1. $W = mg$

$$6500\ \text{pound}\left(\frac{1\ \text{kg}}{2.2\ \text{lb}}\right) = 2955\ \text{kg}$$

$$60\ \text{mph}\left(\frac{1\ \text{m/s}}{2.24\ \text{mph}}\right) = 26.8\ \text{m/s}$$

$V_0 = 0\ \text{m/s}$

$V = 26.8\ \text{m/s}$

$\Delta t = 3.8\ \text{s}$

$\Delta V = 26.8\ \text{m/s} - 0\ \text{m/s} = 26.8\ \text{m/s}$

$$a = \frac{\Delta V}{\Delta t} = \frac{26.8\ \text{m/s}}{3.8\ \text{s}} = 7.05\ \text{m/s}^2$$

$$\bar{V} = \frac{V_0 + V}{2} = \frac{0\ \text{m/s} + 26.8\ \text{m/s}}{2} = 13.4\ \text{m/s}$$

$$\bar{V} = \frac{\Delta x}{\Delta t} \Rightarrow 13.4\ \text{m/s} = \frac{\Delta x}{3.8\ \text{s}} \Rightarrow \Delta x = 50.9\ \text{m}$$

$\Delta x = 50.9\ \text{m}$

Travel distance = 50.9 m

$$\sum F = ma = 2955\ \text{kg}\,(7.05\ \text{m/s}^2)$$

$$= 20{,}830\ \text{N}\left(\frac{0.225\ \text{lb}}{1\ \text{N}}\right)$$

$\sum F = 4{,}690\ \text{lb}$

2.

$$v = \frac{650 \text{ miles}}{s}\left(\frac{5280 \text{ ft}}{1 \text{ mile}}\right)\left(\frac{0.305 \text{ m}}{1 \text{ ft}}\right) = \frac{1,046,760 \text{ m}}{s}$$

$v_0 = 0$

$\Delta v = 1,046,760 \text{ m/s}$

$\Delta t = 0.001 \text{ s}$

$$a = \frac{\Delta v}{\Delta t} = \frac{1,046,760 \text{ m/s}}{0.001 \text{ s}} = 1.05 \times 10^9 \text{ m/s}^2$$

$$1.05 \times 10^9 \text{ m/s}^2\left(\frac{1 g}{9.8 \text{ m/s}^2}\right) = 1.06 \times 10^8 g$$

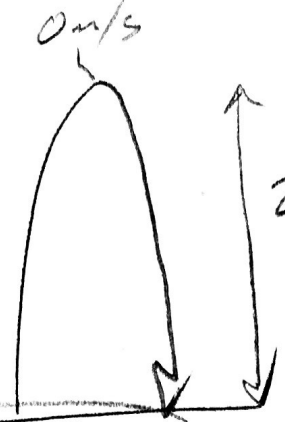
$\sum F = ma$

$$\sum F \quad 250 \text{ lb}\left(\frac{1 \text{ kg}}{2.2 \text{ lb}}\right) = 114 \text{ kg}$$

$$\sum F = 114 \text{ kg}\left(1.05 \times 10^9 \text{ m/s}^2\right) = 1.2 \times 10^{11} \text{ N}$$

$$1.2 \times 10^{11} \text{ N}\left(\frac{0.225 \text{ lb}}{1 \text{ N}}\right) = 2.69 \times 10^{10} \text{ lb}$$

3 (Challenge)



$22.1 \text{ feet} \left(\frac{0.305 \text{ m}}{1 \text{ ft}}\right) = 6.74 \text{ m}$

For the trip down...

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

$V_0 = 0 \text{ m/s}$

$\Delta y = -6.74 \text{ m}$

$$a = \frac{\Delta V}{\Delta t} = \frac{V - V_0}{\Delta t} \Rightarrow \Delta t = \frac{V - V_0}{a}$$

$$\overline{V} = \frac{\Delta y}{\Delta t} = \frac{V_0 + V}{2} \Rightarrow \Delta t = \frac{2\Delta y}{V_0 + V}$$

$$\frac{V - V_0}{a} = \frac{2\Delta y}{V_0 + V}$$

$$-V_0^2 + V^2 = 2a\Delta y$$

$$V^2 = V_0^2 + 2a\Delta y$$

$$V = \pm\sqrt{V_0^2 + 2a\Delta y}$$

$$V = \pm\sqrt{0^2 + 2(-9.8 \text{ m/s}^2)(-6.74 \text{ m})}$$

$$V = -11.5 \text{ m/s} \left(\frac{2.24 \text{ mph}}{1 \text{ m/s}}\right) = 25.7 \text{ mph}$$