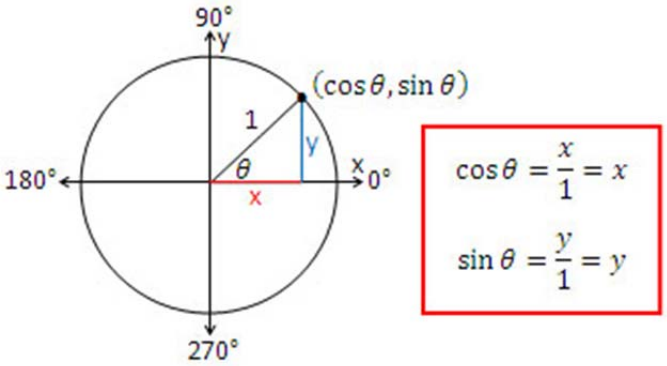
# Harold's Trigonometry "Cheat Sheet"

7 February 2014

## Unit Circle




$$\cos\theta = \frac{x}{1} = x$$

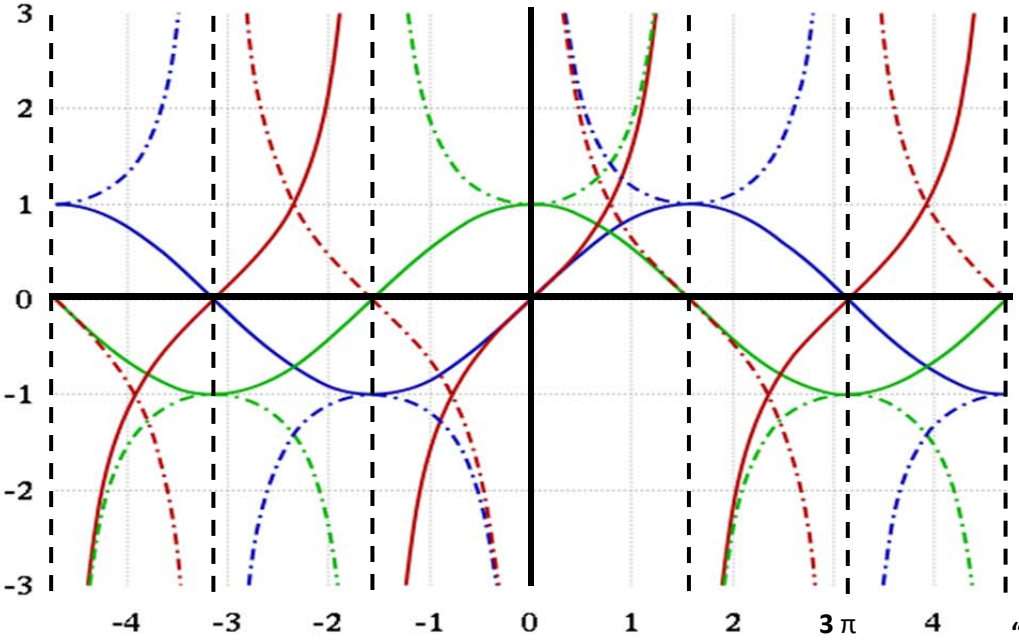
$$\sin\theta = \frac{y}{1} = y$$

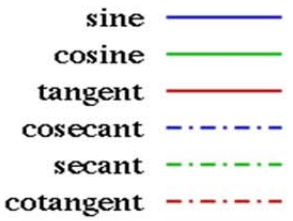
## Trig Chart

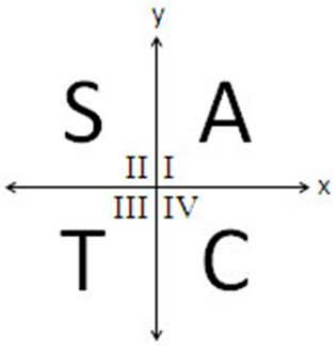
(Quadrant I only)

| Degrees | 0° | 30° | 45° | 60° | 90° |
|---|---|---|---|---|---|
| Radians | 0 | π/6 | π/4 | π/3 | π/2 |
| Sin (θ) → | 0 | 1/2 | $\sqrt{2}/2$ | $\sqrt{3}/2$ | 1 |
| Cos (θ) ← | 1 | $\sqrt{3}/2$ | $\sqrt{2}/2$ | 1/2 | 0 |
| Tan (θ) = S/C | 0 | $\sqrt{3}/3$ | 1 | $\sqrt{3}$ | ±∞ |
| | | | | | |
| Sin (θ) Pattern | $\frac{\sqrt{0}}{2}$ | $\frac{\sqrt{1}}{2}$ | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{3}}{2}$ | $\frac{\sqrt{4}}{2}$ |

## Graphical Representation Of The Trig Functions




"**A**ll **S**tudents **T**ake **C**alculus"

| The Six Trig "Levers" | *y = a sin (b (x - h)) + k* | Graphing Tips | Notes |
|---|---|---|---|
| 1) Move up/down ↕ | k (Vertical translation) | $k = \frac{(\max + \min)}{2}$ | If k = f(x) then x-axis is replaced by f(x)-axis |
| 2) Move left/right ↔ | h (Phase shift) | '+' shifts right | $\sin(x) = \cos(x - \pi/2)$ |
| 3) Stretch up/down ↕ | a (Amplitude) | $a = \frac{(\max - \min)}{2}$ | a is NOT peak-to-peak on y-axis |
| 4) Stretch left/right ↔ | b (Frequency • 2π) | $T = \frac{2\pi}{\lvert b\rvert} = \frac{1}{f}$ | T = peak-to-peak on $\theta$-axis<br>T = π/b for tan (bx) |
| 5) Flip about x-axis | a → –a | f(x) → –f(x) | Odd Function: $\sin(x) = -\sin(-x)$ |
| 6) Flip about y-axis | b → –b | f(x) → f(-x) | Even Function: $\cos(x) = \cos(-x)$ |

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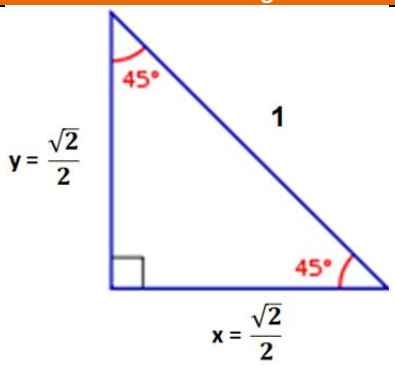
## 45-45-90 Triangle




**Proof:**

$a^2 + b^2 = c^2$

$x = y$

$x^2 + x^2 = 1^2$

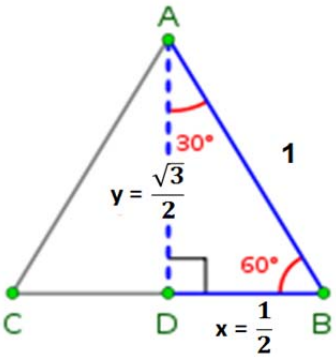
$2x^2 = 1$

$x^2 = ½$

$$\sqrt{x^2} = \sqrt{\frac{1}{2}}$$

$$x = \pm\sqrt{\frac{1}{2}} = \pm\frac{1}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2}$$

## 30-60-90 Triangle




**Proof:**

$a^2 + b^2 = c^2$

$y^2 + (½)^2 = 1^2$

$y^2 + ¼ = 1$

$y^2 = ¾$

$$\sqrt{y^2} = \sqrt{\frac{3}{4}}$$

$$y = \pm\sqrt{\frac{3}{4}} = \pm\frac{\sqrt{3}}{\sqrt{4}} = \pm\frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$$

## Radians and Arc Length

Radian = arc length (s) of a unit circle

$s = r\theta$

$C = \pi D = \pi(2r) = 2\pi r$

**Proof:**

If r = 1 (unit circle)

then $s = (1)\theta = \theta$ and $C = 2\pi(1) = 2\pi$

Therefore 360° = 2π radians

To convert degrees to radians: n° x $\left(\frac{\pi \text{ rad}}{180°}\right)$ = m radians