

Vertical Motion

1. $v_i = -14.5 \frac{m}{s}$
 origin
 $d = ?$
 $t = 2s$
 $a = -9.8 \frac{m}{s^2}$

$$d = v_i t + 0.5 a t^2$$

$$= -14.5(2) + 0.5(-9.8)(2)^2$$

$$= \boxed{-49 m}$$

2. $v_f = 0$
 $d = ?$
 $a = -9.8 \frac{m}{s^2}$
 $v_i = 24.5 \frac{m}{s}$

$$v_f^2 = v_i^2 + 2ad$$

$$d = \frac{0 - v_i^2}{2a} = \frac{-(24.5)^2}{2(-9.8)}$$

$$= 30.6 m$$

3. $v = 0$
 whole path
 $\Delta d = 0$
 $v_i = 19.6 \frac{m}{s}$

$$d = v_i t + \frac{1}{2} a t^2$$

$$0 = 19.6t + \frac{1}{2}(-9.8)t^2$$

$$\frac{-19.6t}{t} = \frac{-4.9t^2}{t}$$

$$-19.6 = -4.9t$$

$$4s = t$$

OR

$\frac{1}{2}$ path $v_i = 19.6 \frac{m}{s}$
 $v_f = 0$
 $a = -9.8 \frac{m}{s^2}$
 $t = ?$

$$v_f = v_i + at$$

$$t = \frac{-v_i}{a} = \frac{-(19.6)}{-9.8} = 2s$$

$$\times 2$$

$$\underline{\quad}$$

$$4s$$

$$v_f^2 = v_i^2 + 2ad$$

$$v_f = v_i + at$$

$$d = v_i t + 0.5 a t^2$$

$$d = 0.5 t (v_i + v_f)$$

always $a = -9.8 \frac{m}{s^2}$
 when object in free fall (projectile motion)
 $v_{top} = 0$

right, up +
 left, down -

$$\Delta d = v_i t + \frac{1}{2} a t^2$$