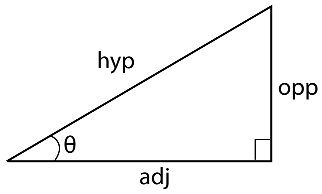
ERA Distributors

Distributors of The MATHOMAT® Drawing Template

In conjunction with ∂φ Publishers

Hands-on: Tips for Trigonometry

Right angle trigonometry

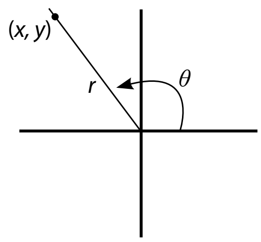


$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \operatorname{cosec}\theta = \frac{\text{hyp}}{\text{opp}}$$

$$\cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \sec\theta = \frac{\text{hyp}}{\text{adj}}$$

$$\tan\theta = \frac{\text{opp}}{\text{adj}} \qquad \cot\theta = \frac{\text{adj}}{\text{opp}}$$

Circular functions



$$\sin\theta = \frac{y}{r} \qquad \operatorname{cosec}\theta = \frac{r}{y}$$

$$\cos\theta = \frac{x}{r} \qquad \sec\theta = \frac{r}{x}$$

$$\tan\theta = \frac{y}{x} \qquad \cot\theta = \frac{x}{y}$$

where $r = \sqrt{x^2 + y^2},\ r \neq 0$

Positive trigonometric values

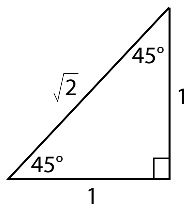
I	II	III	IV
all	sin	tan	cos

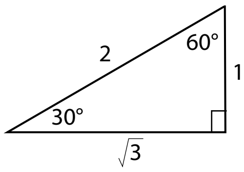
II sin	I all
III tan	IV cos

Polar coordinates

Polar to rectangular:	Rectangular to polar:
$x = r\cos\theta$	$x^2 + y^2 = r^2$
$y = r\sin\theta$	$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

Special triangles





Area of triangle

$A = \frac{1}{2}$ base × height or

$A = \frac{1}{2}ab\sin C$ or

$A = \sqrt{s(s-a)(s-b)(s-c)}$

where $s = \frac{1}{2}(a+b+c)$

Circle

Circumference:	$C = 2\pi r$
Area circle:	$A = \pi r^2$
Length of arc:	$s = r\theta$
Area of sector:	$A_{\text{sector}} = \frac{1}{2}r^2\theta = \frac{1}{2}rs$
Length chord:	$L = 2r\sin\frac{1}{2}\theta$
Area segment:	$A_{\text{seg}} = \frac{1}{2}r^2(\theta - \sin\theta)$

Oblique triangles

Sine rule for AAS, SSA*

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

Cosine rule for SSA*, SAS, SSS

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

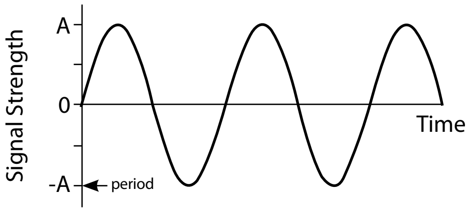
Radians and degrees

1 degree $= 1^\circ = \left(\frac{\pi}{180}\right)$ radians

1 radian $= 1^R = \left(\frac{180}{\pi}\right)$ degrees

(*Ambiguous case)

Sine wave



Sine wave

General form: $y = a \sin(b\theta + c)$

Amplitude is $|a|$

Period (T) is $\frac{2\pi}{|b|} = \frac{360^\circ}{|b|}$

Phase Shift is $-\frac{c}{|b|}$

$\sin(\theta + \alpha)$ *leads* $\sin(\theta)$ by α

For $y = A \sin \omega t$:

$T = \frac{2\pi}{\omega}$ s and frequency (f) is $\frac{1}{T}$ Hz

Basic trigonometric identities

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

$\sec\theta = \frac{1}{\cos\theta}$ $\quad$ $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

Pythagorean identities

$\sin^2\theta + \cos^2\theta = 1$
$\sec^2\theta - \tan^2\theta = 1$
$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

Indentities involving complement

$\cos\theta = \sin\left(\frac{\pi}{2} - \theta\right)$ $\quad$ $\sin\theta = \cos\left(\frac{\pi}{2} - \theta\right)$

$\cot\theta = \tan\left(\frac{\pi}{2} - \theta\right)$ $\quad$ $\tan\theta = \cot\left(\frac{\pi}{2} - \theta\right)$

$\operatorname{cosec}\theta = \sec\left(\frac{\pi}{2} - \theta\right)$ $\quad$ $\sec\theta = \operatorname{cosec}\left(\frac{\pi}{2} - \theta\right)$

Identities involving supplement

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

Identities for negative angles

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

Sum identities

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

$\tan(\theta + \vartheta) = \frac{\tan\theta + \tan\vartheta}{1 - \tan\theta\tan\vartheta}$

Difference identities

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

$\tan(\theta - \vartheta) = \frac{\tan\theta - \tan\vartheta}{1 + \tan\theta\tan\vartheta}$

Double angle identities

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

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

Triple angle identities

$\sin(3\theta) = 3\sin\theta - 4\sin^3\theta$
$\cos(3\theta) = 4\cos^3\theta - 3\cos\theta$

Sum-to-product identities

$\sin\theta + \sin\vartheta = 2\sin\left(\frac{\theta + \vartheta}{2}\right)\cos\left(\frac{\theta - \vartheta}{2}\right)$

$\cos\theta + \cos\vartheta = 2\cos\left(\frac{\theta + \vartheta}{2}\right)\cos\left(\frac{\theta - \vartheta}{2}\right)$

$\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$

Product identities

$\sin\theta\cos\vartheta = \frac{\sin(\theta + \vartheta) + \sin(\theta - \vartheta)}{2}$

$\cos\theta\cos\vartheta = \frac{\cos(\theta + \vartheta) + \cos(\theta - \vartheta)}{2}$

$\sin\theta\sin\vartheta = \frac{\cos(\theta - \vartheta) - \cos(\theta + \vartheta)}{2}$

9 780994 668516