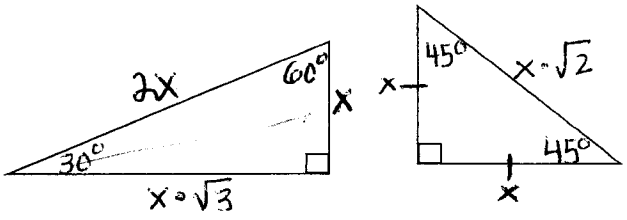
Precalculus Name: _____

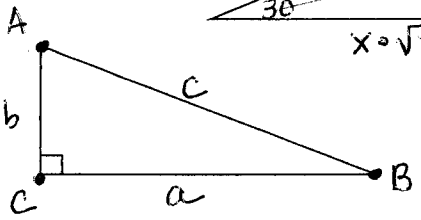
Notes-(4.2) Right Triangle Trig

The Pythagorean Theorem: ONLY works for right triangles!!! $a^2+b^2=c^2$

The 2 Special Triangles: 45°- 45°- 90° and 30°- 60°- 90°



The Nomenclature of the sides:

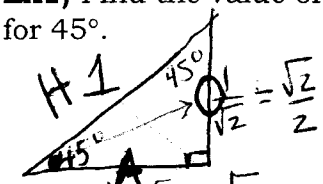


The 6 Trig functions: (pneumonic device: S O H - C A H - T O A)

Sine(θ) = sinθ = $\frac{O}{H}$ Cosine(θ) = cosθ = $\frac{A}{H}$ Tangent(θ) = tanθ = $\frac{O}{A}$

Cosecant(θ) = cscθ = $\frac{H}{O}$ Secant(θ) = secθ = $\frac{H}{A}$ Cotangent(θ) = cotθ = $\frac{A}{O}$

Ex1) Find the value of all 6 trig functions for 45°.



$\tan 45^\circ = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$

$\sin 45^\circ = \frac{\frac{\sqrt{2}}{2}}{1} = \frac{\sqrt{2}}{2}$

$\csc 45^\circ = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

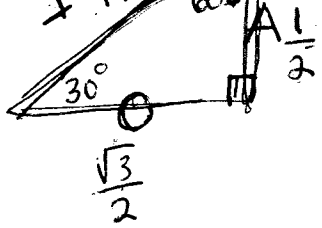
$\cos 45^\circ = \frac{\frac{\sqrt{2}}{2}}{1} = \frac{\sqrt{2}}{2}$

$\sec 45^\circ = \frac{2}{\sqrt{2}} = \sqrt{2}$

$\cot 45^\circ = 1$

Ex2) Find the value of all 6 trig functions for π/3 radians.

$\frac{\pi}{3} \cdot \frac{180^\circ}{\pi} = 60^\circ$



$\csc 60^\circ = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\sec 60^\circ = 2$

$\sin 60^\circ = \frac{\sqrt{3}}{2}$

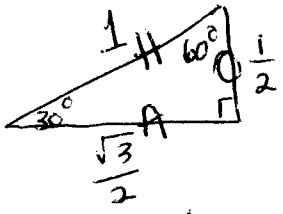
$\cot 60^\circ = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\cos 60^\circ = \frac{1}{2}$

$\tan 60^\circ = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \sqrt{3}$

NOW YOU TRY ☺

3) Find the value of all 6 trig functions for π/6 radians. $\frac{\pi}{6} = 30^\circ$



$\csc 30^\circ = 2$

$\sec 30^\circ = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

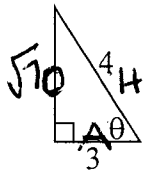
$\cot 30^\circ = \frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \sqrt{3}$

$\sin 30^\circ = \frac{1}{2}$

$\cos 30^\circ = \frac{\sqrt{3}}{2}$

$\tan 30^\circ = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

4) Find the value of all 6 trig functions for θ

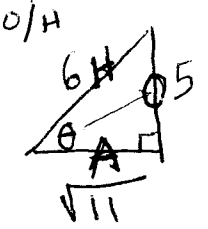


$m^2+3^2=4^2$

$m^2=7$

$m=\sqrt{7}$

Ex5) Let θ be an acute angle such that $\sin\theta = 5/6$. Evaluate the other trig func of θ

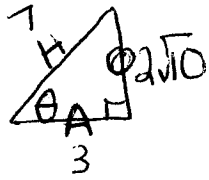


$m^2 + 5^2 = 6^2$

$m^2 = 11$

$m = \sqrt{11}$

***NOW YOU TRY*: 6)** Find the other five trig functions of acute angle θ given that $\cos\theta = 3/7$



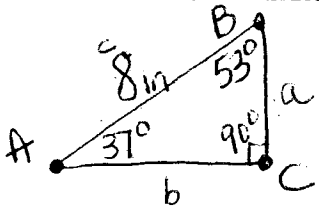
A/H

$m^2 + 3^2 = 7^2$

$m^2 = 40$

$m = \sqrt{40} = 2\sqrt{10}$

Ex7) ΔABC is a right triangle with hypotenuse AB 8 in, and ∠A = 37°. Draw a diagram, label it & solve the triangle (find the measures of all sides & angles). Write answer BOTH in EXACT form & rounded to nearest 10th



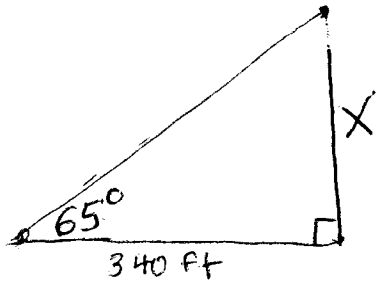
$\sin 37^\circ = \frac{a}{8}$

$a = 8\sin 37^\circ = 4.8\text{ in}$

$\cos 37^\circ = \frac{b}{8}$

$b = 8\cos 37^\circ = 6.4\text{ in}$

Ex8) From a point 340 ft away from the base of the Peach Tree Center Plaza in Atlanta, GA the angle of elevation to the top of the building is 65°. What is the height of the building? Give the EXACT answer & the answer rounded to the nearest ft

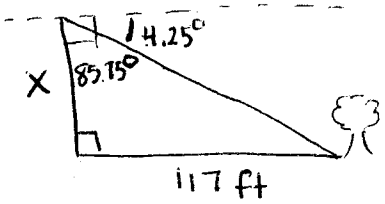


$\tan 65^\circ = \frac{x}{340}$

$x = 340 \cdot \tan 65^\circ = 729\text{ ft}$

~~NOW YOU TRY~~

9) The angle of depression from the edge of a cliff to the base of a tree on the ground below is 4.25°. If the base of the cliff is 117ft from the base of the tree, how high is the cliff?

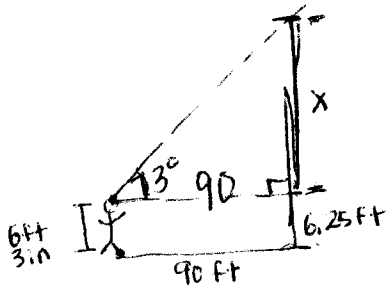


$\tan 85.75^\circ = \frac{117}{x}$

$x \cdot \tan 85.75^\circ = 117$

$x = \frac{117}{\tan 85.75^\circ} = 8.7\text{ ft}$

10) On November 13, 2007 The New Frontier hotel and casino in Las Vegas, NV was to be demolished. To help calculate the safety zone for spectators to watch, the head demolition engineer needed to calculate the height of the New Frontier. His eyes are 6 ft 3in from the ground and his line of sight to the top of the New Frontier forms a 73° angle with the horizontal, if he is standing 90 feet from the base of the building, how tall is the building?



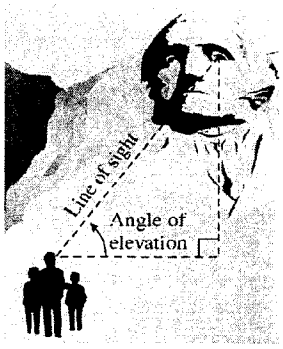
$\tan 73^\circ = \frac{x}{90}$ $x = 90\tan 73^\circ = 294.4$

300.6 ft

THE KEY TO SOLVING ALMOST EVERY WORD PROBLEM INVOLVING TRIGONOMETRY IS TO DRAW A PICTURE!!!!!!

Precal Name: _____

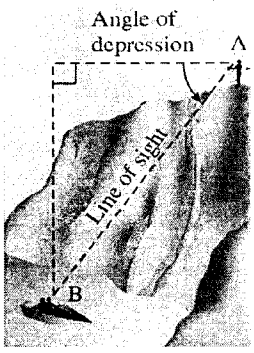
Notes (4.8)-------Solving Problems With Trigonometry



Remember which angle is which!!!

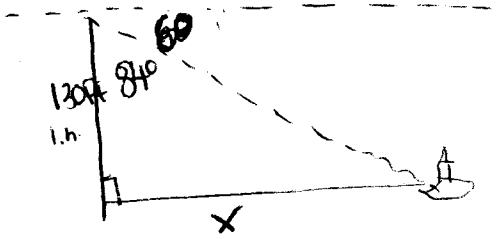
*__*Angle of Elevation*__–from the horizontal up

*__*Angle of Depression*__–from the horizontal down



EXAMPLE 1 Using Angle of Depression

The angle of depression of a buoy from the top of the Barnegat Bay lighthouse 130 feet above the surface of the water is 6°. Find the distance x from the base of the lighthouse to the buoy.



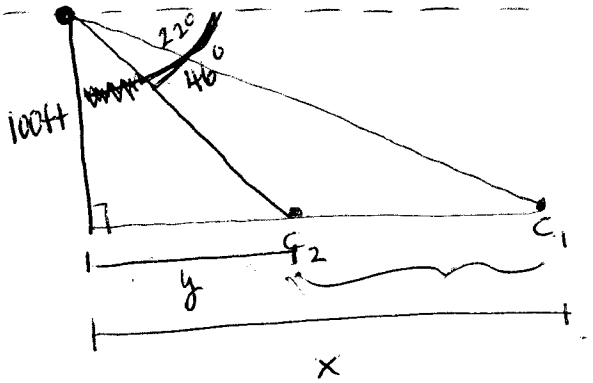
$\tan 84^\circ = \frac{x}{130}$

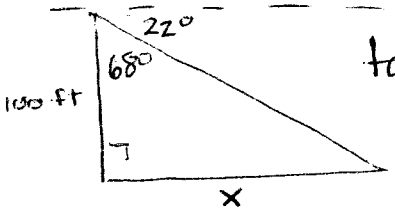
$x = 130 \tan 84^\circ$

$x = 1236.9$ ft

EXAMPLE 2 Making Indirect Measurements

From the top of a 100-ft building a man observes a moving car. If the angle of depression of the car changes from 22° to 46° during the period of observation, how far does the car travel? (can you tell if the car is moving to or from the building? Does this matter? Draw a picture for both)

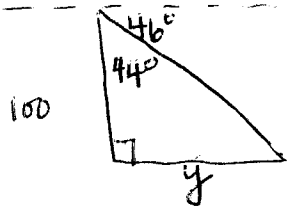




$\tan 68^\circ = \frac{x}{100}$

$x = 100 \tan 68^\circ$

247.509



$\tan 44^\circ = \frac{y}{100}$

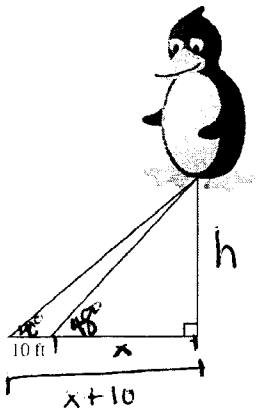
$y = 100 \tan 44^\circ$

$y = 96.569$

$x - y =$ 150.9 ft

EXAMPLE 3 Finding Height Above Ground

A large, helium-filled penguin is awaiting the start of a parade. Two cables attached to the underside of the penguin make angles of 48° and 40° with the ground (see diagram). If the cables are attached to the ground 10 feet from each other, how high above the ground is the penguin?



$\frac{\tan 48^\circ}{1} = \frac{h}{x}$ $\quad h = x \cdot \tan 48^\circ$

$\tan 40^\circ = \frac{h}{x+10}$ $\quad \frac{\tan 40^\circ}{1} = \frac{x \tan 48^\circ}{x+10}$

$x \cdot \tan 40^\circ + 10 \tan 40^\circ = x \tan 48^\circ$

$10 \tan 40^\circ = x \tan 48^\circ - x \cdot \tan 40^\circ$

$10 \tan 40^\circ = x(\tan 48^\circ - \tan 40^\circ)$

$x = \frac{10 \tan 40^\circ}{\tan 48^\circ - \tan 40^\circ} = 30.9$

$h = 30.9 \cdot \tan 48^\circ = 34.3$ ft

EXAMPLE 4 Using Trigonometry in Navigation

A U.S. Coast Guard patrol boat leaves Port Cleveland and averages 35 knots (nautical mph) for 2 hours on a course with a bearing of 53° and then 3 hours on a course with a bearing of 143°. What is the boat's bearing and distance from Port Cleveland?