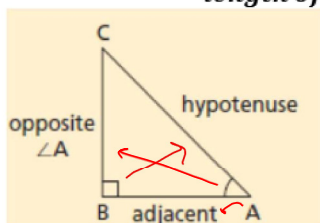


Lesson Three – Sine and Cosine Ratio

We have defined the tangent ratio in a right triangle. There are two other ratios that compare the sides of the triangle; each ratio involves the hypotenuse.

$$\text{Sine Ratio: } \sin A = \frac{\text{length of side opposite to } \angle A}{\text{length of hypotenuse}}$$

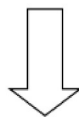
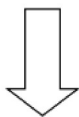
$$\text{Cosine Ratio: } \cos A = \frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}}$$



SOH

CAH

TOA



$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

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

Example 1

Use your calculator to evaluate the following (round to 4 decimal places):

$$\text{a) } \sin 26^\circ = 0.4384$$

$$\text{b) } \cos 78^\circ = 0.2079$$

$$\text{c) } \cos 13^\circ = 0.9744$$

$$\text{d) } \sin 77^\circ = 0.9744$$

Example 2

Use your calculator to find the angle (round to the nearest degree):

* watch notation

$$\text{a) } \sin \theta = 0.7660$$

theta

$$\theta = 50^\circ$$

$$\theta = \sin^{-1}(0.7660)$$

$$\text{b) } \cos \theta = 0.5736$$

$$\theta = 55^\circ$$

$$\text{c) } \sin \theta = 0.0349$$

$$\theta = 2^\circ$$

$$\text{d) } \cos \theta = 0.8996$$

$$\theta = 26^\circ$$

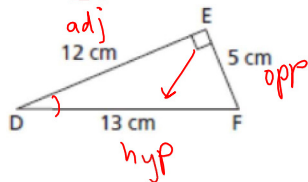
opposite operations

$$\cos^{-1}(\cos \theta) = \theta$$

$$\cos^{-1}(0.8996) = 26^\circ$$

Example 3

Identify the sides of the triangle and then determine the ratio for $\sin D$ and $\cos D$.



SOH CAH

$$\sin D = \frac{\text{opp}}{\text{hyp}} \qquad \cos D = \frac{\text{adj}}{\text{hyp}}$$

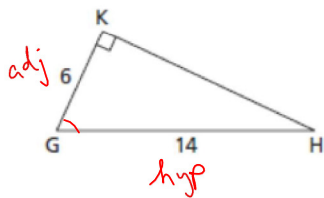
$$\sin D = \frac{5}{13} \qquad \cos D = \frac{12}{13}$$

Leave as is

* These are the ratios
∴ do not find $\angle D$.

Example 4

Determine the measure of angle G and angle H.



$$\cos G = \frac{\text{adj}}{\text{hyp}}$$

$$\cos G = \frac{6}{14}$$

$$G = \cos^{-1}\left(\frac{6}{14}\right)$$

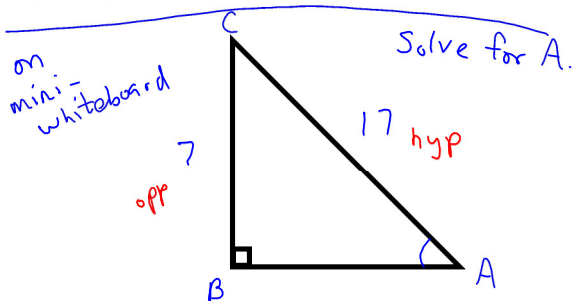
$$G = 64.6^\circ$$

angles G and H
add up to 90°

$$H = 90^\circ - 64.6^\circ$$

$$= 25.4^\circ$$

- ① Label sides given
- ② Select a ratio using SOH (CAH TOA)
- ③ solve ∴ $\cos G$



$$\sin A = \frac{\text{opp}}{\text{hyp}}$$

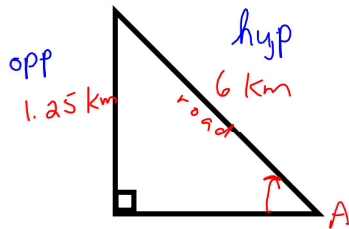
$$\sin A = \frac{7}{17}$$

$$A = \sin^{-1}\left(\frac{7}{17}\right)$$

$$= 24.3^\circ$$

Example 5

A truck travels 6 km up a mountain road. The change in height is 1250 m. What is the angle of inclination of the road?



SOH CAH TOA
 $\therefore \sin \theta$
 sine

$$\sin A = \frac{\text{opp}}{\text{hyp}}$$

$$\sin A = \frac{1.25}{6}$$

$$A = \sin^{-1}\left(\frac{1.25}{6}\right)$$

$$A = 12^\circ$$

Assignment: Pg. 95; 4a, 5 (a, b), 6, 9 (a, b), 10 (b, c), 13