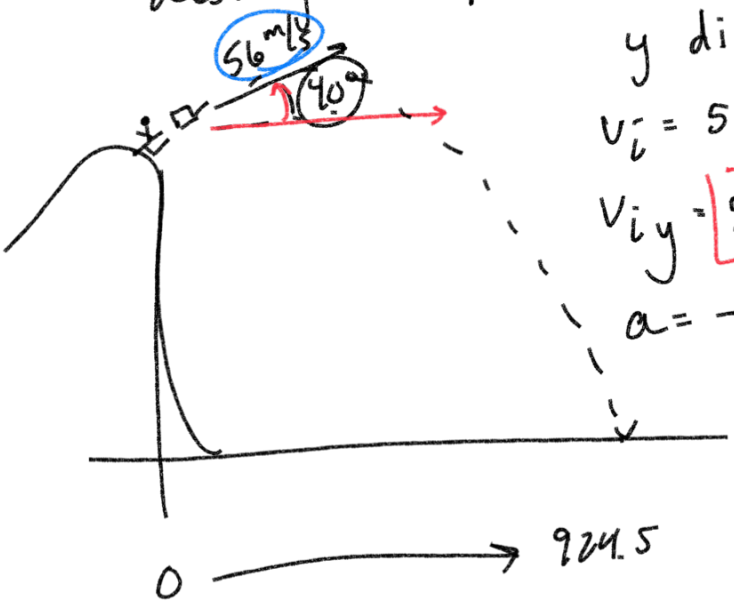
M-GP General Physics Week 18 2/6

James threw Nate's hopes and dreams 56 m/s at an angle of 40° above horizontal from a 1500 m cliff.

a) How long until Nate's hopes and dreams are destroyed upon impacting the ground?



y direction

$v_i = 56\ m/s$

$v_{iy} = 56 \sin 40 \approx 36\ m/s$

$a = -9.80\ m/s^2$

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

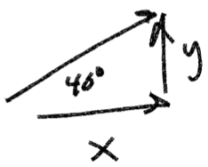
$0 = 1500 + (56 \sin 40)t - 4.9t^2$

$0 = 1500 + 36t - 4.9t^2$

$t \approx 21.55\ s$

2.) How far from the base of the cliff will it land? x-direction

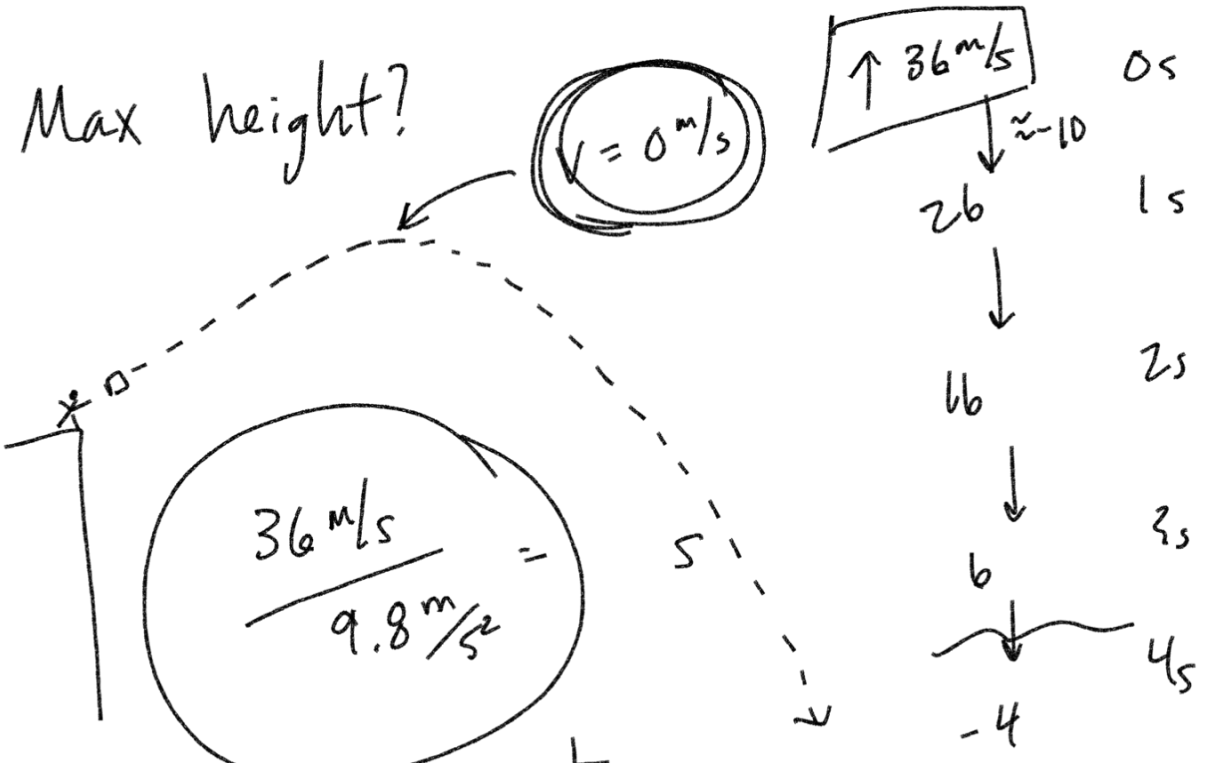
$v_{ix} = 56 \cos 40° = 42.89\ m/s$



$x_f = \cancel{x_0} + v_{ix}t$

$(42.89\ m/s)(21.55\ s) = \boxed{924.5\ m}$

Max height?



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

$$0 = 36 + (-9.8)t$$

$$-36 \quad -36$$

$$\frac{-36}{-9.8} = \frac{-9.8t}{-9.8}$$

$$t = \frac{36}{9.8} = 3.67\text{s}$$

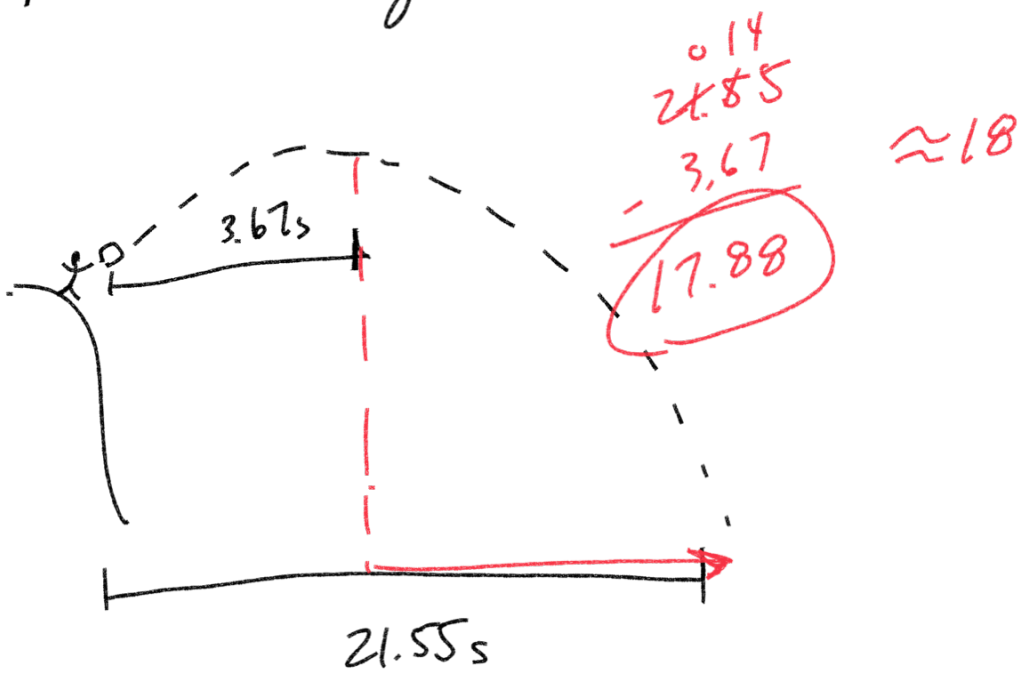
$$y = y_0 + v_{iy}t + \frac{1}{2}a_y t^2$$

$$1500 + 36t - 4.9t^2$$

$$1500 + 36(3.67) - 4.9(3.67)^2$$

$$= 1566.\text{m}$$

Impact Velocity



$$V_f = V_i + at$$

$$\downarrow$$

$$36 + (-9.8)t$$

$$(36) + (-9.8)(21.55) = \boxed{-175.2\ m/s}$$