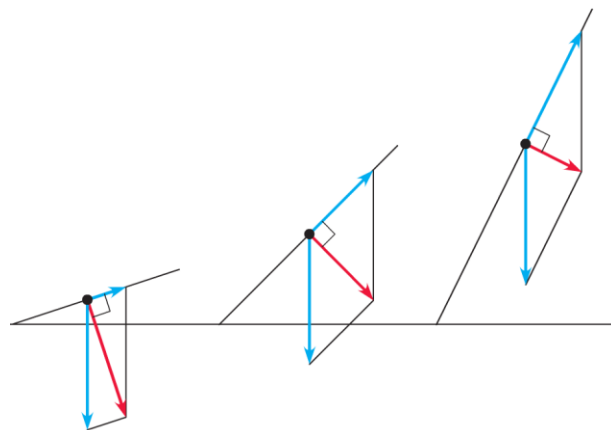


## Applications of Vectors

**Example:** Forces of 2 lb and 12 lb are acting at an angle of  $72^\circ$  to each other. Find the magnitude of the resultant force and the angle between the resultant and each force.

**Example:** The resultant of a 13-lb force and another force has a magnitude of 9 lb at an angle of  $20^\circ$  with the 13-lb force. Find the magnitude of the other force and the angle between the two forces.

**Inclined Plane Problems:** The weight of an object is always modeled as a vertical vector and the force required to move the object is modeled as a vector parallel to the inclined plane. Its length increases as the incline increases. The resultant of these two forces is a vector perpendicular to the inclined plane. It is what a bathroom scale would read if trapped between the object and the plane.

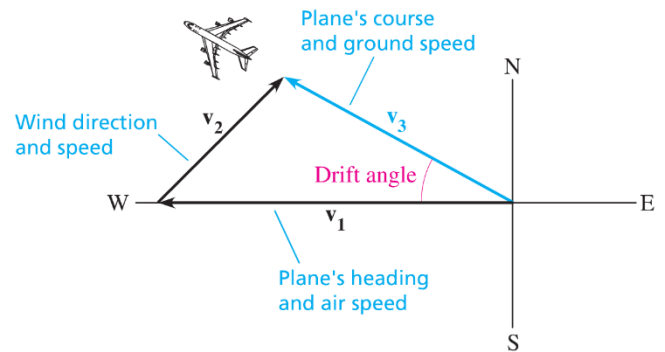


**Example:** Find the amount of force required to push an 800-pound block of ice up a ramp that is inclined  $10^\circ$ .

**Example:** A landscaper uses 100 pounds of force to pull a cart full of rocks up a driveway that is inclined  $15^\circ$ . What is the weight of the cart?

**Example:** If 300 pounds of force is required to push a 1000-pound safe up a ramp, then what is the angle of inclination of the ramp?

**Navigation Problems:** Wind affects the speed and direction of a plane. The **heading** and **air speed** are the direction and speed of the plane before wind is taken into account. The **course** and **ground speed** are the direction and speed of the plane with wind taken into account. The angle between the heading and the course is the **drift angle**.



**Example:** An airplane is headed due east with an air speed of 200 mph. The wind is out of the south (bearing  $0^\circ$ ) at 40 mph. Find the ground speed, the drift angle, and the course of the airplane.

**Example:** An airplane is headed due west with an air speed of 400 mph. The wind is out of the southwest (bearing  $45^\circ$ ) at 90 mph. Find the ground speed, the drift angle, and the course of the airplane.

**Example:** A boat is traveling at 20 mph with a bearing of  $N20^\circ W$ . The current is moving at 4mph with a bearing of  $S40^\circ W$ . Find the boat's true speed, drift angle, and course.