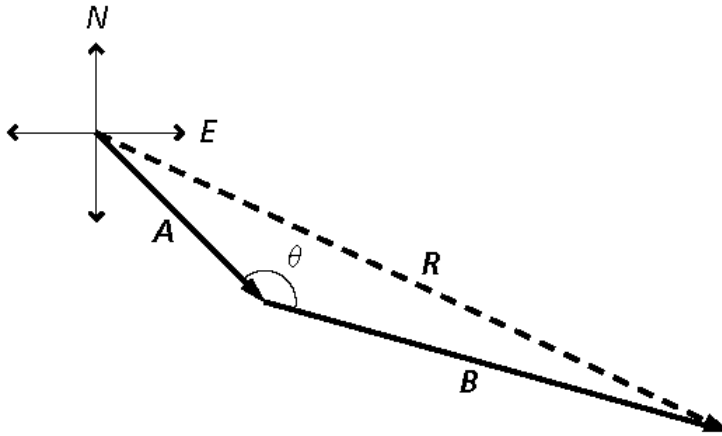


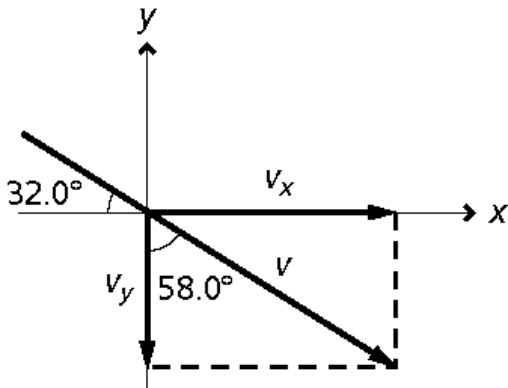
Vectors

Problem

1. A small plane takes off and flies 12.0 km in a direction southeast of the airport. At this point, following the instructions of an air traffic controller, the plane turns 20.0° to the east of its original flight path and flies 21.0 km. What is the magnitude of the plane's resultant displacement from the airport?

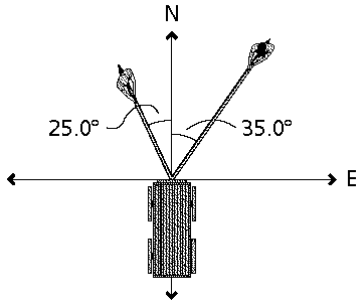


2. A hammer slides down a roof that makes a 32.0° angle with the horizontal. What are the magnitudes of the components of the hammer's velocity at the edge of the roof if it is moving at a speed of 6.25 m/s?

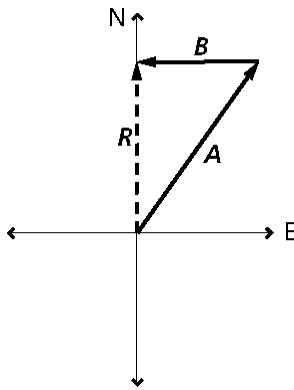


3. A worker has to move a 17.0-kg crate along a flat floor in a warehouse. The coefficient of kinetic friction between the crate and the floor is 0.214. The worker pulls horizontally on a rope attached to the crate, with a 49.0-N force. What is the resultant acceleration of the crate?

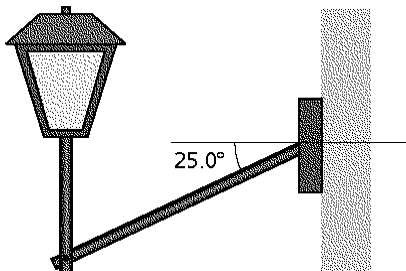
4. To get a cart to move, two farmers pull on ropes attached to the cart, as shown below. One farmer pulls with a force of 50.0 N in a direction 35.0° east of north, while the other exerts a force of 30.0 N in a direction 25.0° west of north. What are the magnitude and the direction of the combined force exerted on the cart?



5. Takashi trains for a race by rowing his canoe on a lake. He starts by rowing along a straight path. Then he turns and rows 260.0 m west. If he then finds he is located 360.0 m exactly north of his starting point, what was his displacement along the straight path?

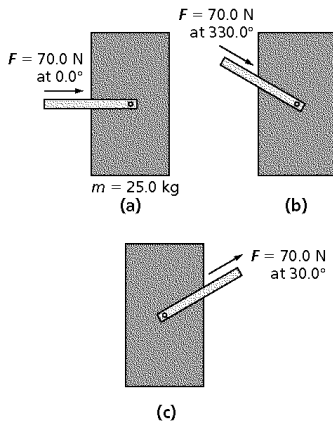


6. Mira received a 235-N sled for her birthday. She takes the sled out to a flat snowy field. When she pushes it with a 45.0-N horizontal force, it slides along at a constant speed. What is the coefficient of kinetic friction between the sled and the snow?
7. A rod supports a 2.35-kg lamp, as shown below.



- What is the magnitude of the tension in the rod?
- Calculate the components of the force that the bracket exerts on the rod.

8. A 25.0-kg crate has an adjustable handle so that it can be pushed or pulled by the handle at various angles. Determine the acceleration of the crate for each situation shown in the diagram, given that the coefficient of sliding friction between the floor and the bottom of the crate is 0.20.



9. A child shoves a small toboggan weighing 100.0 N up a snowy hill, giving the toboggan an initial speed of 6.0 m/s. If the hill is inclined at an angle of 32° above the horizontal, how far along the hill will the toboggan slide? Assume that the coefficient of sliding friction between the toboggan and the snow is 0.15.
10. Two objects are connected by a string passing over a frictionless, massless pulley. As shown below, the block is on an inclined plane and the ball is hanging over the top edge of the plane. The block has a mass of 60.0 kg, and the coefficient of kinetic friction between the block and the inclined plane is 0.22. If the block moves at a constant speed down the incline, and the ball rises at a constant speed, what is the mass of the hanging ball?

