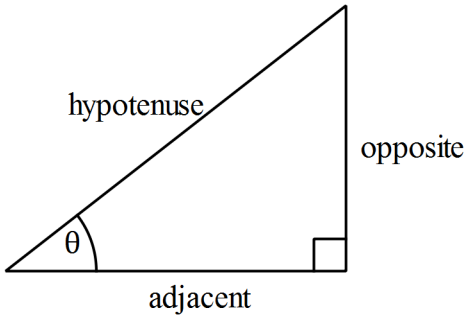
Calculating unknown sides

In right-angled triangles:

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

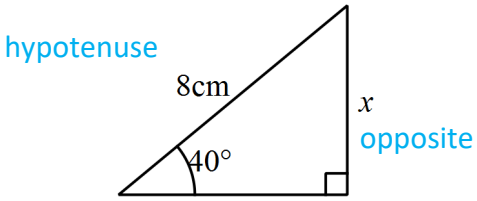


The common mnemonic for the above three equations is SOH CAH TOA.

Method

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

Example 1

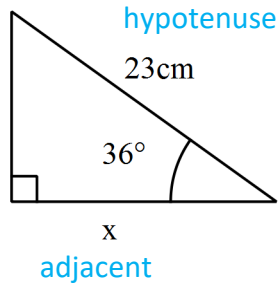


Find the value of x

1. We want the side *opposite* 40° and have the *hypotenuse* so we use $\sin\theta = \frac{\text{opp}}{\text{hyp}}$
2. Substitute in the values
   $$\sin(40°) = \frac{\text{opp}}{8}$$
3. Solve
   $$8 \times \sin(40°) = \text{opp}$$
   Now use your calculator
   $$5.1423 = \text{opp}$$
   Answer is
   $x = 5.1$ cm (to nearest tenth of cm)

Example 2

We want the side *adjacent* to the angle $36°$ and we have the *hypotenuse* so we use



$\cos\theta = \frac{\text{adj}}{\text{hyp}}$ (substitute in the values)

$\cos(36°) = \frac{\text{adj}}{23}$ (x 23, both sides)

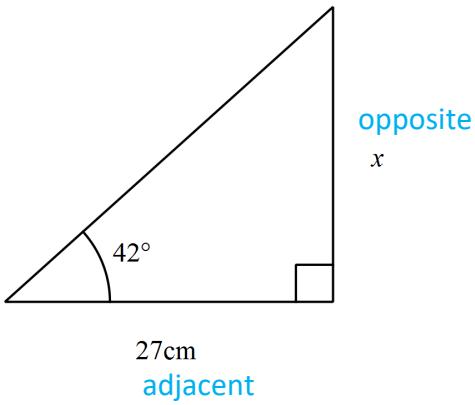
$23 \times \cos(36°) = \text{adj}$

$18.61\ (2\text{ d.p.}) = \text{adj}$ (swap sides)

$\text{adj} = 18.61\ (2\text{ d.p.})$

Answer is $x = 18.61$ cm

Example 3



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

$\tan 42° = \frac{\text{adj}}{27}$

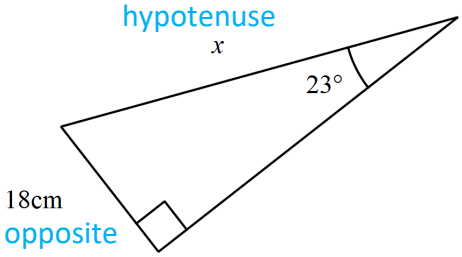
$27 \times \tan 42° = \text{adj}$

$24.31\ (2\text{ d.p.}) = \text{adj}$

$\text{adj} = 24.31\ (2\text{ d.p.})$

$x = 24.31$ cm (2 d.p.)

Example 4



$\sin\theta = \frac{\text{opp}}{\text{hyp}}$ (substitute in values)

$\sin 23° = \frac{18}{\text{hyp}}$ (x hyp, both sides)

$\text{hyp} \times \sin 23° = 18$ (divide by sin23, both sides)

$\frac{\text{hyp}\times\sin 23°}{\sin 23°} = \frac{18}{\sin 23°}$

$\text{hyp} = \frac{18}{\sin 23°}$

$\text{hyp} = 46.07\ (2d.p.)$

Answer $x = 46.07$ cm (2 d.p.)