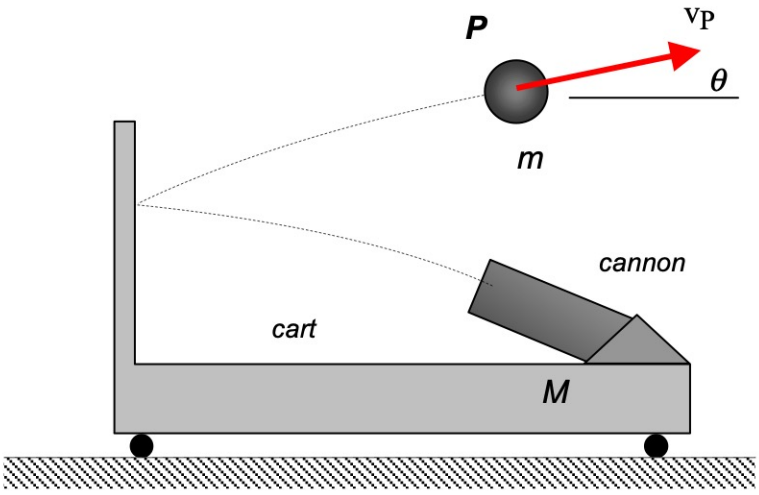
Homework H.4.M

Given: A cannonball P of mass m is fired toward a steel barrier on a stationary cart. At some time after rebounding from the barrier, the cannonball is observed to have a speed of v_P and is moving in the direction shown below in the figure. Let M be the combined mass of the cannon/cart. Assume that the cart is able to move without friction along the horizontal surface and ignore the influence of air resistance.

Find: For this problem:
(a) Determine the velocity vector of the cart after the cannonball bounces off the steel barrier at the instant shown below;
(a) If Δt represents the elapsed time between the firing of the cannonball and the instant shown below, determine the average value of the horizontal force acting on the combined cannon/cart over the time period of $0 < t < \Delta t$.

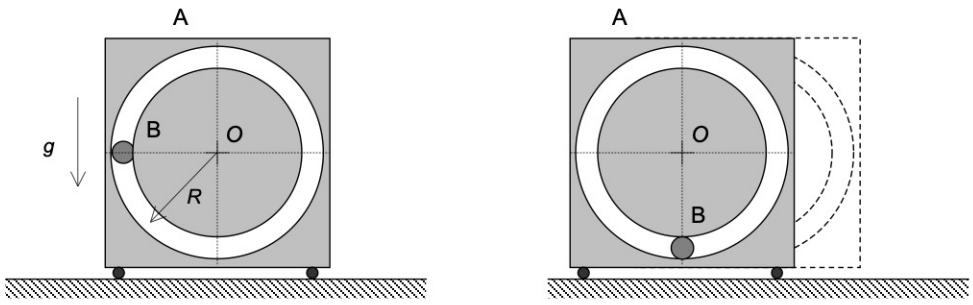


Use the following parameters in your analysis: $mg = 80$ lb, $Mg = 240$ lb, $\Delta t = 0.3$ s, $\theta = 20°$ and $v_P = 100$ ft/s.

Homework H.4.N

Given: Particle B (having a mass of m) is constrained to move within a circular slot (of radius R) that is cut into block A (having a mass of M). The system is released from rest with particle B on a horizontal line passing through the circle's center O. Consider all surfaces to be smooth.

Find: For this problem:
(a) Determine the velocities of A and B when B has moved position 2 where B is directly below O (write your answers as vectors);
(b) Determine the work done on block A in moving from position 1 to position 2.



Position 1 ***Position 2***

Use the following parameters in your analysis: $m = 30$ kg, $M = 50$ kg and $R = 0.5$ m.

