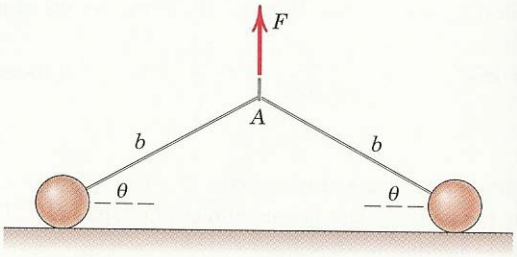
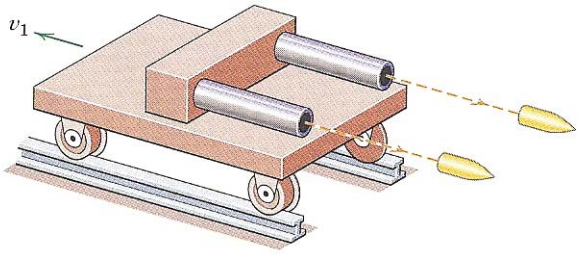
1. 14.55 (14.57 8th edition)

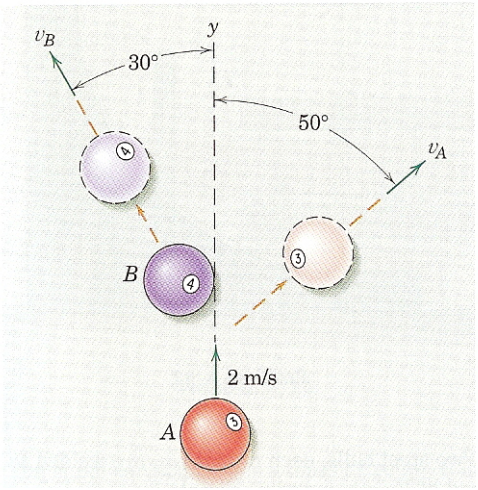
2. The two small spheres, each of mass m, are connected by a cord of length $2b$ (measured from the centers of the spheres) and are initially at rest on a smooth horizontal surface in the position shown. If a vertical force of constant magnitude F is applied to the center A of the cord, determine the velocity v of each sphere when they collide as θ approaches 90°. What is the maximum value of F for which the spheres do not lose contact with the surface? (Analyze the system without dismembering it.)



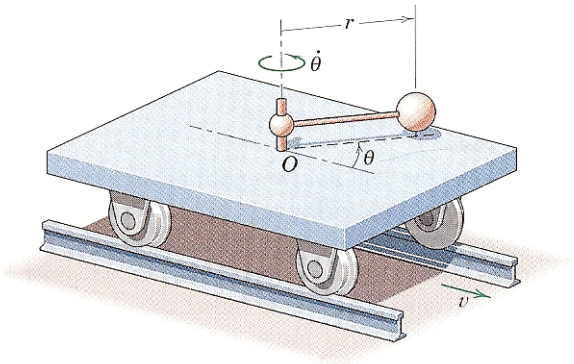
3. Two projectiles, each weighing 20 lb, are fired simultaneously from the vehicle shown which weighs 2000 lb and is moving with an initial velocity v_1 = 4 ft/sec in the direction opposite to the firing. Each projectile has a muzzle velocity v_r = 800 ft/sec relative to the barrel. Calculate the velocity v_2 of the vehicle after the projectiles have been fired.



4. Billiard ball A is moving in the y-direction with a velocity of 2 m/s when it strikes ball B of identical size and mass initially at rest. Following the impact, the balls are observed to move in the directions shown. Calculate the velocities v_A and v_B which the balls have immediately after the impact. Treat the balls as particles and neglect any friction forces acting on the balls compared with the force of impact.



5. The small car, which has a mass of 20 kg, rolls freely on the horizontal track and carries the 5-kg sphere mounted on the light rotating rod with $r = 0.4$ m. A geared motor drive maintains a constant angular speed $\dot{\theta} = 4$ rad/s of the rod. If the car has a velocity $v = 0.6$ m/s when $\theta = 0$, calculate v when $\theta = 60°$. Neglect the mass of the wheels and any friction.



6. 14.C7 (14.C7 8th edition) using Matlab program.