

Trigonometry Facts

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θ	$\sin \theta$	Memory Trick for $\sin \theta$ count 0, 1, 2, 3, 4	$\cos \theta$ (same as $\sin \theta$, but in reverse order)	$\tan \theta = \frac{\sin \theta}{\cos \theta}$
$0, 2\pi$	0	$\frac{\sqrt{0}}{2} = 0$	1	0
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	1	$\frac{\sqrt{4}}{2} = 1$	0	undefined
π	0		-1	0
$\frac{3\pi}{2}$	-1		0	undefined

Arc length = $s = r\theta$ (**in radians only**)

Area of a sector = $\frac{1}{2}r^2\theta = \frac{1}{2}sr$ (**in radians only**)

Area of a triangle = $\frac{1}{2}ab \sin C$ [plus 2 more interchanging the letters]

Trig functions definitions

Function	Using the sides of a right triangle	Using a point (x, y) on the terminal side	Using the point (x, y) on the unit circle
$\sin \theta$	$\frac{\text{opp}}{\text{hyp}}$	$\frac{y}{r}$	y
$\cos \theta$	$\frac{\text{adj}}{\text{hyp}}$	$\frac{x}{r}$	x
$\tan \theta$	$\frac{\text{opp}}{\text{adj}}$	$\frac{y}{x}$	$\frac{y}{x}$

$$r^2 = x^2 + y^2$$

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

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

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

The quadrants in which the functions positive:

Mnemonic: "All Students Take Calculus"

S (sine)	A (all)
T (tangent)	C (cosine)

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

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

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

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

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

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

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

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$
 [plus 2 more interchanging the letters]

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$
 [plus 2 more interchanging the letters]

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

$$\cos(-\theta) = +\cos \theta$$

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

The co-functions of complementary angles are equal:

$$\sin \theta = \cos(90 - \theta) \quad \cos \theta = \sin(90 - \theta)$$

$$\tan \theta = \cot(90 - \theta) \quad \cot \theta = \tan(90 - \theta)$$

$$\sec \theta = \csc(90 - \theta) \quad \csc \theta = \sec(90 - \theta)$$

$$\sin(180^\circ - \theta) = \sin \theta$$

$$\cos(180^\circ - \theta) = -\cos \theta$$

$$\tan(180^\circ - \theta) = -\tan \theta$$

$$\sin(\theta + 90^\circ) = +\cos \theta$$

$$\cos(\theta + 90^\circ) = -\sin \theta$$

$$\tan(\theta + 90^\circ) = -\cot \theta$$

$$\sin(\theta + 180^\circ) = -\sin \theta$$

$$\cos(\theta + 180^\circ) = -\cos \theta$$

$$\tan(\theta + 180^\circ) = +\tan \theta$$