**Circular Motion**

**Arc Length** $S = \theta r$

**Circumference** $C = 2\pi r$ ***Circumference is an <u>Arc Length</u>***

**1 revolution = 1 rotation = 360 degrees = 2 π radians**

$$\frac{360\ deg}{2\pi\ rad}\ or\ \frac{2\pi\ rad}{360\ deg}$$

**What is a radian?**

**Anything times a radian is that thing!**

**Radians * meters = meters**

**Radians$^2$ * meters = meters**

| **Constant Acceleration** | |
|---|---|
| **Linear Kinematic Equations** | **Rotational Kinematic Equations** |
| **Units (m, m/s, m/s$^2$, s)** | **Units (rad, rad/s, rad/s$^2$, s)** |
| $V = V_0 + at$ | $\omega = \omega_0 + \alpha t$ |
| $X = X_0 + V_0 t + \frac{1}{2} a t^2$ | $\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$ |
| $V^2 = {V_0}^2 + 2a\Delta X$ | $\omega^2 = {\omega_0}^2 + 2\alpha\Delta\theta$ |
| $\Delta X = \frac{1}{2}(V + V_0)\ t$ | $\Delta\theta = \frac{1}{2}(\omega + \omega_0)\ t$ |

$$\frac{m}{s} = \frac{rad}{s} * m$$

$$v = \omega * r$$

$$\frac{m}{s^2} = \frac{rad}{s^2} * m$$

$$a = \alpha * r$$

$$\omega = \omega_0 + \alpha t \quad \rightarrow \quad (\omega * r) = (\omega_0 * r) + (\alpha * r)t \quad \rightarrow \quad v = v_0 + at$$

$$\frac{rad}{s} = \frac{rad}{s} + \frac{rad}{s^2} * s$$

$$\left(\frac{rad}{s} * r\right) = \left(\frac{rad}{s} * r\right) + \left(\frac{rad}{s^2} * r\right) t$$

$$\frac{m}{s} = \frac{m}{s} + \frac{m}{s^2} * s$$

**Period time to complete one cycle**

**(ADD THE PERIOD STUFF HERE DUMMY)**

$$\frac{m}{s} = \frac{m}{s} + \frac{m}{s^2} * s \quad \pi$$

**Centripetal Acceleration**
**(Centripetal means = CENTER SEEKING)**

$$a_c = \frac{v^2}{r}$$

$$\Sigma F = ma \qquad \textbf{becomes} \qquad \Sigma F_c = ma_c$$

$$\Sigma F_c = m\frac{v^2}{r}$$

$$\Sigma F_c = m\frac{\left(\frac{2\pi r}{T}\right)^2}{r}$$

$$\Sigma F_c = m\frac{\frac{4\pi^2 r^2}{T^2}}{r}$$

$$\Sigma F_c = m\frac{4\pi^2 r}{T^2}$$