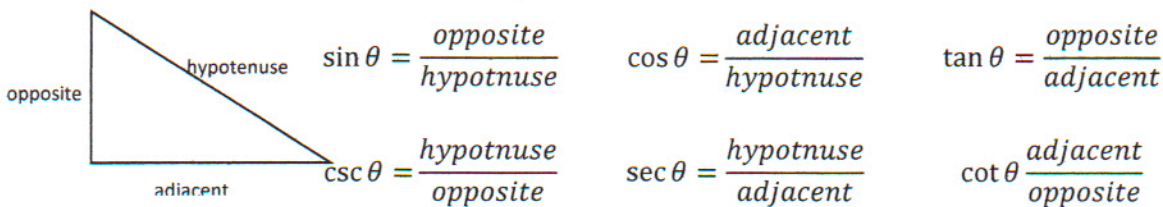


Precalculus

Lesson 8.1: Right triangle Trigonometry Applications

Mrs. Snow, Instructor

Review of the trig ratios for a right triangle



EXAMPLE: Find the six trig ratios

	$\sin \theta = \frac{O}{H}$ $= \frac{2}{3}$	$\cos \theta = \frac{A}{H}$ $= \frac{\sqrt{5}}{3}$	$\tan \theta = \frac{O}{A}$ $= \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$
	$\csc \theta = \frac{H}{O}$ $= \frac{3}{2}$	$\sec \theta = \frac{H}{A}$ $= \frac{3}{\sqrt{5}} = \frac{3\sqrt{5}}{5}$	$\cot \theta = \frac{A}{O}$ $= \frac{\sqrt{5}}{2}$

Solving Right Triangles

Calculators really are nice!

Given $a = 3$, and $b = 2$, find c , A , and B

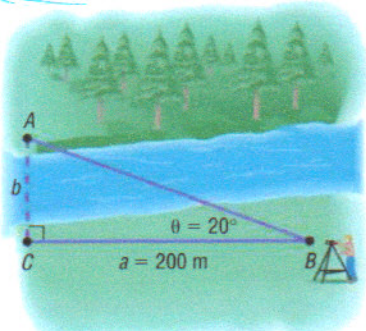
	$2^2 + 3^2 = c^2$ $4 + 9 = 13$ $c = \sqrt{13}$ ≈ 3.61	$\tan A = \frac{3}{2}$ $A = \tan^{-1} \frac{3}{2}$ $\approx 56.3^\circ$
		$180 - 90 - 56.3 = B$ 33.7°

$c = 3.6$

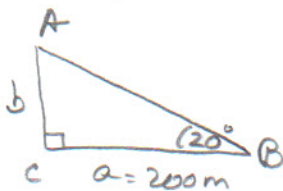
$A = 56.3^\circ$

$B = 33.7^\circ$

A surveyor can measure the width of a river by setting up a transit at a point C on one side of the river and taking a sighting of a point A on the other side. After turning through an angle of 90° at C the surveyor walks a distance of 200 meters to point B. Using the transit at B the angle θ is measured and found to be 20° . What is the width of the river rounded to the nearest meter?



Draw a clean diagram



$$\tan \theta = \frac{o}{a}$$

$$\tan B = \frac{b}{a}$$

$$\tan 20^\circ = \frac{b}{200}$$

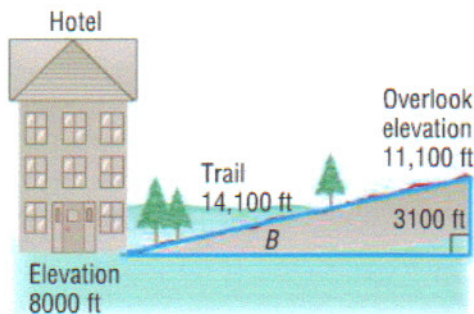
$$200 \tan 20^\circ = b$$

$$12.79 =$$

$$b \sim 73 \text{ meters}$$

Remember units!

A straight trail leads from the Alpine Hotel, elevation 8000 feet, to a scenic overlook, elevation 11,100 feet. The length of the trail is 14,100 feet. What is the inclination (grade) of the trail? That is what is the angle B?

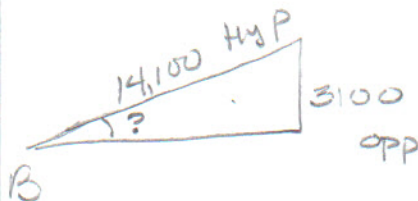


$$\sin B = \frac{o}{H}$$

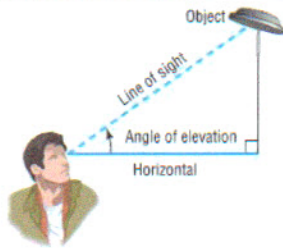
$$\sin B = \frac{3100}{14100}$$

$$B = \sin^{-1} \frac{3100}{14100}$$

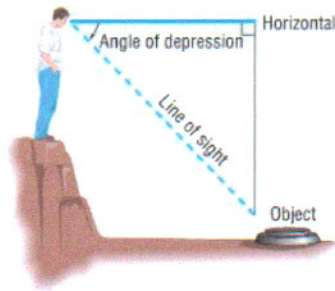
$$B \sim 12.7^\circ$$



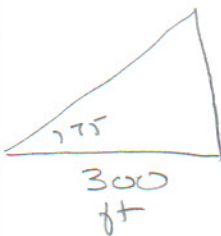
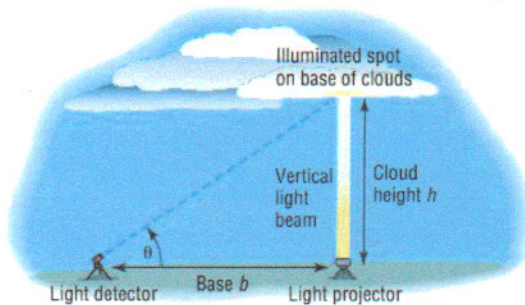
Angle of Elevation: When you look up, you *elevate* your line of vision to see an object.



Angle of Depression: To see an object below you, you look down (when you are *depressed*, you look down).



Meteorologists find the height of a cloud using an instrument called a **ceilometer**. A ceilometer consists of a light projector that directs a vertical light beam up to the cloud base and a light detector that scans the cloud to detect the light beam. On December 13, 2011, at Midway Airport in Chicago, a ceilometer was employed to find the height of the cloud cover. It was set up with its light detector 300 feet from its light projector. If the angle of elevation from the light detector to the base of the cloud were 75° , what was the height of the cloud cover?



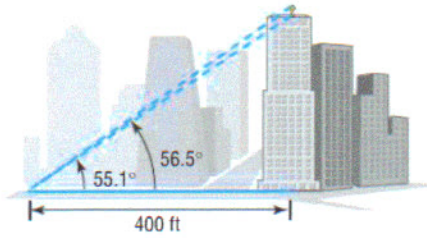
$$\tan \theta = \frac{h}{b}$$

$$\tan 75 = \frac{h}{300}$$

$$300(\tan 75^\circ) = h = 1119.6$$

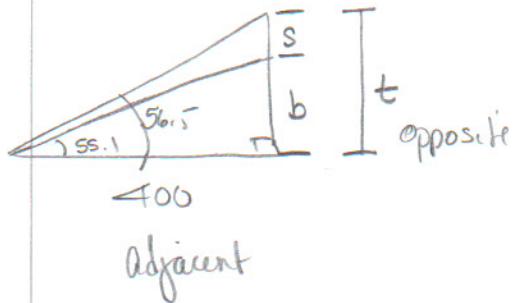
≈ 1200 ft height

Adorning the top of the Board of Trade building in Chicago is a statue of Ceres, the Roman goddess of wheat. From street level, two observations are taken 400 feet from the center of the building. The angle of elevation to the base of the statue is found to be 55.1° and the angle of elevation to the top of the statue is 56.5° . What is the height of the statue?



$$\tan 56.5^\circ = \frac{t}{400}$$

$$400 \tan 56.5^\circ = 604.33$$



$$\tan 55.1^\circ = \frac{b}{400}$$

$$400 \tan 55.1^\circ = 573.39$$

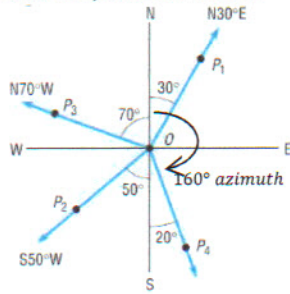
$$- 604.33$$

$$- 573.39$$

$$\hline 30.94$$

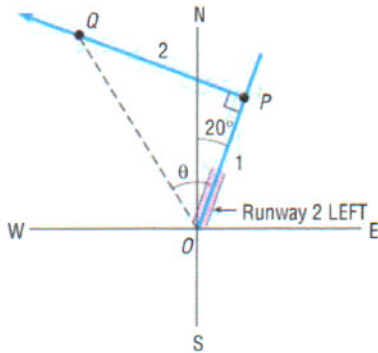
≈ 31 feet

Bearing: The direction north or south always appears first, followed by an acute angle, and ending with east or west. Describes the number of degrees off of north or south and in which direction, east or west.



Azimuth Bearing: Uses all 360° to measure direction

A Boeing 777 aircraft takes off from O'Hare Airport on runway 2 LEFT, which has a bearing of $N20^\circ E$. After flying for one mile, the pilot of the aircraft requests to turn 90° and head northwest. The request is granted. After the plane goes 2 miles in this direction, what bearing should the control tower use to locate the aircraft?



OPP/ADJ

$$\tan \theta = \frac{2}{1}$$

$$\theta = \tan^{-1} 2$$

$$\theta = 63.4^\circ$$

Bearing:

$$63.4 - 20^\circ$$

$$43.4^\circ$$

$N 43.4^\circ W$