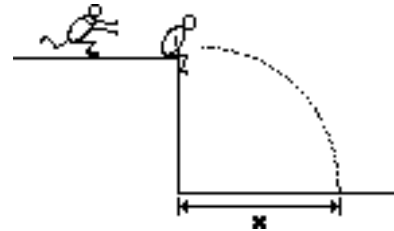


**Momentum Zingers**

1. While doing internet problems, Frieda Inhibitions becomes overwhelmed by rage and hurls her 120-gram Hostess Twinkie at 270 cm/s. The Twinkie plasters itself to a 480-g Coke can and the two objects slide across the table top. If the coefficient of friction between the table top and the Coke can is 0.821, determine the distance that the midnight snack travels before stopping (as though Frieda would want to know). **PSAYW**
2. Jack D. Ripper flipped out after his Health Bar dropped to 0% for the third time on his Minds On Physics mission. Outraged by the futility of his efforts, he flings a 4.8-gram pencil across the room. The pencil lodges into a 344.0-gram Sponge Bob doll which is at rest on a countertop. Once in motion, the pencil/doll combination slide a distance of 33.4 cm across the countertop before stopping. The coefficient of friction between the doll and the countertop is 0.375. Determine the speed at which the pencil is moving prior to striking Sponge Bob. **PSAYW**

3. A 65-kg student is contemplating the poor score just received on a physics test. He sits on the edge of a 22-m high cliff, pondering his bleak future. Just then, his good buddy rushes up from behind at 6.4 m/s to grab him consolingly. (Unfortunately, his buddy did not fair any better on the physics test.) How far will the student and his 58-kg buddy land from the bottom of the cliff?  
**PSAYW**

(HINT: the distance a projectile moves horizontally depends upon the initial horizontal speed and the time of fall:  $x = v_{0x} \cdot t$  and  $y = v_{0y} \cdot t - 0.5 \cdot g \cdot t^2$ )

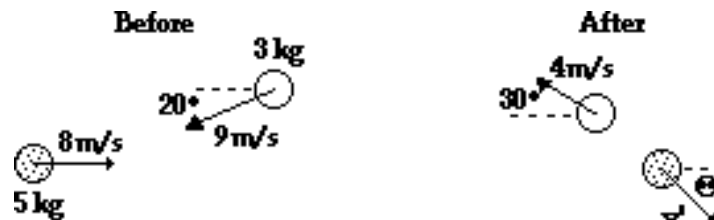


4. A 75-kg man stands in the middle of a frozen pond of radius 14 m. He is unable to reach the other side because of a lack of friction between his shoes and the ice. To overcome his difficulty, he throws his backpack horizontally at a speed of 9.5 m/s toward the north shore. The man reaches the south shore 22 seconds later. Determine the mass of the backpack. **PSAYW**
  
5. A 56-kg boy and a 38-kg girl, both wearing skates face each other at rest on a skating rink. The two skaters push upon each other. When they are done pushing each other, their outstretched arms have positioned them 1.1 meters apart (as measured from the boy's skates to the girl's skates) and have set them into motion. The girl is set into eastward motion with a speed of 5.6 m/s. Determine the distance of separation between the boy and the girl 5.0 seconds after the impulse. (Neglect friction.)
  
6. In a physics lab, the pitching speed of a student is determined by throwing a baseball into a box and observing the box's motion after the catch. A measurement of the the distance the box slides across a rough surface of known coefficient of friction will allow one to determine the pre-impact speed of the pitched ball. If a 0.256-kg ball hits a 3.18-kg box and the ball and box slide a distance of 2.39 meters across a surface with a coefficient of friction of 0.388, then what is the pre-impact speed of the pitched ball?

7. A 88-kg fullback moving south with a speed of 7.6 m/s collides in mid-air with a 72-kg opponent moving west with a speed of 5.4 m/s. The tackle is made and the two players move together with the same speed and direction after the collision. Determine the post-collision velocity (magnitude and direction) of the two players.

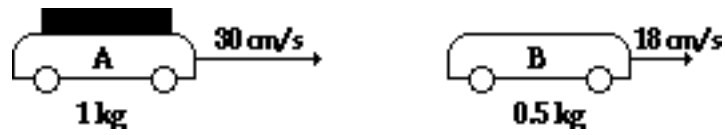
8. Arthur Moore (88 kg) heads for the goal line at 5.4 m/s when he is tackled from the side by Cole deWinters (67 kg) traveling at 3.5 m/s. In what direction (relative to Moore's original line of motion) and with what speed do they move after the collision?

9. A 2-D collision occurs as shown. Find the unknown angle and velocity.



### Elastic Collision Problems

10. Two Pasco carts collide elastically on a low-friction track. Determine their velocities after the collision.



11. Two Pasco carts collide elastically on a low-friction track. Determine their velocities after the collision.

