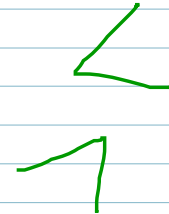
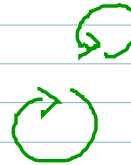
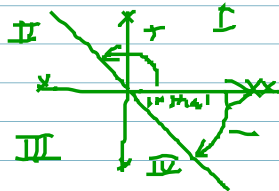


positive - counter-clockwise  
 negative - clockwise



standard Position



Quadrantal

Degree -  $\frac{1}{360}$  revolution =  $1^\circ$

Right Angle -  $90^\circ$

straight Angle -  $180^\circ$

Acute Angle -  $0^\circ < \theta < 90^\circ$   
 $\uparrow$   
 theta

obtuse Angle -  $90^\circ < \theta < 180^\circ$

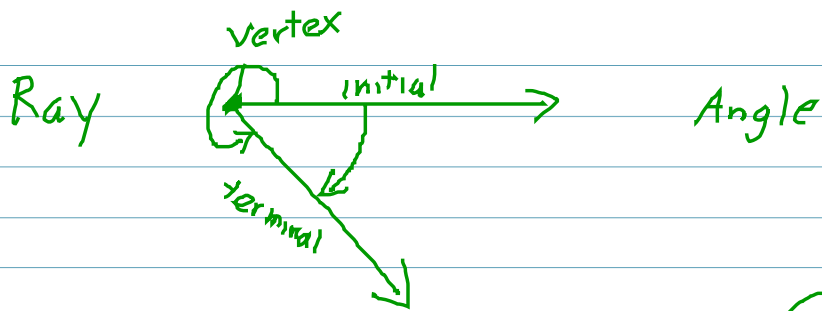
Reflex Angle -  $\theta > 180^\circ$

DMS

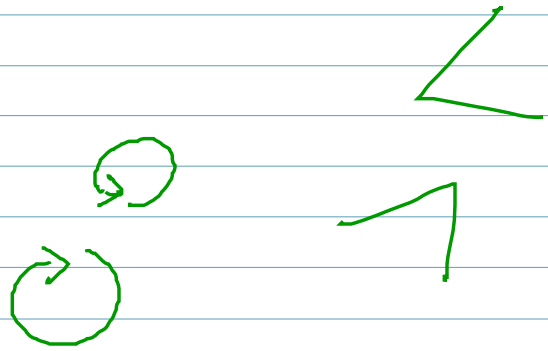
$D^\circ M' S''$

$$1' = 60''$$

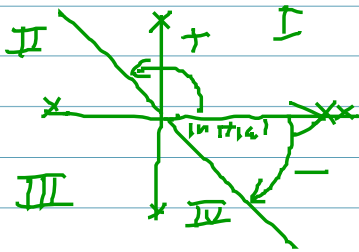
$$1^\circ = 60' = 3600''$$



positive - counter-clockwise  
 negative - clockwise



standard Position

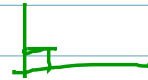


Quadrantal

Degree -  $\frac{1}{360}$  revolution

$= 1^\circ$

Right Angle -  $90^\circ$



straight Angle -  $180^\circ$



Acute Angle -  $0^\circ < \theta < 90^\circ$   
 $\uparrow$   
 $\theta$



Obtuse Angle -  $90^\circ < \theta < 180^\circ$



Reflex Angle -  $\theta > 180^\circ$



DMS

$D^\circ M' S''$

$1' = 60''$

$1^\circ = 60' = 3600''$

$$43.36^\circ \rightarrow 43^\circ 21' 36''$$

$$0.36^\circ \times \frac{60'}{1^\circ} = 21.6'$$

$$0.6' \times \frac{60''}{1'} = 36''$$

$$51^\circ 20' 30''$$

$$30'' \times \frac{1'}{60''} = 0.5'$$

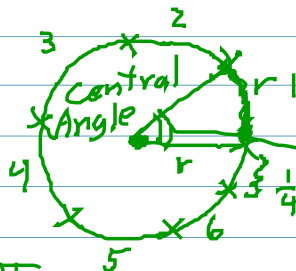
$$51.341\bar{6}^\circ$$

$$20.5' \times \frac{1^\circ}{60'} = 0.341\bar{6}$$

$$20' \times \frac{1^\circ}{60'} = 0.3\bar{3}^\circ$$

$$30'' \times \frac{1^\circ}{3600''} = 0.08\bar{3}$$

### Radian



$$6.28$$

$$2(3.14)$$

$$2\pi$$

$$\frac{360}{2\pi} = \frac{180}{\pi}$$

$$\frac{\pi}{180}$$

$$\frac{R}{\pi} = \frac{D}{180}$$

|   |   |                 |                 |                 |                 |                  |                  |                  |       |                  |                  |                  |                  |                  |                  |                   |
|---|---|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|-------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
| D | 0 | 30              | 45              | 60              | 90              | 120              | 135              | 150              | 180   | 210              | 225              | 240              | 270              | 300              | 315              | 330               |
| R | 0 | $\frac{\pi}{6}$ | $\frac{\pi}{4}$ | $\frac{\pi}{3}$ | $\frac{\pi}{2}$ | $\frac{2\pi}{3}$ | $\frac{3\pi}{4}$ | $\frac{5\pi}{6}$ | $\pi$ | $\frac{7\pi}{6}$ | $\frac{5\pi}{4}$ | $\frac{4\pi}{3}$ | $\frac{3\pi}{2}$ | $\frac{5\pi}{3}$ | $\frac{7\pi}{4}$ | $\frac{11\pi}{6}$ |

$$\frac{R}{\pi} = \frac{30}{180} \rightarrow R = \frac{30\pi}{180} = \frac{\pi}{6}$$

$$\frac{R}{\pi} = \frac{60}{180} \rightarrow R = \frac{60\pi}{180} = \frac{\pi}{3}$$

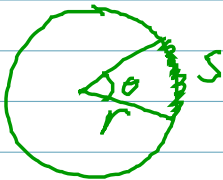
$$\frac{R}{\pi} = \frac{45}{180} \rightarrow R = \frac{45\pi}{180} = \frac{\pi}{4}$$

$$\frac{R}{\pi} = \frac{90}{180} \rightarrow R = \frac{90\pi}{180} = \frac{\pi}{2}$$

$$\frac{\frac{\pi}{8}}{\pi} = \frac{D}{180} \rightarrow D = 180 \cdot \frac{\frac{\pi}{8}}{\pi} = 180 \frac{\pi}{8} \cdot \frac{1}{\pi} = 22.5^\circ$$

$$\frac{\frac{2\pi}{3}}{\pi} = \frac{D}{180} \rightarrow D = 180 \cdot \frac{\frac{2\pi}{3}}{\pi} = \frac{360}{3} = 120^\circ$$

### Arc length

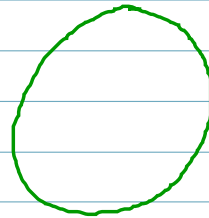


$$s = r\theta$$

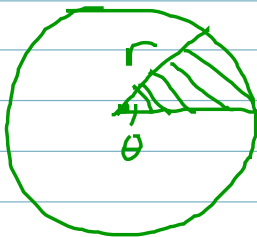
radians  
↓  
↑   ↑   ↑

$$C = 2\pi r$$

$$s = \theta r$$

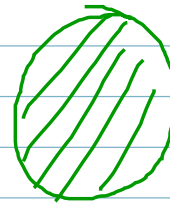


### Area of sector



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

radians  
↓



$$A = \pi r^2$$

$$= 2\pi \frac{r^2}{2}$$

### Linear speed

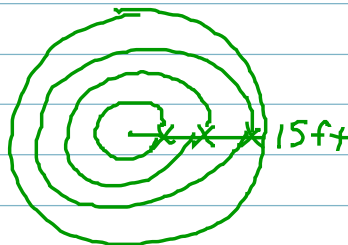
$$\frac{\text{Distance}}{\text{time}} = v = \frac{s}{t}$$

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

$$= r\omega$$

### Angular speed

$$\frac{\text{radians}}{\text{time}} = \omega = \frac{\theta}{t}$$



$$10 \frac{\text{rev}}{\text{min}}, \frac{2\pi}{1 \text{ rev}} = 20\pi \frac{\text{radians}}{\text{min}} = \omega$$

$$v = r\omega = 15 \text{ ft} \cdot 20\pi \frac{\text{rad}}{\text{min}} = \frac{300\pi \text{ ft}}{\text{min}}$$