Right angled triangles: Part II

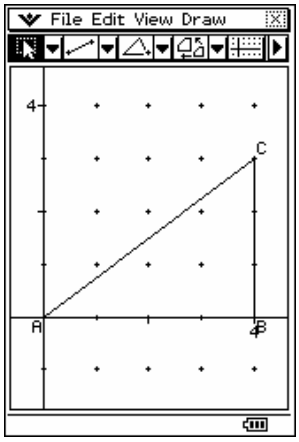
- an introduction to trigonometry -

Objectives:

1. To reinforce that *sine, cosine* and *tangent* are ratios.
2. To use these ratios to determine unknown lengths in right angled triangles.

Background

ΔABC is right angled and ∠CAB = 37°**.**



Looking at ∠CAB, we see that

- side BC is **opposite** this angle and has length 3 units
- side AB is **adjacent** to this angle and has length 4 units
- side AC is the triangle's **hypotenuse** and has length 5 units

For the 37° angle in a right angled triangle:

$$\frac{\text{opp}}{\text{hyp}} = \frac{3}{5} = 0.6 \qquad \frac{\text{adj}}{\text{hyp}} = \frac{4}{5} = 0.8 \qquad \frac{\text{opp}}{\text{adj}} = \frac{3}{4} = 0.75$$

ClassPad already knows these ratios!

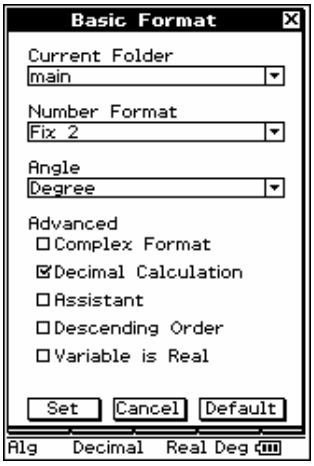
From the Menu screen, open the Main application .

Tap in the menu bar, then choose "Basic format".

Use the down arrows to adjust these features:

- Number Format : Fix 2
- Angle : Degree
- Advanced : Decimal Calculation

Tap "Set" to confirm this.

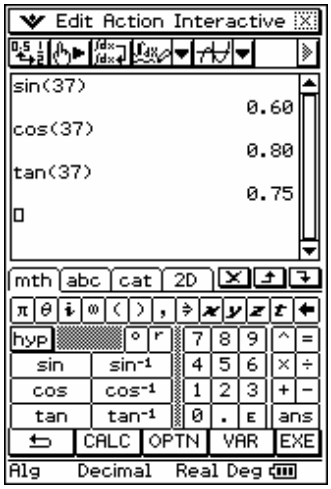


ClassPad will now measure angles in degrees
and give answers as decimals correct to 2 decimal places.

Right angled triangles: Part II

Studying the properties of triangles is often called **trigonometry**.

While working in the Main Menu , access the trigonometry functions by tapping Keyboard, then TRIG.



Enter *sin 37°* by tapping sin, then 37, and pressing EXE.

(You have already told ClassPad that the angle will be in degrees.)

Tap cos and tan to enter *cos 37°* and *tan 37°* respectively.

The results are the decimal values you were using before! However they are correct only to 2 decimal places, so they are approximations.

ClassPad knows the ratios $\frac{\text{opp}}{\text{hyp}}$, $\frac{\text{adj}}{\text{hyp}}$ and $\frac{\text{opp}}{\text{adj}}$ for any right angled triangle.

The values are stored using the terms **sin**, **cos** and **tan**.

For $\angle$A, we have:

the ***sine ratio***... $\sin A = \frac{\text{opp}}{\text{hyp}}$

the ***cosine ratio***... $\cos A = \frac{\text{adj}}{\text{hyp}}$

the ***tangent ratio***... $\tan A = \frac{\text{opp}}{\text{adj}}$

Right angled triangles: Part II

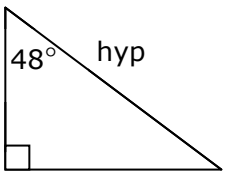
Find decimal approximations for

a) sin40° = _____ b) cos73° = _____ c) tan45° = _____

Remember these are **ratios**… they compare side lengths in right angled triangles.

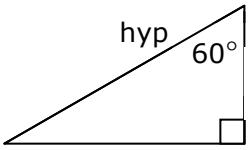
In right angled triangles,

- sin48° = 0.74 ⇒ the side *opposite* a 48° angle is 74% of the *hypotenuse* length



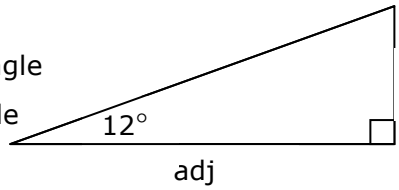
opp = 74% of hyp

- cos60° = 0.50 ⇒ the side *adjacent* to a 60° angle is half as long as the *hypotenuse*



adj = 50% of hyp

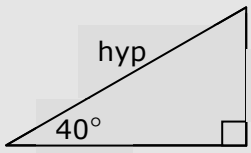
- tan12° = 0.21 ⇒ the side opposite a 12° angle is 21% of the adjacent side



opp = 21% of adj

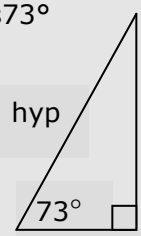
Use these right angled triangles to illustrate the ratios you found earlier.

a) sin40°



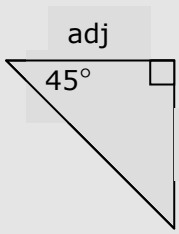
opp = __% of hyp

b) cos73°



adj = __% of hyp

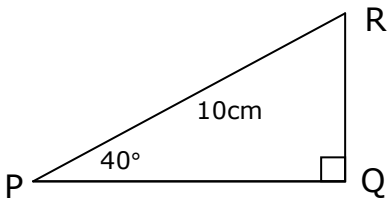
c) tan45°



opp =

Right angled triangles: Part II

Example: Finding lengths with the trigonometric ratios

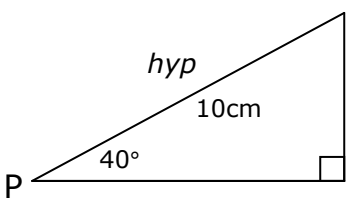


How long is QR in this right angled triangle?

We know ∠P is 40°.
We know the *hypotenuse* PR is 10cm long.
We want to find QR, which is *opposite* ∠P.

To compare the *opposite* and *hypotenuse*, we need the *sine ratio*.

ClassPad tells us that sin40° is 0.64

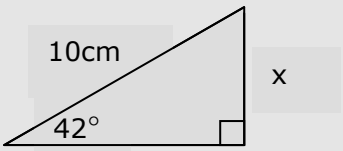


opp = 64% of hyp

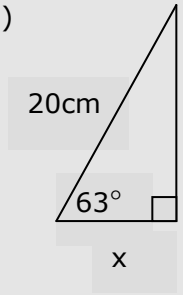
QR = 0.64 x 10 = 6.4cm

Use trigonometric ratios to find the length marked x.

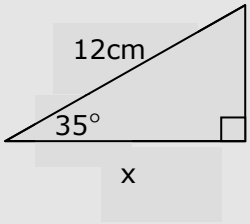
a)



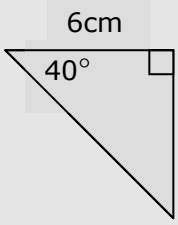
b)



c)



d)



Checkpoint