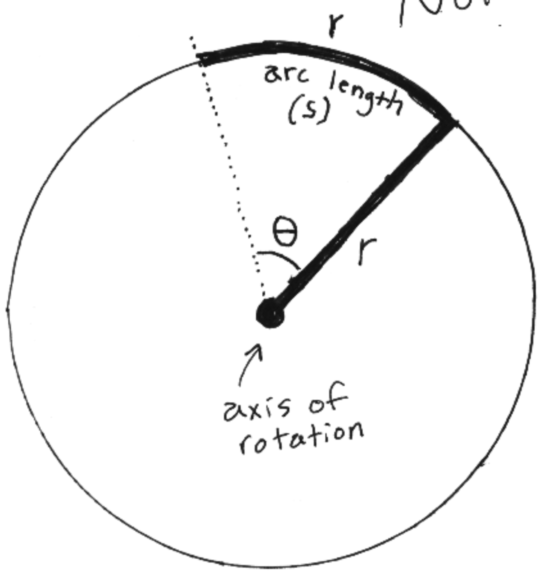
Notes For APC



6.28 radiuses
2π radiuses
} radians

2π radians $= 360^\circ$

$C = 2\pi \text{ rad} = 1 \text{ rev}$

radian = 1 radius

$\theta(\text{rad}) = \frac{\pi}{180}\theta(\text{degrees})$

Angular speed

$$\omega = \frac{2\pi \text{ (radiuses)}}{1 \text{ s}}$$

θ = radian = radiuses

$$S = \theta \cdot r$$

$1 \text{ radian} \cdot 1 \text{ m} = \text{m}$

$S = r\theta$

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

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

$$V = \omega \cdot r$$

$$V = \frac{1 \text{ radian}}{1 \text{ s}} \cdot \frac{1 \text{ m}}{1 \text{ radian}} = \frac{\text{m}}{\text{s}}$$

1 circle

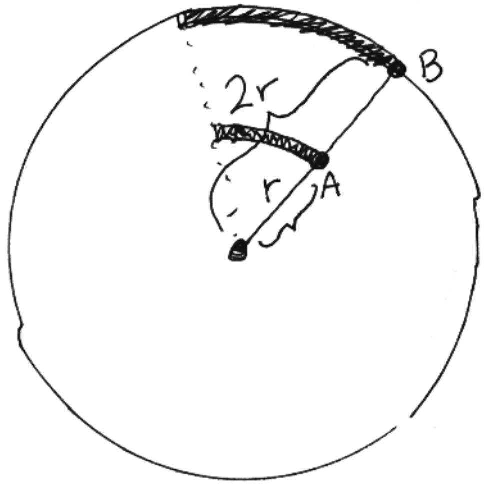
$\theta = 2\pi$ radians

$$a = \alpha \cdot r$$

$$a = \frac{1 \text{ radian}}{1 \text{ s}^2} \cdot \frac{1 \text{ m}}{1 \text{ radian}} = \frac{\text{m}}{\text{s}^2}$$

Direction
counterclockwise (+)
clockwise (−)

$T = 1s \quad r = 1m$



linear velocity (tangential)

A $\quad V = \frac{2\pi r}{T} = 6.28\,m/s$

B $\quad V = \frac{2\pi r}{T} = 12.56\,m/s$

angular velocity

A $\quad \omega = \frac{2\pi\,\text{radians}}{T} = \frac{2\pi\,\text{rad}}{s}\ (s^{-1})$

B $\quad \omega = \frac{2\pi\,\text{radians}}{T} = 2\pi\,\text{rad}/s\ (s^{-1})$

$V = \omega \cdot r \qquad \omega = \frac{V}{r}$

Analogy to Kinematics

$\Delta X = \Delta\theta \qquad V = \frac{dx}{dt} \qquad \omega = \frac{d\theta}{dt}$

$V = \omega$

$a = \alpha \qquad a = \frac{dv}{dt} \qquad \alpha = \frac{d\omega}{dt}$

For constant α

$\omega = \omega_0 + \alpha t \rightarrow V = V_0 + at$

$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \rightarrow X = X_0 + V_0 t + \frac{1}{2}at^2$

$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0) \rightarrow V^2 = V_0^2 + 2a(X - X_0)$

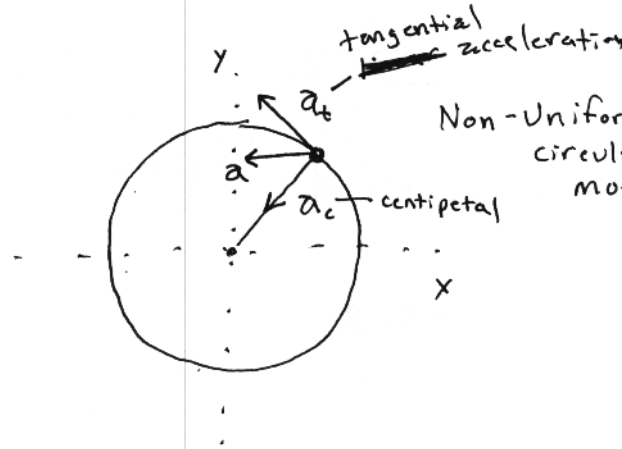
$S = r\theta$

$$V = \frac{ds}{dt} = r\frac{d\theta}{dt} = r\omega$$

$$a_t = \frac{dv}{dt} = r\frac{d\omega}{dt} = r\alpha$$

$$a_c = \frac{V^2}{r} = \frac{r^2\omega^2}{r} = r\omega^2$$

Non-Uniform circular motion



$$a = \sqrt{a_t^2 + a_c^2}$$

↑ total linea acceleractih