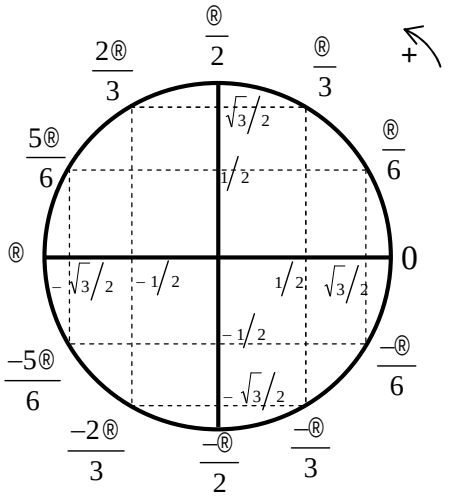
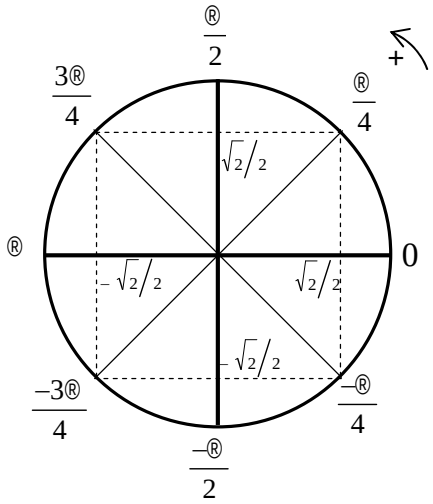
النسب المثلثية للزوايا الهامة





~	0	®/6	®/4	®/3	®/2	2®/3	3®/4	5®/6	®
sin ~	0	1/2	√2/2	√3/2	1	√3/2	√2/2	1/2	0
cos ~	1	√3/2	√2/2	1/2	0	−1/2	−√2/2	−√3/2	−1
tan ~	0	√3/3	1	√3		−√3	−1	−√3/3	0

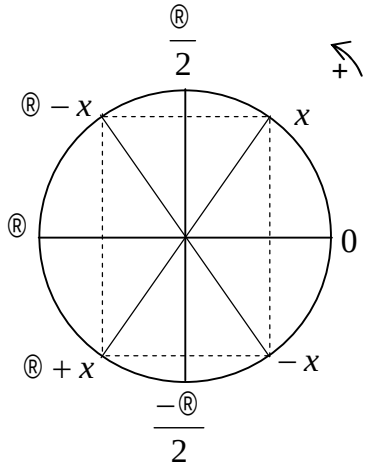
صيغ و تعاريف مثلثية هامة

$\sin^2 x+\cos^2 x=1$	$\tan x=\dfrac{\sin x}{\cos x}$	$\text{cotan}\, x=\dfrac{1}{\tan x}=\dfrac{\cos x}{\sin x}$	$\tan^2 x=\dfrac{1}{\cos^2 x}-1$	$\text{cotan}^2 x=\dfrac{1}{\sin^2 x}-1$

$$\sin(x+2k®)=\sin x$$
$$\sin(-x)=-\sin x$$
$$\sin(®-x)=\sin x$$
$$\sin(®+x)=-\sin x$$
$$\sin\left(\frac{®}{2}-x\right)=\cos x$$
$$\sin\left(\frac{®}{2}+x\right)=\cos x$$

$$\cos(x+2k®)=\cos x$$
$$\cos(-x)=\cos x$$
$$\cos(®-x)=-\cos x$$
$$\cos(®+x)=-\cos x$$
$$\cos\left(\frac{®}{2}-x\right)=\sin x$$
$$\cos\left(\frac{®}{2}+x\right)=-\sin x$$

$$\tan(x+k®)=\tan x$$
$$\tan(-x)=-\tan x$$
$$\tan\left(\frac{®}{2}-x\right)=\frac{1}{\tan x}$$
$$\tan\left(\frac{®}{2}+x\right)=\frac{-1}{\tan x}$$



المعادلات المثلثية

$\cos x=\cos y \Leftrightarrow (x=y+2k® \,/\, k\in Z)\ \ ou\ \ (x=-y+2k® \,/\, k\in Z)$
$\sin x=\sin y \Leftrightarrow (x=y+2k® \,/\, k\in Z)\ \ ou\ \ (x=(®-y)+2k® \,/\, k\in Z)$
$\tan x=\tan y \Leftrightarrow x=y+k® \,/\, k\in Z$

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حـــــالات خاصة

$\sin x = 0 \Leftrightarrow x = k\pi \ / k \in Z$ $\sin x = 1 \Leftrightarrow x = \frac{\pi}{2} + 2k\pi \ / k \in Z$ $\sin x = -1 \Leftrightarrow x = \frac{-\pi}{2} + 2k\pi \ / k \in Z$	$\cos x = 0 \Leftrightarrow x = \frac{\pi}{2} + k\pi \ / k \in Z$ $\cos x = 1 \Leftrightarrow x = 2k\pi \ / k \in Z$ $\cos x = -1 \Leftrightarrow x = (2k+1)\pi \ / k \in Z$	$\tan x = 0 \Leftrightarrow x = k\pi \ / k \in Z$ $\tan x = 1 \Leftrightarrow x = \frac{\pi}{4} + k\pi \ / k \in Z$ $\tan x = -1 \Leftrightarrow x = \frac{-\pi}{4} + k\pi \ / k \in Z$

صيغ التحويل

$\sin(a+b) = \sin a \cos b + \cos a \sin b$ $\cos(a+b) = \cos a \cos b - \sin a \sin b$ $\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \tan b}$	$\sin(a-b) = \sin a \cos b - \cos a \sin b$ $\cos(a-b) = \cos a \cos b + \sin a \sin b$ $\tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a \tan b}$

صيغ النشر و التعميل

$\cos p + \cos q = 2\cos\left(\frac{p+q}{2}\right)\cos\left(\frac{p-q}{2}\right)$ $\cos p - \cos q = -2\sin\left(\frac{p+q}{2}\right)\sin\left(\frac{p-q}{2}\right)$ $\sin p + \sin q = 2\sin\left(\frac{p+q}{2}\right)\cos\left(\frac{p-q}{2}\right)$ $\sin p - \sin q = 2\cos\left(\frac{p+q}{2}\right)\sin\left(\frac{p-q}{2}\right)$	$\sin a \sin b = \frac{-1}{2}\left[\cos(a+b) - \cos(a-b)\right]$ $\cos a \cos b = \frac{1}{2}\left[\cos(a+b) + \cos(a-b)\right]$ $\sin a \cos b = \frac{1}{2}\left[\sin(a+b) + \sin(a-b)\right]$

المربع و الضعف

$\cos 2a = 1 - 2\sin^2 a = 2\cos^2 a - 1$ $\sin 2a = 2\sin a \cos a$ $\tan 2a = \frac{2\tan a}{1 - \tan^2 a}$	$\cos^2 a = \frac{1 + \cos 2a}{2}$ $\sin^2 a = \frac{1 - \cos 2a}{2}$	$\sin^2 a = \frac{1 - \cos 2a}{2}$ $\cos^2 a = \frac{1 + \cos 2a}{2}$ $\tan^2 a = \frac{1 - \cos 2a}{1 + \cos 2a}$

كتابة $\sin a$ و $\cos a$ و $\tan a$ بدلالة $\tan\frac{a}{2}$

$\sin a = \frac{2\tan\frac{a}{2}}{1 + \tan^2\frac{a}{2}}$	$\cos a = \frac{1 - \tan^2\frac{a}{2}}{1 + \tan^2\frac{a}{2}}$	$\tan a = \frac{2\tan\frac{a}{2}}{1 - \tan^2\frac{a}{2}}$

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