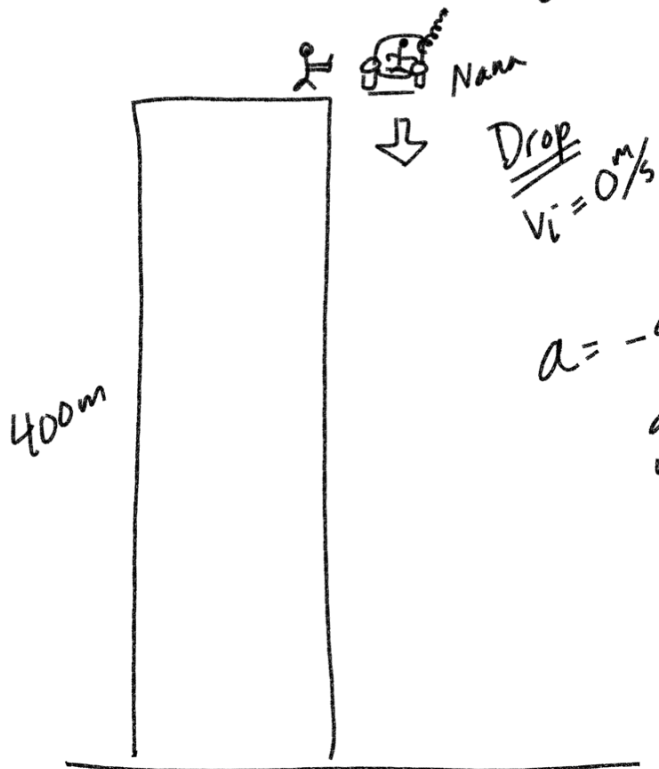


M-6P General Physics



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

$$0 = 400 \text{ m} + \frac{1}{2} (-9.8 \text{ m/s}^2) t^2$$

$$a = -9.8 \text{ m/s}^2$$

gravity

$$0 = 400 \text{ m} - 4.9 \text{ m/s}^2 t^2$$

$$0 = 400 - 4.9 t^2$$

-400 -400

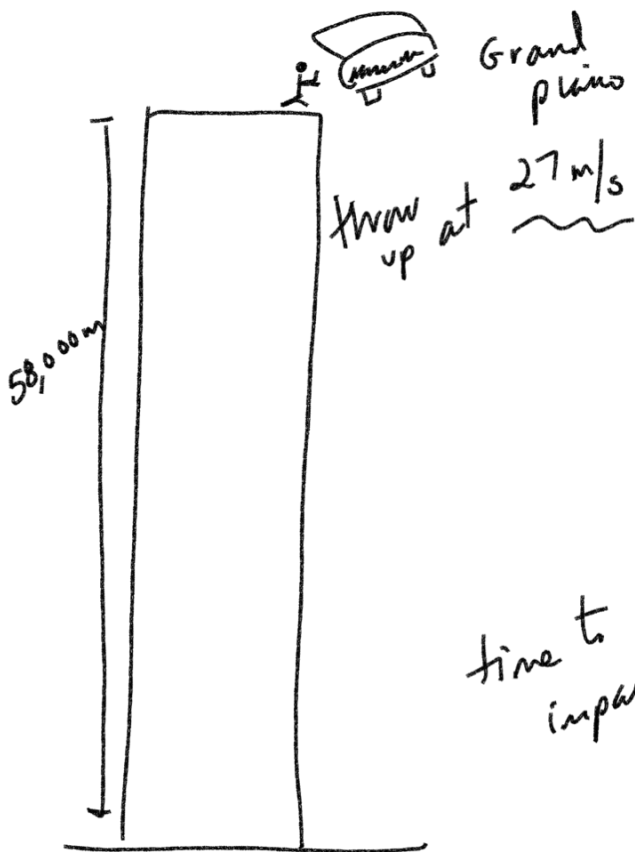
$$\frac{-400}{-4.9} = \frac{-4.9 t^2}{-4.9}$$

$$\sqrt{\frac{400}{4.9}} = \sqrt{t^2}$$

$$\sqrt{\frac{400}{4.9}} = t$$

$$\boxed{9.0 \text{ s} = t}$$

time to impact



$$y = y_0 + v_0 t + \frac{1}{2} a t^2$$

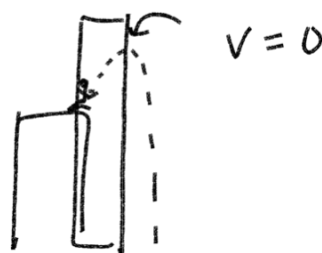
\downarrow \downarrow \downarrow \downarrow

$$\Rightarrow 0 = 58,000 + 27t - 4.9t^2$$

$$t = 111.6 \text{ s}$$

time to impact

time to max height



$$v_f = v_i + at$$

$$0 = 27 - 9.8t$$

$+9.8t$ $+9.8t$

$$\frac{9.8t}{9.8} = \frac{27}{9.8}$$

$$t = 2.76 \text{ s}$$

Max Height

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

\downarrow \downarrow

$$y = 58,000 + 27(2.76) + \frac{1}{2}(-9.8)(2.76)^2$$



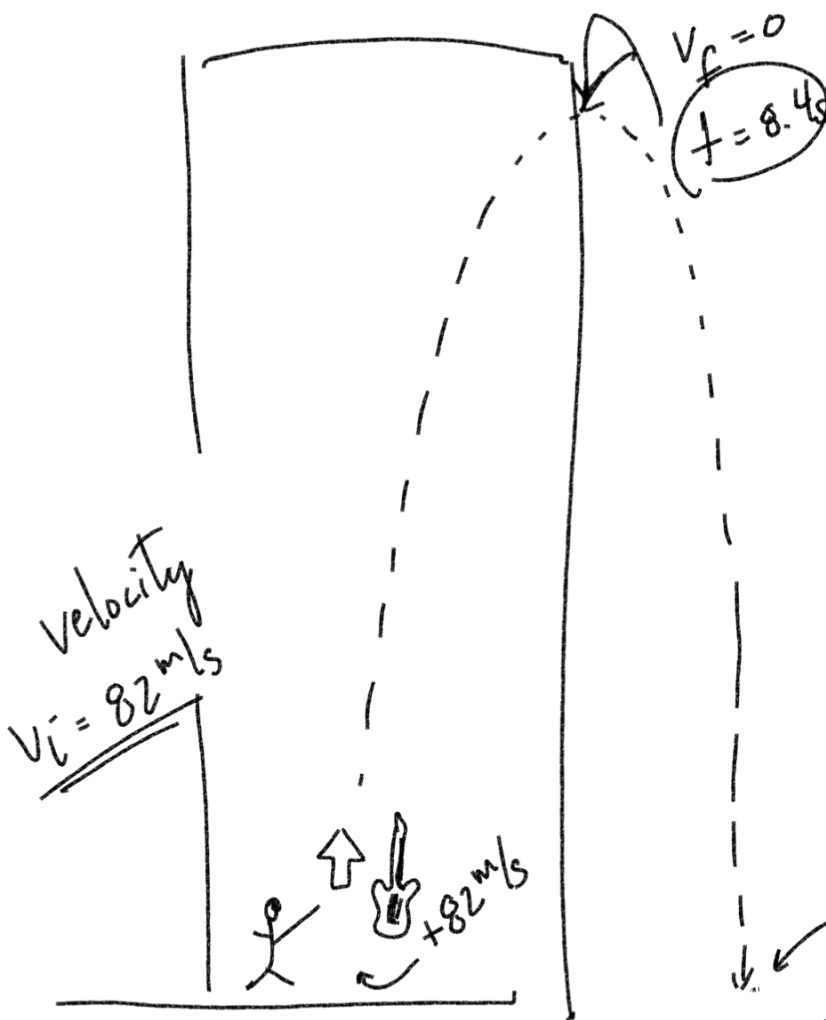
$$y = 58,037 \text{ m}$$

What is the velocity on impact

$$V_f = V_i + at$$

↓ ↓ ↘
27 + (-9.8)(111.6)

$$\boxed{-1066 \text{ m/s}}$$



time to impact

Use symmetry of the parabola

$$a = \text{gravity} = -9.8 \text{ m/s}^2$$

$$V_f = V_i + at$$

$$0 = 82 + (-9.8)t$$

$$0 = 82 - 9.8t$$

$$-82 \text{ m/s} \quad -82 \quad -82$$

$$\frac{-82}{-9.8} = \frac{-9.8t}{-9.8}$$

$$t = 8.4s * 2$$

$$\boxed{16.8s}$$