Mathematics 11U

5.1 – Trigonometric Ratios of Acute Angles

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Three Primary and Three Reciprocal Ratios.

$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\tan\theta = \frac{opposite}{adjacent}$$

Primary

SohCahToa

cosecant

$$\csc\theta = \frac{hypotenuse}{opposite}$$

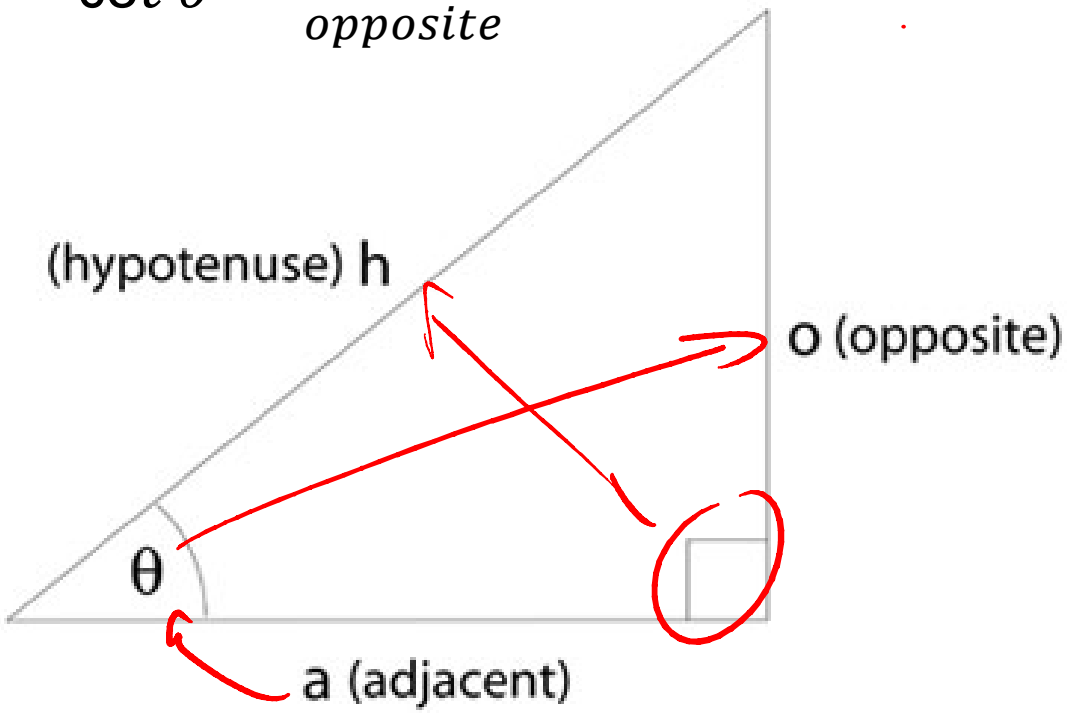
Secant

$$\sec\theta = \frac{hypotenuse}{adjacent}$$

cotangent

$$\cot\theta = \frac{adjacent}{opposite}$$

reciprocal



There are no *csc, sec, cot* buttons on the calculator!

Determine the following ratios:

1. $\sin 36$

$= 0.5878$

2. $\tan 123$

$= -1.5399$

3. $\sec 23$

$= \frac{1}{\cos 23}$

$= 1.0864$

4. $\cot 75$

$= \frac{1}{\tan 75}$

$= 0.2679$

Determine the following angles:

1. $\sin\theta = 0.2745$

$\theta = \sin^{-1}(0.2745)$

$\theta = 15.9°$

$\theta = 16°$

2. $\cos\theta = 0.8175$

$\theta = \cos^{-1}(0.8175)$

$\theta = 35.2°$

$\theta = 35°$

3. $\csc\theta = 1.2241$

$\frac{1}{\sin\theta} = \frac{1.2241}{1}$

$\sin\theta = \frac{1}{1.2241}$

$\theta = \sin^{-1}\left(\frac{1}{1.2241}\right)$

$\theta = 54.7° = 55°$

4. $\cot\theta = 5.3267$

$\tan\theta = \frac{1}{5.3267}$

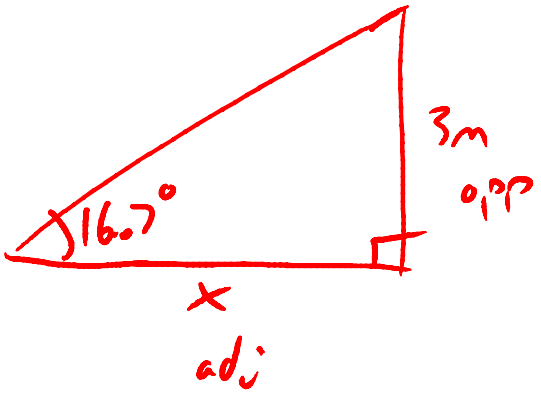
$\theta = \tan^{-1}\left(\frac{1}{5.3267}\right)$

$\theta = 10.6°$

$\theta = 11°$

A word problem:

From a position some distance away from the base of a tree, Monique uses a clinometer and determines that the angle of elevation to the top of the tree is 16.7^{o}. Monique estimates that the high of the tree is 3m. How far away is Monique from the base of the tree?



① Reciprocal.

$\cot 16.7 = \frac{x}{3}$

② Primary

$\tan 16.7 = \frac{3}{x}$

$x = \frac{3}{\tan 16.7}$

$x = 10$

∴ Monique is 10m from the tree