

M-GP General Physics Week 20

16.2 seconds

It took 8.1s to exhaust all of the initial velocity.

Every second, gravity reduces velocity by -10 m/s

$$(10 \text{ m/s})(8.1 \text{ s}) = \boxed{81 \text{ m/s}}$$

$\approx 181 \text{ mi/hr}$

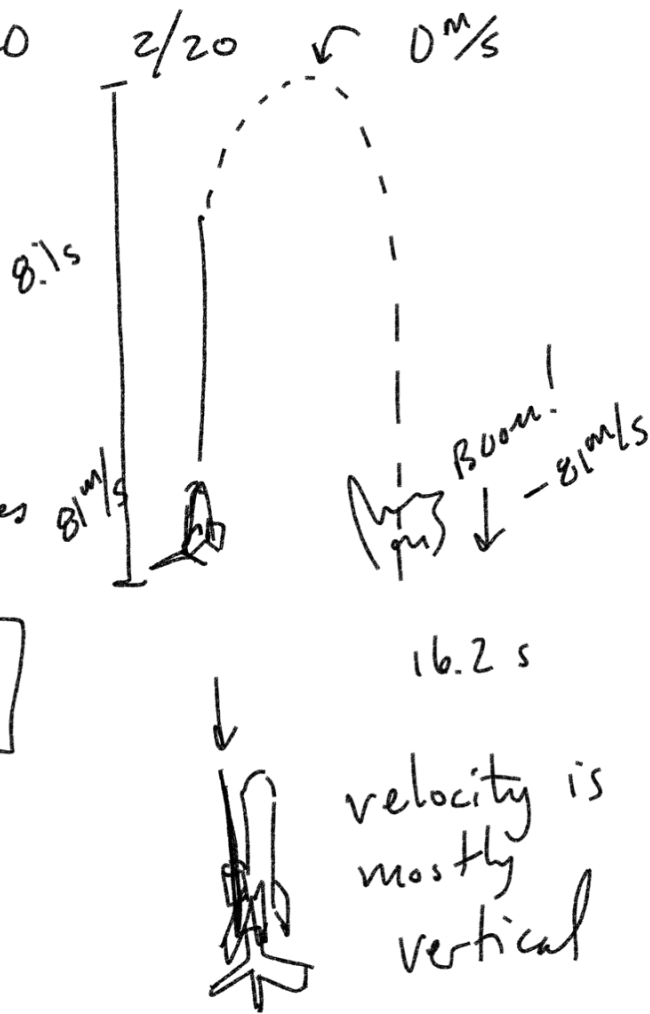
Could we have hit a plane

$$2700 \text{ ft} \rightarrow \frac{\quad}{822.96} \text{ m} \quad 2700 \text{ ft} * \frac{12 \text{ in}}{1 \text{ ft}} * \frac{2.54 \text{ cm}}{1 \text{ in}} * \frac{1 \text{ m}}{100 \text{ cm}} \approx \boxed{820 \text{ m}}$$

$$y = y_0 + v_{iy}t + \frac{1}{2}a_y t^2$$

$$y = 0 + 81t - 4.9t^2$$

$$y = 81(8.1) - 4.9(8.1)^2 = \boxed{335 \text{ m}}$$



We want an altitude of 820 m.

assume $t = 8.1$ s what initial velocity we would need?

$$y = y_0 + v_y t + \frac{1}{2} a t^2$$

$$820 = x(8.1) + \left(\frac{1}{2}\right)(-9.8)(8.1)^2$$

$$820 = 8.1x - 321.5$$

$$+ 321.5$$

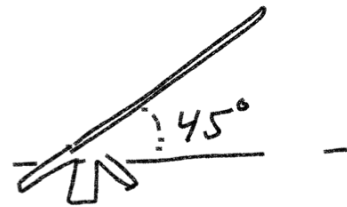
$$+ 321.5$$

$$\frac{1141.5}{8.1} = \frac{8.1x}{8.1}$$

$$x = \boxed{141 \text{ m/s}}$$

initial 81 m/s

$$y_0 = 0$$



How far will it go?

- 1.) Find time of flight. (y-comp)
- 2.) Distance traveled (x-comp)

1.) Time of flight

$$V_0 = 81 \text{ m/s} \quad \theta = 45^\circ$$

vertical: $y = y_0 + v_{0y}t + \frac{1}{2}at^2$

$\downarrow \quad \downarrow \quad \downarrow$

$$0 = 0 + v_0 \sin \theta t + \frac{1}{2}at^2$$

$$0 = 0 + (81 \sin 45^\circ)t - 4.9t^2$$

$$0 = (81 \sin 45^\circ)t - 4.9t^2 + 4.9t^2$$

$$\frac{4.9t^2}{t} = \frac{81 \sin 45^\circ t}{t}$$

$$\frac{4.9t}{4.9} = \frac{81 \sin 45^\circ}{4.9} = 11.75$$

11.75

2.) Distance traveled horizontal $\rightarrow \cos \theta$

$$x = x_0 + v_{0x}t$$

\downarrow

$$0 + v_0 \cos \theta t$$

$$x = (81 \cos 45^\circ)(11.7) = \approx \boxed{670 \text{ m}}$$

Nate ^(Iron Man) threw his dignity

at 900
m/s at an angle 30°

above the horizontal from a cliff

1000 m off the ground.

- 1.) time of flight
- 2.) max height
- 3.) time to max height
- 4.) Distance traveled

1.) Time of flight

$$y = y_0 + v_{0y}t - 4.9t^2$$

$$\downarrow$$
$$0 = 1000\text{m} + (900 \sin 30^\circ)t - 4.9t^2$$

$$0 = 1000\text{m} + 450t - 4.9t^2$$

$$t = 94\text{s}$$

Time to max height

max height $v = 0 \text{ m/s}$

$$v_f = v_{oy} + at$$

$$0 = 900 \sin 30 - 9.8t$$

$$0 = 450 - 9.8t$$

$$\frac{9.8t}{9.8} = \frac{450}{9.8} \quad t = \boxed{45.9 \text{ s}}$$

3.) Find max height

$$y = y_0 + v_{oy}t - 4.9t^2$$

$$y = 1000 + (900 \sin 30)t - 4.9t^2$$

$$y = 1000 + (900 \sin 30)(45.9) - 4.9(45.9)^2$$

$$y = \boxed{11,332 \text{ m}}$$

4.) Distance traveled

$$X_f = X_0 + v_{0x} t \quad t = 94.5$$

$$X_f = \underset{\downarrow}{0} + (\underset{\downarrow}{900 \cos 30}) (94)$$

$$X_f = 73,272 \text{ m}$$