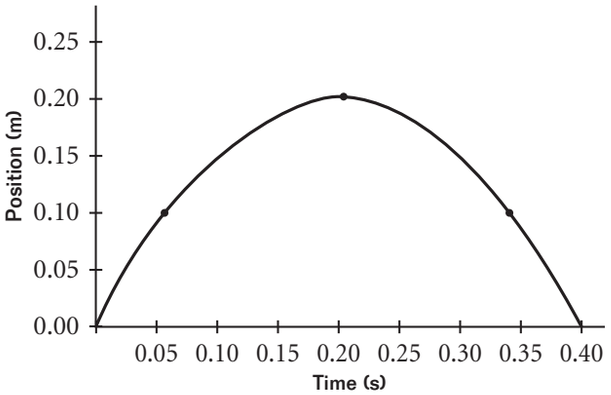
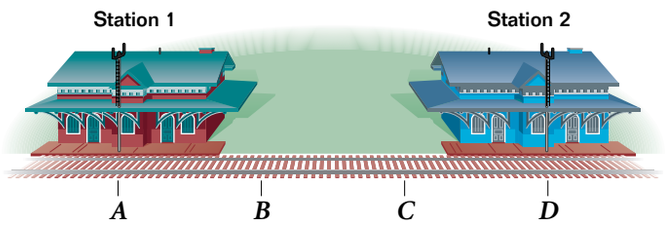
34. A ball is thrown directly upward into the air. The graph below shows the vertical position of the ball with respect to time.

- **a.** How much time does the ball take to reach its maximum height?
- **b.** How much time does the ball take to reach one-half its maximum height?
- **c.** Estimate the slope of $\Delta y/\Delta t$ at $t = 0.05$ s, $t = 0.10$ s, $t = 0.15$ s, and $t = 0.20$ s. On your paper, draw a coordinate system with velocity (v) on the y-axis and time (t) on the x-axis. Plot your velocity estimates against time.
- **d.** From your graph, determine what the acceleration on the ball is.



35. A train travels between stations 1 and 2, as shown below. The engineer of the train is instructed to start from rest at station 1 and accelerate uniformly between points *A* and *B*, then coast with a uniform velocity between points *B* and *C*, and finally accelerate uniformly between points *C* and *D* until the train stops at station 2. The distances *AB*, *BC*, and *CD* are all equal, and it takes 5.00 min to travel between the two stations. Assume that the uniform accelerations have the same magnitude, even when they are opposite in direction.



- **a.** How much of this 5.00 min period does the train spend between points *A* and *B*?
- **b.** How much of this 5.00 min period does the train spend between points *B* and *C*?
- **c.** How much of this 5.00 min period does the train spend between points *C* and *D*?

36. Two students are on a balcony 19.6 m above the street. One student throws a ball vertically downward at 14.7 m/s. At the same instant, the other student throws a ball vertically upward at the same speed. The second ball just misses the balcony on the way down.

- **a.** What is the difference in the time the balls spend in the air?
- **b.** What is the velocity of each ball as it strikes the ground?
- **c.** How far apart are the balls 0.800 s after they are thrown?

37. A rocket moves upward, starting from rest with an acceleration of +29.4 m/s^2 for 3.98 s. It runs out of fuel at the end of the 3.98 s but does not stop. How high does it rise above the ground?

38. Two cars travel westward along a straight highway, one at a constant velocity of 85 km/h, and the other at a constant velocity of 115 km/h.

- **a.** Assuming that both cars start at the same point, how much sooner does the faster car arrive at a destination 16 km away?
- **b.** How far must the cars travel for the faster car to arrive 15 min before the slower car?

39. A small first-aid kit is dropped by a rock climber who is descending steadily at 1.3 m/s. After 2.5 s, what is the velocity of the first-aid kit, and how far is the kit below the climber?

40. A small fish is dropped by a pelican that is rising steadily at 0.50 m/s.

- **a.** After 2.5 s, what is the velocity of the fish?
- **b.** How far below the pelican is the fish after 2.5 s?

41. A ranger in a national park is driving at 56 km/h when a deer jumps onto the road 65 m ahead of the vehicle. After a reaction time of t s, the ranger applies the brakes to produce an acceleration of −3.0 m/s^2. What is the maximum reaction time allowed if the ranger is to avoid hitting the deer?

34. **a.** 0.20 s
b. 0.06 s and 0.34 s
c. Answers may vary slightly but should be close to the following:
$t = 0.05$ s, $v = 2$ m/s
$t = 0.10$ s, $v = 1$ m/s
$t = 0.15$ s, $v = 0.5$ m/s
$t = 0.20$ s, $v = 0$ m/s
d. Answers will vary but should be near −10 m/s^2.

35. **a.** 2.00 min
b. 1.00 min
c. 2.00 min

36. **a.** 3.0 s
b. −24.5 m/s for each
c. 23.6 m

37. 931 m

38. **a.** 0.05 h
b. 81 km

39. −26 m/s; 31 m

40. **a.** −24 m/s
b. 31 m

41. 1.6 s