Name: _____

Period: _____

2.1

Trigonometry Basics

Basic Terms

θ (theta) – variable for any angle.

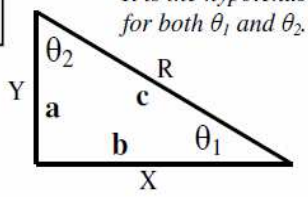
Hypotenuse – longest side of a triangle.

Opposite – side opposite the angle (θ).

Adjacent – side next to the angle (θ).

Which side is opposite? It depends on the angle.

Y is opposite to θ_1; Y is adjacent to θ_2.



R is the hypotenuse for both θ_1 and θ_2.

X is adjacent to θ_1; X is opposite to θ_2.

Pythagorean Theorem

Remember that

$$a^2 + b^2 = c^2$$

Where a and b are either of the sides and c is the hypotenuse.

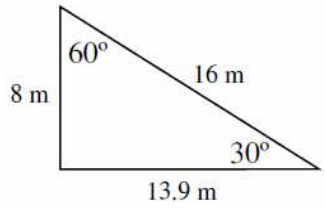
Trigonometric Functions

Sin, cos, and tan are ratios, telling you how big (what percentage) one side is in relation to another.

Sin (Sine) – ratio of the opposite side to the hypotenuse. $\sin\theta = \frac{opp}{hyp}$

Cos (Cosine) – ratio of the adjacent side to the hypotenuse. $\cos\theta = \frac{adj}{hyp}$

Tan (Tangent) – ratio of the opposite side to the adjacent side. $\tan\theta = \frac{opp}{adj}$



Trigonometric Ratios for This Triangle

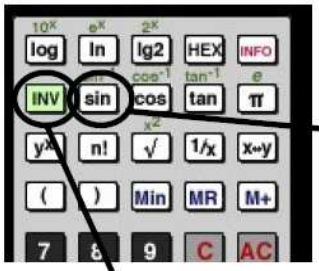
$\sin 60° = \frac{opp.}{hyp.} = \frac{13.9m}{16m} = 0.866$

$\sin 30° = \frac{opp.}{hyp.} = \frac{8m}{16m} = 0.5$

$\tan 30° = \frac{opp.}{adj.} = \frac{8m}{13.9m} = .5774$

Calculators and Trig

You will have to find the sin, cos, or tan ratios OR you will have to find θ, given the ratios. You must know how to use your calculator to do this.



Given the angle (θ), find sin, cos, or tan.

Scientific Calculator:
Type "30"
Push "sin"
Answer: "0.5"

Graphing Calculator:
Push "sin"
Type "30"
Answer: "0.5"

Ex: sin 30° = _____

Answer: sin 30° = 0.5

Given sin, cos, or tan, find θ.

Scientific Calculator:
Type ".4226"
Push "INV" then "sin"
Gives "25"

Graphing Calculator:
Push "2nd" then "sin"
Type ".4226"
Gives "25"

Ex: $\sin\theta = .4226$

$\theta = \sin^{-1}(.4226)$

θ = _____

Answer: θ = 25°

Use Degrees not Radians! When using sin, cos, and tan your calculator MUST be in degrees or all of your numbers will be wrong.

Quick Check: The **sin 30° = 0.5!** If sin 30° ≠ 0.5, your calculator in in radians and must be changed.

Scientific Calculator:
Press the **DRG** key until degrees shows in the display. *Recheck*!

DRG

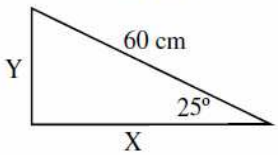
Graphing Calculator:
Press the **MODE** key. Find where RADIANS is selected. Select DEGREES instead. Press ENTER. Recheck!

MODE

Finding Unknowns

The real power of trigonometry is that it relates the angles and sides of a right triangle. If, for example, you know θ and a side, you can find all the other parts of the triangle.

Problem: Find the length of X.



Step 1: Assign Variables

Variables:
θ = 25°
opp. = Y
adj. = X
hyp.= 60 cm

Step 2: Choose a Formula

You know hyp and need adj., so use cos.

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

Step 3: Solve

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

$\cos 25° = \frac{X}{60cm}$

$.9063 = \frac{X}{60cm}$

$(60).9063 = X$

$X = 54.4cm$

Using your calculator, give the following ratios.

Cos 30° = .8660 Tan 85° = _____

Tan 15° = _____ Cos 45° = _____

Sin 60° = _____ Cos 60° = _____

Tan 30° = _____ Sin 30° = _____

Sin 45° = _____ Tan 45° = _____

Given the following ratios, use your calculator to find θ.

Cos θ = .8192; θ = 35° Sin θ = .866 θ = _____ Tan θ = 1 θ = _____

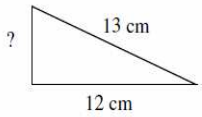
Sin θ = 0.5 θ = _____ Tan θ = 1.732 θ = _____ Cos θ = .866 θ = _____

Tan θ = .8391 θ = _____ Cos θ = 0.5 θ = _____ Sin θ = .7071 θ = _____

What is the sin of 75°?

If tan θ = 0.868, solve for θ.

Two sides of this triangle are given. Calculate the third side.

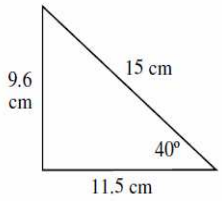


θ = _____

Opposite = _____

Adjacent = _____

Hypotenuse = _____

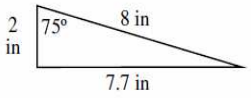


θ = _____

Opposite = _____

Adjacent = _____

Hypotenuse = _____



Adjacent for 20° = _____

Hypotenuse for 70° = _____

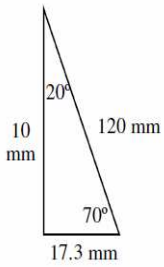
Opposite for 70° = _____

Hypotenuse for 20° = _____

Adjacent for 70° = _____

Opposite for 20° = _____

If opposite = 17.3 cm, then θ = _____



Opposite for 30° = _____

Hypotenuse for 60° = _____

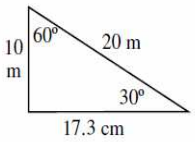
Adjacent for 60° = _____

Hypotenuse for 30° = _____

If opposite = 17.3 cm, then θ = _____

If adjacent = 10 m, then θ = _____

If adjacent = 17.3 cm, then θ = _____

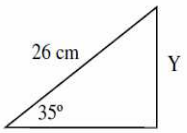


Step 1: Assign Variables

26 cm = _____

35° = _____

Y = _____



Step 2: Choose a Formula
(Sin, Cos, or Tan?)

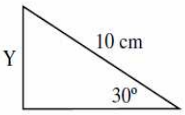
Step 3: Solve

Y = _____

$\sin 30° = \frac{Y}{10cm}$

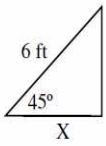
$.988 = \frac{Y}{10cm}$

Y = 9.88cm



Obviously Y ≠ 9.88 cm.
What went wrong?

Following the three steps at the left, find the length of X.



How long is Y?