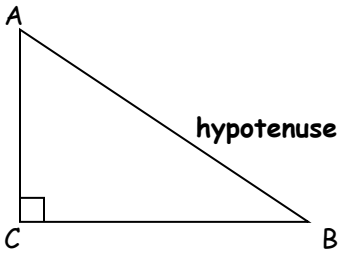
MCF3M **UNIT 5 – TRIGONOMETRY**

PREREQUISITE SKILLS

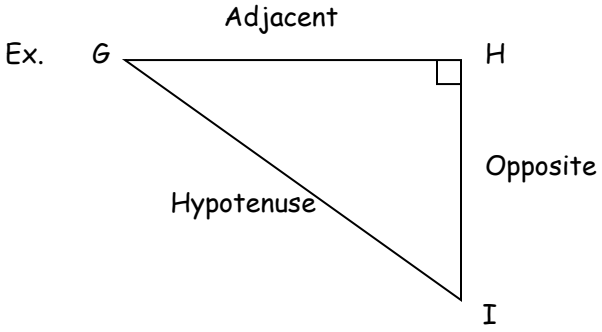
Trigonometric Ratios

Trigonometry is a branch of mathematics that deals with measurement properties of triangles (angles and side measures)

Recall: In a **right-angled triangle**, the hypotenuse is always the:
1) side opposite the right angle, and
2) longest side length.



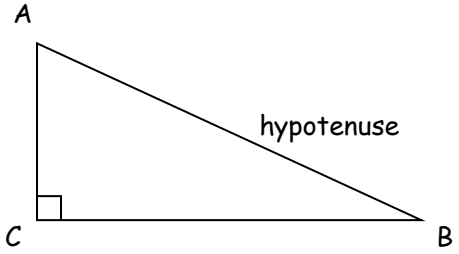
Naming a right-angled triangle with reference to an angle:
The 3 sides in a right triangle are called:
1) Hypotenuse
2) Opposite side (the side **opposite** the **reference angle**)
3) Adjacent side



In the diagram above, the **hypotenuse** has to be side GI because it is opposite the right angle.
If $\angle G$ is the reference angle, then the side **opposite** to angle G is side HI.
The remaining side, GH, is the **adjacent side**.

Primary Trigonometric Ratios

- For every right triangle, the 3 primary trigonometric ratios are: Sine, Cosine, and Tangent.



Recall: The hypotenuse is opposite the right angle, the opposite side is the side opposite the reference angle, θ, and the adjacent side is the remaining side.

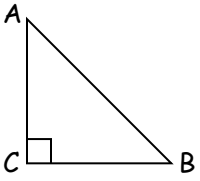
- **The value of the 3 primary trigonometric ratios are** :

$$\sin\theta = \frac{opposite}{hypotenuse} \qquad \cos\theta = \frac{adjacent}{hypotenuse} \qquad \tan\theta = \frac{opposite}{adjacent}$$

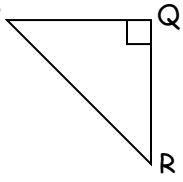
* Memory trick : **"SOH CAH TOA"**

Examples

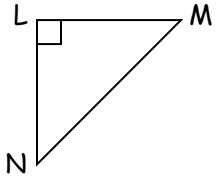
1. Identify the hypotenuse, opposite side, and adjacent side for the following triangles.

a) 

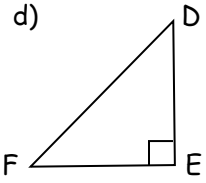
Reference angle A

b) 

Reference angle R

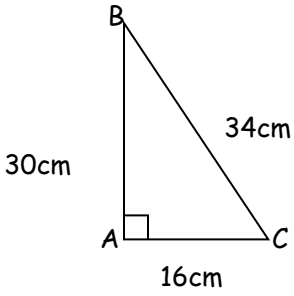
c) 

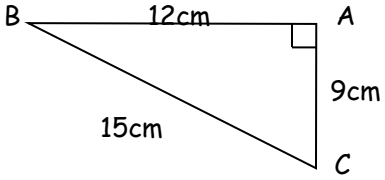
Reference angle N

d) 

Reference angle F

2. For the following triangles, write the 3 trig ratios for $\angle B$ as a fraction in simplest form.





Using our scientific calculators with trigonometry:

The **SIN**, ***COS***, and **TAN** buttons on your calculators are the trig functions.
We use these functions to calculate a trig ratio or an angle measure.
Make sure your calculators are on DEGREE mode.

* To calculate a **trig ratio** given the angle measure:

  Press the trig (SIN, COS, or TAN) button, then enter the angle measure, then press the equal sign.

  OR

  Enter the angle measure, then press the trig (SIN, COS, or TAN) button.

  Ex. Determine the ratio for tan50°, to 3 decimal places.
  tan50° =

* To calculate an **angle measure** given the trig ratio:

  Press the **2nd function**/Shift/Mode button, then the trig button (SIN^{-1}, COS^{-1}, or TAN^{-1}), then enter the ratio, then press the equal sign.

  OR

  Enter the ratio, then press the 2nd function/Shift/Mode button, then the trig button (SIN^{-1}, COS^{-1}, or TAN^{-1}).

  Ex. Determine the measure of $\angle A$, to the nearest degree.
  $\sin A = 0.547$
  $\angle A = \sin^{-1}(0.547)$
  $\angle A =$

Examples :

1. Write the trigonometric ratios, to 3 decimal places.
   a) sin42° b) cos59° c) tan12° d) sin85° e) cos21°

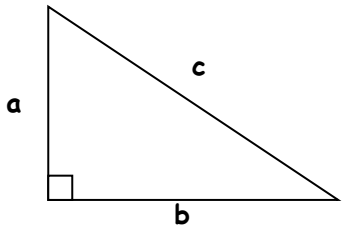
2. Write the angle measures, to the nearest degree.
   a) $\sin A = 0.925$ b) $\cos P = 0.513$ c) $\tan F = 0.481$ d) $\sin X = \frac{1}{3}$ e) $\cos B = \frac{4}{5}$

   f) $\tan G = \frac{3}{7}$ g) $\sin D = 2.743$ h) $\cos M = 1.889$ i) $\tan C = 5.623$

*** The sine and cosine ratios must <u>always</u> be between 0 and 1 or 0 and –1.**

Pythagorean Theorem

For any right-angled triangle, the sum of squares of the two smaller sides is equal to the square of the larger side.

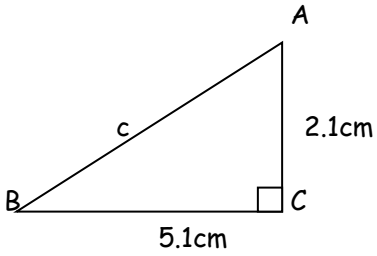


$$c^2 = a^2 + b^2$$

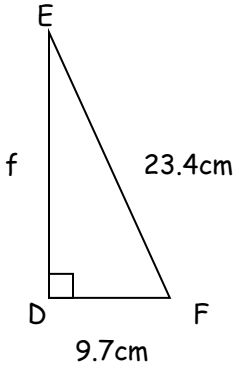
where c is the length of the hypoteneuse and a and b are the lengths of the two other sides.

Example – Determine the length of the unknown side. Round answers to 1 decimal place.

a)



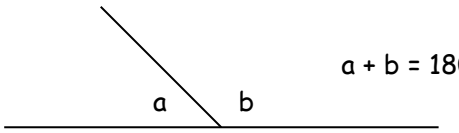
b)



Geometry

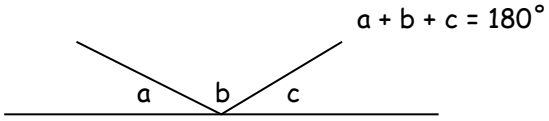
Supplementary Angles:

- angles that add up to 180°

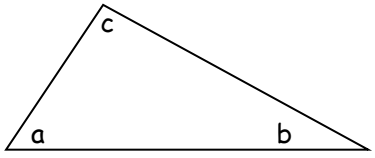


Complementary Angles:

- angles that add up to 90°



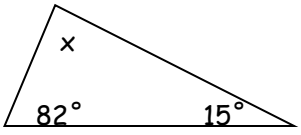
Sum of the Angles in a Triangle



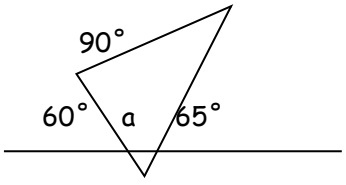
a + b + c = 180°

Examples: Determine the missing angles measures.

a)



b)



Rearrange Formulas

To rearrange formulas: Move variable from one side of the equals sign to the other to isolate the appropriate variable using opposite operations.

Examples: Isolate for x.

a) $\frac{a}{b} = \frac{x}{y}$

b) $n = \frac{x}{z}$

c) $\frac{r}{5} = \frac{s}{x}$

d) $b^2 - a^2 = x^2$

e) $x(\sin A) = b(\sin B)$