

Chapter 1

(1) Trigonometric Functions I



Table 1-1: Special angles (0° , 30° , 45° , 60° and 90°)

	0	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	∞

Table 1-2: Clockwise angles and their anticlockwise equivalents illustrated for the four quadrants

Quadrant	Anti-clockwise measurement range	Clockwise measurement range
First	$0 \leq \theta \leq 90^\circ$	$-270^\circ < \theta \leq -360^\circ$
Second	$90 < \theta \leq 180^\circ$	$-180^\circ < \theta \leq -270^\circ$
Third	$180^\circ < \theta \leq 270^\circ$	$-90^\circ < \theta \leq -180^\circ$
Fourth	$270^\circ < \theta \leq 360^\circ$	$0 \leq \theta \leq -90^\circ$

Table 1-3: Sign (positive and negative) of the three trigonometric ratios in the four quadrants illustrated

	1 st Quadrant	2 nd Quadrant	3 rd Quadrant	4 th Quadrant
$\sin \theta$	Positive	Positive	Negative	Negative
$\cos \theta$	Positive	Negative	Negative	Positive
$\tan \theta$	Positive	Negative	Positive	Negative

Table 1-4: Equations for determining equivalent angles in the four quadrants

Quadrant	Equation	Illustration
First	NA	NA
Second	$180^\circ - \theta$	<ul style="list-style-type: none">▪ $\sin(180^\circ - \theta) = \sin \theta$▪ $\cos(180^\circ - \theta) = -\cos \theta$▪ $\tan(180^\circ - \theta) = -\tan \theta$
Third	$180^\circ + \theta$	<ul style="list-style-type: none">▪ $\sin(180^\circ + \theta) = -\sin \theta$▪ $\cos(180^\circ + \theta) = -\cos \theta$▪ $\tan(180^\circ + \theta) = \tan \theta$
Fourth	$360^\circ - \theta$	<ul style="list-style-type: none">▪ $\sin(360^\circ - \theta) = -\sin \theta$▪ $\cos(360^\circ - \theta) = \cos \theta$▪ $\tan(360^\circ - \theta) = -\tan \theta$

Table 1-5: Special angles (angles between 90° and 360°)

	0	90°	180°	270°	360°
$\sin \theta$	0	1	0	-1	0
$\cos \theta$	1	0	-1	0	1
$\tan \theta$	0	∞	0	$-\infty/\infty$	0

Table 1-6: Sine function in the interval $0 \leq \theta \leq 360^\circ$ illustrated

θ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\sin \theta$	0	0.5	0.866	1	0.866	0.5	0	-0.5	-0.866	-1	-0.866	-0.5	0

Table 1-7: Cosine function in the interval $0 \leq \theta \leq 360^\circ$ illustrated

θ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\cos \theta$	1	0.866	0.5	0	-0.5	-0.866	-1	-0.866	-0.5	0	0.5	0.866	1

Table 1-8: Tangent function in the interval $0 \leq \theta \leq 360^\circ$ illustrated

θ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\tan \theta$	0	0.5774	1.7321	∞	-1.7321	-0.5774	0	0.5774	1.7321	∞	-1.7321	-0.5774	0



Thank You

