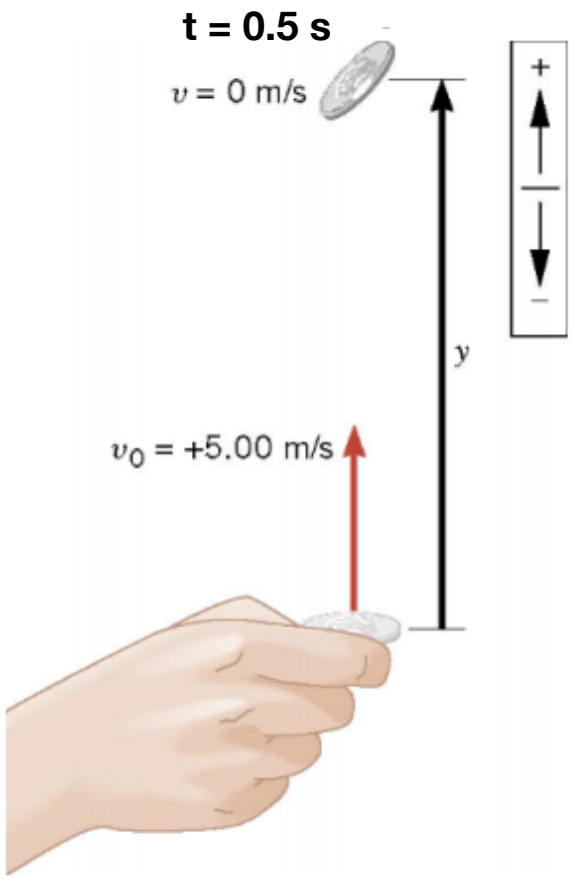
Example 3:

A Referee Tosses the Coin Up. The referee tosses the coin up with an initial speed of 5.00m/s. In the absence of air resistance, what kinematic variables can you calculate? Free Fall: **a = g = -9.8 m/s²**

Y Displacement	**a = g** acceleration	**t** time	**Vo =Vi** initial velocity	**V = Vf** Final velocity
?	**- 9.8 m/s²**		**5 m/s**	**0**

Kinematic Equations for Motion with Constant Acceleration (g) along the Y axis (Vertically)
$V = Vo + g\,t$
$Y = 1/2\,(Vo + V)\,t$
$V^2 = Vo^2 + 2\,g\,Y$
$Y = Vo\,t + 1/2\,g\,t^2$



a = g = - 9.8 m/s²

Free Fall

$$V = Vo + 2\,gY$$

$$0 = 25 + 2\,(-9.8)\,Y$$

$$0 = 25 - 19.6\,Y$$

$$-25 \quad -25$$

$$-25 = -19.6\,Y$$

$$-\frac{-25}{-19.6} = \frac{-19.6\,Y}{-19.6}$$

$$Y = 1.27\ m$$

$$V = V_o + g\,t$$

$$0 = 5 - 9.8\,t$$

$$-5 \quad -5$$

$$-5 = -9.8\,t$$

$$\frac{-5}{-9.8} = \frac{-9.8\,t}{-9.8}$$

$$t = 0.52 \text{ s.}$$

A Falling Stone: A stone is dropped from the top of a tall building.

After t = 3.00s of free fall, what is the displacement y of the stone?

Free Fall: **a = g = -9.8 m/s²**

y	a	v	v_o	t
?	-9.80 m/s²		0 m/s	3.00 s

Kinematic Equations for Motion with Constant Acceleration (g) along the Y axis (Vertically)

$$V = Vo + g\,t$$

$$Y = 1/2\,(Vo + V)\,t$$

$$V^2 = Vo^2 + 2\,g\,Y$$

$$Y = Vo\,t + 1/2\,g\,t^2$$

$$Y = Vo\ t + 1/2\ g\ t^2$$

$$Y = 0 \times 3 + 1/2\ (-\ 9.8\ )\ (\ 3)^2$$

$$Y = 0 + -\ 4.9 \times (9)$$

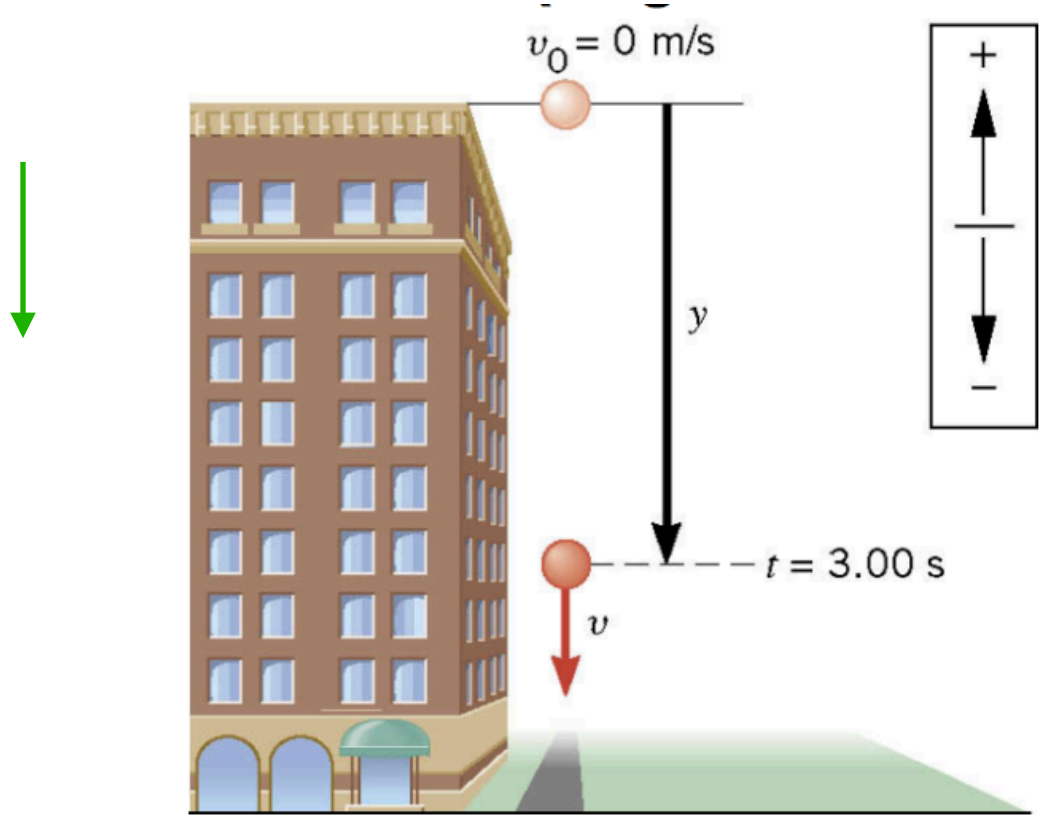
$$Y = \ -\ 44.1\ m$$

Y is negative = down

$$V = Vo + at = 0\ -9.8 \times 3 = -\ 29.4\ m/s$$

a = g = - 9.8 m/s²

Free Fall



y	a	v	v_o	t
?	-9.80 m/s²		0 m/s	3.00 s