* deg & rad degree

$x^\circ \neq x$ $\quad 1^\circ \neq 1$ $\quad \left.\begin{array}{l} v = \frac{s}{t} \\ \omega = \frac{\theta}{t} \end{array}\right\}$

arc length: $s = r\theta$

area: $A = \frac{1}{2} r^2 \theta$ $\quad \theta$ must <u>radian</u>

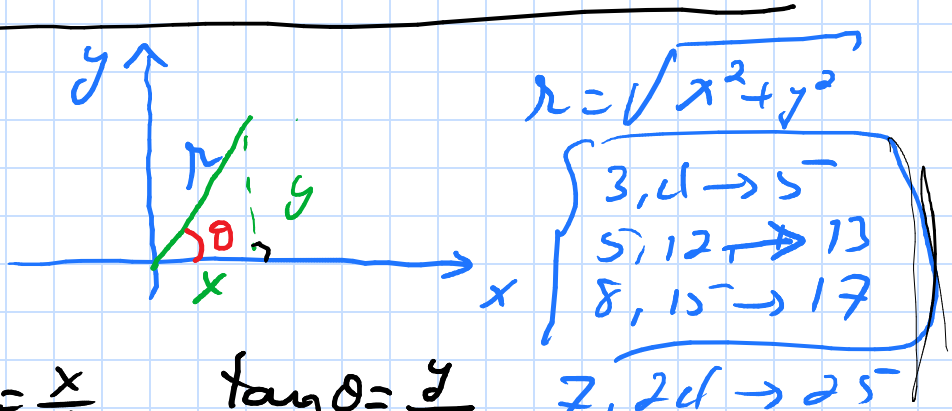
$\pi \to 180^\circ$

6.3 Trig. Fcts

cos(angle) = ratio $\quad$ ~~cos =~~

$\cos\theta = \frac{1}{\sec\theta}$ $\quad \sin\theta = \frac{1}{\csc\theta}$

$\tan\theta = \frac{1}{\cot\theta} = \frac{\sin\theta}{\cos\theta}$



$\sin\theta = \frac{y}{r}$ $\quad \cos\theta = \frac{x}{r}$ $\quad \tan\theta = \frac{y}{x}$

$\csc\theta = \frac{r}{y}$ $\quad \sec\theta = \frac{r}{x}$ $\quad \cot\theta = \frac{x}{y}$

Ex $\quad (8, 15) \to 17$ $\quad \theta$:

$\sin\theta = \frac{15}{17}$ $\quad \cos\theta = \frac{8}{17}$ $\quad \tan\theta = \frac{15}{8}$

$\csc\theta = \frac{17}{15}$ $\quad \sec\theta = \frac{17}{8}$ $\quad \cot\theta = \frac{8}{15}$

#9 $(-6, 8) \to 2(-3, 4) \to 5$

$\sin\theta = \frac{4}{5}$ $\quad \cos\theta = -\frac{3}{5}$ $\quad \tan\theta = -\frac{4}{3}$

$\csc\theta = \frac{5}{4}$ $\quad \sec\theta = -\frac{5}{3}$ $\quad \cot\theta = -\frac{3}{4}$

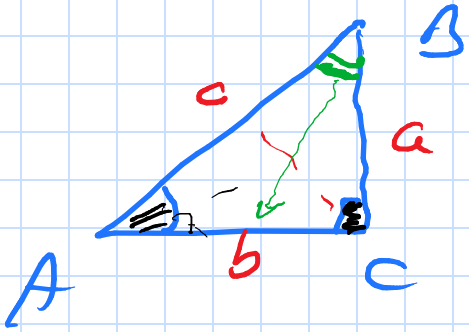
#31 $\cos\theta = -\frac{5}{13}$ $\quad \theta \in QII$

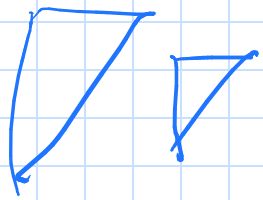
(+) y's

$(-5, 12) \to 13$

$\sin\theta = \frac{12}{13}$ $\quad \cos\theta = -\frac{5}{13}$ ✓ $\quad \tan\theta = -\frac{12}{5}$

$\csc\theta = \frac{13}{12}$ $\quad \sec\theta = -\frac{13}{5}$ $\quad \cot\theta = -\frac{5}{12}$





$\sin A = \frac{a}{c}$ $\quad \cos A = \frac{b}{c}$ $\quad \tan A = \frac{a}{b}$

$\csc A = \frac{c}{a}$ $\quad \sec A = \frac{c}{b}$ $\quad \cot A = \frac{b}{a}$

$\sin B = \frac{b}{c}$ $\quad \cos B = \frac{a}{c}$ $\quad \tan B = \frac{b}{a}$

$\csc B = \frac{c}{b}$ $\quad \sec B = \frac{c}{a}$ $\quad \cot B = \frac{a}{b}$

$A + B = 90^\circ$

$A = 90^\circ - B$

$\sin A = \cos B$

$= \cos(90^\circ - A)$

$\cos A = \sin B$

$\sec A = \csc B$

$\tan A = \cot B$

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

$r^2\cos^2\theta + r^2\sin^2\theta = r^2$

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

$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$

$y = r\sin\theta$ $x = r\cos\theta$

Polar

$r \neq 0$

$\cos^2\alpha + \sin^2\alpha = 1$

$\cos^2\alpha = (\cos\alpha)^2$ means

$\neq \cos 2\alpha \neq \cos(2\alpha)$ double angle

$\neq \cos\alpha^2$ mean

$\cos(\alpha^2)$

$\cos(\alpha^2) = \cos\alpha^2$

$\cos(2\alpha) = \cos 2\alpha$ ← Identity

$(\cos\alpha)^2 = \cos^2\alpha$

$$\frac{\cos^2\theta}{\cos^2\theta} + \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$ ← $\left(\frac{\sin\theta}{\cos\theta}\right)^2$

$$1 + \tan^2\theta = \sec^2\theta$$

$$\cot^2\theta + 1 = \csc^2\theta$$

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

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

$\sin\theta = \pm\sqrt{1 - \cos^2\theta}$

$\sqrt{x^2+9} = \sqrt{9\tan^2\theta + 9}$ $3\tan\theta$ for x

$= \sqrt{9(\tan^2\theta + 1)}$ $\boxed{x = 3\tan\theta}$

$= 3\sqrt{\sec^2\theta}$

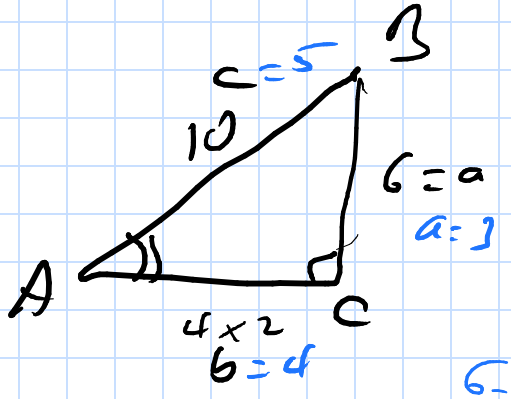
$= 3\sec\theta$

Ex $c = 90^\circ$ $a = 6$, $c = 10$

$A \Rightarrow$ 6 trig

$(\ , 6) \rightarrow 10$

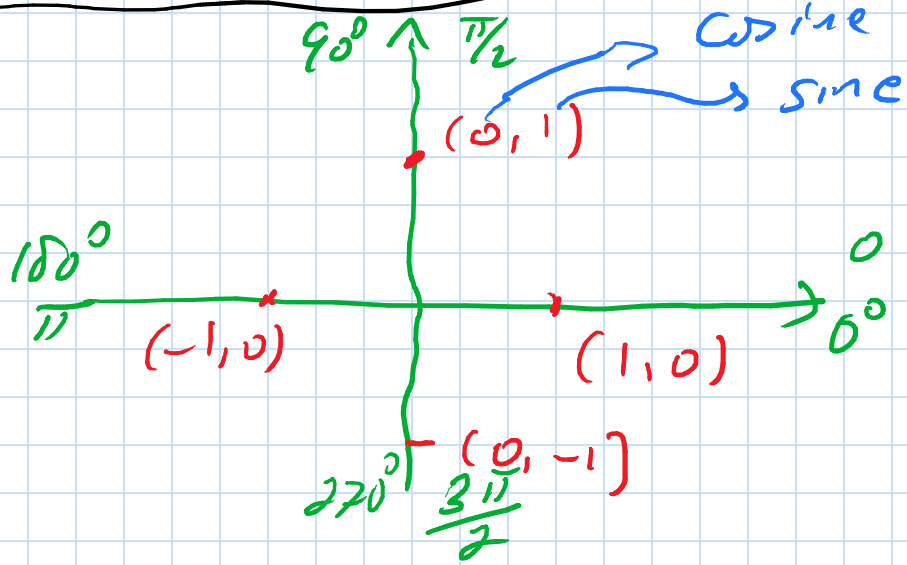
$2[(4, 3) \rightarrow 5]$



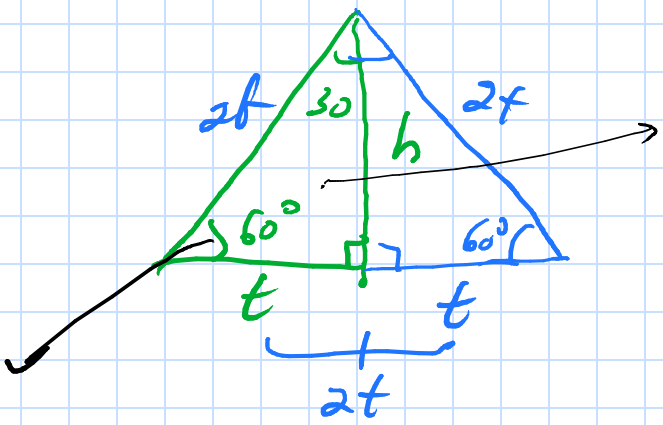
$a = 3$, $c = 5$, $b = 4$

$\sin A = \frac{3}{5}$ $\cos A = \frac{4}{5}$ $\tan A = \frac{3}{4}$

$\csc A = \frac{5}{3}$ $\sec A = \frac{5}{4}$ $\cot A = \frac{4}{3}$



$30^\circ - 60^\circ \to 90^\circ$

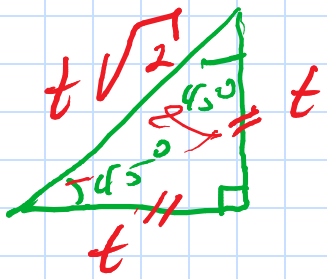


$$(2t)^2 = h^2 + t^2$$
$$h^2 = 4t^2 - t^2$$
$$= 3t^2$$
$$h = t\sqrt{3}$$

$$\cos 60^\circ = \frac{t}{2t} = \frac{1}{2} = \sin(90^\circ - 60^\circ)$$
$$= \sin 30^\circ$$

$$\sin 60^\circ = \frac{h}{2t} = \frac{t\sqrt{3}}{2t}$$
$$= \frac{\sqrt{3}}{2} = \cos 30^\circ$$

$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$

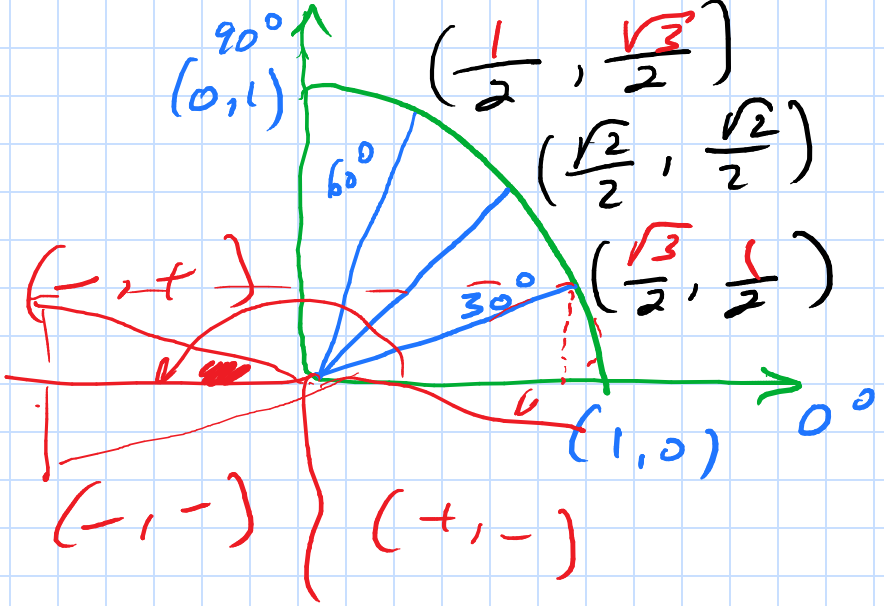


$$(hyp)^2 = t^2 + t^2 = 2t^2$$
$$hyp = t\sqrt{2}$$

$$\cos 45^\circ = \frac{t}{t\sqrt{2}} = \frac{1}{\sqrt{2}} = \sin 45^\circ$$
$$\text{or } \frac{\sqrt{2}}{2}$$

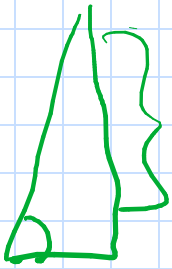
$$\cos 45^\circ = \sin 45^\circ = \frac{1}{\sqrt{2}} \text{ or } \frac{\sqrt{2}}{2}$$

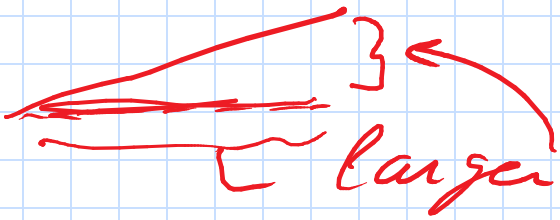
$$\tan 45^\circ = 1$$



$\frac{1}{2}, \frac{\sqrt{3}}{2}$

$\frac{\sqrt{2}}{2}$





$30^\circ \quad \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

$60^\circ \quad \left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

0°	1	4
30°	$\frac{\sqrt{3}}{2}$	
45°	$\frac{\sqrt{2}}{2}$	
60°	$\frac{1}{2}$	
90°	0	

Q II $\quad 180^\circ - \theta$

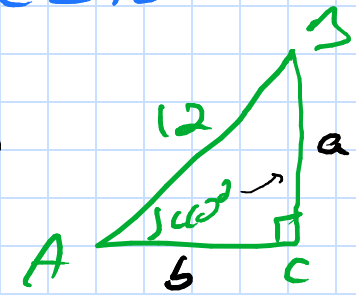
Q III $\quad 180^\circ + \theta$

Q IV $\quad 360^\circ - \theta$

$\frac{\pi}{a}$	Q II
$\frac{(a-1)\pi}{a}$	Q II
$\frac{(a+1)\pi}{a}$	Q III
$\frac{(2a-1)\pi}{a}$	Q IV

6.4 Right △

Ex $\triangle ABC$, $C = 90°$, $A = 40°$, $c = 12$



$B = 90° - A$
$= 90° - 40°$
$= 50°$

$180° - (A + C)$

$\sin 40° = \frac{a}{12} \Rightarrow a = 12 \sin 40°$
≈ 7.7 cm

$\cos 40° = \frac{b}{12}$
$b = 12 \cos 40°$ ≈ 9.2 cm

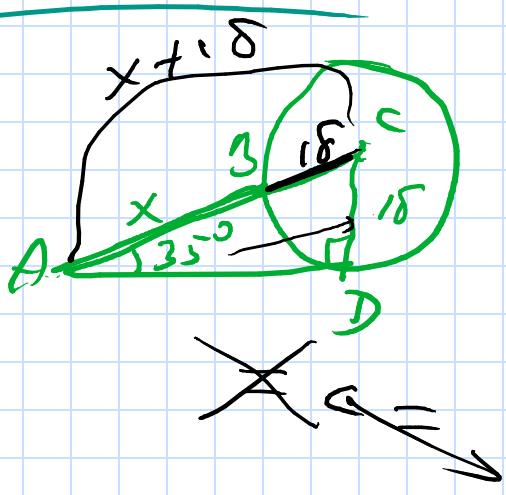
Given hyp } sine → opp.
cosine → adj.
no hyp ⇒ tangent

Ex $\sin 35° = \frac{18}{x+18}$

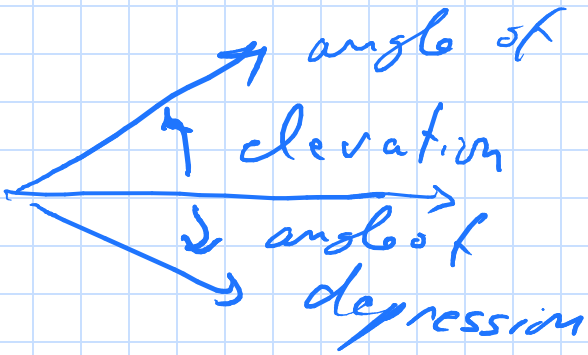
$x + 18 = \frac{18}{\sin 35°}$

$x = \frac{18}{\sin 35°} - 18$

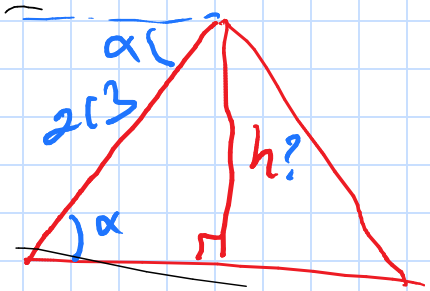
≈ 13 in



Defn



Ex $\alpha = 52.6°$



$$\sin 52.6° = \frac{h}{213}$$

$$h = 213 \sin 52.6°$$