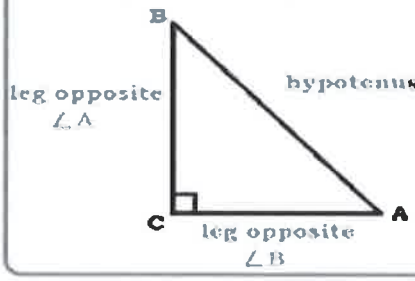
Soh - Cah - Toa: Intoduction to Trigonometry Notes

What is Trigonometry?

- It is the study of the properties of triangles and trigonometric functions and their applications
- Using Sine, Cosine or Tangent you can find the missing sides or angles of a right triangle by setting up trigonometric ratios
    - The Trig functions as defined here work for ***RIGHT TRIANGLES ONLY***

Sine

The ratio of the measure of the leg opposite of an angle to the hypotenuse in a right triangle



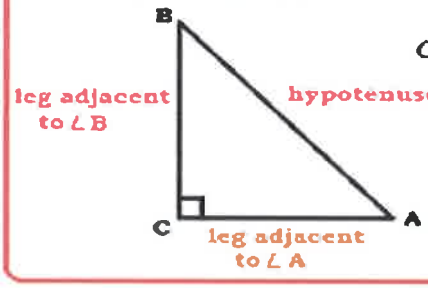
$$Sin = \frac{opposite}{hypotenuse}$$

$$Sin\ A = \frac{BC}{BA}$$

$$Sin\ B = \frac{CA}{BA}$$

Cosine

The ratio of the measure of the leg adjacent to an angle to the hypotenuse in a right triangle



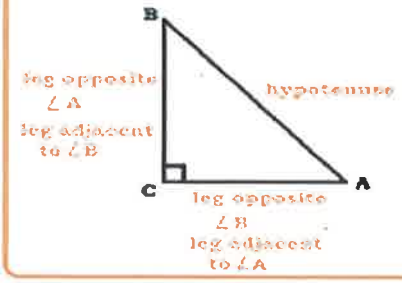
$$Cos = \frac{adjacent}{hypotenuse}$$

$$Cos\ A = \frac{CA}{BA}$$

$$Cos\ B = \frac{BC}{BA}$$

Tangent

The ratio of the measurement of the leg opposite an angle to the measurement of the leg adjacent in a right triangle



$$Tan = \frac{opposite}{adjacent}$$

$$Tan\ A = \frac{BC}{CA}$$

$$Tan\ B = \frac{CA}{BC}$$

SOH – CAH – TOA

S – Sine

O – Opposite

H – Hypotenuse

C – Cosine

A – Adjacent

H – Hypotenuse

T – Tangent

O – Opposite

A – Adjacent

Setting up Ratios:

- Each time you set up a Trig. Ratio it is set up in the form:

$$trig\ ratio\ (angle) = \frac{side}{side}$$

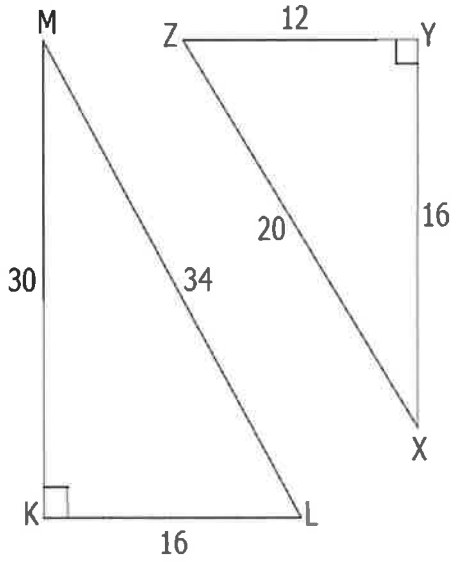
Examples: Find the ratio for each given Trig. Function.

$$\sin\angle M = \frac{16}{34} = \frac{8}{17} \qquad \cos\angle Z = \frac{12}{20} = \frac{3}{5}$$

$$\tan\angle L = \frac{30}{16} = \frac{15}{8} \qquad \tan\angle X = \frac{12}{16} = \frac{3}{4}$$

$$\cos\angle L = \frac{16}{34} = \frac{8}{17} \qquad \tan\angle Z = \frac{16}{12} = \frac{4}{3}$$

$$\cos\angle M = \frac{30}{34} = \frac{15}{17} \qquad \sin\angle X = \frac{12}{20} = \frac{3}{5}$$



Using the calculator:

- When you put a trig function into the calculator you want to make sure that your calculator is in degree mode
- If you simply want to find the value of the sin, cos or tan of an angle you can input it as sin (angle), cos (angle) or tan (angle)
- If you want to find out what angle has that trig value you will need to use the inverse trig function key on your calculator and put it in as $\sin^{-1}$(angle), $\cos^{-1}$(angle), or $\tan^{-1}$(angle)

Examples: Find the value of each ratio. Round your answer to 4 places past the decimal place.

$\sin 12° = 0.2079$ $\tan 74° = 3.4874$ $\sin 7° = 0.1219$

$\cos 24° = 0.9135$ $\tan 54° = 1.3764$ $\sin 72° = 0.9511$

$\cos 12° = 0.9781$ $\cos 20° = 0.9397$ $\tan 37° = 0.7536$

Examples: Find the measure of each angle to the nearest whole degree.

$\sin A = 0.7245 = 46°$ $\cos B = 0.2493 = 76°$

$\tan C = 9.4618 = 84°$ $\sin D = 0.4567 = 27°$

$\cos E = 0.1212 = 83°$ $\tan C = 0.4279 = 23°$

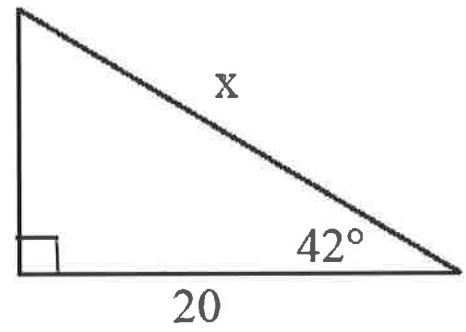
Solving Trig. Problems Using the Ratios:

- The majority of trigonometry problems that you encounter will fall into two categories:
  - Find the missing side given a side and an angle
  - Find the missing angle given two sides
  - Both of these can be solved by substituting into the equation:

$$trig\ ratio\ (angle) = \frac{side}{side}$$

  - They will be solved in different ways however.

Finding the Missing Side Problems:



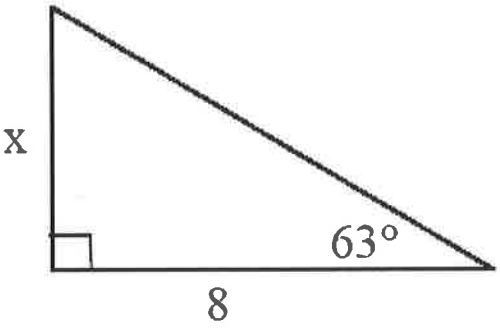
We are given the ***angle***, the ***adjacent*** and the ***hypotenuse*** so that this is a ***cosine*** problem.

$\cos 42 = \frac{20}{x}$ *set – up trig ratio*

$x\,(\cos 42) = 20$ *cross multiply*

$x = \frac{20}{\cos 42}$ *divide both sides by* cos 42

$x = 26.91$ *put in calculator*

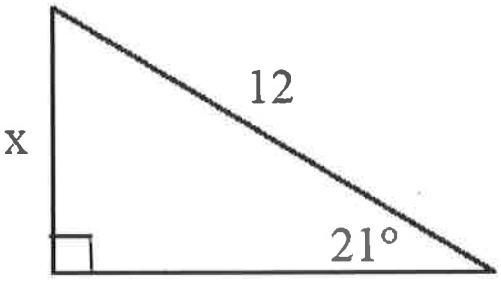


We are given the ***angle***, the ***adjacent*** and the ***opposite*** so that this is a ***tangent*** problem.

$\tan 63 = \frac{x}{8}$ *set – up trig ratio*

$8\,(\tan 63) = x$ *cross multiply*

$15.7 = x$ *put in calculator*



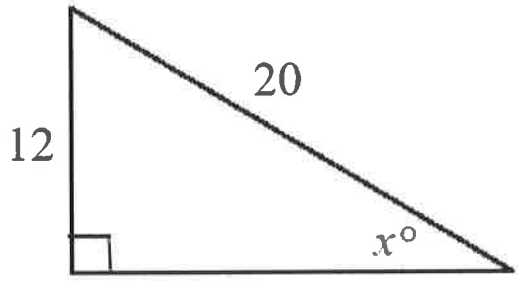
We are given the ***angle***, the ***opposite*** and the ***hypotenuse*** so that this is a ***sine*** problem.

$\sin 21 = \frac{x}{12}$ *set – up trig ratio*

$12\,(\sin 21) = x$ *cross multiply*

$4.3 = x$ *put in calculator*

Finding the Missing Angle Problems:

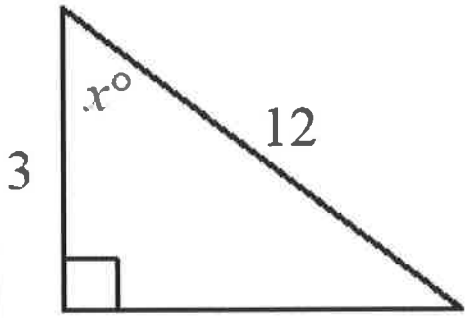


We are given the ***angle***, the ***opposite*** and the ***hypotenuse*** so that this is a ***sine*** problem.

$\sin x = \frac{12}{20}$ *set – up trig ratio*

$x = \sin^{-1}(\frac{12}{20})$ *use the inverse trig function to*

$x = 37°$ *put in calculator*

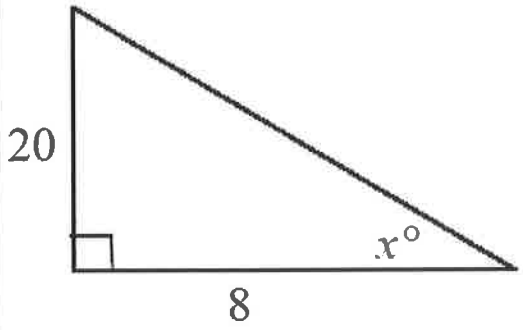


We are given the ***angle***, the ***adjacent*** and the ***hypotenuse*** so that this is a ***cosine*** problem.

$\cos x = \frac{3}{12}$ *set – up trig ratio*

$x = \cos^{-1}(\frac{3}{12})$ *use the inverse trig function to*

$x = 76°$ *put in calculator*



We are given the ***angle***, the ***opposite*** and the ***adjacent*** so that this is a ***tangent*** problem.

$\tan x = \frac{20}{8}$ *set – up trig ratio*

$x = \tan^{-1}(\frac{20}{8})$ *use the inverse trig function to*

$x = 68°$ *put in calculator*