Problems

14.1 Car A of mass 1800 kg and car B of mass 1700 kg are at rest on a 20-Mg flatcar which is also at rest. Cars A and B then accelerate and quickly reach constant speeds relative to the flatcar of 2.35 m/s and 1.175 m/s, respectively, before decelerating to a stop at the opposite end of the flatcar. Neglecting friction and rolling resistance, determine the velocity of the flatcar when the cars are moving at constant speeds.

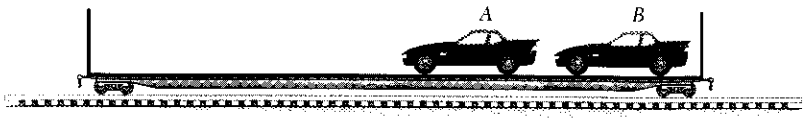

Fig. P14.1 and P14.2

14.2 Car A of mass 1800 kg and car B of mass 1700 kg are at rest on a flatcar which is also at rest. Cars A and B then accelerate and quickly reach constant speeds relative to the flatcar of 2.55 m/s and 2.50 m/s, respectively, before decelerating to a stop at the opposite end of the flatcar. Knowing that the speed of the flatcar is 0.34 m/s when the cars are moving at constant speeds, determine the mass of the flatcar. Neglect friction and rolling resistance.

14.3 An airline employee tosses two suitcases, of weight 30 lb and 40 lb, respectively, onto a 50-lb baggage carrier in rapid succession. Knowing that the carrier is initially at rest and that the employee imparts a 9-ft/s horizontal velocity to the 30-lb suitcase and a 6-ft/s horizontal velocity to the 40-lb suitcase, determine the final velocity of the baggage carrier if the first suitcase tossed onto the carrier is (*a*) the 30-lb suitcase, (*b*) the 40-lb suitcase.

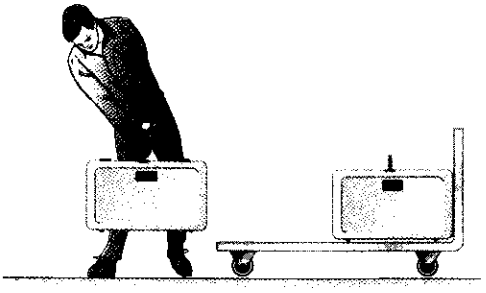

Fig. P14.3 and P14.4

14.4 An airline employee tosses two suitcases in rapid succession, with a horizontal velocity of 7.2 ft/s, onto a 50-lb baggage carrier which is initially at rest. (*a*) Knowing that the final velocity of the baggage carrier is 3.6 ft/s and that the first suitcase the employee tosses onto the carrier has a weight of 30 lb, determine the weight of the other suitcase. (*b*) What would be the final velocity of the carrier if the employee reversed the order in which he tosses the suitcases?

14.5 A bullet is fired with a horizontal velocity of 500 m/s through a 3-kg block A and becomes embedded in a 2.5-kg block B. Knowing that blocks A and B start moving with velocities of 3 m/s and 5 m/s, respectively, determine (*a*) the mass of the bullet, (*b*) its velocity as it travels from block A to block B.

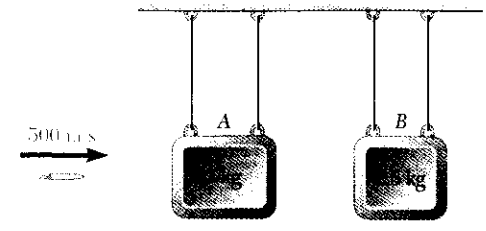

Fig. P14.5