

Roller Coaster Physics

Lesson 1 - Assignment 2

Name: _____

1. Given the equation $W_{1-2} = \frac{1}{2}m_{mass}v_2^2 + m_{mass}gh_2$, solve for m_{mass} .

$$W_{1-2} = \frac{1}{2}m_{mass}v_2^2 + m_{mass}gh_2$$

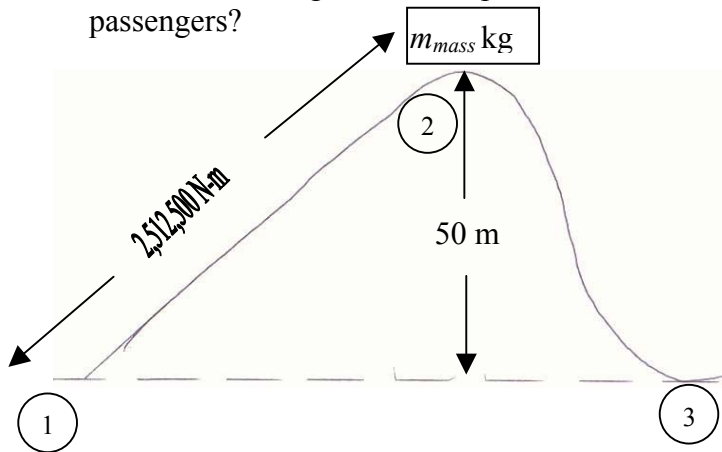
$$2W_{1-2} = m_{mass}v_2^2 + 2m_{mass}gh_2$$

$$2W_{1-2} = m_{mass}(v_2^2 + 2gh_2)$$

$$\frac{2W_{1-2}}{v_2^2 + 2gh_2} = \frac{m_{mass}(v_2^2 + 2gh_2)}{v_2^2 + 2gh_2}$$

$$m_{mass} = \frac{2W_{1-2}}{v_2^2 + 2gh_2}$$

2. If the lift motors of a roller coaster do 2,512,500 Newton-meters (joules) of work to lift a car and passengers 50 meters up to the top of a hill (call it point 2) and if the lift is traveling at 5 meters per second, what is the mass of the car and passengers?



$$m_{mass} = \frac{2W_{1-2}}{v_2^2 + 2gh_2}$$

$$= \frac{2(2,512,500 \text{ N} \cdot \text{m})}{(5 \frac{\text{m}}{\text{sec}})^2 + 2(9.8 \frac{\text{m}}{\text{sec}^2})(50 \text{ m})} = \frac{5025000 \frac{\text{kg} \cdot \text{m}}{\text{sec}^2} \cdot \text{m}}{25 \frac{\text{m}^2}{\text{sec}^2} + 980 \frac{\text{m}^2}{\text{sec}^2}}$$

$$= \frac{5025000 \frac{\text{kg} \cdot \text{m}^2}{\text{sec}^2}}{1005 \frac{\text{m}^2}{\text{sec}^2}} = 5000 \frac{\cancel{\frac{\text{m}^2}{\text{sec}^2}} \text{ kg}}{\cancel{\frac{\text{m}^2}{\text{sec}^2}}}$$

$$m_{mass} = 5,000 \text{ kg}$$