

3 Describing Motion

Practice Problems

3.1 Picturing Motion pages 44–46

No practice problems.

3.2 Where and When? pages 47–51

No practice problems.

3.3 Velocity and Acceleration pages 53–59

No practice problems.

Chapter Review Problems

page 61

Create pictorial and physical models for the following problems.

Section 3.3

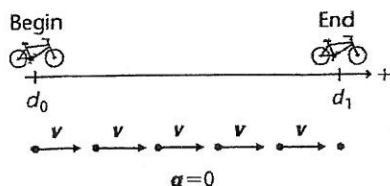
Level 1

17. A bike travels at a constant speed of 4.0 m/s for 5 s. How far does it go?

$$v_0 = 4.0 \text{ m/s} \quad v_1 = 4.0 \text{ m/s}$$

$$d_0 = 0 \text{ m} \quad d_1 = ?$$

$$t_0 = 0 \text{ s} \quad t_1 = 5 \text{ s}$$

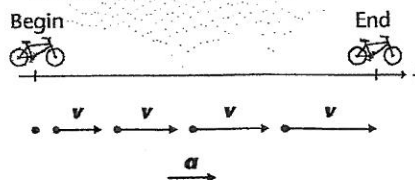


18. A bike accelerates from 0.0 m/s to 4.0 m/s in 4 s. What distance does it travel?

$$v_0 = 0 \text{ m/s} \quad v_1 = 4.0 \text{ m/s}$$

$$d_0 = 0 \text{ m} \quad d_1 = ?$$

$$t_0 = 0 \text{ s} \quad t_1 = 4 \text{ s}$$

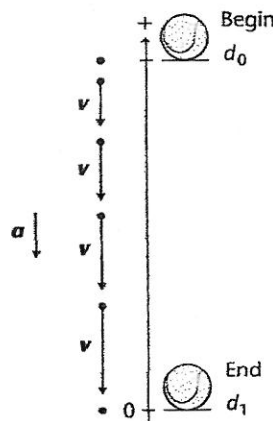


19. A student drops a ball from a window 3.5 m above the sidewalk. The ball accelerates at 9.80 m/s^2 . How fast is it moving when it hits the sidewalk?

$$d_0 = 3.5 \text{ m} \quad d_1 = 0$$

$$v_0 = 0 \quad v_1 = ?$$

$$a = -9.80 \text{ m/s}^2$$



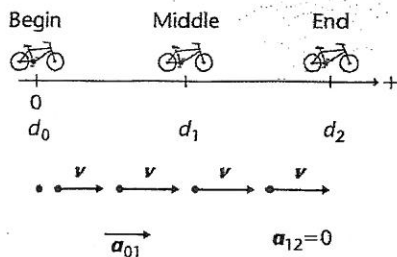
Level 2

20. A bike first accelerates from 0.0 m/s to 5.0 m/s in 4.5 s, then continues at this constant speed for another 4.5 s. What is the total distance traveled by the bike?

$$t_0 = 0 \quad t_1 = 4.5 \text{ s} \quad t_2 = 4.5 \text{ s} + 4.5 \text{ s} \\ = 9.0 \text{ s}$$

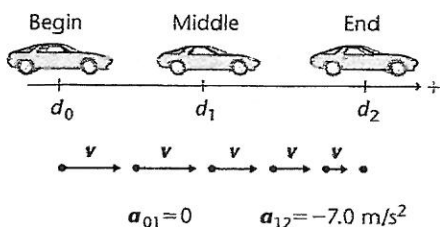
$$v_0 = 0.0 \quad v_1 = 5.0 \text{ m/s} \quad v_2 = 5.0 \text{ m/s}$$

$$d_0 = 0 \quad d_2 = ?$$



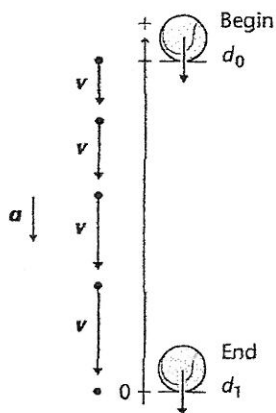
21. A car is traveling 20 m/s when the driver sees a child standing in the road. He takes 0.8 s to react, then steps on the brakes and slows at 7.0 m/s². How far does the car go before it stops?

$$\begin{array}{lll}
 a_{01} = 0 & a_{12} = -7.0 \text{ m/s}^2 \\
 v_0 = 20 \text{ m/s} & v_1 = 20 \text{ m/s} & v_2 = 0 \\
 t_0 = 0 & t_1 = 0.8 \text{ s} & t_2 = ? \\
 & & d_2 = ?
 \end{array}$$



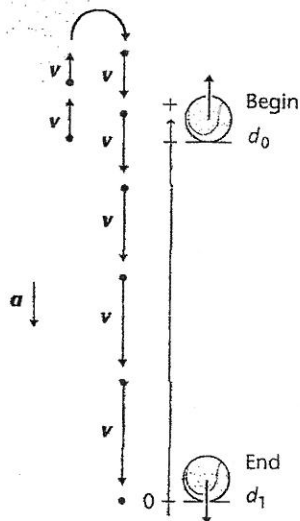
22. You throw a ball downward from a window at a speed of 2.0 m/s. The ball accelerates at 9.80 m/s². How fast is it moving when it hits the sidewalk 2.5 m below?

$$\begin{array}{ll}
 d_0 = 2.5 \text{ m} & d_1 = 0 \text{ m} \\
 v_0 = -2.0 \text{ m/s} & v_1 = ? \\
 & a = -9.80 \text{ m/s}^2
 \end{array}$$



23. If you throw the ball in problem 22 up instead of down, how fast is it moving when it hits the sidewalk? **Hint:** Its acceleration is the same whether it is moving up or down.

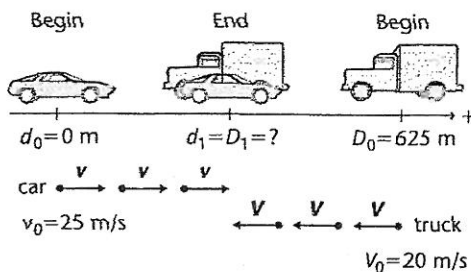
$$\begin{array}{ll}
 d_0 = 2.5 \text{ m} & d_1 = 0 \text{ m} \\
 v_0 = 2.0 \text{ m/s} & v_1 = ? \\
 & a = -9.80 \text{ m/s}^2
 \end{array}$$



Critical Thinking Problems

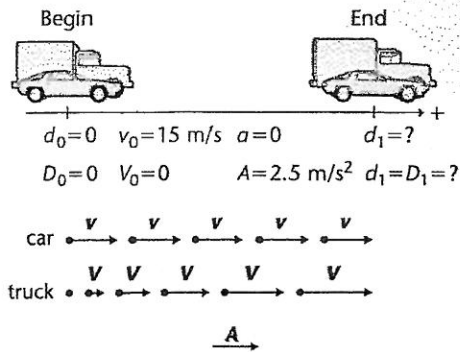
Each of the following problems involves two objects. Draw the pictorial and physical models for each. Use different symbols to represent the position, velocity, and acceleration of each object. Do not solve the problem.

24. A car is traveling 25 m/s to the east, while a truck, initially 625 m away, is moving at 20 m/s to the west along the same road. Where do they meet?



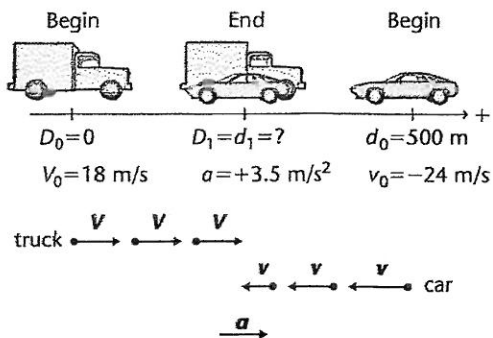
The lowercase symbols represent the car's position, velocity, and acceleration. The uppercase symbols represent the truck's position, velocity, and acceleration.

25. A truck is stopped at a stoplight. When the light turns green, it accelerates at 2.5 m/s^2 . At the same instant, a car passes the truck going 15 m/s . Where and when does the truck catch up with the car?



The lowercase symbols represent the car's position, velocity, and acceleration. The uppercase symbols represent the truck's position, velocity, and acceleration.

26. A truck is traveling at 18 m/s to the north. The driver of a car, 500 m to the north and traveling south at 24 m/s , puts on the brakes and slows at 3.5 m/s^2 . Where do they meet?



The lowercase symbols represent the car's position, velocity, and acceleration. The uppercase symbols represent the truck's position, velocity, and acceleration.

