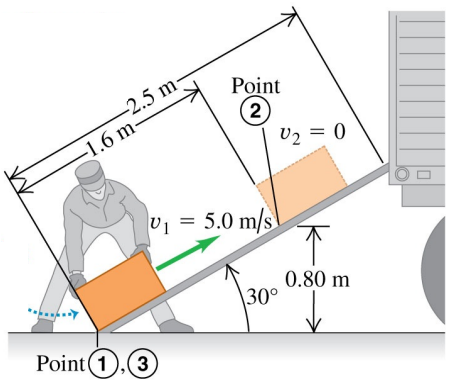
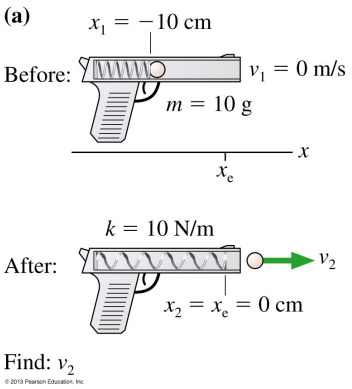
Conservation of Energy

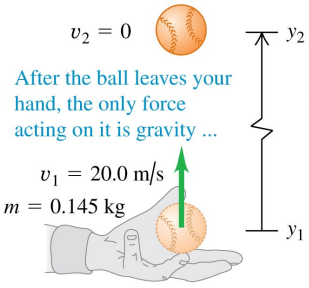
1. We want to slide a 12 kg crate up a 2.5 m long ramp at 30°. A worker, ignoring friction, calculates that he can do this by giving it an initial speed of 5.0 m/s at the bottom and letting it go. The crate slides 1.6 m up the ramp and stops (and slides back down). Find the magnitude of the friction force, assuming it is constant.



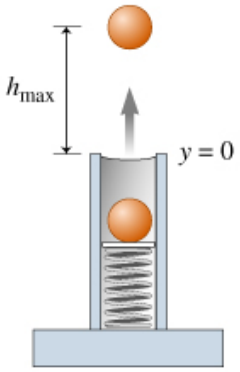
2. A spring-loaded toy gun launches a 10 g plastic ball. The spring, with k = 10 N/m, is compressed 10 cm as the ball is pushed into the barrel. What is the ball's speed as it leaves the barrel when the trigger is pulled. Assume no friction.



3. You throw a 0.145 kg baseball straight up, giving it an initial velocity of 20 m/s. Find how high it goes, ignoring air resistance.



4. A spring-loaded toy gun is used to shoot a ball of mass 1.5 kg straight up in the air. The spring constant k = 667 N/m. The spring is compressed a distance of 25.0 centimeters from its equilibrium position y = 0 and then release. Find the maximum height of the ball if there is no friction.



If the ball reaches a maximum height of 0.95 m, what is the magnitude of the force of friction between the ball and the barrel of the toy gun?

5. A hockey puck is given an initial speed of 4.3 m/s. If the coefficient of kinetic friction between the puck and the ice is 0.05, how far does the puck slide before coming to rest? Solve this problem using conservation of energy.

6. In a physics lab experiment, a spring clamped to the table shoots a 20 g ball horizontally. When the spring is compressed 19 cm, the ball travels horizontally a distance d = 5.0 m and lands on the floor 1.5 m below below the point at which it left the spring. What is the spring constant?