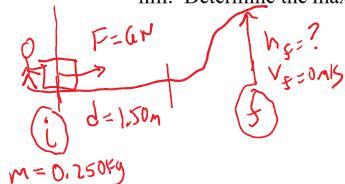


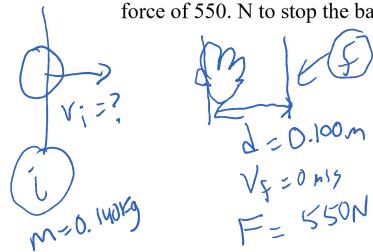
$$KE_i + PE_i \pm W = KE_f + PE_f$$

5. A 0.250 kg box is moving at 5.00 m/s on a frictionless level surface. A person applies a force of 6.00 N over a distance of 1.50 m as it moves across the floor. The box approaches a hill. Determine the maximum height the box will make it up the hill.



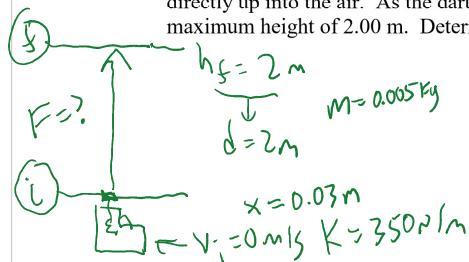
$$\begin{aligned} KE_i + PE_i \pm W &= KE_f + PE_f \\ \frac{1}{2}mv_i^2 + mgh_i &\xrightarrow{\text{GAIN IN ME}} \frac{1}{2}mv_f^2 + mgh_f \\ \frac{1}{2}(0.250\text{kg})(5.00\text{m/s})^2 + (6.00\text{N})(1.50\text{m}) &= (0.250\text{kg})(9.81\text{m/s}^2)h_f \\ h_f &= 4.94 \text{ m} \end{aligned}$$

6. A person catches a 0.140 kg ball in a mitt and recoils back 0.100 m. If the person applies a force of 550 N to stop the ball, determine the initial speed of the ball.



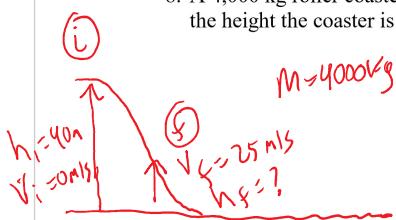
$$\begin{aligned} KE_i + PE_i \pm W &= KE_f + PE_f \\ \frac{1}{2}mv_i^2 - Fd &\xrightarrow{\text{LOSS IN ME}} 0 \\ \frac{1}{2}(0.140\text{kg})v_i^2 - (550\text{N})(0.100\text{m}) &= 0 \\ v_i &= 28.0 \text{ m/s} \end{aligned}$$

7. A spring loaded dart gun ( $k = 350 \text{ N/m}$ ) is compressed 0.030 m and fires a 0.00500 kg dart directly up into the air. As the dart climbs it experiences air resistance and reaches a maximum height of 2.00 m. Determine the average amount of air resistance force.



$$\begin{aligned} KE_i + PE_i \pm W &= KE_f + PE_f \\ \frac{1}{2}Kx^2 - Fd &\xrightarrow{\text{LOSS IN ME}} Mgh_f \\ \frac{1}{2}(350\text{N/m})(0.030\text{m})^2 - F(2.00\text{m}) &= (0.00500\text{kg})(9.81\text{m/s}^2)(2.00\text{m}) \\ F &= 0.0297 \text{ N} \end{aligned}$$

8. A 4,000 kg roller coaster cart starts from rest at top of a 40.0 m frictionless track. Determine the height the coaster is at when it reaches a speed of 25.0 m/s.



$$\begin{aligned} KE_i + PE_i \pm W &= KE_f + PE_f \\ KE_i + PE_i \pm W &= KE_f + PE_f \\ mgh_i &= \frac{1}{2}mv_f^2 + mgh_f \\ (9.81\text{m/s}^2)(40.0\text{m}) &= \frac{1}{2}(25.0\text{m/s})^2 + (9.81\text{m/s}^2)h_f \\ h_f &= 8.14 \text{ m} \end{aligned}$$