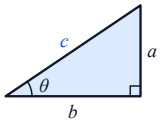
Trigonometry formulas

coddy.tech/math/formulas/trigonometry

TRIG RATIOS

Sine, cosine and tangent

$$\sin\theta = \frac{a}{c}$$
$$\cos\theta = \frac{b}{c}$$
$$\tan\theta = \frac{a}{b}$$



a opposite side
b adjacent side
c hypotenuse

Reciprocal identities

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

Quotient identities

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

Special angles

Angle	sin	cos	tan
0°	0	1	0
30° $\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
45° $\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
60° $\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90° $\frac{\pi}{2}$	1	0	—

IDENTITIES

Pythagorean identities

$$\sin^2\theta + \cos^2\theta = 1$$
$$1 + \tan^2\theta = \sec^2\theta$$
$$1 + \cot^2\theta = \csc^2\theta$$

Even and odd identities

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

Cofunction identities

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

ANGLE FORMULAS

Sum and difference formulas

$$\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$$
$$\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A\tan B}$$

Double angle formulas

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

Half angle formulas

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

Power reducing formulas

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

Product to sum formulas

$$\sin A\sin B = \tfrac{1}{2}[\cos(A-B) - \cos(A+B)]$$
$$\cos A\cos B = \tfrac{1}{2}[\cos(A-B) + \cos(A+B)]$$
$$\sin A\cos B = \tfrac{1}{2}[\sin(A+B) + \sin(A-B)]$$

Sum to product formulas

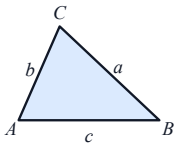
$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2}$$
$$\sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}$$
$$\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

TRIANGLES

Law of sines

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

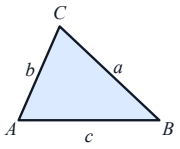
A, B, C angles
a, b, c the sides opposite them



Law of cosines

$$c^2 = a^2 + b^2 - 2ab\cos C$$

A, B, C angles
a, b, c the sides opposite them



Area of a triangle

AREA

$$A = \tfrac{1}{2}ab\sin C$$

C the angle between sides a and b

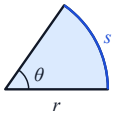
RADIANS AND GRAPHS

Radians, arcs and sectors

$$180^\circ = \pi \text{ rad}$$

DEGREES TO RADIANS

$$\theta_{\text{rad}} = \theta^\circ \cdot \frac{\pi}{180^\circ}$$



ARC LENGTH

$$s = r\theta$$

SECTOR AREA

$$A = \tfrac{1}{2}r^2\theta$$

r radius θ angle in radians s arc length

Sine and cosine graphs

$$y = A\sin(Bx - C) + D$$

AMPLITUDE

$$|A|$$

PERIOD

$$\frac{2\pi}{|B|}$$

PHASE SHIFT

$$\frac{C}{B}$$

MIDLINE

$$y = D$$