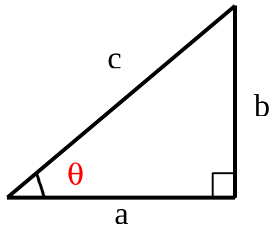
Pythagorean Theorem:



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

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

$\sin(0) = 0, \quad \cos(0) = 1, \quad \tan(0) = 0$

$\sin(90) = 1, \quad \cos(90) = 0, \quad \tan(90) = \infty$

$\sin(180) = 0, \quad \cos(180) = -1, \quad \tan(180) = 0$

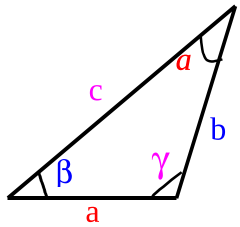
$\sin(270) = -1, \quad \cos(270) = 0, \quad \tan(270) = -\infty$

$\sin(30) = \cos(60) = \frac{1}{2}, \quad \cos(30) = \sin(60) = \frac{\sqrt{3}}{2}, \quad \tan(30) = \frac{\sqrt{3}}{3}, \quad \tan(60) = \sqrt{3}$

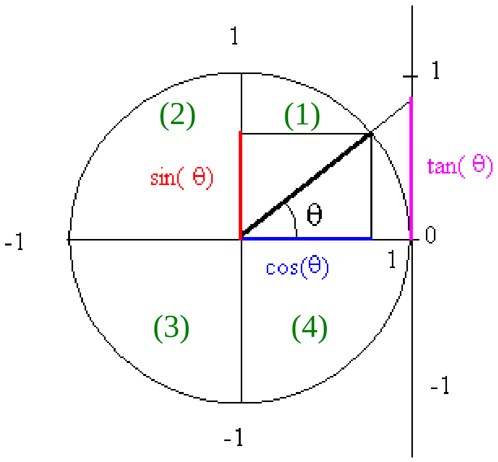
$\sin(45) = \cos(45) = \frac{\sqrt{2}}{2}, \quad \tan(45) = 1$

Law of sines: $\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$

Law of cosines: $c = \sqrt{a^2 + b^2 - 2ab\cos\gamma}$



The unit circle and trigonometric functions:



$\sin(-\theta) = -\sin\theta, \quad \cos(-\theta) = \cos\theta, \quad \tan(-\theta) = -\tan\theta$ (4th quadrant)

$\sin(180-\theta) = \sin\theta, \quad \cos(180-\theta) = -\cos\theta, \quad \tan(180-\theta) = -\tan\theta$ (2nd quadrant)

$\sin(180+\theta) = -\sin\theta, \quad \cos(180+\theta) = -\cos\theta, \quad \tan(180+\theta) = \tan\theta$ (3rd quadrant)

$\sin(90-\theta) = \cos\theta, \quad \cos(90-\theta) = \sin\theta$ (1st quadrant)

$\sin(90+\theta) = \cos\theta, \quad \cos(90+\theta) = -\sin\theta$ (2nd quadrant)

Double angle relations:

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

$$\cos(2q) = \cos^2 q - \sin^2 q = 2\cos^2 q - 1 \quad \left(\text{so: } \cos^2 q = \frac{\cos(2q)+1}{2}\right)$$

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

Two angle relations:

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

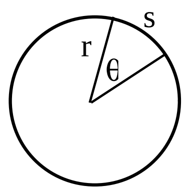
$$\cos(a \pm b) = \cos a \cos b \mp \sin a \sin b$$

$$\tan(a \pm b) = \frac{\tan a \pm \tan b}{1 \mp \tan a \tan b}$$

Arc Length, $s = rq$

Angle measured in radians, $q = s/r$ = arc length/radius

Sector area $= \left(\dfrac{q}{2p}\right) p r^2 = \dfrac{1}{2} r^2 q$



Similar triangles:

The sides of two similar triangles are proportional and the angels are the same. The respective heights of these triangles are also proportional to the sides.

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f} = \frac{h}{H}$$