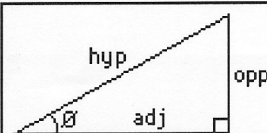
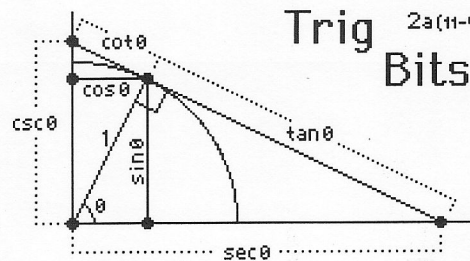


# Trig Bits



$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

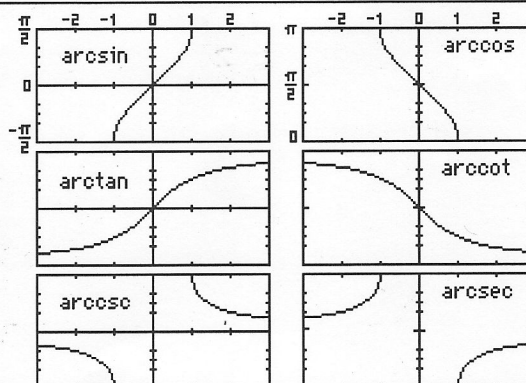
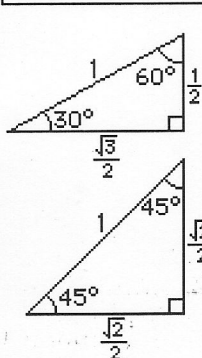
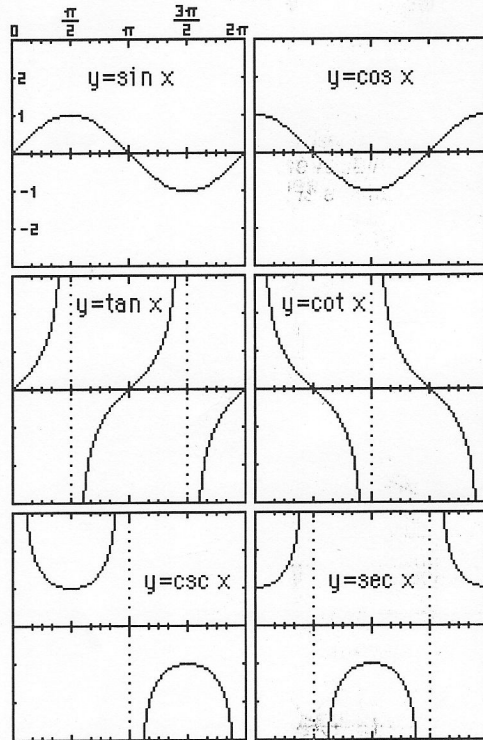
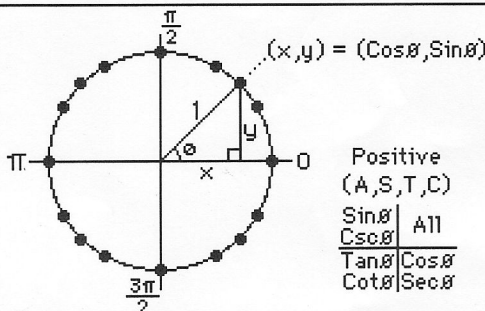
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

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

$$\begin{aligned} \text{opp} &= \text{hyp} \cdot \sin \theta \\ \text{adj} &= \text{hyp} \cdot \cos \theta \end{aligned}$$

## On the Unit Circle

$$\begin{aligned} \sin \theta &= y \\ \cos \theta &= x \\ \tan \theta &= \frac{y}{x} = \frac{\sin \theta}{\cos \theta} \\ \cot \theta &= \frac{x}{y} = \frac{\cos \theta}{\sin \theta} \\ \sec \theta &= \frac{1}{x} = \frac{1}{\cos \theta} \\ \csc \theta &= \frac{1}{y} = \frac{1}{\sin \theta} \end{aligned}$$



## Addition Identities

$$\begin{aligned} \sin(a \pm b) &= \sin a \cos b \pm \cos a \sin b \\ \cos(a \pm b) &= \cos a \cos b \mp \sin a \sin b \\ \tan(a \pm b) &= \frac{\tan a \pm \tan b}{1 \mp \tan a \tan b} \end{aligned}$$

## Negative Angles

$$\begin{aligned} \sin(-a) &= -\sin(a) \\ \cos(-a) &= \cos(a) \\ \tan(-a) &= -\tan(a) \end{aligned}$$

m°	m <sup>r</sup>	Sin θ	Cos θ	Tan θ	Cot θ	Csc θ	Sec θ	Arc Ansr
0	0	0	1	0	Undef	Undef	1	0
30	π/6	1/2	√3/2	√3/3	√3	2	2√3/3	π/6
45	π/4	√2/2	√2/2	1	1	√2	√2	π/4
60	π/3	√3/2	1/2	√3	√3/3	2√3/3	2	π/3
90	π/2	1	0	Undef	0	1	Undef	π/2
120	2π/3	√3/2	-1/2	-√3	-√3/3	2√3/3	-2	2π/3
135	3π/4	√2/2	-√2/2	-1	-1	√2	-√2	3π/4
150	5π/6	1/2	-√3/2	-√3/3	-√3	2	-2√3/3	5π/6
180	π	0	-1	0	Undef	Undef	-1	π
210	7π/6	-1/2	-√3/2	√3/3	√3	-2	-2√3/3	7π/6
225	5π/4	-√2/2	-√2/2	1	1	-√2	-√2	5π/4
240	4π/3	-√3/2	-1/2	√3	√3/3	-2√3/3	-2	4π/3
270	3π/2	-1	0	Undef	0	-1	Undef	3π/2
300	5π/3	-√3/2	1/2	-√3	-√3/3	-2√3/3	2	5π/3
315	7π/4	-√2/2	√2/2	-1	-1	-√2	√2	7π/4
330	11π/6	-1/2	√3/2	-√3/3	-√3	2	2√3/3	11π/6
360	2π	0	1	0	Undef	Undef	1	0

## Half Angle Formulas

$$\begin{aligned} \sin \frac{\theta}{2} &= \pm \sqrt{\frac{1 - \cos \theta}{2}} \\ \cos \frac{\theta}{2} &= \pm \sqrt{\frac{1 + \cos \theta}{2}} \\ \tan \frac{\theta}{2} &= \frac{1 - \cos \theta}{\sin \theta} = \frac{\sin \theta}{1 + \cos \theta} \end{aligned}$$

## Double Angle Formulas

$$\begin{aligned} \sin(2\theta) &= 2 \sin \theta \cos \theta \\ \cos(2\theta) &= \cos^2 \theta - \sin^2 \theta \\ \cos(2\theta) &= 2 \cos^2 \theta - 1 \\ \cos(2\theta) &= 1 - 2 \sin^2 \theta \end{aligned}$$

## Triangle Identities

$$\begin{aligned} \sin^2 \theta + \cos^2 \theta &= 1 \\ 1 + \tan^2 \theta &= \sec^2 \theta \\ 1 + \cot^2 \theta &= \csc^2 \theta \end{aligned}$$

## Cofunction Identities

$$\begin{aligned} \sin\left(\frac{\pi}{2} - \theta\right) &= \cos \theta \\ \cos\left(\frac{\pi}{2} - \theta\right) &= \sin \theta \\ \tan\left(\frac{\pi}{2} - \theta\right) &= \cot \theta \end{aligned}$$

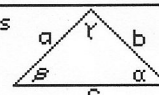
Conversions:  $m^\circ \cdot \frac{\pi}{180^\circ} = m^r$       $m^r \cdot \frac{180^\circ}{\pi} = m^\circ$

Approximate π's: 22/7 or 355/113

$y = A \sin [B(x - C)] + D$   
 $y = A \cos [B(x - C)] + D$

A = Amplitude  
 B = Frequency in 2π (2π/B = Period)  
 C = x shift  
 D = y shift

## Laws of Sines and Cosines



$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$$

$$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos \alpha$$