

Halverson 6/19/2017

Explanation of "Falling Ball"  $\Delta t = 1$  looptime

$t=0$   $v_x = v_{0x}$   $v_y = 0$   $x_0 = 0$   $y_0 = h$

$t=1$  looptime  $v_{x1} = v_{0x}$   $v_{y1} = -gt$

$x_1 = x_0 + v_x \Delta t = v_{0x} t$

$y = y_0 + v_{y0} \Delta t - \frac{1}{2} g \Delta t^2$

$= h - \frac{1}{2} g t^2$

$t=2$  looptimes

$v_{x2} = v_{0x}$

$v_{y2} = v_{y1} - g \Delta t$

$x_2 = x_1 + v_x \Delta t$

$y_2 = y_1 + v_{y1} \Delta t - \frac{1}{2} g \Delta t^2 = h - \frac{1}{2} g t^2$

$= 2 v_{0x} t$

$t=3$

$v_{y3} = v_{y2} - g \Delta t$

$v_{x3} = v_{0x}$

$y_3 = y_2 + v_{y2} \Delta t - \frac{1}{2} g \Delta t^2$

$x_3 = x_2 + v_x \Delta t$

Note: if  $\Delta t$  is small then it's almost "O.K." to not include it. The error will be small.