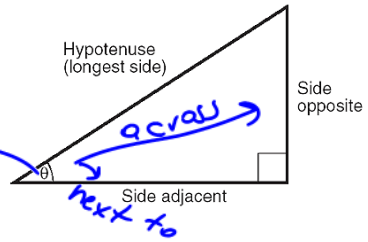
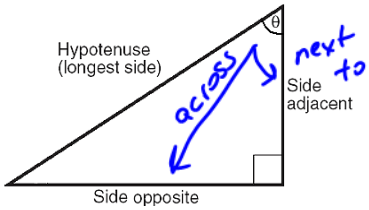
TRIGONOMETRIC RATIOS

When dealing with right angled triangles, we often use the Greek letters θ, α, β to represent the measure of unknown angle.
The hypotenuse is always the longest side, across from the right angle. The other two sides are named either 'opposite side' or 'adjacent side' depending on the location of θ.

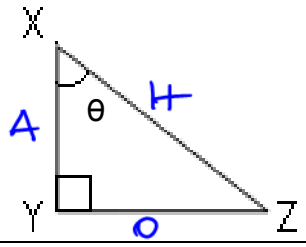
reference angle





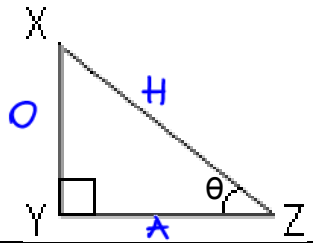
LABEL

Ex1. In ΔXYZ, identify the hypotenuse, adjacent side, and opposite side for ∠X (θ)



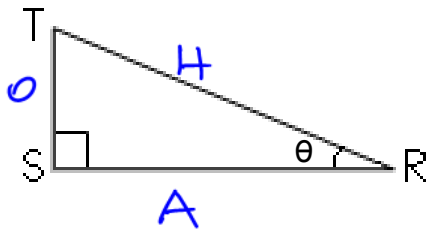
Hypotenuse: XZ
Adjacent: XY
Opposite: YZ

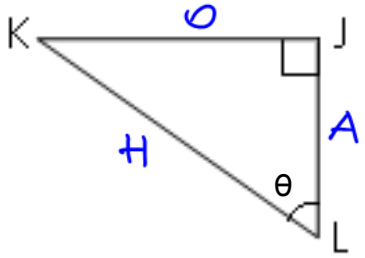
Ex2. In ΔXYZ, identify the hypotenuse, adjacent side, and opposite side for ∠Z (θ)



Hypotenuse: XZ
Adjacent: YZ
Opposite: XY

Ex3. Label the hypotenuse (hyp), opposite (opp) and adjacent (adj) sides for marked angles.





3 PRIMARY TRIG RATIOS

Formulas for Right Triangle Trigonometry

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

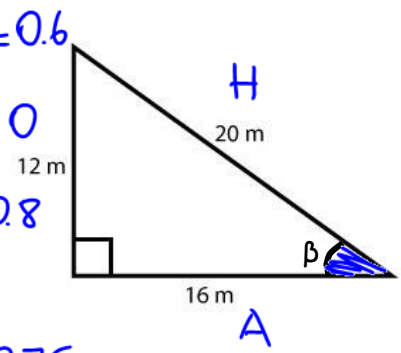
where θ is the angle of reference

The formulas can be remembered by:

SOH **CAH** **TOA**

CASE 1A: DETERMINE THE RATIO FROM THE TRIANGLE SIDES

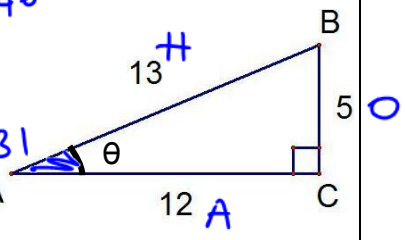
State the **three primary trig ratios** to four decimal places for the indicated angle:



sin β°= $\frac{O}{H} = \frac{12}{20} = 0.6$ (H, O)

cos β°= $\frac{A}{H} = \frac{16}{20} = 0.8$ (A)

tan β°= $\frac{O}{A} = \frac{12}{16} = 0.75$



sin θ°= $\frac{O}{H} = \frac{5}{13} \doteq 0.3846$

cos θ°= $\frac{A}{H} = \frac{12}{13} = 0.9231$

tan θ°= $\frac{O}{A} = \frac{5}{12} \doteq 0.4167$

CASE 1b: DETERMINE THE RATIO FROM THE ANGLE (calculator must be in degree mode)

Determine the following ratios to four decimal places.

sin 36° ≐ 0.5878

cos 55° ≐ 0.5736

tan 66° ≐ 2.2460

tan 6° ≐ 0.1051

CASE 2: DETERMINE THE ANGLE

It is relatively straightforward to find the trig ratio knowing the angle, but what if we don't know the angle? *We need the **inverse** (opposite) operation to find the angle.*

cos β = 0.8660 swap the ratio and the angle.

$\cos^{-1}$ 0.8660 = β On the calculator press one of the following (depending on your brand of calculator): either '2ndF cos' or 'shift cos'.

cos α° = 0.9952 → $\cos^{-1}(0.9952) = \alpha$ → α ≐ 5.6°

tan θ° = 1.1918 → $\tan^{-1}(1.1918) = \theta$ → θ ≐ 50°

sin α° = 0.9781 → $\sin^{-1}(0.9781) = \alpha$ → α ≐ 80°

tan β° = 11.4301 → $\tan^{-1}(11.4301) = \beta$ → β ≐ 85°

sin Ω° = 0.1788 → $\sin^{-1}(0.1788) = \Omega$ → Ω ≐ 10.3°

Cos β° = 0.019 → $\cos^{-1}(0.019) = \beta$ → β ≐ 88.9°