Trigonometry Facts for SL

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θ	**sin θ**	**Memory Trick for sin θ count 0, 1, 2, 3, 4**	**cos θ** (same as sin θ, but in reverse order)	**tan θ =** $\frac{\sin\theta}{\cos\theta}$
0, 2π	0	$\frac{\sqrt{0}}{2} = 0$	1	0
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	1	$\frac{\sqrt{4}}{2} = 1$	0	undefined
π	0		-1	0
$\frac{3\pi}{2}$	-1		0	undefined

Arc length = $s = r\,\theta$ (**in radians only**)

Area of a sector = $\frac{1}{2}r^2\theta = \frac{1}{2}sr$ (**in radians only**)

Area of a triangle = $\frac{1}{2}ab\sin C$

[plus 2 more interchanging the letters]

Trig functions definitions

Function	Using the sides of a right triangle	Using a point (x, y) on the terminal side	Using the point (x, y) on the unit circle
sin θ	$\frac{opp}{hyp}$	$\frac{y}{r}$	y
cos θ	$\frac{adj}{hyp}$	$\frac{x}{r}$	x
tan θ	$\frac{opp}{adj}$	$\frac{y}{x}$	$\frac{y}{x}$

$r^2 = x^2 + y^2$

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

The quadrants in which the function is positive:
Mnemonic: "All Students Take Calculus"

S	(sine)	A	(all)
T	(tangent)	C	(cosine)

$\sin^2\theta + \cos^2\theta = 1$
$\sin 2\theta = 2\sin\theta\cos\theta$
$\cos 2\theta = \cos^2\theta - \sin^2\theta$
$= 2\cos^2\theta - 1$
$= 1 - 2\sin^2\theta$

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

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

$a^2 = b^2 + c^2 - 2bc\cos A$ [plus 2 more interchanging the letters]

$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ [plus 2 more interchanging the letters]

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

The co-functions of complementary angles are equal:

$sin\,\theta = cos\,(90 - \theta)$ $\quad$ $cos\,\theta = sin\,(90 - \theta)$

$\sin(180° - \theta) = \sin\theta$
$\cos(180° - \theta) = -\cos\theta$
$\tan(180° - \theta) = -\tan\theta$

Angle between two lines with slopes

m_1 and m_2 : $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$