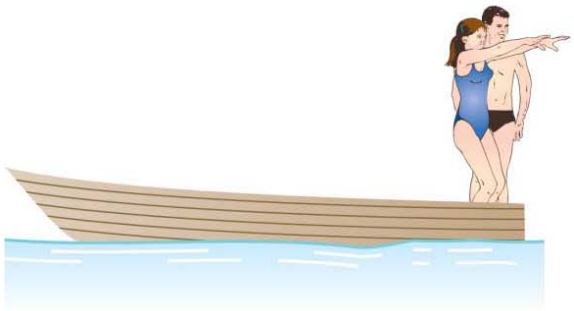
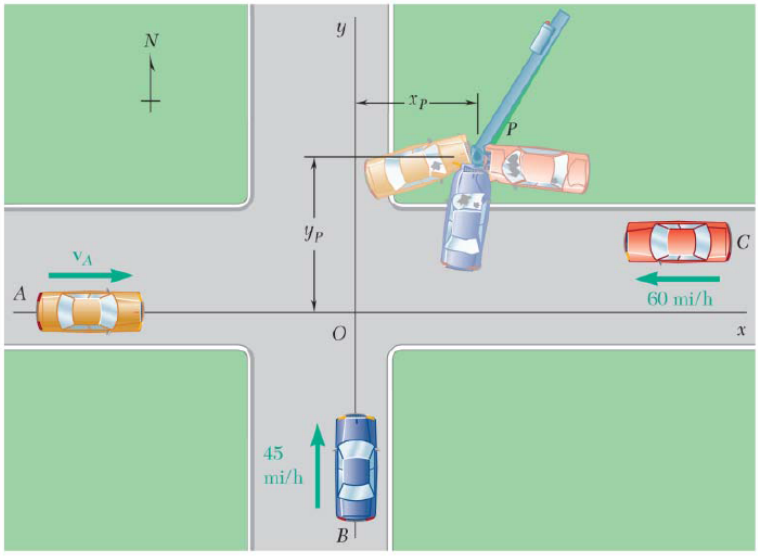
HW #7 – Chapter 14



PROBLEM 14.6

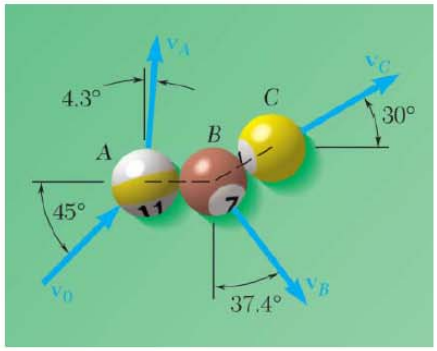
A 180-lb man and a 120-lb woman stand side by side at the same end of a 300-lb boat, ready to dive, each with a 16-ft/s velocity relative to the boat. Determine the velocity of the boat after they have both dived, if (*a*) the woman dives first, (*b*) the man dives first.



PROBLEM 14.19

Car *A* was traveling east at high speed when it collided at Point *O* with car *B*, which was traveling north at 45 mi/h. Car *C*, which was traveling west at 60 mi/h, was 32 ft east and 10 ft north of Point *O* at the time of the collision. Because the pavement was wet, the driver of car *C* could not prevent his car from sliding into the other two cars, and the three cars, stuck together, kept sliding until they hit the utility pole *P*. Knowing that the weights of cars *A*, *B*, and *C* are, respectively, 3000 lb, 2600 lb, and 2400 lb, and neglecting the forces exerted on the cars by the wet pavement, solve the problems indicated.

Knowing that the speed of car *A* was 75 mi/h and that the time elapsed from the first collision to the stop at *P* was 2.4 s, determine the coordinates of the utility pole *P*.

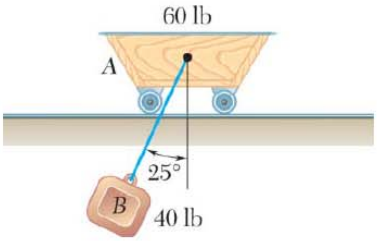


PROBLEM 14.23

In a game of pool, ball *A* is moving with a velocity $\mathbf{v}_0$ when it strikes balls *B* and *C* which are at rest and aligned as shown. Knowing that after the collision the three balls move in the directions indicated, and that $v_0 = 12$ ft/s and $v_C = 6.29$ ft/s, determine the magnitude of the velocity of (*a*) ball *A*, (*b*) ball *B*.

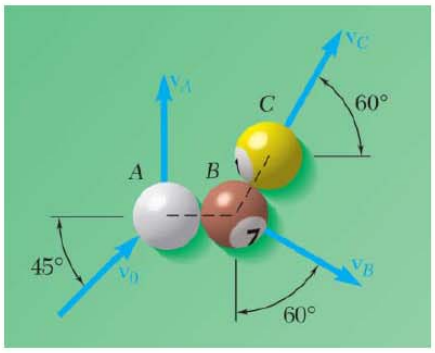
PROBLEM 14.35

Two automobiles A and B, of mass m_A and m_B, respectively, are traveling in opposite directions when they collide head on. The impact is assumed perfectly plastic, and it is further assumed that the energy absorbed by each automobile is equal to its loss of kinetic energy with respect to a moving frame of reference attached to the mass center of the two-vehicle system. Denoting by E_A and E_B, respectively, the energy absorbed by automobile A and by automobile B, (*a*) show that $E_A/E_B = m_B/m_A$, that is, the amount of energy absorbed by each vehicle is inversely proportional to its mass, (*b*) compute E_A and E_B, knowing that $m_A = 1600$ kg and $m_B = 900$ kg and that the speeds of A and B are, respectively, 90 km/h and 60 km/h.



PROBLEM 14.40

A 40-lb block B is suspended from a 6-ft cord attached to a 60-lb cart A, which may roll freely on a frictionless, horizontal track. If the system is released from rest in the position shown, determine the velocities of A and B as B passes directly under A.



PROBLEM 14.42

In a game of pool, ball A is moving with a velocity $\mathbf{v}_0$ of magnitude $v_0 = 15$ ft/s when it strikes balls B and C, which are at rest and aligned as shown. Knowing that after the collision the three balls move in the directions indicated and assuming frictionless surfaces and perfectly elastic impact (that is, conservation of energy), determine the magnitudes of the velocities $\mathbf{v}_A$, $\mathbf{v}_B$ and $\mathbf{v}_C$.