

## Trig Identities Cheat Sheet

### Trigonometric Inverses/Identities:

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

$$\cot\theta = \frac{\cos\theta}{\sin\theta} \quad \cot\theta = \frac{1}{\tan\theta}$$

### Ratio Identities:

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

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

### Trig. Proofs Ex:

$$\tan\theta = \sin\theta\sec\theta$$

$$\tan\theta = \sin\theta \times \frac{1}{\cos\theta}$$

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

$$\tan\theta = \tan\theta$$

### Pythagorean Identities:

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

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

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

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

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

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

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

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

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

### Co-Function Identities:

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

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

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

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

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

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

### Half Angle Formulas:

$$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1 - \cos\theta}{2}}$$

$$\cos\frac{\theta}{2} = \pm\sqrt{\frac{1 + \cos\theta}{2}}$$

$$\tan\frac{\theta}{2} = \frac{\sin\theta}{1 + \cos\theta} = \frac{1 - \cos\theta}{\sin\theta}$$

### Double Angle Formulas:

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

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

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

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

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

---

**Double Angle Formulas:**

$$\sin(a + b) = \sin a \cos b + \cos a \sin b$$

$$\cos(a + b) = \cos a \cos b - \sin a \sin b$$

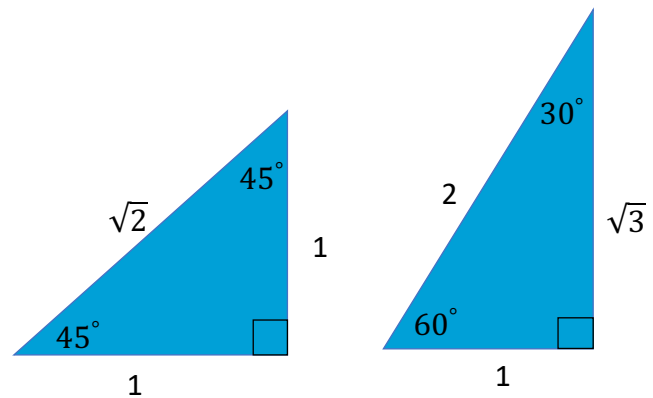
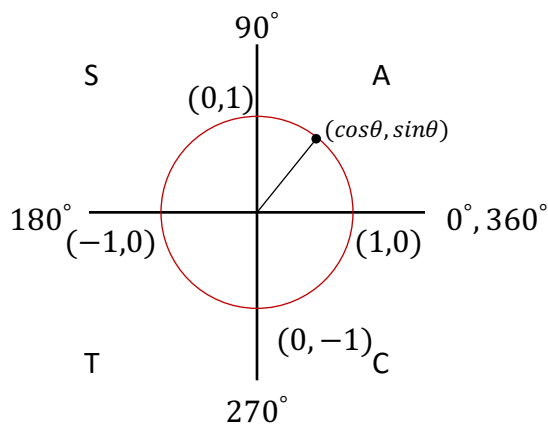
$$\sin(a - b) = \sin a \cos b - \cos a \sin b$$

$$\cos(a - b) = \cos a \cos b + \sin a \sin b$$

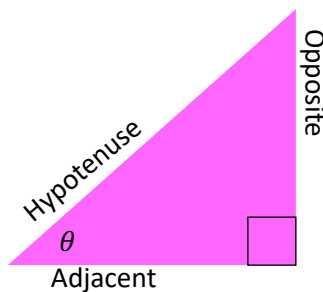
$$\tan(a + b) = \frac{\tan a + \tan b}{1 - \tan a \tan b}$$

$$\tan(a - b) = \frac{\tan a - \tan b}{1 + \tan a \tan b}$$

---

**Unit Circle:**

---

**Trigonometric Functions: (SOH CAH TOA)**  
**(Only work on right triangles.)**

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

**Converting Degrees to Radians:**

$$60^\circ \times \frac{\pi}{180} = \frac{\pi}{3}$$

**Converting Radians to Degrees:**

$$\frac{\pi}{3} \times \frac{180}{\pi} = 60^\circ$$