Name _____ Class _____ Date _____

Chapter 11 Motion

Section 11.1 Distance and Displacement

(pages 328–331)

This section defines distance and displacement. Methods of describing motion are presented. Vector addition and subtraction are introduced.

Reading Strategy (page 328)

Predicting Write a definition for *frame of reference* in your own words in the left column of the table. After you read the section, compare your definition to the scientific definition and explain why a frame of reference is important. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Frame of Reference	
Frame of reference probably means	**Frame of reference actually means**

1. What two things must you know to describe the motion of an object?

Choosing a Frame of Reference (pages 328–329)

2. Is the following sentence true or false? A frame of reference is not necessary to describe motion accurately and completely. _____
3. What is a frame of reference? _____
4. Movement in relation to a frame of reference is called _____.
5. Imagine that you are a passenger in a car. Circle the letter of the best frame of reference you could use to determine how fast the car is moving relative to the ground.
   a. the people sitting next to you in the backseat
   b. the driver of the car
   c. a van traveling in the lane next to your car
   d. a sign post on the side of the road

Measuring Distance (page 329)

6. Distance is _____.
7. Circle the letter of the SI unit best suited for measuring the length of a room in your home.
   a. kilometers b. meters
   c. centimeters d. millimeters

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Measuring Displacements (page 330)

8. Is the following sentence true or false? Five blocks south is an example of a displacement. _____

9. Compare and contrast distance and displacement. _____

_____

_____

10. What would your total displacement be if you walked from your front door, around the block, and then stopped when you reached your front door again?

a. one block b. two blocks

c. the entire distance of your trip d. zero

Combining Displacements (pages 330–331)

11. A vector is a quantity that has both _____ and _____.

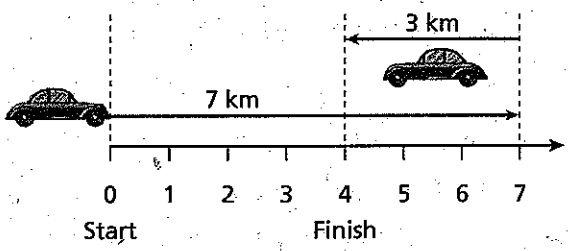
12. Circle the letter of each answer that could describe the magnitude of a vector.

a. length b. direction

c. amount d. size

13. To combine two displacements that are in opposite directions, the magnitudes _____ from one another.

For questions 14 and 15, refer to the figure below.



14. The magnitudes of the two displacement vectors are _____ and _____.

15. Because the two displacements are in opposite directions, the magnitude of the total displacement is _____.

16. Circle the letter that answers the question. What is the displacement of a cyclist who travels 1 mile north, then 1 mile east, and finally 1 mile south?

a. 3 miles east b. 1 mile north

c. 3 miles south d. 1 mile east

17. The vector sum of two or more other vectors is called the _____.

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Section 11.2 Speed and Velocity
(pages 332–337)

This section defines and compares speed and velocity. It also describes how to calculate average speed.

Reading Strategy (page 332)

Monitoring Your Understanding After you read this section, identify several things you have learned that are relevant to your life. Explain why they are relevant to you. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Facts About Speed and Velocity	
What Is Important	**Why It Is Important**

Speed (pages 332–334)

1. Define speed. _____

2. The SI units for speed are _____.

3. How is instantaneous speed different from average speed? _____

4. The equation used for calculating average speed is _____.

5. Is the following sentence true or false? You can determine how fast you were going at the midpoint of a trip by calculating average speed for the entire trip. _____

6. A student walked 1.5 km in 25 minutes, and then, realizing he was late, ran the remaining 0.5 km in 5 minutes. Calculate his average speed on the way to school.

_____

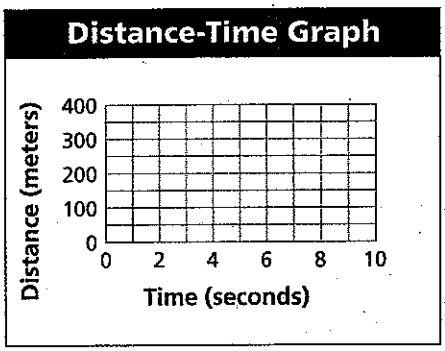
7. What type of speed does an automobile's speedometer display?

_____

Graphing Motion (page 334)

8. The slope of a line on a distance-time graph represents _____.

For questions 9 through 11, refer to the graph below.



9. Draw a point on the graph that represents 200 m traveled in 4 seconds. Draw a line connecting this point with the origin (0,0). Label this as line A.
10. Draw a point on the graph that represents 100 m traveled in 10 seconds. Draw a line connecting this point with the origin (0,0). Label this as line B.
11. Calculate the average speed (slope) of lines A and B. Be sure to include units.

Velocity (page 336)

12. How do speed and velocity differ? _____

_____

13. Circle the letter of each sentence that describes a change in velocity.
    a. A moving object gains speed.
    b. A moving object changes direction.
    c. A moving object moves in a straight line at a constant speed.
    d. A moving object slows down.
14. Is the following sentence true or false? If a car travels around a gentle curve on a highway at 60 km/h, the velocity does not change. _____

Combining Velocities (page 337)

15. How do velocities combine? _____
16. A river flows at a velocity of 3 km/h relative to the riverbank. A boat moves upstream at a velocity of 15 km/h relative to the river. What is the velocity of the boat relative to the riverbank?
    a. 18 km/h downstream
    b. 15 km/h upstream
    c. 12 km/h upstream
    d. 12 km/h downstream

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Chapter 11 Motion

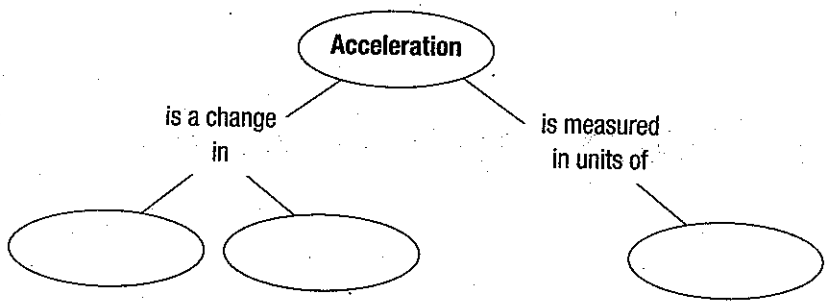
Section 11.3 Acceleration

(pages 342–348)

This section describes the relationships among speed, velocity, and acceleration. Examples of these concepts are discussed. Sample calculations of acceleration and graphs representing accelerated motion are presented.

Reading Strategy (page 342)

Summarizing Read the section on acceleration. Then complete the concept map to organize what you know about acceleration. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



What Is Acceleration? (pages 342–345)

1. The rate at which velocity changes is called _____.
2. In terms of speed and direction, in what ways can an object accelerate? _____
   _____
3. Because acceleration is a quantity that has both magnitude and direction, it is a(n) _____.
4. Is the following sentence true or false? Acceleration is the result of increases or decreases in speed. _____
5. Ignoring air resistance, a rock in free fall will have a velocity of _____ after 4.0 seconds.
6. A horse on a carousel that is moving at a constant speed is accelerating because _____.
7. Describe constant acceleration. _____
   _____

Calculating Acceleration (pages 345–346)

8. Write the equation used to calculate the acceleration of an object.
   _____

9. Is the following sentence true or false? When the final velocity is less than the initial velocity of an object, the acceleration is negative. _____

10. A skateboarder begins down a ramp at a speed of 1.0 m/s. After 3 seconds, her speed has increased to 4.0 m/s. Calculate her acceleration.

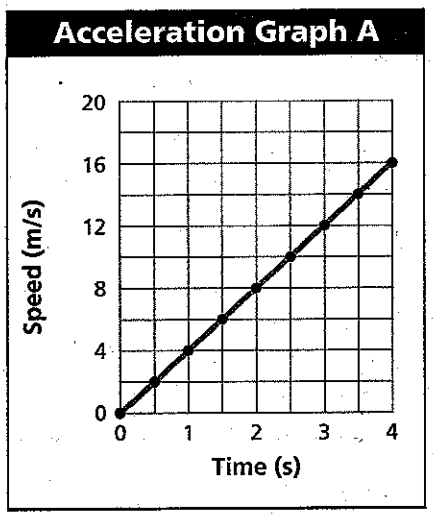
a. 1.0 m/s^2 b. 3.0 m/s^2

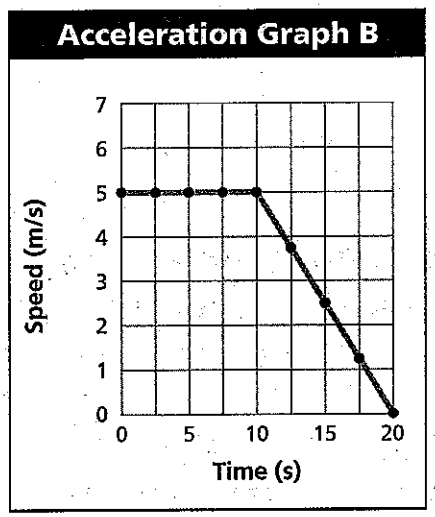
c. 5.0 m/s^2 d. 9.8 m/s^2

Graphs of Accelerated Motion (pages 346–348)

11. A speed-time graph in which the displayed data forms a straight line is an example of a(n) _____.

For questions 12 through 15, refer to the graphs below.





12. Graph A represents the motion of a downhill skier. How fast was the skier moving after traveling down the hill for 2.5 seconds? _____

13. In which graph does an object move at constant speed during the first 4 seconds? _____

14. Graph B represents the motion of a mountain biker. What is the biker's speed at times of 10 s and 20 s? _____

15. Determine the acceleration of the mountain biker during the 10 second to 20 second time period. Show your work.

_____

_____

16. The plotted data points representing acceleration in a distance-time graph form a(n) _____.

Instantaneous Acceleration (page 348)

17. The measure of how fast a velocity is changing at a specific instant is known as _____.

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WordWise

Complete the sentences by using one of the scrambled vocabulary words below.

vrlaeeit oinotm	mefar fo ecrneeefr	gvaeera dspee
levotciy	nerlia	centidsa
esdep	erfe lafl	aulsettrn crovet
atnicoelecar	rotcev	nnilraeon

An expression for _____ is $(v_f - v_i)/t$.

A quantity that has both magnitude and direction is called a(n) _____.

The total distance traveled divided by the total time is _____.

A speed-time graph in which data points form a straight line is an example of a(n) _____ graph.

Common units for _____ include meters per second (m/s).

In order to accurately and completely describe the motion of an object, a(n) _____ is necessary.

You can determine _____ by measuring the length of the actual path between two points in space.

Two or more vectors combine to form a(n) _____.

Objects in _____ accelerate at 9.8 m/s^2.

A curve often connects data points on a(n) _____ graph.

Together, the speed and direction in which an object is moving are called _____.

Movement in relation to a frame of reference is _____.

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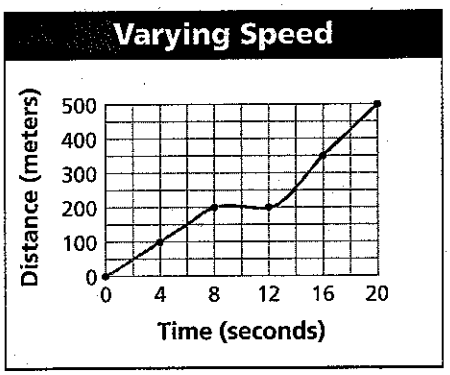
Interpreting a Distance-Time Graph

The distance-time graph below illustrates the motion of a car whose speed varied with time during a trip. Calculate the average speed of the car during the first 8 seconds of the trip. Give your answer in km/h.



Math Skill: Line Graphs and Conversion Factors

You may want to read more about this **Math Skill** in the **Skills and Reference Handbook** at the end of your textbook.

1. Read and Understand

What information are you given?

A graph of distance versus time.

2. Plan and Solve

How will you determine speed for the time interval referenced in the question?

1. To determine the distance traveled in 8 s, move your finger up from the 8 s mark on the time axis to the plotted line.
2. Now move your finger horizontally to the left to the distance axis. Read the value from the axis. (200 m)
3. Calculate the average speed using the formula

   Speed = Distance/Time = 200 m/8 s = 25 m/s
4. Convert from m/s to km/h:

   (25 m/s)(3600 s/h)(1 km/1000 m) = 90 km/h

3. Look Back and Check

Is your answer reasonable?

A quick calculation from the interval of constant speed shows that the car traveled 100 meters in 4 seconds—an average speed of 25 m/s.

Math Practice

On a separate sheet of paper, solve the following problems.

1. How long did it take the car to travel a distance of 350 m? _____

2. Determine the speed of the car in km/h during the interval 0 s to 12 s.