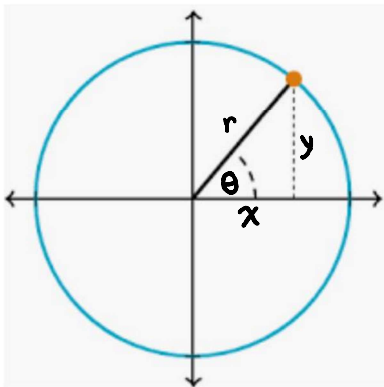


## 6.3 Trig Ratios Part I

PC12

### Trigonometric Ratios



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

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

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

"cosecant"

"secant"

"cotangent"

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

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

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

Using your trig wheel, determine the following ratios:

unit circle  $\rightarrow r = 1$

$$\sin \frac{\pi}{6} = \frac{1/2}{1} = \frac{1}{2}$$

$$\cos \frac{\pi}{6} = \frac{\sqrt{3}/2}{1} = \frac{\sqrt{3}}{2}$$

$$\tan \frac{\pi}{6} = \frac{1/2}{\sqrt{3}/2} = \frac{1}{\sqrt{3}} \text{ or } \frac{\sqrt{3}}{3}$$

$$\csc \frac{\pi}{6} = \frac{1}{1/2} = 2$$

$$\sec \frac{\pi}{6} = \frac{1}{\sqrt{3}/2} = \frac{2}{\sqrt{3}} \text{ or } \frac{2\sqrt{3}}{3}$$

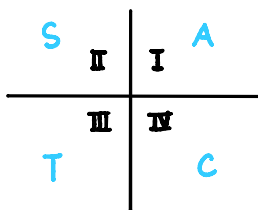
$$\cot \frac{\pi}{6} = \frac{\sqrt{3}/2}{1/2} = \sqrt{3}$$

To determine the ratios of angles in different quadrants:

1. Identify the reference angle and calculate the ratio.
2. Determine which quadrant the terminal arm lies in and decide whether the ratio is positive or negative.

|  | Reference Angle |
|--|-----------------|
| $\pm \frac{\pi}{6}, \pm \frac{5\pi}{6}, \pm \frac{7\pi}{6}, \pm \frac{11\pi}{6}$ and all other coterminal angles | $\frac{\pi}{6}$ |
| $\pm \frac{\pi}{4}, \pm \frac{3\pi}{4}, \pm \frac{5\pi}{4}, \pm \frac{7\pi}{4}$ and all other coterminal angles  | $\frac{\pi}{4}$ |
| $\pm \frac{\pi}{3}, \pm \frac{2\pi}{3}, \pm \frac{4\pi}{3}, \pm \frac{5\pi}{3}$ and all other coterminal angles  | $\frac{\pi}{3}$ |

Example: Determine  $\cos \frac{4\pi}{3}$ .



1. reference angle is  $\frac{\pi}{3}$

$$\cos \frac{\pi}{3} = \frac{1}{2}$$

2. quadrant III "All students take calculus"  
 $\rightarrow \cos \theta$  is negative

$$\therefore \cos \frac{4\pi}{3} = -\frac{1}{2}$$

**Assignment: Complete the table (Master 6.2a).**