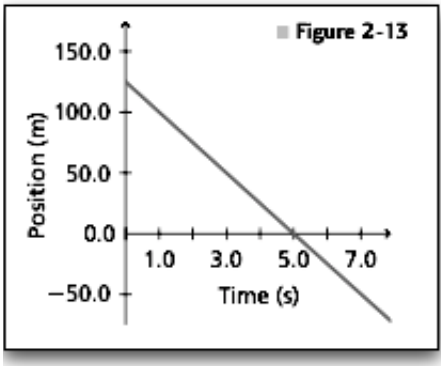
Problems 1 & 2 refer to Figure 2-13.



1. Describe the motion of the car shown by the graph

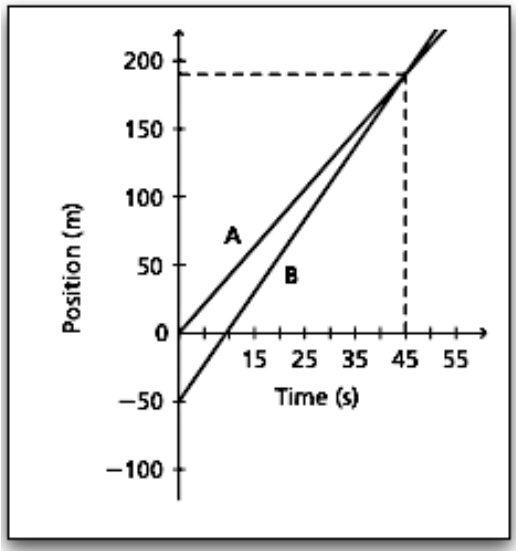
2. Answer the following questions about the car's motion. Assume that the positive direction is east and the negative direction is west.

   A) When was the car 25.0 m east of the origin?

   B) Where was the car at 1.0 s?

3. A student walked down the hall at school from the cafeteria to the band room, a distance of 100.0 m. A class of physics students recorded and graphed her position every 2.0 s, noting that she moved 2.6 m every 2.0 s. When was she in the following positions?
   a. 25.0 m from the cafeteria
   b. 25.0 m from the band room
   c. Create a graph showing her motion.

Problems 4 to 7 refer to Figure 2-13.



4. Which runner was ahead at t = 480 s?

5. When runner A was at 0.0 m, where was runner B?

6. How far apart were runners A and B at t = 20 s?

7. What is the velocity of runner A?

Problems 8 refers to Figure 2-16.

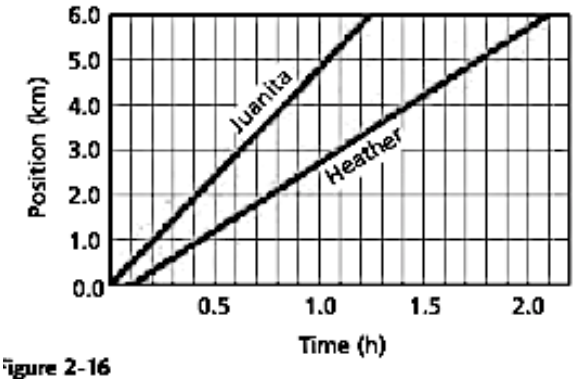


Figure 2-16

8. Juanita goes for a walk. Sometime later, her friend Heather starts to walk after her. Their motions are represented by the position-time graphs in Figure 2-16.

   A) In seconds, how long had Juanita been walking when Heather started her walk?

   B) Will Heather catch up to Juanita? How can you tell?

   C) What was Heather's average velocity?

Constant Velocity

9. The speed of light is 3×10^8 m/s. Light from the Sun reaches Earth in 8.3 min. How far is Earth from the Sun?

10. A car is moving down a street at 55 km/h. A child suddenly runs into the street. If it takes the driver 0.75 s to react and apply the brakes, how many meters will the car have moved before it begins to slow down?

11. * You plan a car trip for which you want to average 90 km/h. You cover the first half of the distance at an average speed of only 48 km/h. What must your average speed be in the second half of the trip to meet your goal? Is this reasonable? Hint: determine where and when the first half trip ends, then what has to happen in the second part for the right average.

Acceleration

12. A race car's velocity increases from 4.0 m/s to 36 m/s over a 4.0 s time interval. What is its average acceleration?

13. The race car in the previous problem slows from 36 m/s to 15 m/s over 3.0 s. What is its average acceleration?

14. A bus is moving at 25 m/s when the driver steps on the brakes and brings the bus to a stop in 3.0 s.
    A) What is the average acceleration of the bus while braking?
    B) If the bus took twice as long to stop, how would the acceleration compare with what you found in part a?

Acceleration (time)

15. A golf ball rolls up a hill toward a miniature-golf hole. Assume that the direction toward the hole is positive.
    A) If the golf ball starts with a speed of 2.0 m/s and slows at a constant rate of 0.50 m/s^2, what is its velocity after 2.0 s?

    B) What is the golf ball's velocity if the constant acceleration continues for 6.0 s?

16. A bus that is traveling at 30.0 km/h speeds up at a constant rate of 3.5 m/s^2. What velocity does it reach 6.8 s later?

17. If a car accelerates from rest at a constant 5.5 m/s^2, how long will it take for the car to reach a velocity of 28 m/s?

18. A car slows from 22 m/s to 3.0 m/s at a constant rate of 2.1 m/s^2. How many seconds are required before the car is traveling at 3.0 m/s?

19. A skateboarder is moving at a constant velocity of 1.75 m/s when she starts up an incline that causes her to slow down with a constant acceleration of - 0.20 m/s^2. How much time passes from when she begins to slow down until she begins to move back down the incline?

Acceleration (time)

20. A race car travels on a racetrack at 44 m/s and slows at a constant rate to a velocity of 22 m/s over 11 s. How far does it move during this time?

21. A car accelerates at a constant rate from 15 m/s to 25 m/s while it travels a distance of 125 m. How long does it take to achieve this speed?

22. A bike rider pedals with constant acceleration to reach a velocity of 7.5 m/s over a time of 4.5 s. During the period of acceleration, the bike's displacement is 19 m. What was the initial velocity of the bike?

23. Find the uniform acceleration that causes a car's velocity to change from 32 m/s to 96 m/s in an 8.0 s period.

Acceleration (mixed)

24. A car with a velocity of 22 m/s is accelerated uniformly at the rate of 1.6 m/s^2 for 6.8 s. What is its final velocity?

25. A dragster starting from rest accelerates at 49 m/s^2. How fast is it going when it has traveled 325 m?

26. A race car can be slowed with a constant acceleration of -11 m/s^2.
    A) If the car is going 55 m/s, how many meters will it travel before it stops?
    B) How many meters will it take to stop a car going twice as fast?

27. How far does a plane fly in 15 s while its velocity is changing from 145 m/s to 75 m/s at a uniform rate of acceleration?

Using Gravity ($g = -9.8\ m/s^2$)

28. A construction worker accidentally drops a brick from a high scaffold.
    A) What is the velocity of the brick after 4.0 s?

    B) How far does the brick fall during this time?

29. A student drops a ball from a window 3.5 m above the sidewalk. How fast is it moving when it hits the sidewalk?

30. A tennis ball is thrown straight up with an initial speed of 22.5 m/s. It is caught at the same distance above the ground.
    A) How high does the ball rise?

    B) How long does the ball remain in the air? Hint: The time it takes the ball to rise equals the time it takes to fall.

31. You decide to flip a coin to determine whether to do your physics or English homework first. The coin is flipped straight up.
    A) If the coin reaches a high point of 0.25 m above where you released it, what was its initial speed?

    B) If you catch it at the same height as you released it, how much time did it spend in the air?

More Practice

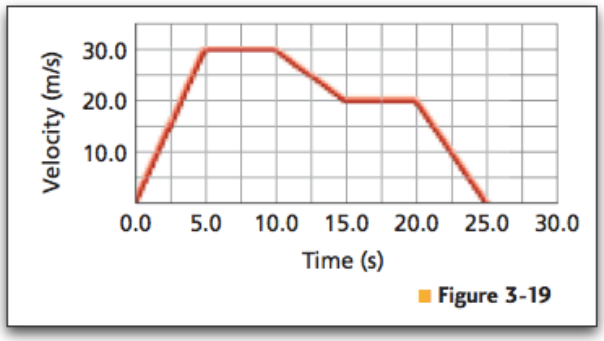


Figure 3-19

32. Use Figure 3-19 to find the acceleration of the moving object at each of the following times.

A) during the first 5.0 s of travel
B) between 5.0 s and 10.0 s
C) between 10.0 s and 15.0 s
D) between 20.0 s and 25.0 s

33. Marco is looking for a used sports car. He wants to buy the one with the greatest acceleration.

Car A can go from 0 m/s to 17.9 m/s in 4.0 s;
Car B can accelerate from 0 m/s to 22.4 m/s in 3.5 s;
Car C can go from 0 to 26.8 m/s in 6.0 s.

Rank the three cars from greatest acceleration to least, specifically indicating any ties.

34. A dragster starting from rest accelerates at 49 m/s^2. How fast is it going when it has traveled 325 m?

35. A race car can be slowed with a constant acceleration of -11 m/s^2.
A) If the car is going 55 m/s, how many meters will it travel before it stops?

B) How many meters will it take to stop a car going twice as fast?

36. How far does a plane fly in 15 s while its velocity is changing from 145 m/s to 75 m/s at a uniform rate of acceleration?

37. Suppose an astronaut drops a feather from 1.2 m above the surface of the Moon. If the acceleration due to gravity on the Moon is 1.62 m/s^2 downward, how long does it take the feather to hit the Moon's surface?

38. A stone that starts at rest is in free fall for 8.0 s.
    A) Calculate the stone's velocity after 8.0 s.

    B) What is the stone's displacement during this time?

39. A bag is dropped from a hovering helicopter. The bag has fallen for 2.0 s.
    A) What is the bag's velocity?

    B) How far has the bag fallen?

40. You throw a ball downward from a window at a speed of 2.0 m/s. How fast will it be moving when it hits the sidewalk 2.5 m below?