Formula Sheet

Quotient Identity:

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

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

Pythagorean Identities:

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

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

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

Cofunction Identity:

$$\sin(\pi/2 - \theta) = \cos\theta \qquad \cos(\pi/2 - \theta) = \sin\theta \qquad \tan(\pi/2 - \theta) = \cot\theta$$

$$\csc(\pi/2 - \theta) = \sec\theta \qquad \sec(\pi/2 - \theta) = \csc\theta \qquad \cot(\pi/2 - \theta) = \tan\theta$$

Sum and Difference Formula:

$$\sin(x+y) = \sin x \cos y + \cos x \sin y$$

$$\sin(x-y) = \sin x \cos y - \cos x \sin y$$
$$\cos(x+y) = \cos x \cos y - \sin x \sin y$$
$$\cos(x-y) = \cos x \cos y + \sin x \sin y$$
$$\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$$
$$\tan(x-y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$$

Double Angle Formula:

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

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

Power Reducing Formula:

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

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

Power Reducing Formula:

$$\sin x \sin y = 1/2(\cos(x-y) - \cos(x+y))$$

$$\cos x \cos y = 1/2(\cos(x-y) + \cos(x+y))$$

$$\sin x \cos y = 1/2(\sin(x+y) + \sin(x-y))$$

$$\cos x \sin y = 1/2(\sin(x+y) - \sin(x-y))$$

Sum Product Formula:

$$\sin x + \sin y = 2\sin(\frac{x+y}{2})\cos(\frac{x-y}{2})$$

$$\sin x - \sin y = 2\cos(\frac{x+y}{2})\sin(\frac{x-y}{2})$$

$$\cos x + \cos y = 2\cos(\frac{x+y}{2})\cos(\frac{x-y}{2})$$

$$\cos x - \cos y = -2\sin(\frac{x+y}{2})\sin(\frac{x-y}{2})$$

Trig Functions for Special Angles

	$\theta = 0$ (0°)	$\pi/6$ (30°)	$\pi/4$ (45°)	$\pi/3$ (60°)	$\pi/2$ (90°)	$2\pi/3$ (120°)	$3\pi/4$ (135°)	$5\pi/6$ (150°)	π (180°)	$3\pi/2$ (270°)	2π (360°)
$\sin\theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0	-1	0
$\cos\theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0	$-1/2$	$-1/\sqrt{2}$	$-\sqrt{3}/2$	-1	0	1
$\tan\theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	—	$-\sqrt{3}$	-1	$-1/\sqrt{3}$	0	—	0
$\csc\theta$	—	2	$\sqrt{2}$	$2/\sqrt{3}$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	—	-1	—
$\sec\theta$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	—	-2	$-\sqrt{2}$	$-2/\sqrt{3}$	-1	—	1
$\cot\theta$	—	$\sqrt{3}$	1	$1/\sqrt{3}$	0	$-1/\sqrt{3}$	-1	$-\sqrt{3}$	—	0	—

The Law of Sine: For any triangle with sides a,b,and c, and respective opposite angels α, β, and γ,

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

The Area of an Oblique Triangle: For any oblique triangle with side lengths a, b, and c, and angles α, β, and γ, the area of the triangle is given by $A = \frac{cb\sin\alpha}{2} = \frac{ca\sin\beta}{2} = \frac{ab\sin\gamma}{2}$.

The Law of Cosine: For any triangle with sides a,b,and c, and respective opposite angels α, β, and γ,

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

$$b^2 = a^2 + c^2 - 2ac\cos\beta$$

$$c^2 = b^2 + a^2 - 2ba\cos\gamma$$