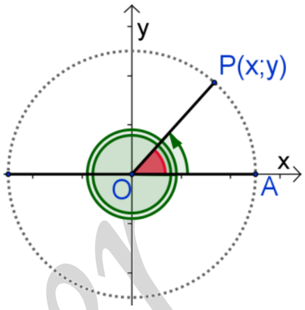
A. Principal determination:



Principal angle is the measure of the oriented arc AP that belongs to the interval:

$]-\pi, \pi]$	$]-180^\circ, 180^\circ]$
If angle is in radian	If angle is in degrees

B. Range of trigonometric ratios:

Bounding trigonometric lines			
$\lvert\cos\alpha\rvert \leq 1$	means	$-1 \leq \cos\alpha \leq 1$	For all $\alpha \in \mathbb{R}$
$\lvert\sin\alpha\rvert \leq 1$		$-1 \leq \sin\alpha \leq 1$	
$-\infty < \tan\alpha < +\infty$; $-\infty < \cot\alpha < +\infty$ } For all $\alpha \in \mathbb{R}$			

C. Remarkable angles:

Degrees versus radian										
α : in degrees	0°	30°	45°	60°	90°	120°	135°	150°	180°	270°
β : in radians	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{3\pi}{2}$

From the table

If α and β

Quadrant	1^{st} - quadrant				
Complements					
Angle (α) / Ratios	$0\,rad$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin\alpha$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos\alpha$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan\alpha$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	∞
$\cot\alpha$	∞	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$	0

We notice that

Complementary

$\alpha + \beta = \frac{\pi}{2}$

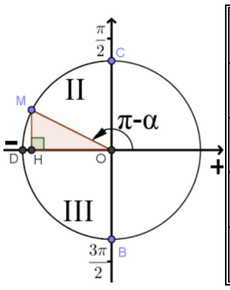
$\cot\alpha \times \cot\beta = 1$

$\tan\alpha = \cot\beta$

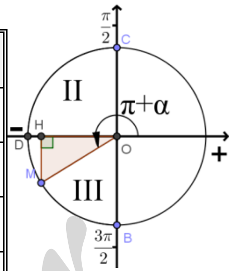
$\tan\alpha \times \tan\beta = 1$

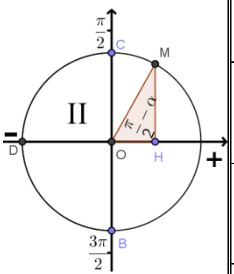
$\cos\alpha = \sin\beta$

D. *Associated arcs for:*

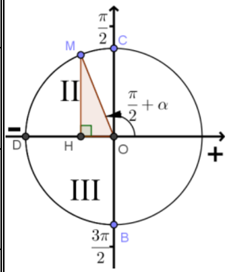


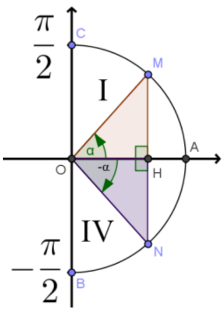
Supplementary arcs: $(\alpha \ \& \ \pi-\alpha)$	Arcs differing by $\pi : (\alpha \ \& \ \pi+\alpha)$
$\cos(\pi-\alpha)=-\cos\alpha$	$\cos(\pi+\alpha)=-\cos\alpha$
$\sin(\pi-\alpha)=\sin\alpha$	$\sin(\pi+\alpha)=-\sin\alpha$
$\tan(\pi-\alpha)=-\tan\alpha$	$\tan(\pi+\alpha)=\tan\alpha$
$\cot(\pi-\alpha)=-\cot\alpha$	$\cot(\pi+\alpha)=\cot\alpha$





Complementary arcs: $(\alpha \ \& \ \frac{\pi}{2}-\alpha)$	Arcs differing by $\frac{\pi}{2} : (\alpha \ \& \ \frac{\pi}{2}+\alpha)$
$\cos(\frac{\pi}{2}-\alpha)=\sin\alpha$	$\cos(\frac{\pi}{2}+\alpha)=-\sin\alpha$
$\sin(\frac{\pi}{2}-\alpha)=\cos\alpha$	$\sin(\frac{\pi}{2}+\alpha)=\cos\alpha$
$\tan(\frac{\pi}{2}-\alpha)=\cot\alpha$	$\tan(\frac{\pi}{2}+\alpha)=-\cot\alpha$
$\cot(\frac{\pi}{2}-\alpha)=\tan\alpha$	$\cot(\frac{\pi}{2}+\alpha)=-\tan\alpha$





Opposite arcs: $(\alpha \ \& \ -\alpha)$	Arcs differing by $2k\pi : (\alpha \ \& \ \alpha \pm 2k\pi)\ s.t (k \in Z)$
$\cos(-\alpha)=\cos\alpha$	$\cos(\alpha \pm 2k\pi)=\cos\alpha$
$\sin(-\alpha)=-\sin\alpha$	$\sin(\alpha \pm 2k\pi)=\sin\alpha$
$\tan(-\alpha)=-\tan\alpha$	$\tan(\alpha \pm 2k\pi)=\tan\alpha$
$\cot(-\alpha)=-\cot\alpha$	$\cot(\alpha \pm 2k\pi)=\cot\alpha$

E. *Equations:*

$\cos x=\cos\alpha \overset{means}{\Leftrightarrow} \begin{cases} x=\alpha+2k\pi \\ or \quad where\ k\ \&\ k' \in Z \\ x=-\alpha+2k'\pi \end{cases}$	$\sin x=\sin\alpha \overset{means}{\Leftrightarrow} \begin{cases} x=\alpha+2k\pi \\ or \quad where\ k\ \&\ k' \in Z \\ x=\pi-\alpha+2k'\pi \end{cases}$
$\cos x=0 \overset{means}{\Leftrightarrow} x=\frac{\pi}{2}+k\pi$	$\sin x=0 \overset{means}{\Leftrightarrow} x=k\pi$
$\tan x=\tan\alpha \overset{means}{\Leftrightarrow} \{x=\alpha+k\pi$ $\tan x=0 \overset{means}{\Leftrightarrow} x=k\pi$	

Transformation formulas

Basic formulas:

	$\sin^2\alpha+\cos^2\alpha=1$	
$1+\cot^2\alpha=\dfrac{1}{\sin^2\alpha}$	$\tan\alpha\times\cot\alpha=1$	$1+\tan^2\alpha=\dfrac{1}{\cos^2\alpha}$
$\sin^2\alpha=\dfrac{1}{1+\cot^2\alpha}=\dfrac{\tan^2\alpha}{1+\tan^2\alpha}$	$\tan\alpha=\dfrac{\sin\alpha}{\cos\alpha}$	$\cos^2\alpha=\dfrac{1}{1+\tan^2\alpha}=\dfrac{\cot^2\alpha}{1+\cot^2\alpha}$

Formulas for:

Sum and difference of two angles	*Double the angle* (*If* $a=b$, *then*)
$\cos(a+b)=\cos a\cdot\cos b-\sin a\cdot\sin b$ $\cos(a-b)=\cos a\cdot\cos b+\sin a\cdot\sin b$	$\cos(2a)=\cos^2 a-\sin^2 a$ *Or* $\begin{cases}\cos(2a)=2\cos^2 a-1\\ \cos(2a)=1-2\sin^2 a\end{cases}$
$\sin(a+b)=\sin a\cdot\cos b+\cos a\cdot\sin b$ $\sin(a-b)=\sin a\cdot\cos b-\cos a\cdot\sin b$	$\sin(2a)=2\sin a\cdot\cos a$
$\tan(a+b)=\dfrac{\tan a+\tan b}{1-\tan a\cdot\tan b}$ $\tan(a-b)=\dfrac{\tan a-\tan b}{1+\tan a\cdot\tan b}$	$\tan(2a)=\dfrac{2\tan a}{1-\tan^2 a}$

Half the angle (*If* $\alpha=2a$, *then*)	
$\cos\alpha=\cos^2\left(\dfrac{\alpha}{2}\right)-\sin^2\left(\dfrac{\alpha}{2}\right)$ *Or* $\begin{cases}\cos(\alpha)=2\cos^2\left(\dfrac{\alpha}{2}\right)-1\\ \cos(\alpha)=1-2\sin^2\left(\dfrac{\alpha}{2}\right)\end{cases}$	$\cos^2 a=\dfrac{1+\cos(2a)}{2}$ $\sin^2 a=\dfrac{1-\cos(2a)}{2}$
$\sin\alpha=2\sin\dfrac{\alpha}{2}\cdot\cos\dfrac{\alpha}{2}$	
$\tan(\alpha)=\dfrac{2\tan\frac{\alpha}{2}}{1-\tan^2\frac{\alpha}{2}}$	

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

Triple the angle
$\cos 3a = 4\cos^3 a - 3\cos a$
$\sin 3a = 3\sin a - 4\sin^3 a$

Product form
$\cos a + \cos b = 2\cos\left(\frac{a+b}{2}\right)\cdot\cos\left(\frac{a-b}{2}\right)$
$\cos a - \cos b = -2\sin\left(\frac{a+b}{2}\right)\cdot\sin\left(\frac{a-b}{2}\right)$
$\sin a + \sin b = 2\sin\left(\frac{a+b}{2}\right)\cdot\cos\left(\frac{a-b}{2}\right)$
$\sin a - \sin b = 2\cos\left(\frac{a+b}{2}\right)\cdot\sin\left(\frac{a-b}{2}\right)$
$\tan a + \tan b = \frac{\sin(a+b)}{\cos a \cdot \cos b}$
$\tan a - \tan b = \frac{\sin(a-b)}{\cos a \cdot \cos b}$