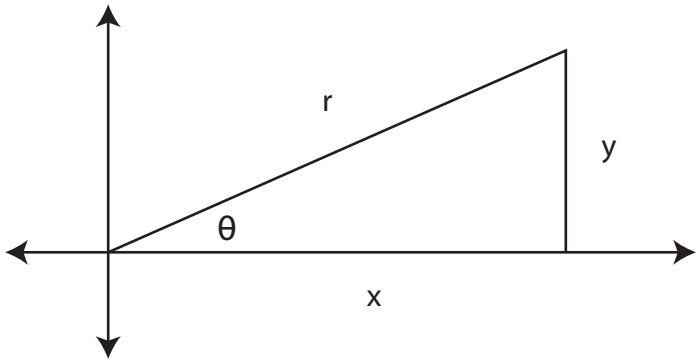
TRIGONOMETRIC IDENTITIES

SOH - CAH - TOA

$$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} \qquad \cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} \qquad \tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$



$$\sin\theta = \frac{y}{r}$$

$$\cos\theta = \frac{x}{r}$$

$$\tan\theta = \frac{y}{x}$$

$$r = 1$$

Reciprocal Identities

$$\sin x = \frac{1}{\csc x} \qquad \csc x = \frac{1}{\sin x}$$

$$\cos x = \frac{1}{\sec x} \qquad \sec x = \frac{1}{\cos x}$$

$$\tan x = \frac{1}{\cot x} \qquad \cot x = \frac{1}{\tan x}$$

Quotient Identities

$$\tan x = \frac{\sin x}{\cos x}$$

$$\cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1$$

$$\tan^2 x + 1 = \sec^2 x$$

$$1 + \cot^2 x = \csc^2 x$$

Co-Function Identities

$$\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta \qquad \cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$$

$$\csc\left(\frac{\pi}{2} - \theta\right) = \sec\theta \qquad \sec\left(\frac{\pi}{2} - \theta\right) = \csc\theta$$

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta \qquad \cot\left(\frac{\pi}{2} - \theta\right) = \tan\theta$$

Odd/Even (Negative Angle) Identities

Odd	Even
$\sin(-\theta) = -\sin\theta$	$\cos(-\theta) = \cos\theta$
$\csc(-\theta) = -\csc\theta$	$\sec(-\theta) = \sec\theta$
$\tan(-\theta) = -\tan\theta$	
$\cot(-\theta) = -\cot\theta$	

Product-Sum Identities	Sum and Difference Identities
$\sin(\alpha+\beta)+\sin(\alpha-\beta)=2\sin\alpha\cos\beta$ $\sin(\alpha+\beta)-\sin(\alpha-\beta)=2\cos\alpha\sin\beta$ $\cos(\alpha+\beta)+\cos(\alpha-\beta)=2\cos\alpha\cos\beta$ $\cos(\alpha+\beta)-\cos(\alpha-\beta)=-2\sin\alpha\sin\beta$	$\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$ $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$ $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$ $\tan(\alpha+\beta)=\dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$ $\tan(\alpha-\beta)=\dfrac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$
Double Angle Identities	**Half Angle Identities**
$\sin 2x=2\sin x\cos x$ $\cos 2x=\cos^2 x-\sin^2 x$ $\cos 2x=2\cos^2 x-1$ $\cos 2x=1-2\sin^2 x$ $\tan 2x=\dfrac{2\tan x}{1-\tan^2 x}$	$\sin\dfrac{x}{2}=\pm\sqrt{\dfrac{1-\cos x}{2}}$ or $\sin^2 x=\dfrac{1-\cos x}{2}$ $\cos\dfrac{x}{2}=\pm\sqrt{\dfrac{1+\cos x}{2}}$ or $\cos^2 x=\dfrac{1+\cos x}{2}$ $\tan\dfrac{x}{2}=\pm\sqrt{\dfrac{1-\cos x}{1+\cos x}}$ or $\tan^2 x=\dfrac{1-\cos x}{1+\cos x}$