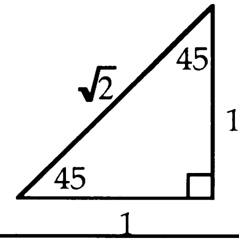
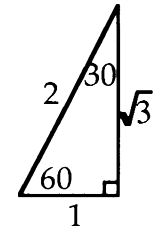
| $x°$ | $x^R$ | Sin x | Cos x | Tan x |
|---|---|---|---|---|
| 0° | 0 | $\sqrt{\frac{0}{4}}=0$ | 1 | 0 |
| 30° | $\frac{\pi}{6}$ | $\sqrt{\frac{1}{4}}=\frac{1}{2}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{3}}$ |
| 45° | $\frac{\pi}{4}$ | $\sqrt{\frac{2}{4}}=\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{2}}{2}$ | 1 |
| 60° | $\frac{\pi}{3}$ | $\sqrt{\frac{3}{4}}=\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$ | $\sqrt{3}$ |
| 90° | $\frac{\pi}{2}$ | $\sqrt{\frac{4}{4}}=1$ | 0 | *undef* |
| 180° | $\frac{2\pi}{2}=\pi$ | 0 | −1 | 0 |
| 270° | $\frac{3\pi}{2}$ | −1 | 0 | *undef* |




$$\sin\theta=\frac{y}{r}\qquad \cos\theta=\frac{x}{r}\qquad \tan\theta=\frac{y}{x}$$

$$\sin\theta=\frac{\text{opp}}{\text{hyp}}\qquad \cos\theta=\frac{\text{adj}}{\text{hyp}}\qquad \tan\theta=\frac{\text{opp}}{\text{adj}}$$

$x=r\cos\theta,\ y=r\sin\theta\}$ Polar ⇒ Rect.

$r=\sqrt{x^2+y^2},\ \theta=\tan^{-1}\left(\frac{y}{x}\right)\}$ Rect. ⇒ Polar

$$\left.\begin{array}{c} -\frac{\pi}{2}\le\sin^{-1}x\le\frac{\pi}{2} \\ 0\le\cos^{-1}x\le\pi \\ -\frac{\pi}{2}<\tan^{-1}x<\frac{\pi}{2}\end{array}\right\}\text{ Ranges of Inverse Fns.}$$

$$\left.\begin{array}{l} s=r\theta \\ v=r\omega\end{array}\right\}\text{ Arc Length \& Vel.}$$

# Identities

$$\left.\begin{array}{r} \sin x\cdot\csc x=1 \\ \cos x\cdot\sec x=1 \\ \tan x\cdot\cot x=1\end{array}\right\}\text{ Reciprocal}$$

$$\left.\begin{array}{r} \sin^2 x+\cos^2 x=1 \\ 1+\tan^2 x=\sec^2 x \\ 1+\cot^2 x=\csc^2 x\end{array}\right\}\text{ Pythagorean}$$

$$\left.\begin{array}{l} \frac{\sin x}{\cos x}=\tan x \\ \frac{\cos x}{\sin x}=\cot x\end{array}\right\}\text{ Ratio}$$

$$\left.\begin{array}{l} \sin(x\pm y)=\sin x\cos y\pm\sin y\cos x \\ \cos(x\pm y)=\cos x\cos y\mp\sin x\sin y \\ \tan(x\pm y)=\frac{\tan x\pm\tan y}{1\mp\tan x\cdot\tan y}\end{array}\right\}\text{ Sum / Difference}$$

$$\left.\begin{array}{l} \sin 2x=2\sin x\cdot\cos x \\ \cos 2x=\cos^2 x-\sin^2 x \\ \cos 2x=2\cos^2 x-1 \\ \cos 2x=1-2\sin^2 x \\ \tan 2x=\frac{2\tan x}{1-\tan^2 x}\end{array}\right\}\text{ Double Angle}$$

$$\left.\begin{array}{l} \sin^2 x=\frac{1}{2}(1-\cos 2x) \\ \cos^2 x=\frac{1}{2}(1+\cos 2x)\end{array}\right\}\text{ Useful in Calculus}$$

$$\left.\begin{array}{l} \sin\frac{1}{2}x=\pm\sqrt{\frac{1-\cos x}{2}} \\ \cos\frac{1}{2}x=\pm\sqrt{\frac{1+\cos x}{2}} \\ \tan\frac{1}{2}x=\pm\sqrt{\frac{1-\cos x}{1+\cos x}} \\ \tan\frac{1}{2}x=\frac{1-\cos x}{\sin x} \\ \tan\frac{1}{2}x=\frac{\sin x}{1+\cos x}\end{array}\right\}\text{ Half Angle}$$

$$\left.\frac{\text{sin(angle)}}{\text{opposite side}}=\text{constant}\right\}\text{Law of Sines}$$

$$\left.a^2=b^2+c^2-2bc\cos A\right\}\text{Law of Cosines}$$

Area of a triangle = half the product of 2 sides and the sine of the included angle.

Area of a triangle $=\sqrt{s(s-a)(s-b)(s-c)}$ where $s$ is the semi-perimeter.