

## SAMPLE MOMENTUM PROBLEMS

### IMPULSE

A 65-kg person is skiing down a hill. The skier's speed at the bottom is 15 m/s. If the skier hits a stationary snowplow and stops in 0.11 s, with what average force will she feel?

A 25-kg wagon moves eastward at 3.5 m/s. A force acting on the wagon for 4.0 s changes its speed to 1.3 m/s to the west. Calculate (a) the impulse acting on the wagon and (b) the magnitude and direction of the force.

### REGULAR COLLISION

Two soccer balls collide head on. One was going 22 m/s East, and the other 15 m/s. If they both have a mass of 1.2 kg, and the first ball is going 12 m/s West after the collision, how fast is the second ball going after the collision?

A hockey puck ( $m = 0.8$  kg) moving 34 m/s slides into the side of a helmet ( $m = 1.3$  kg) that is at rest on the ice. If the puck is going 12 m/s in the same direction after the collision how fast is the helmet going after the collision?

### INELASTIC COLLISION

A 55.0-kg sailor jumps from a dock into a 100-kg rowboat at rest beside it. If the velocity of the sailor is 5.0 m/s as he leaves the dock, what is the resultant velocity of the sailor and the boat?

A 1250-kg car is stopped at a traffic light. A 3550-kg truck moving at 8.33 m/s crashes into the car from behind. What is the new velocity of the system if the bumpers lock during the collision?

An 85.0-g bullet is shot at a 3.00 kg piece of wood at rest at the edge of a counter 1.20 m high. If the bullet becomes embedded in the block and they travel together at 10 m/s, what was the initial speed of the bullet?

### INITIALLY AT REST

A man (80 kg) on skates stands behind a boy (50 kg) on skates. The man pushes the boy in the back, sending the boy forward. If the boy is moving 12 m/s after the push, how fast is the man going in the opposite direction?