

Primary Trigonometry Ratios – Finding Angles

RECALL the three primary trigonometry ratios.

$\sin \theta = \frac{\text{OPP}}{\text{HYP}}$	$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$	$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$
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For every trigonometry ratio there is an inverse ratio. It is used to calculate **ANGLES**. Inverse ratios are usually found on a Scientific calculator by using the 2ndF, INV, or SHIFT key

The inverse for **sin** is: \sin^{-1} The inverse for **cos** is: \cos^{-1} The inverse for **tan** is: \tan^{-1}

Example: Calculate each of the angles given. Round to one decimal place.

a) $\sin \theta = 0.667$ $\sin^{-1}(0.667) = \theta$ $\theta = 41.8^\circ$	b) $\cos \theta = 0.667$ $\cos^{-1}(0.667) = \theta$ $\theta = 48.2^\circ$	c) $\tan \theta = 0.667$ $\tan^{-1}(0.667) = \theta$ $\theta = 33.7^\circ$
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To find the measure of a(n) acute angle in a right angle triangle, it is necessary to have the measure of any two sides of the triangle.

3 Steps to Solving ANGLES

Step 1: Label the sides of your triangle relative to the angle you want to find

Step 2: Determine which trig ratio to use (sin?, cos?, tan?)

Step 3: Set up the equation with the unknown and solve using the **inverse** trig ratio (\sin^{-1} , \cos^{-1} , or \tan^{-1}).

Example: Find each of the angles shown, rounded to one decimal place.

a) Find $\angle C$

SOH
 $\sin \theta = \frac{O}{H}$
 $\sin \theta = \frac{6}{11}$
 $\sin^{-1}\left(\frac{6}{11}\right) = \theta$
 $\theta = 33.1^\circ$

b) Find $\angle T$

TOA
 $\tan \theta = \frac{O}{A}$
 $\tan \theta = \frac{4.5}{6.5}$
 $\tan^{-1}\left(\frac{4.5}{6.5}\right) = \theta$
 $\theta = 34.7^\circ$

c) Find $\angle M$

CAH
 $\cos \alpha = \frac{A}{H}$
 $\cos \alpha = \frac{2}{3}$
 $\cos^{-1}\left(\frac{2}{3}\right) = \alpha$
 $\alpha = 48.2^\circ$

Primary Trigonometry Ratios – Angles Practice

1. Evaluate each of the following to the nearest degree.

a) $\sin a = 0.34$

$\sin^{-1}(0.34) = a$
 $a = 20^\circ$

b) $\cos b = 0.5$

$\cos^{-1}(0.5) = b$
 $b = 60^\circ$

c) $\tan c = 0.466$

$\tan^{-1}(0.466) = c$
 $c = 25^\circ$

d) $\sin d = 0.951$

$\sin^{-1}(0.951) = d$
 $d = 72^\circ$

e) $\cos e = 0.574$

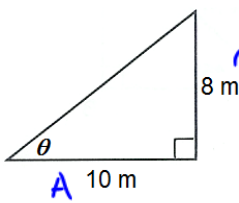
$\cos^{-1}(0.574) = e$
 $e = 55^\circ$

f) $\tan f = 0.268$

$\tan^{-1}(0.268) = f$
 $f = 15^\circ$

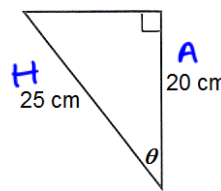
2. Find each of the angles shown. Round to one decimal.

a)



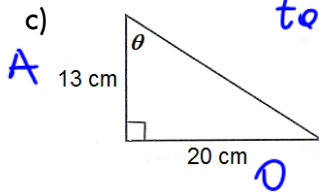
$\tan \theta = \frac{8}{10}$
 $\tan^{-1}\left(\frac{8}{10}\right) = \theta$
 $\theta = 38.7$

b)



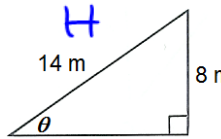
$\cos \theta = \frac{20}{25}$
 $\cos^{-1}\left(\frac{20}{25}\right) = \theta$
 $\theta = 36.9$

c)



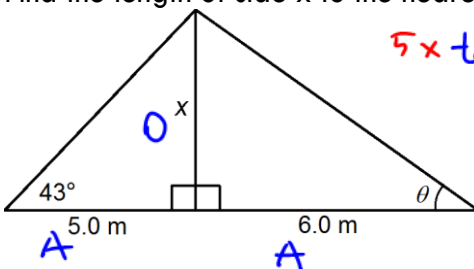
$\tan \theta = \frac{20}{13}$
 $\tan^{-1}\left(\frac{20}{13}\right) = \theta$
 $\theta = 57$

d)



$\sin \theta = \frac{8}{14}$
 $\sin^{-1}\left(\frac{8}{14}\right) = \theta$
 $\theta = 34.8$

3. Find the length of side x to the nearest tenth of a metre and of angle θ to the nearest degree.



~~$5 \times \tan 43 = \frac{x}{5}$~~
 $x = 5 \times \tan 43$
 $x = 4.7 \text{ m}$

$\tan \theta = \frac{x}{6}$
 $\tan \theta = \frac{4.7}{6}$
 $\tan^{-1}\left(\frac{4.7}{6}\right) = \theta$
 $\theta = 38$

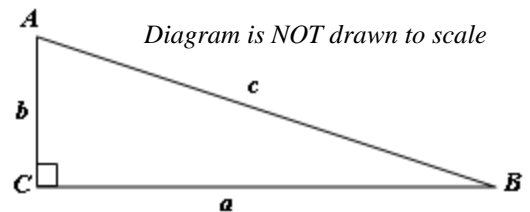
4. Based on the following diagram use the values given to find the missing angles indicated.

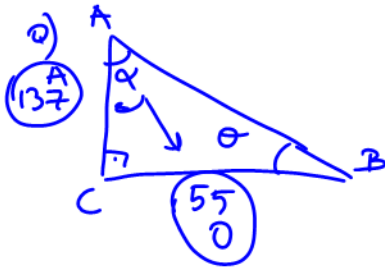
a) $a = 55 \text{ m}, b = 137 \text{ m} \rightarrow$ find $\angle A, \angle B$

b) $a = 235 \text{ cm}, c = 268 \text{ cm} \rightarrow$ find $\angle A, \angle B$

c) $b = 21 \text{ mm}, c = 40 \text{ mm} \rightarrow$ find $\angle A, \angle B$

d) $a = 30 \text{ cm}, b = 285 \text{ cm} \rightarrow$ find $\angle A, \angle B$





$$\alpha + \theta + 90 = 180$$

$$\alpha + \theta = 90^\circ$$

$$\tan \alpha = \frac{55}{137} \Rightarrow \tan^{-1}\left(\frac{55}{137}\right) = \alpha \Rightarrow \boxed{\alpha = 22^\circ}$$

$$\alpha + \theta = 90 \quad \alpha = 22$$

$$22 + \theta = 90$$

$$\theta = 90 - 22$$

$$\boxed{\theta = 68^\circ}$$



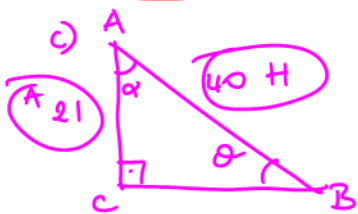
$$\sin \alpha = \frac{235}{268} \Rightarrow \sin^{-1}\left(\frac{235}{268}\right) = \alpha \Rightarrow \boxed{\alpha = 61^\circ}$$

$$\alpha + \theta = 90$$

$$61 + \theta = 90$$

$$\theta = 90 - 61$$

$$\boxed{\theta = 29^\circ}$$



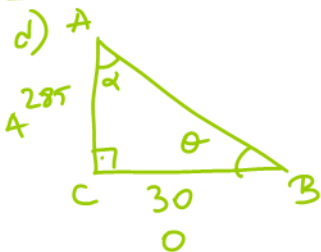
$$\cos \alpha = \frac{21}{40} \Rightarrow \cos^{-1}\left(\frac{21}{40}\right) = \alpha \Rightarrow \boxed{\alpha = 58^\circ}$$

$$\alpha + \theta = 90^\circ$$

$$58 + \theta = 90$$

$$\theta = 90 - 58$$

$$\boxed{\theta = 32^\circ}$$



$$\tan \alpha = \frac{30}{285}$$

$$\tan^{-1}\left(\frac{30}{285}\right) = \alpha$$

$$\boxed{\alpha = 6^\circ}$$

$$\alpha + \theta = 90$$

$$6 + \theta = 90$$

$$\boxed{\theta = 84^\circ}$$