

## PRACTICE PROBLEMS

- 27.** The graph in **Figure 21** describes the motion of a cruise ship drifting slowly through calm waters. The positive  $x$ -direction (along the vertical axis) is defined to be south.
- What is the ship's average speed?
  - What is its average velocity?

- 0.3 m/s
- The average velocity is the slope of the line, including the sign, so it is  $-0.3$  m/s or 0.3 m/s north.

- 28.** Describe, in words, the cruise ship's motion in the previous problem.

The ship is moving north at a speed of 0.3 m/s.

- 29.** What is the average velocity of an object that moves from 6.5 cm to 3.7 cm relative to the origin in 2.3 s?

$-1.2$  cm/s

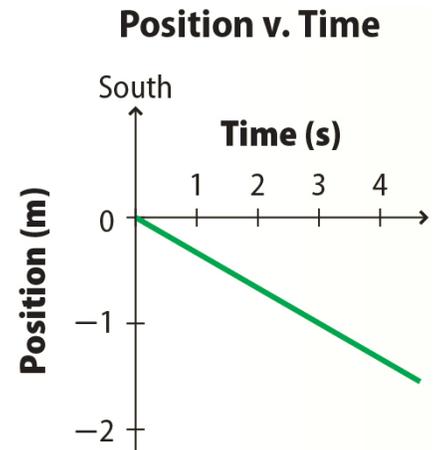
- 30.** The graph in **Figure 22** represents the motion of a bicycle.
- What is the bicycle's average speed?
  - What is its average velocity?

- 0.7 km/min
- 0.7 km/min in the positive direction

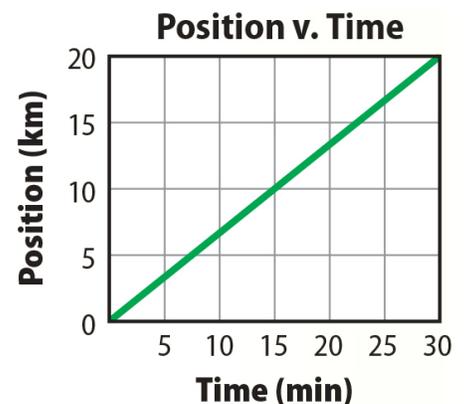
- 31.** Describe, in words, the bicycle's motion in the previous problem.

The bicycle is moving in the positive direction at a speed of 0.7 km/min.

- 32. CHALLENGE** When Marshall takes his pet dog for a walk, the dog walks at a very consistent pace of 0.55 m/s. Draw a motion diagram and a position-time graph to represent Marshall's dog walking the 19.8-m distance from in front of his house to the nearest stop sign.



**Figure 21**

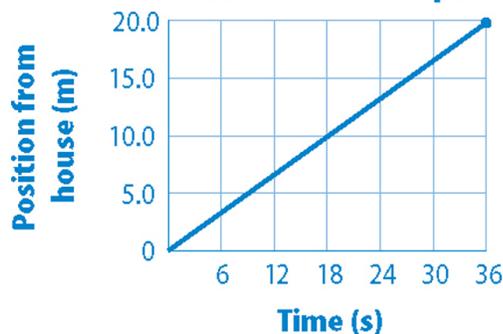


**Figure 22**

### Motion Diagram



### Position-Time Graph



### GET IT?

**Explain** how average velocity is different from velocity.

Average velocity is determined by dividing the difference in the final and initial velocities by the time interval. It does not take into account any changes in velocity during the time interval. Instantaneous velocity is the velocity of an object at a specific moment in time.



### GET IT?

**Identify** what the lengths of velocity vectors mean.

Lengths of velocity vectors indicate the speed of the object compared to the speed of other objects.

### PRACTICE PROBLEMS

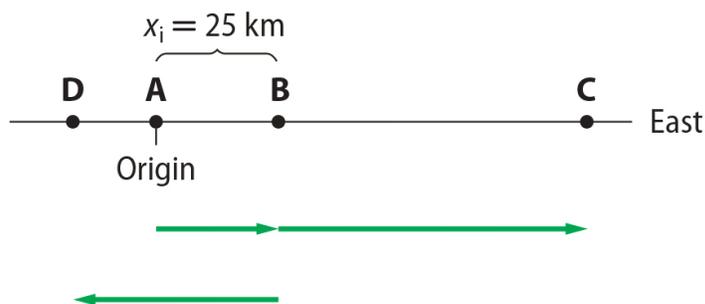
For problems 33-36, refer to **Figure 24**.

- 33.** The diagram at the right shows the path of a ship that sails at a constant velocity of 42 km/h east. What is the ship's position when it reaches point **C**, relative to the starting point, **A**, if it sails from point **B** to point **C** in exactly 1.5 h?

88 km east

- 34.** Another ship starts at the same time from point **B**, but its average velocity is 58 km/h east. What is its position, relative to **A**, after 1.5 h?

$1.1 \times 10^2$  km east



**Figure 24**

35. What would a ship's position be if that ship started at point **B** and traveled at an average velocity of 35 km/h west to point **D** in a time period of 1.2 h?

17 km west

36. **CHALLENGE** Suppose two ships start from point **B** and travel west. One ship travels at an average velocity of 35 km/h for 2.2 h. Another ship travels at an average velocity of 26 km/h for 2.5 h. What is the final position of each ship?

52 km west and  $4.0 \times 10^1$  km west

## **REVIEW IT! How Fast?**

### **TEKS 4(A), 4(B)**

37. **MAIN IDEA** How is an object's velocity related to its position?

An object's velocity is the rate of change in its position.

For problems 38-40, refer to **Figure 25**.

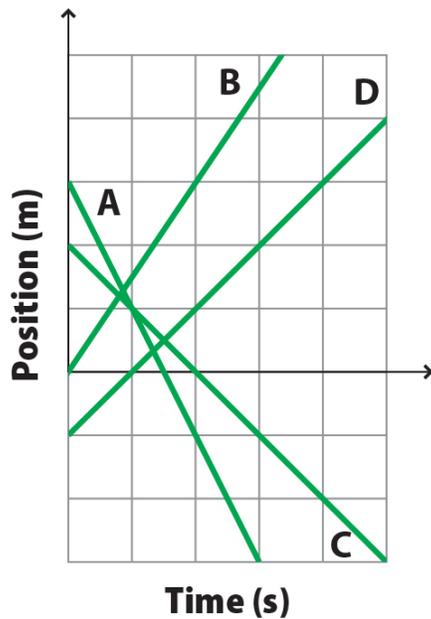
38. **Ranking Task** Rank the position-time graphs according to the average speed, from greatest average speed to least average speed. Specifically indicate any ties.

A, B, C = D

39. **Contrast Average Velocities** Describe differences in the average velocities shown on the graph for objects A and B. Describe differences in the average velocities shown on the graph for objects C and D.

The magnitude of the average velocity of A is greater than that of B, but the average velocity of A is negative, and the average velocity of B is positive. The magnitudes of the average velocities of C and D are equal, but the average velocity of D is positive, and the average velocity of C is negative.

40. **Ranking Task** Rank the graphs in **Figure 25** according to each object's initial position, from most positive position to most negative position. Specifically indicate any ties. Would your ranking be different if you ranked according to initial distance from the origin?



**Figure 25**

A, C, B, D. Yes; the ranking from greatest to least distance would be A, C, D, B.

- 41. Average Speed and Average Velocity** Explain how average speed and average velocity are related to each other for an object in uniform motion.

Average speed is the absolute value of the average velocity if an object is in uniform motion.