Additional Exercises

A-1: A flock of Canada geese is flying south for the winter. On the first day the geese fly due south a distance of 800. km. On the second day they fly back north 100. km and pause for a couple of days to graze on a sod farm. The last day the geese continue their journey due south, covering a distance of 750. km. a) Draw a vector diagram of the journey and find the total displacement of the geese during this time. b) How does this value differ from the total distance traveled?

A-2: A seal swims toward an inlet with a speed of 5.0 m/s as a current of 1.0 m/s flows in the opposite direction. How long will it take the seal to swim 100. m?

A-3: In Moncton, New Brunswick, each high tide in the Bay of Fundy produces a large surge of water known as a tidal bore. If a riverbed fills with this flowing water that travels north with a speed of 1.0 m/s, what is the resultant velocity of a puffin who tries to swim east across the tidal bore with a speed of 4.0 m/s?

A-4: Lynn is driving home from work and finds that there is road construction being done on her favorite route, so she must take a detour. Lynn travels 5 km north, 6 km east, 3 km south, 4 km west, and 2 km south. a) Draw a vector diagram of the situation. b) What is her displacement? Solve graphically. c) What total distance has Lynn covered?

A-5: Avery sees a UFO out her bedroom window and calls to report it to the police. She says, "The UFO moved 20.0 m east, 10.0 m north, and 30.0 m west before it disappeared." What was the displacement of the UFO while Avery was watching? Solve graphically.

A-6: Eli finds a map for a buried treasure. It tells him to begin at the old oak and walk 21 paces due west, 41 paces at an angle 45° south of west, 69 paces due north, 20 paces due east, and 50 paces at an angle of 53° south of east. How far from the oak tree is the buried treasure? Solve graphically.

A-7: Dwight pulls his sister in her wagon with a force of 65 N at an angle of 50.0° to the vertical. What are the horizontal and vertical components of the force exerted by Dwight?

A-8: Esther dives off the 3-m springboard and initially bounces up with a velocity of 8.0 m/s at an angle of 80.° to the horizontal. What are the horizontal and vertical components of her velocity?

A-9: In many locations, old abandoned stone quarries have become filled with water once excavating has been completed. While standing on a 10.0-m-high quarry wall, Clarence tosses a piece of granite into the water below. If Clarence throws the rock horizontally with a velocity of 3.0 m/s, how far out from the edge of the cliff will it hit the water?

A-10: While skiing, Ellen encounters an unexpected icy bump, which she leaves horizontally at 12.0 m/s. How far out, horizontally, from her starting point will Ellen land if she drops a distance of 7.00 m in the fall?

A-11: The Essex county sheriff is trying to determine the speed of a car that slid off a small bridge on a snowy New England night and landed in a snow pile 4.00 m below the level of the road. The tire tracks in the snow show that the car landed 12.0 m measured horizontally from the bridge. How fast was the car going when it left the road?

A-12: Superman is said to be able to "leap tall buildings in a single bound." How high a building could Superman jump over if he were to leave the ground with a speed of 60.0 m/s at an angle of 75.0° to the horizontal?

A-13: Len is running to school and leaping over puddles as he goes. From the edge of a 1.5-m-long puddle, Len jumps 0.20 m high off the ground with a horizontal velocity component of 3.0 m/s in an attempt to clear it. Determine whether or not Len sits in school all day with wet socks on.

Challenge Exercises for Further Study

B-1: Veronica can swim 3.0 m/s in still water. While trying to swim directly across a river from west to east, Veronica is pulled by a current flowing southward at 2.0 m/s. a) What is the magnitude of Veronica's resultant velocity? b) If Veronica wants to end up exactly across stream from where she began, at what angle to the shore must she swim upstream?

B-2: Solve Practice Exercise A-6 using vector components.

B-3: Mubarak jumps and shoots a field goal from the far end of the court into the basket at the other end, a distance of 27.6 m. The ball is given an initial velocity of 17.1 m/s at an angle of 40.0° to the horizontal from a height of 2.00 m above the ground. What is its velocity as it hits the basket 3.00 m off the ground?

B-4: Drew claims that he can throw a dart at a dartboard from a distance of 2.0 m and hit the 5.0-cm-wide bulls-eye if he throws the dart horizontally with a speed of 15 m/s. He starts the throw at the same height as the top of the bulls-eye. See if Drew is able to hit the bulls-eye by calculating how far his shot falls from the bulls-eye's lower edge.

B-5: Caitlin is playing tennis against a wall. She hits the tennis ball from a height of 0.5 m above the ground with a velocity of 20.0 m/s at an angle of 15.0° to the horizontal toward the wall that is 6.00 m away. a) How far off the ground is the ball when it hits the wall? b) Is the ball still traveling up or is it on its way down when it hits the wall?

B-6: From Chapter 1, Exercise B-6, determine how far from the base of Niagara Falls Annie Taylor landed in her wooden barrel.

A1. a) 1450 km south
   b) 1650 km
A3. 4.1 m/s
   76° east of north
A5. 14.1 m
   45° north of west
A7. Horizontal: 50. N
   Vertical: 42 N
A9. 4.2 m
A11. 13.4 m/s
A13. 1.2 m (does not clear)