

2.4 degree

$$60 \text{ min} = 1 \text{ degree} = 3600 \text{ sec} \\ = 1^\circ \quad 3600''$$

$$1 \text{ rev} = 360^\circ$$

Radian 1 means 1 rad rad
 1° means 1 deg.

$$1 \text{ rev.} \quad 2\pi = 360^\circ \\ \boxed{\pi = 180^\circ}$$

$$45^\circ = 45^\circ \frac{\pi \text{ rad}}{180^\circ} = \frac{\pi}{4} \text{ rad.}$$

$$249.8^\circ = \frac{1249^\circ}{105} \cdot \frac{\pi \text{ rad}}{180^\circ} \\ = \frac{1249}{900} \pi \text{ rad}$$



$$1 \text{ rad} = 1 \text{ rad} \frac{180^\circ}{\pi \text{ rad}}$$

$$= \left(\frac{180}{\pi} \right)^\circ$$

$$\boxed{1 \text{ rad} \approx 57.3^\circ}$$

(deg)

$$\frac{4\pi}{3} \text{ rad} = \frac{4(180^\circ)}{3}$$

$$= 240^\circ$$

$$\pi \text{ rad} = 180^\circ$$

Q. 2

Arc length s radius r
 $s = r\theta$



θ in rad central angle

Ex. $r = 3 \text{ cm}$ $s = 6 \text{ cm}$ $\theta = ?$

soln $s = r\theta$

$$\theta = \frac{s}{r}$$

$$= \frac{6}{3}$$

$$= 2 \text{ rad}$$

Ex. $r = 18.2$ $s = ?$ $\theta = 30^\circ$

$$s = r\theta$$

$$= 18.2 \cdot \frac{30}{180} \pi$$

$$= \frac{273}{40} \pi \text{ cm}$$

Ex. $r = .8725 = \frac{8725}{1000}$

$$\theta = 39.72^\circ = \frac{\pi}{180^\circ}$$

$$s = r\theta$$

$$= \frac{8725}{1000} \cdot \frac{39.72}{180} \frac{\pi}{180^\circ}$$

$$= \frac{1232785}{9} \pi \cdot 10^{-7} \mu$$

$$\approx .6049 \mu$$

$$r = 6 \quad \theta = 30^\circ = 30^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{6}$$

$$\begin{aligned} s &= r\theta \\ &= 6 \cdot \frac{\pi}{6} \\ &= \pi \text{ in} \end{aligned}$$

Area of a Sector

$$A = \frac{1}{2} r^2 \theta \quad \text{rad.}$$



Ex $\theta = 1.4 = \frac{14}{10} = \frac{7}{5} \quad r = 2.1 = \frac{21}{10}$

$$\begin{aligned} A &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} \cdot \frac{21^2}{10^2} \cdot \frac{7}{5} \\ &= \frac{3,087}{1,000} \text{ m}^2 \end{aligned}$$

Ex $\theta = 90^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{2} \quad r = 30 \text{ ft}$

$$\begin{aligned} A &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} (30)^2 \frac{\pi}{2} \\ &= \frac{900}{4} \pi \\ &= 225 \pi \text{ ft}^2 \end{aligned}$$

$$\frac{1}{r^2} = \frac{\theta}{2s}$$

$$\left\{ \begin{aligned} s &= r\theta \\ A &= \frac{1}{2} r^2 \theta \end{aligned} \right.$$

$$\frac{\theta \text{ (rad)}}{\text{unitless}}$$

$$\text{deg} \rightarrow \text{rad} \quad \text{by } \frac{\pi}{180^\circ} =$$

$$\text{speed} = |v| = \frac{\text{distance}}{\text{time}} = \frac{s}{t}$$

Ex $s = 5 \text{ cm}, t = 2$

$$v = \frac{s}{t} \\ = \frac{5}{2} \text{ cm/sec}$$

Angular velocity $\omega = \frac{\theta}{t}$ $v = \frac{s}{t}$

Ex $\theta = \frac{3\pi}{4} \quad t = 3 \text{ sec}$

$$\omega = \frac{\theta}{t} \quad 0. \frac{1}{6} \\ = \frac{3\pi}{4} \cdot \frac{1}{3} \\ = \frac{\pi}{4} \text{ rad/sec}$$

$$\left. \begin{aligned} \omega = \frac{\theta}{t} &\rightarrow t = \frac{\theta}{\omega} \\ v = \frac{s}{t} &\rightarrow t = \frac{s}{v} \end{aligned} \right\} \quad \frac{\theta}{\omega} = \frac{s}{v}$$

$$s = r\theta$$

$$\theta \omega = s \omega$$

$$\theta \omega = r \theta \omega$$

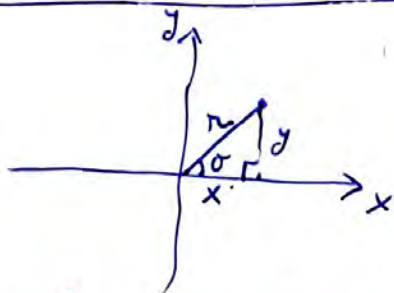
$$\boxed{v = r\omega}$$

#3

$$0^\circ = 0 \text{ rad}$$

$$10^\circ = 10^\circ \frac{\pi}{180^\circ} = \frac{\pi}{18} \text{ rad}$$

$$10^\circ = \frac{\pi}{18} \text{ rad}$$



$$r^2 = x^2 + y^2 \quad r = \sqrt{x^2 + y^2}$$

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

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

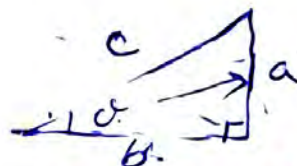
$$\tan \theta = \frac{y}{x} = \frac{\sin \theta}{\cos \theta} \quad \frac{\text{opp}}{\text{adj}}$$

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

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

$$\cot \theta = \frac{1}{\tan \theta} = \frac{x}{y}$$

$$a, b, c > 0$$



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

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b}$$

$$\csc \theta = \frac{c}{a}$$

$$\sec \theta = \frac{c}{b}$$

$$\cot \theta = \frac{b}{a}$$

$$\left\{ \begin{array}{l} 3, 4 \rightarrow 5 \\ 8, 15 \rightarrow 17 \\ 5, 12 \rightarrow 13 \end{array} \right.$$

Ex point $(8, 15)$ 6 trig. 0

$$8, 15 \rightarrow 17$$

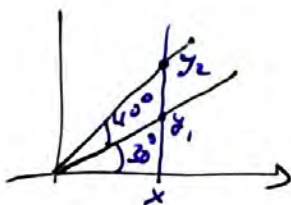
$$\sin \theta = \frac{15}{17} \quad \cos \theta = \frac{8}{17} \quad \tan \theta = \frac{15}{8}$$

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

$(16, -12)$ 4 $(4, -3) \rightarrow 5$

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

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



$$\tan 30^\circ = \frac{y_1}{x}$$

$$\tan 40^\circ = \frac{y_2}{x}$$

$$x = \frac{y_1}{\tan 30^\circ} \quad x = \frac{y_2}{\tan 40^\circ}$$

$$y_2 > y_1$$

$$\frac{y_2}{x} > \frac{y_1}{x}$$

$$\tan 40^\circ > \tan 30^\circ$$

$$\cos \theta = \frac{\sqrt{3}}{2} \quad \theta \in QII \quad \sin \theta, \tan \theta$$

$$\sin \theta = -\frac{1}{2}$$

$$\tan \theta = -\frac{1}{\sqrt{3}}$$

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

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

$$y^2 = 1^2 - x^2$$

$$y = \sqrt{1 - (\frac{\sqrt{3}}{2})^2} = 1$$

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

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

Reciprocal

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

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

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

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

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

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

$$\left. \begin{array}{l} \sin \theta \csc \theta = 1 \\ \cos \theta \sec \theta = 1 \\ \tan \theta \cot \theta = 1 \end{array} \right\}$$

$$\frac{x^2}{r^2} + \frac{y^2}{r^2} = \frac{1^2}{r^2}$$

$$\left(\frac{x}{r}\right)^2 + \left(\frac{y}{r}\right)^2 = 1$$

$$\boxed{\cos^2 \theta + \sin^2 \theta = 1}$$

$$\underbrace{\cos^2 \theta + \sin^2 \theta}_{\text{same}} = 1$$

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

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

$$\frac{\cos^2 \theta}{\cos^2 \theta} + \frac{\sin^2 \theta}{\cos^2 \theta} = \frac{1}{\cos^2 \theta}$$

$$\boxed{1 + \tan^2 \theta = \sec^2 \theta}$$

$$\boxed{1 + \cot^2 \theta = \csc^2 \theta}$$

30 $\cos \theta = -\frac{12}{13}$ $\theta \in Q_{III}$ $5, 12 \rightarrow 13$

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

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

Ex $C = 90^\circ$ $a = 6$ $c = 10$
 $a, b, c \rightarrow$ side
 A, B, C angle & point

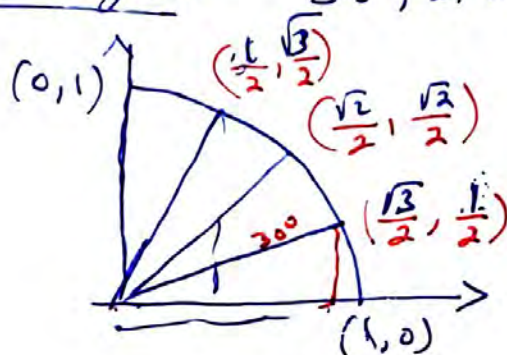


$\sin A = \frac{3}{5} = \cos B$ $\cos A = \frac{4}{5} = \sin B$ $\tan A = \frac{3}{4}$

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

$6, \rightarrow 10$
 $3, 4 \rightarrow 5$

Special Angles $30^\circ, 45^\circ, 60^\circ$

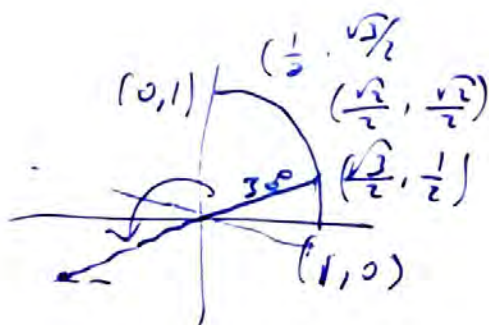


$30^\circ = \frac{\pi}{6}$
 $45^\circ = \frac{\pi}{4}$
 $60^\circ = \frac{\pi}{3}$

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

1
2
3

$2 = \frac{\sqrt{4}}{\sqrt{4}}$



$$Q II \quad 180^\circ - 30^\circ = 150^\circ \quad (-, +)$$

$$Q III \quad 180^\circ + 30^\circ = 210^\circ \quad (-, -)$$

$$Q IV \quad 360^\circ - 30^\circ = 330^\circ \quad (+, -)$$

Radian $\frac{\pi}{n}$ Q I

$$Q II \quad \frac{(1-1)\pi}{n}$$

$$Q III \quad \frac{(1+1)\pi}{n}$$

$$Q IV \quad \frac{(2n-1)\pi}{n}$$

co-function right Δ

$$A + B = 90^\circ$$

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

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

2.2	(1-16)	(20-30)	exam
	6, 8, 11	20, 23, 29	

6.3 # 12

$$(10, -24) \quad (5, -12) \rightarrow 13$$

$$\sin \theta = -\frac{12}{13}$$

$$\cos \theta = \frac{5}{13}$$

$$\tan \theta = -\frac{12}{5}$$

$$\csc \theta = -\frac{13}{12}$$

$$\sec \theta = \frac{13}{5}$$

$$\cot \theta = -\frac{5}{12}$$

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$$\sin \theta = -\frac{8}{17}$$

$$\theta \in \text{Q III}$$

$$8, 15 \rightarrow 17$$

$$\sin \theta = -\frac{8}{17}$$

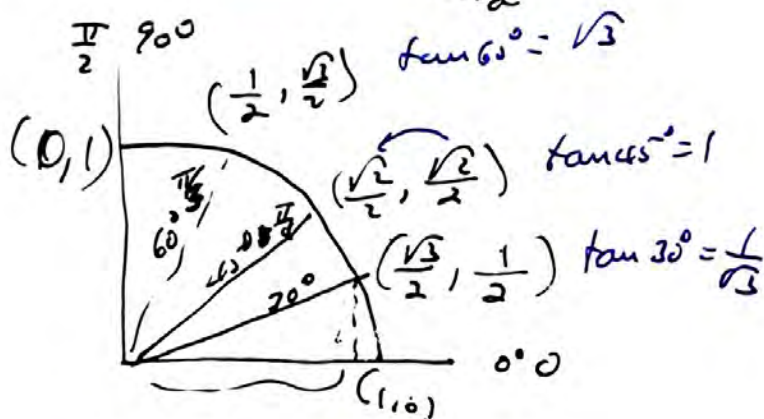
$$\cos \theta = -\frac{15}{17}$$

$$\tan \theta = \frac{8}{15}$$

$$\csc \theta = -\frac{17}{8}$$

$$\sec \theta = -\frac{17}{15}$$

$$\cot \theta = \frac{15}{8}$$



$$\tan 45^\circ = \tan \frac{\pi}{4} = 1$$