

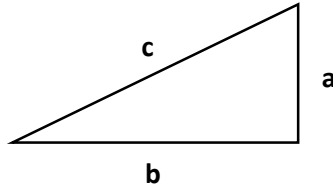
# TRIGONOMETRY CHEAT SHEET

## Basic Formulas

Pythagorean Theorem

$$c^2 = a^2 + b^2$$

$$\sin(a) = \frac{\text{Opposite}}{\text{Hypotenuse}}$$



$$\cos(a) = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\tan(a) = \frac{\sin(a)}{\cos(a)}$$

$$\csc(a) = \frac{1}{\sin(a)}$$

$$\sec(a) = \frac{1}{\cos(a)}$$

$$\cot(a) = \frac{1}{\tan(a)}$$

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

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

$$\tan(-a) = -\tan(a)$$

## Pythagoras identities

$$\sin^2(a) + \cos^2(a) = 1$$

$$1 + \tan^2(a) = \sec^2(a)$$

$$1 + \cot^2(a) = \csc^2(a)$$

## Double angle formulas

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

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

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

## Half Angle Formulas

$$\sin\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 - \cos(a)}{2}}$$

$$\cos\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 + \cos(a)}{2}}$$

$$\tan\left(\frac{a}{2}\right) = \frac{\sin(a)}{1 + \cos(a)} = \frac{1 - \cos(a)}{\sin(a)}$$

## More Trigonometry Formulas

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

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

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

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

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

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

$$\sin(a) + \sin(b) = 2 \sin\left(\frac{a+b}{2}\right) \cos\left(\frac{a-b}{2}\right)$$

$$\sin(a) - \sin(b) = 2 \cos\left(\frac{a+b}{2}\right) \sin\left(\frac{a-b}{2}\right)$$

$$\cos(a) + \cos(b) = 2 \cos\left(\frac{a+b}{2}\right) \cos\left(\frac{a-b}{2}\right)$$

$$\cos(a) - \cos(b) = -2 \sin\left(\frac{a+b}{2}\right) \sin\left(\frac{a-b}{2}\right)$$

UNIT CIRCLE

