Challenge Exercises for Further Study

B-1: On a hot sumer afternoon, Keith and Nate are out fishing in their rowboat when they decide to jump into the water and go for a swim. Keith, whose mass is 65.0 kg, jumps straight off the front of the boat with a speed of 2.00 m/s relative to the boat, while Nate propels his 68.0-kg body simultaneously off the back of the boat at 4.00 m/s relative to the boat. If the 100.-kg boat is initially traveling forward at 3.00 m/s, what is its velocity after both boys jump?

B-2: Lilly, whose mass is 45.0 kg, is ice skating with a constant speed of 7.00 m/s when she hits a rough patch of ice with a coefficient of friction of 0.0800. How long will it take before Lilly coasts to a stop?

B-3: In a train yard, train cars are rolled down a long hill in order to link them up with other cars as shown. A car of mass 4000. kg starts to roll from rest at the top of a hill 5.0 m high, and inclined at an angle of 5.0° to the horizontal. The coefficient of rolling friction between the train and the track is 0.050. What velocity would the car have if it linked up with 3 identical cars sitting on flat ground at the bottom of the track? (Hint: The equation for rolling friction is just like the one for sliding friction.)