PRACTICE B

Determining Net Force

1. A man is pulling on his dog with a force of 70.0 N directed at an angle of +30.0° to the horizontal. Find the *x* and *y* components of this force.
2. A gust of wind blows an apple from a tree. As the apple falls, the gravitational force on the apple is 2.25 N downward, and the force of the wind on the apple is 1.05 N to the right. Find the magnitude and direction of the net force on the apple.
3. The wind exerts a force of 452 N north on a sailboat, while the water exerts a force of 325 N west on the sailboat. Find the magnitude and direction of the net force on the sailboat.

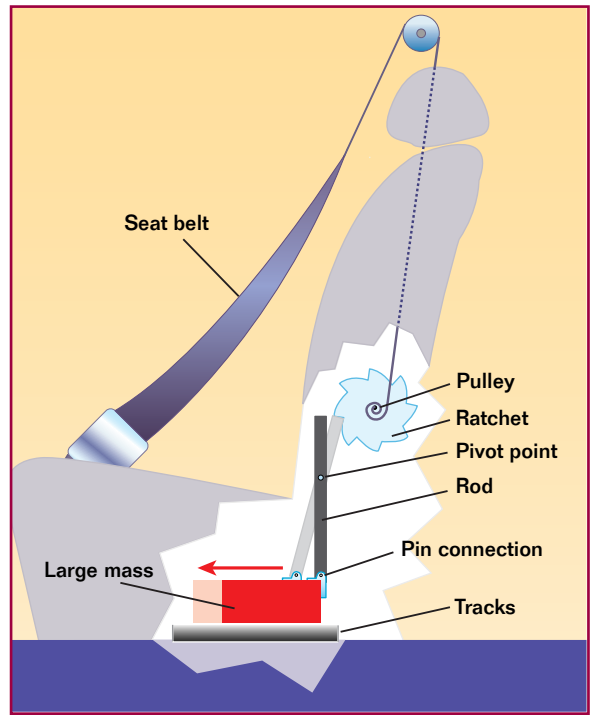
TIP *If there is a net force in both the x and y directions, use vector addition to find the total net force.*

Why it Matters

Seat Belts

The purpose of a seat belt is to prevent serious injury by holding a passenger firmly in place in the event of a collision. A seat belt may also lock when a car rapidly slows down or turns a corner. While inertia causes passengers in a car to continue moving forward as the car slows down, inertia also causes seat belts to lock into place.

The illustration shows how one type of shoulder harness operates. Under normal conditions, the ratchet turns freely to allow the harness to wind or unwind along the pulley. In a collision, the car undergoes a large acceleration and rapidly comes to rest. Because of its inertia, the large mass under the seat continues to slide forward along the tracks, in the direction indicated by the arrow. The pin connection between the mass and the rod causes the rod to pivot and lock the ratchet wheel in place. At this point, the harness no longer unwinds, and the seat belt holds the passenger firmly in place.



When the car suddenly slows down, inertia causes the large mass under the seat to continue moving, which activates the lock on the safety belt.