32. What is the skier's displacement in problem 31?

33. A speedboat uniformly increases its speed from 25 m/s west to 35 m/s west. How long does it take the boat to travel 250 m west?

34. A ship accelerates at -7.6×10^{-2} m/s^2 so that it comes to rest at the dock 255 m away in 82.0 s. What is the ship's initial speed?

35. A student skates downhill with an average acceleration of 0.85 m/s^2. Her initial speed is 4.5 m/s, and her final speed is 10.8 m/s. How long does she take to skate down the hill?

36. A wrench dropped from a tall building is caught in a safety net when the wrench has a velocity of −49.5 m/s. How far did it fall?

37. A rocket sled comes to a complete stop from a speed of 320 km/h in 0.18 s. What is the sled's average acceleration?

38. A racehorse uniformly accelerates 7.56 m/s^2, reaching its final speed after running 19.0 m. If the horse starts at rest, what is its final speed?

39. An arrow is shot upward at a speed of 85.1 m/s. How long does the archer have to move from the launching spot before the arrow returns to Earth?

40. A handball strikes a wall with a forward speed of 13.7 m/s and bounces back with a speed of 11.5 m/s. If the ball changes velocity in 0.021 s, what is the handball's average acceleration?

41. A ball accelerates at 6.1 m/s^2 from 1.8 m/s to 9.4 m/s. How far does the ball travel?

42. A small sandbag is dropped from rest from a hovering hot-air balloon. After 2.0 s, what is the sandbag's displacement below the balloon?

43. A hippopotamus accelerates at 0.678 m/s^2 until it reaches a speed of 8.33 m/s. If the hippopotamus runs 46.3 m, what was its initial speed?

44. A ball is hit upward with a speed of 7.5 m/s. How long does the ball take to reach maximum height?

45. A surface probe on the planet Mercury falls 17.6 m downward from a ledge. If free-fall acceleration near Mercury is −3.70 m/s^2, what is the probe's velocity when it reaches the ground?

Chapter 3 Two-Dimensional Motion and Vectors

46. A plane moves 599 m northeast along a runway. If the northern component of this displacement is 89 m, how large is the eastern component?

47. Find the displacement direction in problem 46.

48. A train travels 478 km southwest along a straight stretch. If the train is displaced south by 42 km, what is the train's displacement to the west?

49. Find the displacement direction in problem 48.

50. A ship's total displacement is 7400 km at 26° south of west. If the ship sails 3200 km south, what is the western component of its journey?

51. The distance from an observer on a plain to the top of a nearby mountain is 5.3 km at 8.4° above the horizontal. How tall is the mountain?

52. A skyrocket travels 113 m at an angle of 82.4° with respect to the ground and toward the south. What is the rocket's horizontal displacement?

53. A hot-air balloon descends with a velocity of 55 km/h at an angle of 37° below the horizontal. What is the vertical velocity of the balloon?

54. A stretch of road extends 55 km at 37° north of east, then continues for 66 km due east. What is a driver's resultant displacement along this road?

55. A driver travels 4.1 km west, 17.3 km north, and finally 1.2 km at an angle of 24.6° west of north. What is the driver's displacement?

56. A tornado picks up a car and hurls it horizontally 125 m with a speed of 90.0 m/s. How long does it take the car to reach the ground?

57. A squirrel knocks a nut horizontally at a speed of 10.0 cm/s. If the nut lands at a horizontal distance of 18.6 cm, how high up is the squirrel?

58. A flare is fired at an angle of 35° to the ground at an initial speed of 250 m/s. How long does it take for the flare to reach its maximum altitude?

59. A football kicked with an initial speed of 23.1 m/s reaches a maximum height of 16.9 m. At what angle was the ball kicked?

60. A bird flies north at 58.0 km/h relative to the wind. The wind is blowing at 55.0 km/h south relative to Earth. How long will it take the bird to fly 1.4 km relative to Earth?

61. A race car moving at 286 km/h is 0.750 km behind a car moving at 252 km/h. How long will it take the faster car to catch up to the slower car?

62. A helicopter flies 165 m horizontally and then moves downward to land 45 m below. What is the helicopter's resultant displacement?

63. A toy parachute floats 13.0 m downward. If the parachute travels 9.0 m horizontally, what is the resultant displacement?