KINEMATICS MODEL

CONDITION: ACCELERATION MUST BE CONSTANT!

LINEAR MODEL

1. LIST EQUATIONS

$$x = x_0 + v_0 t + \frac{1}{2} a t^2 \qquad y = y_0 + v_{y0} t + \frac{1}{2} g t^2$$

$$v = v_0 + at \qquad v_y = v_{y0} + gt$$

$$v^2 = v_0^2 + 2a(x - x_0) \qquad v_y^2 = v_{y0}^2 + 2g(y - y_0)$$

2. LIST VARS

$x_0 = [m]i$ $\quad y_0 = [m]j$

$x = [m]i$ $\quad y = [m]j$

$v_{x0} = [m/s]i$ $\quad v_{y0} = [m/s]j$

$v_x = [m/s]i$ $\quad v_y = [m/s]j$

$a_x = [m/s^2]i$ $\quad a_y = [m/s^2]j$

$t = [s]$

2B. SIDE DISH

CONVERT VECTOR QUANTITIES INTO X AND Y COMPONENTS USING TRIG FUNCTIONS

IF OBJECT IS FREE FALLING, THE ACCELERATION IS = -9.8 M/S²J

3. SOLVE

ROTATIONAL MODEL

1. LIST EQUATIONS

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\omega = \omega_0 + \alpha t$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

2. LIST VARS

$\theta = [rad]$

$\theta_0 = [rad]$

$\omega_0 = [rad/s]$

$\omega = [rad/s]$

$\alpha = [rad/s^2]$

$t = [s]$

3. SOLVE

SUPPLEMENTAL EQUATIONS

$$\bar{v} = \frac{\Delta x}{\Delta t} \qquad v = \frac{dx}{dt}$$

$$\bar{a} = \frac{\Delta v}{\Delta t} \qquad a = \frac{dv}{dt} = \frac{d^2x}{dt^2}$$

$$x = r\theta \qquad v = r\omega \qquad a = r\alpha$$

$$\bar{\omega} = \frac{\Delta \theta}{\Delta t} \qquad \omega = \frac{d\theta}{dt}$$

$$\bar{\alpha} = \frac{\Delta \omega}{\Delta t} \qquad \alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$$