

# Trigonometry

→  $\frac{\pi}{2}$  radian =  $90^\circ$

1 radian =  $\frac{180^\circ}{\pi}$

→ Sum of internal angles of a polygon is  $(n-2)\pi$

sin	All
Tan	Cos

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

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

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

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

•  $S_C + S_D = 2 S_{\frac{C+D}{2}} C_{\frac{C-D}{2}}$

$S_C - S_D = 2 C_{\frac{C+D}{2}} S_{\frac{C-D}{2}}$

$C_C + C_D = 2 C_{\frac{C+D}{2}} C_{\frac{C-D}{2}}$

$C_C - C_D = 2 S_{\frac{C+D}{2}} S_{\frac{D-C}{2}}$

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

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

• Range

$S_\theta$   $[-1, 1]$      $\sec \theta$   $(-\infty, -1] \cup [1, \infty)$

$C_\theta$   $[-1, 1]$      $\csc \theta$   $(-\infty, -1] \cup [1, \infty)$

$t_\theta$   $(-\infty, \infty)$      $\cot \theta$   $(-\infty, \infty)$

•  $\frac{C_\theta \pm S_\theta}{C_\theta \mp S_\theta} = \frac{1 \pm \tan \theta}{1 \mp \tan \theta} = \tan(45^\circ \pm \theta)$

•  $\sin a \pm \sin a \pm d + \dots + \sin(a + n-1)d$   
 $= \frac{\sin \frac{nd}{2}}{\sin \frac{d}{2}} \sin \frac{(2a + n-1)d}{2}$

•  $S_\theta = 2 S_{\theta/2} C_{\theta/2}$   
 $= \frac{2 \tan \theta/2}{1 + \tan^2 \theta/2}$

•  $C_\theta = 2 C_{\theta/2}^2 - 1$   
 $= 1 - 2 S_{\theta/2}^2$   
 $= C_{\theta/2}^2 - S_{\theta/2}^2$   
 $= \frac{1 - \tan^2 \theta/2}{1 + \tan^2 \theta/2}$

•  $t_\theta = \frac{2 \tan \theta/2}{1 - \tan^2 \theta/2}$

•  $1 + \sin \theta = (\sin \theta/2 + \cos \theta/2)^2$

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

•  $\cos(60-\theta) \cos \theta \cos(60+\theta) = \frac{1}{4} \cos 3\theta$

•  $\sin(60-\theta) \sin \theta \sin(60+\theta) = \frac{1}{4} \sin 3\theta$

•  $\tan(60-\theta) \tan \theta \tan(60+\theta) = \tan 3\theta$

•  $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$

•  $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$

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

•  $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$

•  $\cos(A+B) \cos(A-B) = \cos^2 A - \cos^2 B$

•  $\sin \theta = \sin \alpha \Rightarrow \theta = n\pi + (-1)^n \alpha$

•  $\cos \theta = \cos \alpha \Rightarrow \theta = 2n\pi \pm \alpha$

•  $\tan \theta = \tan \alpha \Rightarrow \theta = n\pi + \alpha$

\* Sine Rule

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

\* Cosine Rule

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

$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$

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