

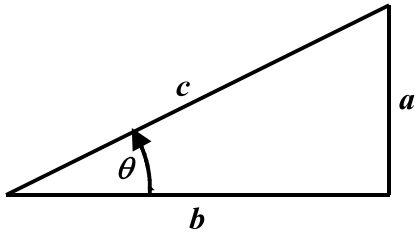
## Table of Trigonometric Identities

### Definitions

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

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



### Basic Identities

$$\sin \theta = \frac{1}{\csc \theta} \qquad \cos \theta = \frac{1}{\sec \theta}$$

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

$$\csc \theta = \frac{1}{\sin \theta} \qquad \sec \theta = \frac{1}{\cos \theta}$$

### Periodicity

$$\sin(\theta + 2\pi) = \sin \theta$$

$$\cos(\theta + 2\pi) = \cos \theta$$

$$\tan(\theta + \pi) = -\tan \theta$$

### Pythagorean Identities

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

$$\sec^2 \theta - \tan^2 \theta = 1$$

$$\csc^2 \theta - \cot^2 \theta = 1$$

### Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \qquad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

### Co-Function Identities

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

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

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

### Even or Odd Symmetry

$$\sin(-\theta) = -\sin \theta \qquad \cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta \qquad \cot(-\theta) = -\cot \theta$$

$$\csc(-\theta) = -\csc \theta \qquad \sec(-\theta) = \sec \theta$$

### Angle Sum and Difference Formulas

$$\sin(\theta \pm \varphi) = \sin \theta \cos \varphi \pm \cos \theta \sin \varphi$$

$$\cos(\theta \pm \varphi) = \cos \theta \cos \varphi \mp \sin \theta \sin \varphi$$

$$\tan(\theta \pm \varphi) = \frac{\tan \theta \pm \tan \varphi}{1 \mp \tan \theta \tan \varphi}$$

### Double Angle Formulas

$$\sin(2\theta) = 2 \sin \theta \cos \theta$$

$$\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$$

$$= 2 \cos^2 \theta - 1$$

$$= 1 - 2 \sin^2 \theta$$

$$\tan(2\theta) = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

### Half Angle Formulas

$$\sin^2 \theta = \frac{1 - \cos(2\theta)}{2}$$

$$\cos^2 \theta = \frac{1 + \cos(2\theta)}{2}$$

$$\tan^2 \theta = \frac{1 - \cos(2\theta)}{1 + \cos(2\theta)}$$

### Sum-to-Product Formulas

$$\sin \theta + \sin \varphi = 2 \sin\left(\frac{\theta + \varphi}{2}\right) \cos\left(\frac{\theta - \varphi}{2}\right)$$

$$\sin \theta - \sin \varphi = 2 \cos\left(\frac{\theta + \varphi}{2}\right) \sin\left(\frac{\theta - \varphi}{2}\right)$$

$$\cos \theta + \cos \varphi = 2 \cos\left(\frac{\theta + \varphi}{2}\right) \cos\left(\frac{\theta - \varphi}{2}\right)$$

$$\cos \theta - \cos \varphi = -2 \sin\left(\frac{\theta + \varphi}{2}\right) \sin\left(\frac{\theta - \varphi}{2}\right)$$

### Product-to-Sum Formulas

$$\sin \theta \sin \varphi = \frac{1}{2} [\cos(\theta - \varphi) - \cos(\theta + \varphi)]$$

$$\cos \theta \cos \varphi = \frac{1}{2} [\cos(\theta - \varphi) + \cos(\theta + \varphi)]$$

$$\sin \theta \cos \varphi = \frac{1}{2} [\sin(\theta + \varphi) + \sin(\theta - \varphi)]$$

$$\cos \theta \sin \varphi = \frac{1}{2} [\sin(\theta + \varphi) - \sin(\theta - \varphi)]$$