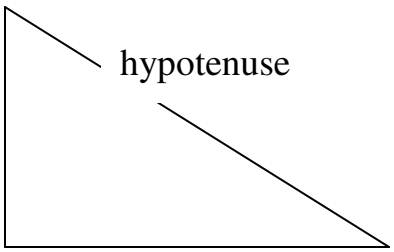
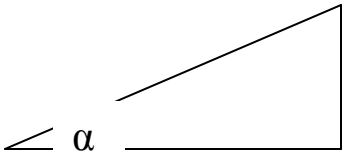
Pre Calculus Notes Unit 4 Triangle Trigonometry

Right Triangles (textbook section 4.3 & 4.8)

Greek letters used to represent angles: α (alpha), β (beta),
γ (gamma), θ (theta)



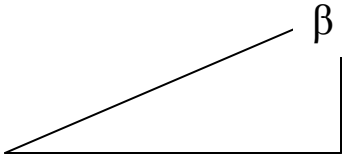
Always opposite right angle, always longest side of the triangle.



Opposite and adjacent sides are named with respect to an acute angle

a (opposite)

b (adjacent)



a (adjacent)

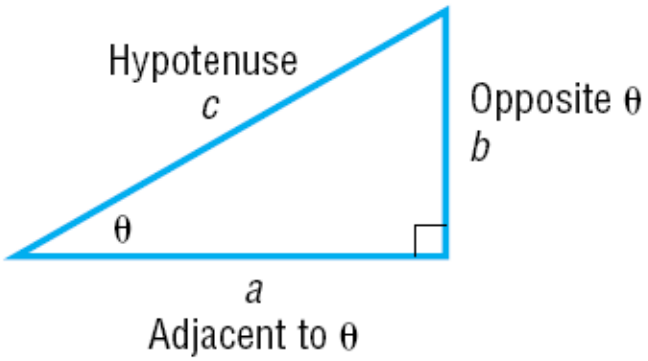
b (opposite)

Side a is always opposite angle A or α
Side b is always opposite angle B or β
Side c is always opposite angle C or γ (in right triangle C=90˚)

Pythagorean Theorem: $a^2 + b^2 = c^2$

The sum of the squares of the two legs of a right triangle is equal to the square of the hypotenuse.

Function Name	Abbreviation
sine of θ	sin θ
cosine of θ	cos θ
tangent of θ	tan θ
cosecant of θ	csc θ
secant of θ	sec θ
cotangent of θ	cot θ



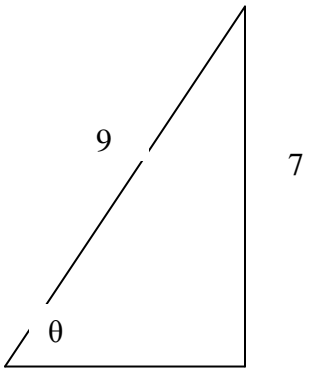
Six Trig Ratios defined using an acute angle in a Right Triangle

$\sin\theta = \frac{opp}{hyp}$ $\quad \csc\theta = \frac{1}{\sin\theta} = \frac{hyp}{opp}$ Use SOH-CAH-TOA to remember

$\cos\theta = \frac{adj}{hyp}$ $\quad \sec\theta = \frac{1}{\cos\theta} = \frac{hyp}{adj}$

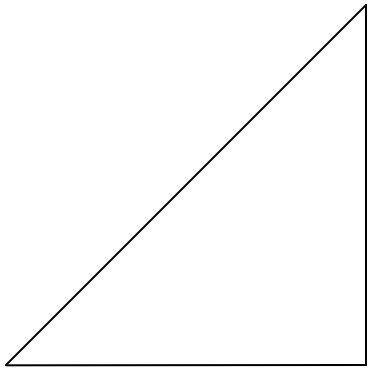
$\tan\theta = \frac{opp}{adj}$ $\quad \cot\theta = \frac{1}{\tan\theta} = \frac{adj}{opp}$

Ex 1 Use triangle to find the **exact** values of the six trig functions of θ

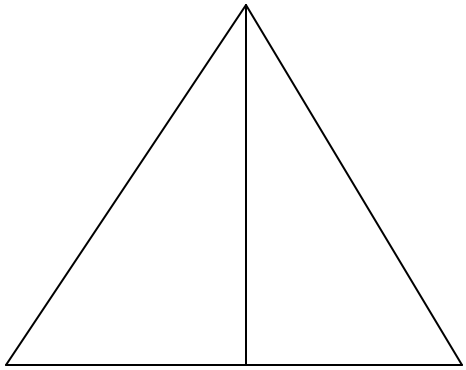


Ex 2 Special Right Triangle: 45-45-90 (Isosceles Right)

Find the exact values of sin 45°,cos 45°, tan 45°



Ex 3 Special Right 30-60-90

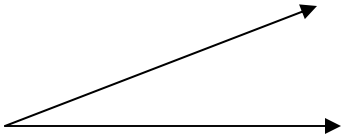


Find the exact values for sin, cos, tan of 30° and 60°.

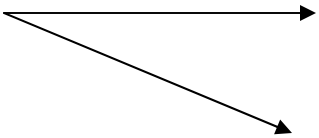
Ex 4 $\cot\theta = 5$, find the other 5 trig ratios for θ.
(hint: draw a triangle using the given info to find sides)

4-3
Angles of Elevation and Angles of Depression

Angle of Elevation – angle between a horizontal line and the line of sight from an observer to an object at a higher level



Angle of Depression - angle between a horizontal line and the line of sight from an observer to an object at a lower level



Always draw the angles in the correct direction to create the right triangle.

Example 1: The angle of elevation from a ship to the top of a 150 ft lighthouse is 9°. How far away from the lighthouse is the ship?

Example 2: The Washington Monument is 169.29 meters tall and at a particular time casts a shadow 201.2 meters long. Find the approximate angle of elevation of the sun at that time.

Example 3: A security camera in a neighborhood bank is mounted on a wall. The camera is to be directed to a spot 6 feet above the floor and 12 feet from the wall. If the angle of depression to the appropriate spot is 24°, how far up the wall should the camera be mounted?

Converting DMS – DD by hand

Ex: 50°15´45" 1°=60´ 1´ = 60" so when you are converting begin with the smallest unit.

Example: $45'' \cdot \frac{1'}{60''} = 0.75'$, add to 15´, change 15.75´ to degrees.

$15.75' \cdot \frac{1°}{60'} = 0.2625°$ add to 50° so 50°15´45"=50.2625°

To convert from decimal degrees to DMS: multiply the decimal part by 60 to get minutes Example .2625 (60)=15.75 then multiply that decimal part by 60 to get seconds. .75(60) = 45. Round to a whole number of seconds if needed.

On calculator, you can input DMS using 2nd Apps for degrees and minutes and Alpha + for seconds. When you hit enter, it will convert to decimal degrees.
To convert from decimal degrees to DMS, use 2nd Angle 4:>DMS after inputting the angle.

Using calculator to find reciprocal functions:

Ex: 1) csc 23.5°=1/sin 23.5° 2) $\csc\theta = 2.3662, \textit{find } \theta.$ change to sin by using $x^{-1} key$ or $1/2.3662,$ then do $\sin^{-1}$.

p 274 # 1-3,9-15,41-43,53-55odds only.