

20080131-1000

Name Key

A projectile is shot upward in a perfectly vertical direction on Earth at  $60.00 \text{ m/s}$ . Neglect friction.

A) Determine initial vertical velocity

$$V_{iy} = 60.00 \text{ m/s}$$

B) Determine vertical velocity at apex

$$V_{fy} = 0$$

C) Determine initial horizontal velocity

$$V_{ix} = 0$$

D) Determine time to reach apex

$$V_f = V_i + at$$

$$0 = 60 + (-9.8)t \quad t = \frac{60}{9.8} = \frac{600}{98} = \frac{300}{49} = 6.12244898$$

E) Determine maximum height at apex

$$\Delta y = V_i t + \frac{1}{2} at^2 \quad \text{or} \quad V_f^2 = V_i^2 + 2a\Delta y \quad \Delta y = \frac{-V_i^2}{2a} = \frac{-(60)^2}{-19.6} = \frac{3600}{19.6}$$

$$\Delta y = 183.6734694$$

F) Determine time to fall from apex to ground

$$V_f = V_i + at$$

$$t = \frac{V_f - V_i}{a} = \frac{-60}{-9.8} = 6.12244898$$

G) Determine total flight time of projectile

$$t_{\text{total}} = 2t_{\text{top}} = 2(6.12244898) = 12.244897$$

H) Determine height at time = 20 seconds

Flight ends at 12.24 sec so elev must be 0