MATHEMATICS *trigonometry*

TRIGONOMETRIC RATIOS

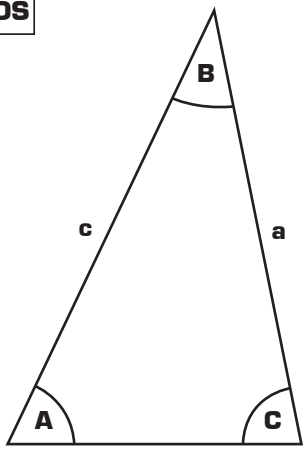
$\sin(A+B) = \sin A \cos B + \cos A \sin B$
$\sin(A-B) = \sin A \cos B - \cos A \sin B$
$\cos(A+B) = \cos A \cos B - \sin A \sin B$
$\cos(A-B) = \cos A \cos B + \sin A \sin B$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

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

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



TRIGONOMETRIC RATIOS

Law of Sines

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

Law of Cosines

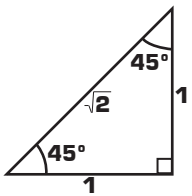
$a^2 = b^2 + c^2 - 2bc(\cos A)$
$b^2 = a^2 + c^2 - 2ac(\cos B)$
$c^2 = a^2 + b^2 - 2ab(\cos C)$

Law of Tangents

$$\frac{a-b}{a+b} = \frac{\tan 1/2(A-B)}{\tan 1/2(A+B)}$$

$$\frac{b-c}{b+c} = \frac{\tan 1/2(B-C)}{\tan 1/2(B+C)}$$

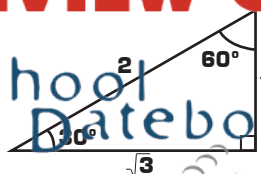
$$\frac{c-a}{c+a} = \frac{\tan 1/2(C-A)}{\tan 1/2(C+A)}$$



$\sin 45° = \frac{1}{\sqrt{2}}$

$\cos 45° = \frac{1}{\sqrt{2}}$

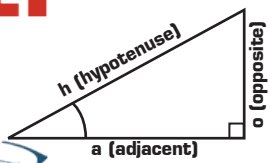
$\tan 45° = 1$



$\sin 30° = \frac{1}{2}$ $\quad \sin 60° = \frac{\sqrt{3}}{2}$

$\cos 30° = \frac{\sqrt{3}}{2}$ $\quad \cos 60° = \frac{1}{2}$

$\tan 30° = \frac{1}{\sqrt{3}}$ $\quad \tan 60° = \sqrt{3}$



$$\sin\theta = \frac{\text{o (opposite)}}{\text{h (hypotenuse)}} = \frac{1}{\csc\theta}$$

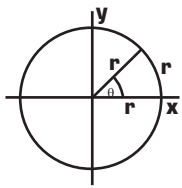
$$\cos\theta = \frac{\text{a (adjacent)}}{\text{h (hypotenuse)}} = \frac{1}{\sec\theta}$$

$$\tan\theta = \frac{\text{o (opposite)}}{\text{a (adjacent)}} = \frac{1}{\cot\theta}$$

VALUES OF TRIGONOMETRIC RATIOS

θ	0	π/2	π	3π/2	2π
sinθ	0	1	0	−1	0
cosθ	1	0	−1	0	1
tanθ (sin/cos)	0	∞	0	−∞	0
secθ (1/cos)	1	∞	−1	∞	1
cscθ (1/sin)	∞	1	∞	−1	∞
cotθ (1/tan)	∞	0	−∞	0	∞

note: ∞ denotes undefined or infinite



θ = 1 radian
π radians = 180°
2π radians = 360°

QUADRANTS

Quad II
90°-180°
sin, csc are +

Quad I
0°-90°
all ratios are +

Quad III
180°-270°
tan, cot are +

Quad IV
270°-360°
cos, sec are +