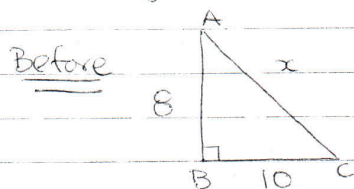


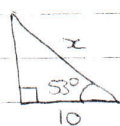
Tangent, Sine, Cosine Ratios

Find the length of sides of a right angle triangle and finding the degrees of the angles.



needed to have 2 side lengths to find the third
→ used Pythagorean Theory $a^2 + b^2 = c^2$

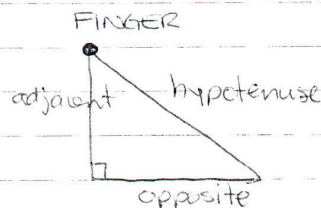
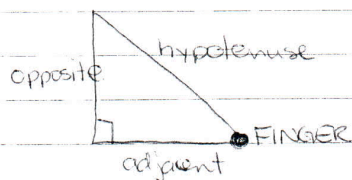
~~Now~~ if you were given 1 side length and an additional angle → you could not do it.



You will now be able to do it using trigonometric ratios → there are 3 ratios

Tangent → tan	} based on hypotenuse, adjacent and opposite sides
Sine → sin	
Cosine → cos	

Which side is which depends on where you place your FINGER



NOTE :- the hypotenuse always remains the same, it is the line opposite of the right angle

- the opposite side is the side your finger is NOT in contact with

- the adjacent side is the side your finger touches which is not the hypotenuse.

How to remember the ratios and what they are:

SOHCAHTOA

Sine = $\frac{\text{opp}}{\text{hyp}}$

Cosine = $\frac{\text{adj}}{\text{hyp}}$

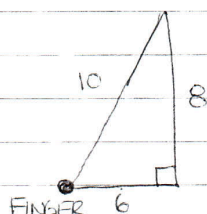
Tangent = $\frac{\text{opp}}{\text{adj}}$

∴ if you were asked for the following ratios

Sine

cosine

tangent



$$S = \frac{O}{H} \therefore S = \frac{8}{10} = .8$$

Angle $\rightarrow \sin^{-1}$

$$\sin^{-1}.8 = 53^\circ$$

$$C = \frac{A}{H} \therefore C = \frac{6}{10} = .6$$

$$\cos^{-1}.6 = 53^\circ$$

$$T = \frac{O}{A} \therefore T = \frac{8}{6} = 1.\overline{33}$$

$$\tan^{-1} 1.\overline{33} = 53^\circ$$

What can we do with them?

- 1) Given an angle with can find its tan, sin or cos ratio

i.e. find the 3 ratios of 40°

$$\tan 40 = .839$$

$$\sin 40 = .643$$

$$\cos 40 = .766$$

Press the ratio and plug in the number of degrees as a number

$$\tan 40 = .839$$

* always take it to 3 decimals

2) to find an angle given a ratio
use \tan^{-1} (usually it is 2nd function and then the ratio). Round degrees to the nearest degree

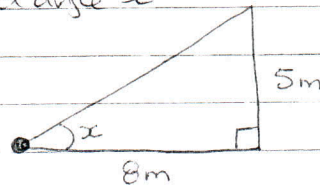
$$\therefore \tan^{-1} .839 = 39.99 \rightarrow 40^\circ$$

$$\sin^{-1} .643 = 40.02 \rightarrow 40^\circ$$

$$\cos^{-1} .766 = 40.00 \rightarrow 40^\circ$$

3) Finding an angle given 2 sides

Example: Find angle x



STEP 1: ~~Find~~ Place FINGER on the angle you need to find.

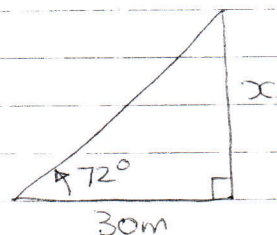
STEP 2: Determine what sides you have
i.e. opposite and adjacent

$$\therefore \text{the ratio is } \tan = \frac{O}{A}$$

STEP 3: Because you are looking for an angle \rightarrow place your calculator in $^{-1}$ (2nd function)

$$\therefore \tan^{-1}\left(\frac{5}{8}\right) = 32^\circ$$

4) Finding a side given an angle and a side



STEP 1: place your finger on the angle you have been given (72°)

STEP 2: Determine what side you have (adjacent) and what side you need to find (opposite)

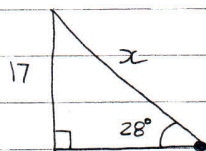
STEP 3: Because you have adjacent and you are looking for opposite, the ratio you will use is then "tan" = $\frac{O}{A}$

$$\therefore \tan 72 = \frac{\text{opp}}{30}$$

$$30 \tan 72 = \text{opp.}$$

$$\therefore x = 92.3$$

Ex: 2 5) Finding a side given an angle and a side



Repeat steps from above

STEP 1: place finger on the angle you have (28°)

STEP 2: Determine what side you have (opposite) and what side you need (hypotenuse)

STEP 3: Because you have opposite and you are looking for hypotenuse \rightarrow use sine = $\frac{O}{H}$

$$\therefore \sin 28 = \frac{17}{x}$$

$$\therefore x = \frac{17}{\sin 28}$$

$$x = 36.2$$

KEY POINT TO KNOW :

