Paramount Academy 2020-2021 Attendance Form WEEK #28

Daily Work Week of: March 1st – 5th **Due Date:** March 8th – 10th

Student Name: _____

Grade: 8th **Teacher Name:** Kime

Date	Daily Work Completed
3/1	
3/2	
3/3	
3/4	
3/5	

**PARENT SIGNATURE REQUIRED, IF ATTENDANCE WAS LOGGED ONLINE PLEASE WRITE ONLINE IN THE DAILY WORK COMPLETED SECTION.

Parent Name (Print): _____ **Parent Signature:** _____

Cove Sheet 8th Grade

March 1-5, 2021

Monday: Math – Lesson #14: Determining Probability of an Event

Writing – Read compositions

Reading – Legends: "The Girl Who Hunted Rabbits"

Language Worksheet & Selection Test

Tuesday: Math - Finish Lesson #14

Problems 1-30

Please do not turn in your lessons, just the answers on the papers I provide for you

Writing – Finish Compositions

Literature – Folktale: "Paul Bunyan of the North Woods"

Selection Test/Language worksheet

Wednesday: Math – 2A as the test

Problems 1-30

Please do not turn in your lessons, just the answers on the papers I provide for you.

Writing – 3.3 Describing an Imaginary Scene

Notes

Describe a Scene

Spelling– Vocabulary: "Debbie" and "My Wild Irish Mother"

Vocabulary Check

Thursday: Math – Lesson #15 – Distributive Property to Simplify Expressions

Problems 1-30

Please do not turn in your lessons, just the answers on the papers I provide for you.

Writing – 3.3 Read descriptive papers

Literature – Start our class reading book, "Swindle"

Friday: Math – Finish lesson #15

Problems 1-30

Please do not turn in your lessons, just the answers on the papers I provide for you.

Writing – 3.4 – Describing an Imaginary person

Notes

Grammar Link

+Reading –Vocabulary

Pages 39-42

Write your name on your papers!

LESSON 14

Determining the Theoretical Probability of an Event

Warm Up

1. Vocabulary _____ (*Closure, Probability*) is the measure of how likely it is that an event will occur. (Inv 1)

Simplify each expression.

2. $5 \times 7 - 27 \div 9 + 6$ (4)

3. $6.3 + (-2.4) + (-8.9)$ (10)

4. $6 + |-72| + |-5|$ (5)

5. Write a number to represent the opposite of "twelve floors up." (6)

New Concepts

A **sample space** is the set of all possible outcomes of an event. For example, a toss of a fair coin has two equally likely outcomes. The two possible outcomes, heads and tails, is the sample space.

Math Language

A fair coin has an equally likely chance of landing on heads or tails. The coin is not weighted so that one outcome is more likely than another.

A **simple event** is an event having only one outcome. For example, rolling a 5 on a number cube is a simple event.

The **theoretical probability** of an outcome is found by analyzing a situation in which all outcomes are equally likely, and then finding the ratio of favorable outcomes to all possible outcomes. For example, the probability of tossing a coin and it landing on heads is $\frac{1}{2}$ or 0.5 or 50%.

Exploration Finding Theoretical Probability

Materials

- small paper sacks
- colored marbles

Place 4 different-colored marbles in a sack. Without looking, draw one marble out of the sack. Record the color in a frequency table.

Color	Tally	Frequency
Red		
Green		
Yellow		
Blue		

a. Repeat the experiment 10 times, 20 times, 50 times and 100 times, replacing the marble after each draw.

b. Divide the number of times a red marble is picked by the total number of times you pick a marble. Write this as a probability.

c. **Generalize** What do you notice about the probabilities as the number of times you pick a marble is increased?

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Example 1 Identifying Sample Spaces

A number cube labeled 1–6 is rolled. List the outcomes for each event.

Math Language

A spinner is divided into four equal parts: blue, yellow, green, and red. If the spinner lands on yellow, then the **outcome** is yellow.

(a.) a number less than or equal to 3

SOLUTION

{3, 2, 1}

(b.) an odd number

SOLUTION

{1, 3, 5}

(c.) a number greater than 4

SOLUTION

{5, 6}

Theoretical probability can be determined using the following formula:

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$$

A **complement of an event** is a set of all outcomes of an experiment that are not in a given event. For example, if heads is the desired event when tossing a coin, tails is the complement of the event. The sum of an event and its complement equals 1.

$$P(\text{event}) + P(\text{not event}) = 1$$
$$P(\text{not event}) = 1 - P(\text{event})$$

Reading Math

The probability of an event can be written ***P*(event)**. The probability of picking a red marble can be written *P*(red).

Example 2 Calculating Theoretical Probability

There are 4 green, 3 blue, and 3 red marbles in a bag.

Give each answer as a decimal and as a percent.

(a.) What is the probability of randomly choosing a red marble?

SOLUTION

$$P(\text{red}) = \frac{3 \text{ red marbles}}{10 \text{ marbles in all}}$$

$$P(\text{red}) = \frac{3}{10}$$

The probability of choosing a red marble is 0.3 or 30%.

Hint

Probability can be expressed as a fraction, decimal, or percent.

(b.) What is the probability of randomly choosing a marble that is not green?

SOLUTION

$$P(\text{green marble}) + P(\text{not green marble}) = 1$$
$$P(\text{not green marble}) = 1 - P(\text{green marble})$$
$$P(\text{not green marble}) = 1 - \frac{4}{10}$$
$$P(\text{not green marble}) = \frac{6}{10} = \frac{3}{5}$$

The probability of not choosing a green marble is 0.6 or 60%.

Chance, like probability, is the likelihood of an event occurring.

Example 3 Calculating Chance

In a bucket there are 10 balls numbered as follows: 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number greater than 4? Is there a greater chance of drawing a number greater than 4 or a 1?

SOLUTION

$P(\text{greater than } 4) = \frac{3}{10}$ 3 out of the 10 balls have a number greater than 4.

The probability of drawing a ball with a number greater than 4 is 0.3, or 30%.

$P(1) = \frac{2}{10} = \frac{1}{5}$ 2 out of the 10 balls are numbered 1.

$\frac{3}{10} > \frac{1}{5}$ Compare $\frac{3}{10}$ and $\frac{1}{5}$.

There is a greater chance of drawing a number greater than 4 than drawing a 1.

Example 4 Application: State Fair

At a carnival game, you drop a ball into the top of the device shown below. As the ball falls, it goes either left or right as it hits each peg. In total, the ball can follow 16 different paths. The ball eventually lands in one of the bins at the bottom and you win that amount of money. (One path to \$0 is shown.) What is the probability of winning \$2?

Math Reasoning

Analyze If you drop the ball once, is there less than or greater than a 20% probability of not winning \$2?

SOLUTION

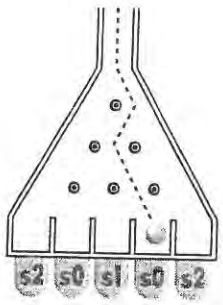
total number of paths = 16

number of paths to \$2 bins = 2

$$P(\$2) = \frac{\text{number of paths to \$2 bins}}{\text{total number of paths to win}} = \frac{2}{16}$$

$$P(\$2) = \frac{1}{8}$$

The probability of winning \$2 is $\frac{1}{8}$.



Lesson Practice

A number cube labeled 1–6 is rolled. List the outcome for each event. *(Ex 1)*

a. a number less than or equal to 4

b. an even number

c. a number greater than 2

There are 4 green, 3 blue, and 3 red marbles in a bag. *(Ex 2)*

d. What is the probability of randomly choosing a blue marble?

e. What is the probability of randomly not choosing a red marble?

(Ex 3) **f.** Suppose there are 8 balls in a bucket numbered as follows; 1, 2, 3, 5, 5, 6, 7, and 7. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number less than 6? Do you have a greater chance of drawing a 7 or a 6?

(Ex 4) **g.** A 52-card deck has 4 kings in the deck. What is the probability of randomly drawing a king out of the deck?

Practice Distributed and Integrated

(14) ***1.** A number cube labeled 1–6 is rolled three times. What is the probability that the next roll will produce a number greater than 4?

(14) ***2.** An jar contains 5 green marbles and 9 purple marbles. A marble is drawn and dropped back into the jar. Then a second marble is drawn and dropped back into the jar. Both marbles are green. If another marble is drawn, what is the probability that it will be green?

(8) **3.** Convert 20 inches to centimeters (2.54 cm = 1 in.).

(8) **4.** Convert 25 feet to centimeters. (Hint: Convert from feet to inches to centimeters.)

Simplify.

(4) **5.** $3 - 2 \cdot 4 + 3 \cdot 2$

(11) **6.** $-3(-2)(-3) - 2$

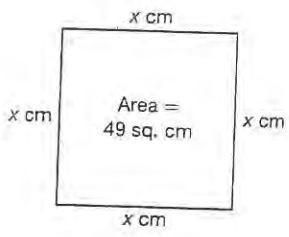
(4) **7.** $5(9 + 2) - 4(5 + 1)$

(4) **8.** $3(6 + 2) + 3(5 - 2)$

(13) **9.** Evaluate $\sqrt{31 + z}$ when $z = 5$.

(10) **10.** Use $<$, $>$ or $=$ to compare $\frac{4}{5}$ and $\frac{5}{6}$.

(13) ***11. Geometry** What is the length of the side of a square that has an area of 49 square centimeters?



(12) **12. Multiple Choice** Which equation demonstrates the Associative Property of Addition?

A $(a + b) + c = a + (b + c)$

B $ab + c = ba + c$

C $a(b + c) = ab + ac$

D $a + (b + c) = a + (c + b)$

*13. (11) **Justify** What must be true of each of the values of x and y if $-xy$ is positive? zero? negative?

14. (12) Identify the property illustrated in the expression $5 \cdot 6 = 6 \cdot 5$.

*15. (14) **Multiple Choice** A number cube labeled 1–6 is tossed. What is the theoretical probability of rolling an odd number?

A $\frac{1}{2}$

B $\frac{1}{3}$

C $\frac{1}{4}$

D $\frac{2}{3}$

*16. (14) A letter is chosen at random from the word probability. What is the probability of randomly choosing the letter b?

*17. (14) **Multiple Choice** A bag contains 4 blue, 6 red, 5 yellow, and 1 orange marble. What is the probability of randomly choosing a blue marble?

A $\frac{1}{16}$

B $\frac{4}{15}$

C $\frac{1}{4}$

D $\frac{4}{32}$

18. (13) **Error Analysis** Students were asked to find the square root of 16. Which student is correct? Explain the error.

Student A	Student B
$\sqrt{16} = 4$	$\sqrt{16} = 8$
$4 \times 4 = 16$	$8 \times 2 = 16$

*19. (13) **Braking Distance** The speed a vehicle was traveling when the brakes were first applied can be estimated using the formula $s = \sqrt{\frac{d}{0.04}}$, where d is the length of the vehicle's skid marks in feet and s is the speed of the vehicle in miles per hour. Determine the speed of a car whose skid marks were 4^2 feet long.

*20. (9) **Physics** The centripetal force of an object in circular motion can be expressed as $\frac{mv^2}{r}$, where m is mass, v is tangential velocity, and r is the radius of the circular path. What is the centripetal force of a 2-kg object traveling at 50 cm/s in a circular path with a radius of 25 centimeters?

21. **Verify** Convert 2.35 pounds to ounces (1 lb = 16 oz). Check to see if your answer is reasonable. (8)

22. **Write** If a computer program is designed to run until it reaches the end of the number pi (π), will the program ever end? Explain. (1)

23. **Geography** The lowest point in elevation in the United States is Death Valley, California. Death Valley is 86 meters below sea level. Which set of numbers best describes elevations in Death Valley? (1)

24. **Temperature** To convert degrees Celsius to degrees Fahrenheit, use the equation $C = \frac{5}{9}(F - 32)$. (2)

a. How many terms are in the expression $\frac{5}{9}(F - 32)$?

b. Identify the constants in the expression.

25. Simplify $-7 + 3 - 2 - 5 + (-6)$. (6)

26. **Error Analysis** Ms. Mahoney, the algebra teacher, has two cakes that weigh 3 pounds and 5 pounds. She cuts the cakes into 16 equal pieces. She asks the students to write an expression that represents the weight of each piece. Which student is correct? Explain the error. (4)

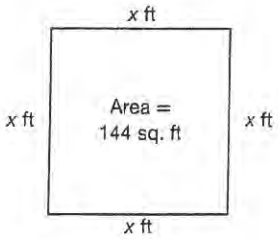
Student A	Student B
uses the expression $3 + 5 \div 16$	uses the expression $(3 + 5) \div 16$

27. **Model** While the Petersen family was waiting for their table, 9 people left the restaurant and 15 people entered. Find the sum of -9 and 15 to determine the change in the number of people in the restaurant. Use algebra tiles to model the situation. (5)

28. **Justify** Simplify $22 - (-11) - 11 - (-22)$. Justify your answer. (6)

29. **Write** Why is the order of operations important when simplifying an expression like $(5 + 7)^2 \div (14 - 2)$? (7)

*30. **Landscaping** Tanisha is building a fence around a square flower bed that has an area of 144 square feet. How many feet of fencing does she need? (13)



1

2

Name:

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4.

Lesson:

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Problem Set _____ Date _____ Name _____

Show all necessary work. Please be neat.

1.

2.

3.

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6.

7.

8.

9

10

Problem Set _____ Date _____ Name _____

Show all necessary work. Please be neat.

21

22

23

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25

26.

28

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30

Name _____ Date _____ Class _____

Cumulative Test 2A

1. (1) Identify the subsets of real numbers to which the number 6 belongs.

Compare the expressions in problems 2–3. Use <, >, or =.

2. (4) $3^2 - 2 \cdot 2.5 \bigcirc (3+4) + 6 \div 3 - \frac{10}{2}$

3. (7) $\left[15 + 5 \div (3+2)\right] + 3 \bigcirc 6 + \left[(7-2)^2 - 11\right]$

4. (2) Identify the variables and constants in the expression $5x + 2$.

Simplify problems 5–9.

5. (3) $(0.4)^3$

6. (4) $100 - 6^2 - 2 \cdot 3^2 + 7$

7. (5) $-|9-3|$

8. (3) $c^7 \cdot d^2 \cdot c \cdot c^2 \cdot d^4$

9. (7) $6 + \left[72 \div (12-4)\right] \cdot 2$

10. (1) Terry says that the set of natural numbers is closed under subtraction. Determine whether this statement is true or false. Give a counterexample if the statement is false.

11. (6) Dave is scuba diving. He is 52 feet below the surface. If he descends another 35 feet, what will be his position in relation to the surface?

12. (6) Find the difference $\left(-\frac{4}{9}\right) - \left(-\frac{5}{9}\right)$.

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13. *(8)* A car traveled at 290,400 feet per hour. How fast did the car travel in miles per hour?

14. *(2)* Identify the terms in the expression $\frac{16a}{(2+b)} - c + 2ac - \frac{b}{4}$.

Evaluate each expression in problems 15–16 for the given values.

15. *(9)* $2n + 3n + mn$ for $m = 4$ and $n = 3$

16. *(9)* $2(x-y)^3 - x^2$ for $x = 5$ and $y = 2$

17. *(10)* Order the numbers below from least to greatest.

$-0.8, \frac{2}{5}, 0.825, -\frac{3}{5}$

18. *(10)* The table shows batting averages for 4 baseball players in 2006 and 2007. Which player had the greatest increase in batting average from 2006 to 2007?

Batting Average		
	2006	**2007**
Player A	0.331	0.343
Player B	0.267	0.280
Player C	0.297	0.326
Player D	0.313	0.330

19. *(8)* The volume of a bucket of water is 864 cubic inches. How many buckets of water will be needed to fill a basin with a volume of 7 cubic feet?

20. *(5)* One day in January the temperature at 8 A.M. was –5°F. By noon, the temperature had risen 15 degrees. What was the temperature at noon?

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LESSON 15

Using the Distributive Property to Simplify Expressions

Warm Up

1. (2) **Vocabulary** In the expression $3x + 5$, $3x$ is a _____ ***(variable, term)*** of the expression.

Simplify each expression.

2. (4) $5 - 7 + 5(3)$
3. (4) $(-5) + (-2) + |(-5) + (-2)|$
4. (9) Evaluate $7x + 4y$ for $x = 2.1$ and $y = -0.7$.
5. (11) Find the product of $\frac{3}{8}$, $\frac{4}{5}$, and $\frac{2}{3}$.

New Concepts

The Distributive Property can be used to simplify expressions. Since subtraction is the same as adding the opposite, the Distributive Property will also work with subtraction.

The Distributive Property

For all real numbers a, b, c,

$$a(b + c) = ab + ac \text{ and } a(b - c) = ab - ac$$

Examples

$5(2 + 1) = 5 \cdot 2 + 5 \cdot 1 = 15$ $\qquad$ $5(2 - 1) = 5 \cdot 2 - 5 \cdot 1 = 5$

Example 1 Distributing a Positive Integer

Simplify each expression.

a. $6(4 + 8)$

SOLUTION

$6(4 + 8)$

$= 6(4) + 6(8)$ Distribute the 6.

$= 24 + 48$ Multiply.

$= 72$ Add.

b. $4(5 - 3)$

SOLUTION

$4(5 - 3)$

$= 4(5) + 4(-3)$ Distribute the 4.

$= 20 - 12$ Multiply.

$= 8$ Subtract.

Math Reasoning

Verify Use the order of operations to show that $4(5 - 3) = 8$.

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Use the Multiplication Property of -1 to simplify an expression like $-(5 + 2)$. Rewrite the expression as $-1(5 + 2)$ and then distribute.

Example 2 **Distributing a Negative Integer**

Simplify each expression.

a. $-(9 + 4)$

SOLUTION

$-(9 + 4)$

$= (-1)(9) + (-1)(4)$ Distribute.

$= -9 - 4$ Multiply.

$= -13$ Simplify.

b. $-9(-6 - 3)$

SOLUTION

$-9(-6 - 3)$

$= (-9)(-6) + (-9)(-3)$

$= 54 + 27$

$= 81$

Hint

The product of a real number and 1 is the real number.

The Distributive Property of Equality applies not only to numeric expressions but also to algebraic expressions.

Example 3 **Simplifying Algebraic Expressions**

Simplify each expression.

a. $-4(x + 7)$

SOLUTION

$-4(x + 7)$

$= (-4)(x) + (-4)(7)$ Distribute.

$= -4x - 28$ Multiply.

b. $(5 - x)6$

SOLUTION

$(5 - x)6$

$= 6(5) + 6(-x)$

$= 30 - 6x$

Reading Math

There are different ways to write the same expression:

$6 \cdot (5 - x)$
$(5 - x) \cdot 6$
$6(5 - x)$
$(5 - x)6$

Example 4 **Simplifying Algebraic Expressions with Exponents**

Simplify each expression.

a. $mn(mx + ny + 2p)$

SOLUTION

$mn(mx + ny + 2p)$

$= m^2nx + mn^2y + 2mnp$ Multiply.

b. $-xy(y^2 - x^2z)$

SOLUTION

$-xy(y^2 - x^2z)$ Distribute.

$= (-xy)(y^2) + (-xy)(-x^2z)$ Combine like terms.

$= -xy^3 + x^3yz$

Hint

When multiplying, add the exponents of powers with the same base.

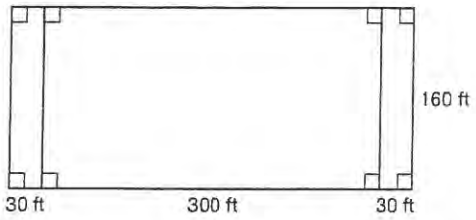
$y(y^2) = y^{1+2} = y^3$

Hint

To find the area of a rectangle, multiply length times width.

Example 5 Application: Landscaping

The turf on a football field is being replaced. The field is 300 feet long and 160 feet wide, not including the two end zones. Each end zone adds an additional 30 feet to the field's length. Write an expression using the Distributive Property to show the entire area of the field. Simplify the expression.



SOLUTION

width	×	length	
= 160	×	(30 + 300 + 30)	
= 160(30 + 300 + 30)			
= 160(30) + 160(300) + 160(30)			Use the Distributive Property.
= 4800 + 48,000 + 4800			Multiply.
= 57,600			Add.

Check Use the order of operations.

160(30 + 300 + 30)	Perform the operation inside the parentheses.
= 160(360)	Multiply.
= 57,600 ✓	

The area of the football field is 57,600 ft^2.

Lesson Practice

Simplify each expression.

a. (Ex 1) $8(2 + 7)$

b. (Ex 1) $4(6 - 2)$

c. (Ex 2) $-(9 + 3)$

d. (Ex 2) $-14(4 - 2)$

e. (Ex 3) $-10(m + 4)$

f. (Ex 3) $(7 - y)8$

g. (Ex 4) $4xy^3(x^4y - 5x)$

h. (Ex 4) $-2x^2m^2(m^2 - 4m)$

i. (Ex 5) A group of 4 adults and 8 children are buying tickets to an amusement park. Tickets are $15 each. Write an expression using the Distributive Property to show the total cost of the tickets. Simplify the expression.

Practice Distributed and Integrated

Evaluate.

1. (15) $-7(-8+3)$

2. (15) $5(-3-6)$

3. (13) Evaluate $\sqrt{10{,}000}$.

4. (13) Solve $c = \sqrt{25}$.

*5. (14) **Multi-Step** In a shipment of 800 eggs, the probability of an egg breaking is $\frac{2}{25}$. How many are likely to be broken in the shipment? Justify the answer.

6. (14) The digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are written on cards that are shuffled and placed face down in a stack. One card is selected at random. What is the probability that the digit is odd and greater than 5?

*7. (14) In a bucket there are 10 balls in a bucket numbered 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number less than 7? Explain.

*8. (15) **Multiple Choice** Simplify the expression $-5(x+6)$. Which is the correct simplification?

A $-5+x-11$ **B** $-5x+1$ **C** $-5x+30$ **D** $-5x-30$

*9. (6) Find the value of y in the equation $18 - x = y$ if $x = -4$.

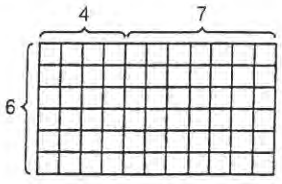
10. (5) The water level of the reservoir in Austin, Texas, was 3 feet below normal. After a heavy rain storm, the water level increased to 5 feet above normal. How much did the rain storm change the water level?

11. (15) **Error Analysis** Two students evaluated a numeric expression. Which student is correct? Explain the error.

Student A	Student B
$-8(-5+14)$ $=40-112$ $=-72$	$-8(-5+14)$ $=-13+6$ $=-7$

12. (15) **Write** Evaluate the expression $-8(9-15)$ using the Distributive Property. Explain.

*13. (15) (Surveying) The county surveyed a piece of property and divided it into equal-sized lots. Use the diagram to write an expression that requires the Distributive Property to evaluate it. Evaluate the expression to find the total number of lots on the property.



*14. (12) True or False: $m + 0 = m$. Justify your answer using the properties.

15. (8) Convert 3.4 yd^3 to ft^3.

16. (15) **Multi-Step** Travis plans to divide his collection of baseball cards among 8 grandchildren. He will give each child the same number of cards. Each card is worth \$14. Write an expression to represent the value of each child's cards. Let c equal the total number of cards in Travis's collection.

17. (15) **Budgeting** Kennedy's teacher asked her to plan the budget for the class party. Kennedy began by writing the expression $g = b + 7$ to represent that the number of girls equals the number of boys plus seven. Each girl will need \$6. Write and simplify an algebraic expression that uses the Distributive Property to show the total cost for girls at the class party.

*18. (14) If a number cube is rolled, what is the probability of it landing on the number 5 or 6?

*19. (13) **Error Analysis** Two students are evaluating the expression $\sqrt{36 + z}$ for $z = 13$. Which student is correct? Explain the error.

Student A	Student B
$\sqrt{36 + z}$	$\sqrt{36 + z}$
$= \sqrt{36 + 13}$	$= \sqrt{36} + z$
$= \sqrt{49}$	$= 6 + 13$
$= 7$	$= 19$

20. (12) **Justify** The expression $6 \cdot 2 \cdot 4$ would be simplified from left to right using the order of operations. What property would allow this expression to be simplified from right to left?

*21. (12) **Investments** Susan invests the same amount of money in each of 7 stocks. In one year, her money increased 8 times. The value of her investment is represented by the expression $7x \cdot 8$. Show two methods to simplify the expression and justify each step using the properties.

22. (10) **Age** Rickie is $3\frac{3}{4}$ years older than Raymond. Raymond is $2\frac{1}{2}$ years younger than Ryan. If Ryan is $14\frac{1}{4}$ years old, how old is Rickie?

23. (9) **Write** Write the procedure for evaluating the expression $16f^2g^3 - 4f^8 + 12$ for $f = 3$ and $g = 5$.

24. (6) **Model** Use the number line to model $x - 8$ when $x = -6$.

25. (3) **Astronomy** In astronomy, brightness is given in a value called magnitude. A -2-magnitude star is 2.512 times brighter than a -1-magnitude star, a -3-magnitude star is 2.512 times brighter than a -2-magnitude star, and so on. If Sirius is magnitude -1.5 and the full moon is magnitude -12.5, how much brighter is the full moon?

26. **Error Analysis** Student A and Student B each solved the absolute-value problem as shown below. Which student is correct? Explain the error.
(5)

Student A	Student B
$-\|12-15\|$	$-\|12-15\|$
$=-\|-3\|$	$=-\|-3\|$
$=-(3)$	$=\|+3\|$
$=-3$	$=3$

***27.** Find the value of y for the given values of x in the equation $x-|x-2|=y$ if $x=-3$.
(6)

28. **Verify** When simplified, will the expression $3+\frac{2}{3}+|-5|$ be positive or negative? Explain.
(7)

29. **Probability** Thomas spun a game spinner and recorded the results in the table below.
(Inv 1)

Outcome	Frequency
Red	3
Blue	5
Yellow	9
Green	8

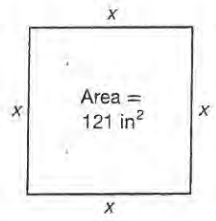
Use the table to find the experimental probability of each event. Express each probability as a fraction and as a percent.

a. landing on red

b. landing on green

c. not landing on green

30. **Geometry** What is the perimeter of a square with an area of 121 sq. in.?
(13)



1

2

3

4.

5

5.

7.

8.

9.

10.

Name:

Lesson:

Problem Set _____ Date _____ Name _____

Show all necessary work. Please be neat.

11.

12.

13.

14.

15.

16.

17.

18.

19

20.

Problem Set _____ Date _____ Name _____

Show all necessary work. Please be neat.

21

22.

23

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30

LESSON 3.3

Descriptive Writing

Describing an Imaginary Place

In the excerpt below Ray Bradbury orders details to create a mood and allow the reader to picture an imaginary place.

Literature Model

They had a house of crystal pillars on the planet Mars by the edge of an empty sea, and every morning you could see Mrs. K eating the golden fruits that grew from the crystal walls, or cleaning the house with handfuls of magnetic dust which, taking all the dirt with it, blew away on the hot wind. Afternoons, when the fossil sea was warm and motionless, and the wine trees stood stiff in the yard, and the little distant Martian bone town was all enclosed, and no one drifted out of their doors, you could see Mr. K himself in his room, reading from a metal book with raised hieroglyphs over which he brushed his hand, as one might play a harp. And from the book, as his fingers stroked, a voice sang, a soft ancient voice, which told tales of when the sea was red steam on the shore and ancient men had carried clouds of metal insects and electrical spiders into battle.

Mr. and Mrs. K had lived by the dead sea for twenty years, and their ancestors had lived in the same house, which turned and followed the sun, flower-like, for ten centuries.

Mr. and Mrs. K were not old. They had the fair, brownish skin of the true Martian, the yellow coin eyes, the soft musical voices. Once they had liked painting pictures with chemical fire, swimming in the canals in the seasons when the wine trees filled them with green liquors, and talking into the dawn together by the blue phosphorus portraits in the speaking room.

Ray Bradbury, *The Martian Chronicles*

"Fossil sea," "motionless," "stiff," "bone town"—what is the overall feeling created by this description?

How does the order in which various activities are described contribute to the overall effect of the description?

Create Your Own Imaginary Place

You might already have an idea for an imaginary place. If not, try brainstorming, freewriting, or clustering to come up with an idea. A few words that might help you focus on imaginary places include *beneath*, *beyond*, *inside*, *before*, and *after*. Let your mind wander or simply let yourself wonder, "What would it be like there?" Look at something familiar, like your school, from a different point of view—such as through the eyes of a bug. Maybe one of the following topics will start you on the way to your own imaginary place:

fantasy lands	future societies	glacial caves
under the sea	behind the wall	a laboratory
an ancient castle	inside a chrysanthemum	alien planets

Grammar

Prewriting Tip

To explore the details of your imaginary place, think about vivid adjectives and adverbs that help evoke clear images. See Lessons 10.4 and 10.5, pages 423–434.

Explore Your Imaginary Place

Mentally exploring your imaginary place will help you see it in greater detail, and these details will enable you to describe the place to your reader. One good way to explore a place in detail is by asking and answering questions about it. What are its inhabitants like, if there are any? What can I see, hear, smell, feel, and taste here? What, if anything, does this place resemble? Don't be afraid to ask creative questions, such as the ones below.

Creative Questions and Answers

Q: What colors do I see here?
A: Neon-green atmosphere, acid-yellow swampland, and orange vines

Q: What do the inhabitants do for fun?
A: March stiffly in long lines around the main swamp

Q: What presents the greatest danger here?
A: Deadly purple vapors from the swamp

Q: What do the inhabitants eat?
A: Yellow vapors that spray from the swamp vines

Journal Writing

In your journal, list questions you could use to explore any imaginary place. Try to come up with questions about specific, even unusual, details of the place. Keep the list. You can use it when you begin planning and creating your own imaginary world or place.

Determine the Mood of Your Place

Vocabulary

Revising Tip

As you revise, eliminate details that detract from the mood of your description. Do the sounds of your words help create the feeling you want? To review how to create mood, see Lesson 3.1, page 131.

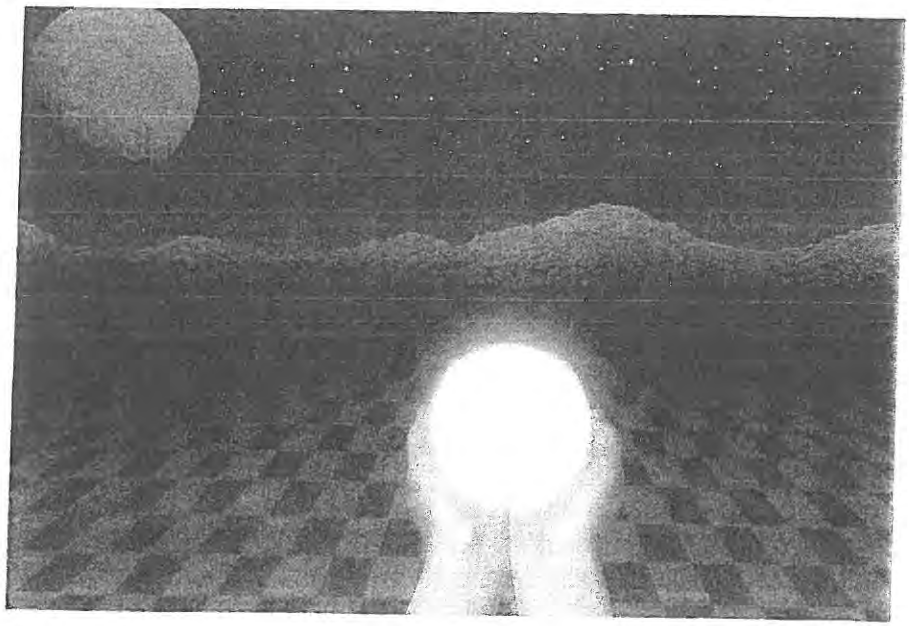
The description you write of your imaginary place will be more effective if it conveys a strong mood. A chart like the one below can help you come up with sensory details that will help you create a mood. Some of the most effective details are those that appeal to a reader's senses. What details can you add to the ones below?

Using Details to Create a Mood

Feeling	Sample Details
Loneliness	utter silence, dusty furniture, ticking clock, dead air, musty odors
Mystery, horror	secret passages, distant moaning, creaking floors
Excitement	fast pace, lively music, bright colors, laughter
Warmth, safety	glowing lights, crackling fire, steaming tea kettle, soft cushions

Organize the Details of Your Place

After you've decided on what details you want to use to create a mood, the next step is to choose the method of organization that will best convey your description to the reader. What is the most important feature of the scene—a castle, a tree, clouds of purple mist? How does that feature relate to other details? You can organize objects and also other descriptive elements, as Ray Bradbury does when he describes actions in a "winding-down" form in the literature model on page 140.



As you draft your description, follow the spatial order that works best for your scene. If, for example, a tree or tall building dominates the picture, top-to-bottom spatial order might work best. What kind of organization would you choose to describe the place pictured to the left?

3.3 Writing Activities

Describe a Scene

Write a paragraph describing a backyard barbecue, from the point of view of a fly. In your description, include details that appeal to each of the five senses—sight, hearing, touch, taste, and smell. Taken together, the details should convey a single, specific mood or idea.

- Decide on the mood you wish to evoke.
- Select sensory details to convey the information.
- Use appropriate spatial order.

PURPOSE To write a description of a place from an unusual perspective
AUDIENCE Your classmates
LENGTH 1–2 paragraphs

Cross-Curricular: Music

Music can evoke a scene or setting in one's imagination. Listen to a piece of classical or other instrumental music with your eyes closed. Then write a paragraph describing the setting the music evokes for you. Use specific sensory details in your description. You may wish to exchange papers with a classmate for peer review.

Grammar Link

Use appositives to clarify.

An *appositive* is a noun or pronoun that follows another noun or pronoun to identify or give additional information:

a house of crystal pillars on the planet ***Mars.***

Expand each of the following sentences. Add an appositive or an appositive phrase—an appositive plus a modifier or modifiers—to follow each italicized term. Remember to add commas where necessary—when the appositive is not essential to the meaning.

1. An excerpt from Ray Bradbury's *book* can be found on page 140.
2. Although the description is imagined, the reader can almost see the *place.*
3. The description of the place includes a description of some of its *inhabitants.*
4. The way the *author* arranges details that appeal to the senses helps evoke a mood.
5. One *character* liked to read.
6. His *wife* cleaned house with magnetic dust.
7. The inhabitants had lived by the dead sea a *long time.*
8. They used to have a *shared interest.*
9. The *book* is science fiction.
10. *Ray Bradbury* has a rich imagination.

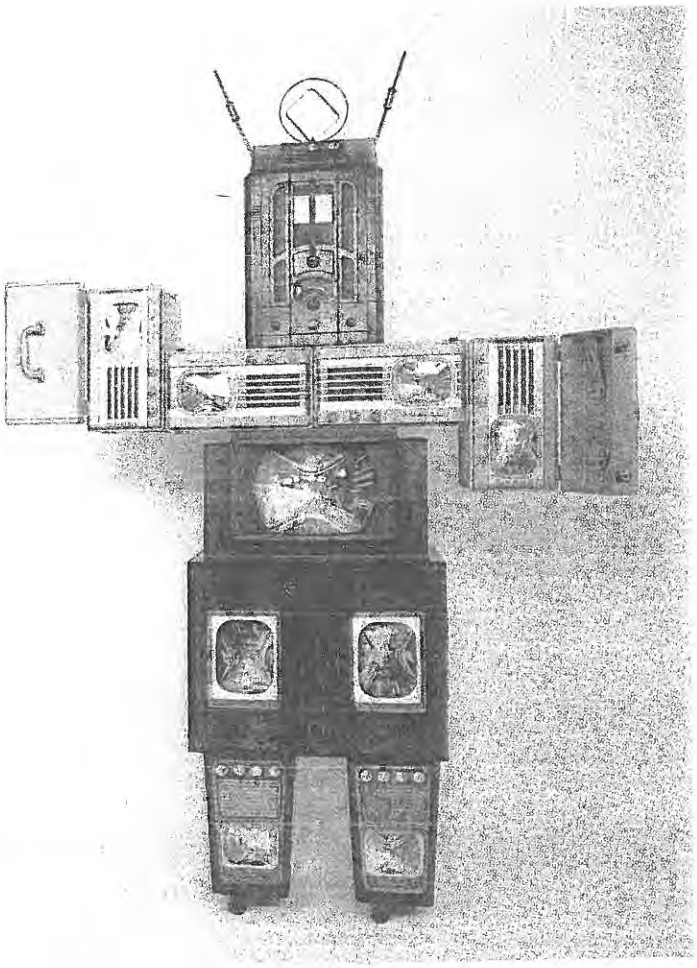
See Lesson 12.2, page 483.

LESSON 3.4

Descriptive Writing

Describing an Imaginary Person

To describe a fictional character, first imagine the character. Then think up details of appearance, movement, or personality that will help bring that character to life.



Nam June Paik, *Family of Robot: Grandfather*, 1986

Imagine a Character

To create an imaginary character, begin by deciding on the type of character you want to create. Your own imaginary character can be based on just about anything—from your wildest fantasy to someone you observe on the bus. Then ask yourself some creative questions to help develop details about your character. Questions like the following might help.

Questions for Developing Character Details

1. What are my character's most prominent features?
2. How does my character move and communicate?
3. What trait or traits set my character apart from others?
4. Does my character's appearance fit his, her, or its personality?

In the model below an aged woman from the imaginary town of Gont is trying to help a child. The observer, Tenar, has doubts about this woman.

Literature Model

Tenar was not at all sure what she wanted Aunty Moss to be, finding her unpredictable, unreliable, incomprehensible, passionate, ignorant, sly, and dirty. But Moss got on with the burned child. Perhaps it was Moss who was working this change, this slight easing, in Therru. With her, Therru behaved as with everyone—blank, unanswering, docile, in the way an inanimate thing, a stone, is docile. But the old woman had kept at her, offering her little sweets and treasures, bribing, coaxing, wheedling. "Come with Aunty Moss now, dearie! Come along and Aunty Moss'll show you the prettiest sight you ever saw. . . ."

Moss's nose leaned out over her toothless jaws and thin lips; there was a wart on her cheek the size of a cherry pit; her hair was a gray-black tangle of charm-knots and wisps; and she had a smell as strong and broad and deep and complicated as the smell of a fox's den. "Come into the forest with me, dearie!" said the old witches in the tales told to the children of Gont. "Come with me and I'll show you such a pretty sight!" And then the witch shut the child in her oven and baked it brown and ate it, or dropped it into her well, where it hopped and croaked dismally forever, or put it to sleep for a hundred years inside a great stone, till the King's son should come, the Mage Prince, to shatter the stone with a word, wake the maiden with a kiss, and slay the wicked witch. . . .

"Come with me, dearie!" And she took the child into the fields and showed her a lark's nest in the green hay, or into the marshes to gather white hallows, wild mint, and blueberries.

Ursula K. LeGuin, *Tehanu: The Last Book of Earthsea*

LeGuin contrasts unpleasant aspects of Moss's appearance with her good side, both here and later in the selection.

What is the picture of Aunty Moss created by such details as "toothless jaws," "thin lips," and "gray-black tangle"?

By contrasting Moss's behavior with that typically attributed to witches, LeGuin helps us to see her more as an individual than as a stereotype.

Journal Writing

In your journal describe a fantasy or science-fiction character with whom you are familiar. Explain how the character's personality does or does not fit his or her appearance.

Make a Character Come to Life

Grammar
Editing Tip

When editing a character sketch, make sure you have used pronouns correctly. See Lessons 17.5 and 17.6, pages 602–609.

If you were to describe your best friend, you would probably mention your friend's looks and personality. You might also note some of your friend's unique quirks, strengths, or habits. Such details would help other people to envision your friend as a real live person.

When describing an imaginary character, you want to include these same kinds of details to make your character come to life. Note that the details that are most unusual or most inconsistent with the rest of the description will do the most to make your character real. Such details will help give your character a three-dimensional quality that a character with no inconsistencies might lack. In addition, inconsistencies will tend to arouse your reader's interest and curiosity. Aunty Moss, in the model on page 145, is interesting because she seems to look like a witch, but she does not behave as we might expect a witch to behave.

Here's a character description from the imagination of student Todd Crusey. How does he bring life to his character? Think about what inconsistencies you might add to make the character more interesting, yet still believable.

Student Model

Sweat rolled like an avalanche down his broad, sloping forehead. It collected on the ledge of his square jutting brow and was then absorbed by the dense brown forest of his eyebrows. Slowly the perspiration dripped down into the large sockets that housed his squinting onyx eyes. From his hollow temples ran a flood of exhaustion that made his whole face glisten in the dark amber light of the prison wall. His nose was a wide, flat wedge, beaten down by the fists of over a hundred men. From his broad shoulders to the carved stones he called hands, he was a warrior. He had done battle in countless brawls and riots and had the scars to show for it. His only reward was his heartbeat; he had survived. This mean and relentless beast of a man always prevailed and was feared by all sane men. That's why they brought him here. Within these prison walls he reigned. He was truly a giant; he made the rules and he had the power to enforce them. That's why they called him warden.

Todd Crusey, Jefferson Davis High School, Montgomery, Alabama

How would you describe the overall impression created by sensory details such as sweat rolling down his forehead "like an avalanche" and "the carved stones he called hands"?

Crusey holds our interest by waiting until the very end to reveal who the character really is.

3.4 Writing Activities

Write About an Imaginary Person

Observe someone while you are riding on a bus or looking out your window or from another location of your choice. Take notes on the person's appearance, and use your notes to create a description of an imaginary person you could later write a short story about.

- List unique physical traits.
- Create possible personality quirks.
- Describe inconsistencies between appearance and personality.

PURPOSE To create an imaginary person based on a real one
AUDIENCE Your teacher and classmates
LENGTH 1–2 paragraphs

Grammar Link

Use correct forms of verbs.

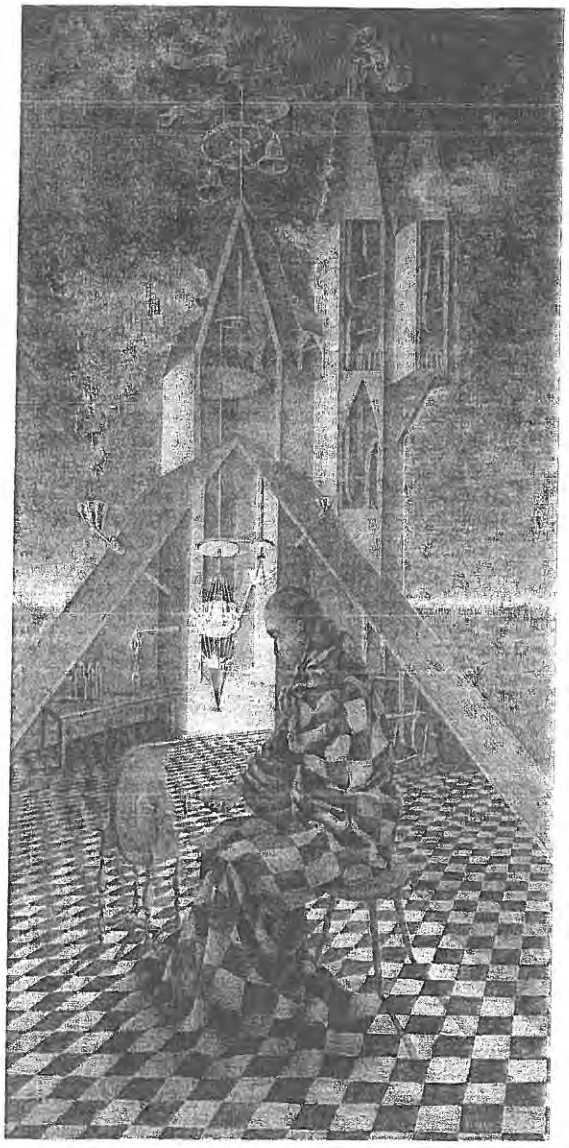
Write the correct form of the verb in parentheses to complete each sentence.

1. When you edit your character sketch, make sure that you have (do) all you can to bring the character to life.
2. The details Ursula K. LeGuin used in writing about Aunty Moss (bring) the character to life.
3. I have (feel) that I've known many of the characters I've read about.
4. I also have (write) about characters I have created myself.
5. Some of these imaginary characters (begin) to seem like friends as I wrote about them.

See Lesson 15.2, page 544.

Cooperative Learning

Brainstorm in a group to come up with details that describe the character in this painting. What does the environment add to your perceptions of the character? After each person writes a one-paragraph description, combine the paragraphs into a group description.



Remedios Varo, *Useless Science or the Alchemist*, 1958

GUIDE FOR READING



The Girl Who Hunted Rabbits

The **Zuñi Indians** live in a harsh and unforgiving land, in northwestern New Mexico near Arizona. The early Zuñis were farmers. Their territory, governed by the United States after 1848, is parched by sun in summer and swept by wind and snow in winter. Yet there is beauty in the land: towering cliffs flaming red in the sunset; deep, cool canyons; and wide-open vistas. "The Girl Who Hunted Rabbits" tells of a courageous girl who faces the harsh elements to bring food home to her family.

Legend

A **legend** is an imaginative story believed to be based on an actual person or event, rather than on the supernatural. The story is passed from generation to generation, often by word of mouth. With retelling, the character's actions or the event may become more fantastic. The character becomes larger than life—a hero or heroine.

Legends also give you information about the people who tell them. "The Girl Who Hunted Rabbits" tells you how the Zuñis lived and some of the gods they believed in.

Look For

As you read "The Girl Who Hunted Rabbits," look for the dangers the girl faces. How is she finally saved from the demon?

Writing

Think of a time when a person did something brave. Freewrite describing what happened. Describe how the brave person may have felt.

Vocabulary

Knowing the following words will help you as you read "The Girl Who Hunted Rabbits."

procured (prō kyo͝ord′) *adv.*: Obtained by some effort (p. 635)

sinew (sin′ y͞oo) **n.**: A tendon, a band of fibrous tissue that connects muscles to bones or to other parts and can also be used as thread for sewing (p. 636)

mantle (man′t'l) *n.*: Sleeveless cloak or cape (p. 636)

unwonted (un wun′ tid) *adj.*: Not usual (p. 636)

bedraggled (bi drag′ 'ld) *adj.*: Dirty and wet (p. 638)

voracious (vô rā′ shəs) *adj.*: Eager to devour large quantities of food (p. 639)

devoured (di vourd′) *v.*: Ate greedily (p. 639)

The Girl Who Hunted Rabbits

Zuñi Indian Legend

It was long ago, in the days of the ancients, that a poor maiden lived at "Little Gateway of Zuñi River." You know there are black stone walls of houses standing there on the tops of the cliffs of lava, above the narrow place through which the river runs, to this day.

In one of these houses there lived this poor maiden alone with her feeble old father and her aged mother. She was unmarried, and her brothers had all been killed in wars, or had died gently; so the family lived there helplessly, so far as many things were concerned, from the lack of men in their house.

It is true that in making the gardens—the little plantings of beans, pumpkins, squashes, melons, and corn—the maiden was able to do very well; and thus mainly on the products of these things the family were supported. But, as in those days of our ancients we had neither sheep nor cattle, the hunt was depended upon to supply the meat; or sometimes it was procured by barter[1] of the products of the fields to those who hunted mostly. Of these things this little family had barely enough for their own subsistence; hence, they could not procure their supplies of meat in this way.

Long before, it had been a great house, for many were the brave and strong young men who had lived in it; but the rooms were now empty, or at best contained only the leavings of those who had lived there, much used and worn out.

One autumn day, near wintertime, snow fell, and it became very cold. The maiden had gathered brush and firewood in abundance, and it was piled along the roof of the house and down underneath the ladder which descended from the top. She saw the young men issue forth the next morning in great numbers, their feet protected by long stockings of deerskin, the fur turned inward, and they carried on their shoulders and stuck in their belts stone axes and rabbit sticks. As she gazed at them from the roof, she said to herself, "O that I were a man and could go forth, as do these young men, hunting rabbits! Then my poor old mother and father would not lack for flesh with which to duly season their food and nourish their lean bodies." Thus ran her thoughts, and before night, as she saw these same young men coming in, one after another, some of them bringing long strings of rabbits, others short ones, but none of them empty-handed, she decided that she would set forth on the morrow to try what luck she might find in the killing of rabbits herself.

It may seem strange that, although this maiden was beautiful and young, the youths did not give her some of their rabbits. But

1. **barter** (bär' tər), *v.*: To exchange goods.

their feelings were not friendly, for no one of them would she accept as a husband, although one after another of them had offered himself for marriage.

Fully resolved, the girl that evening sat down by the fireplace, and turning toward her aged parents, said, "O my mother and father, I see that the snow has fallen, whereby easily rabbits are tracked, and the young men who went out this morning returned long before evening heavily laden with strings of this game. Behold, in the other rooms of our house are many rabbit sticks, and there hang on the walls stone axes, and with these I might perchance strike down a rabbit on his trail, or, if he runs into a log, split the log and dig him out. So I have thought during the day, and have decided to go tomorrow and try my fortunes in the hunt."

"*Naiya*, my daughter," quavered the feeble, old mother, "you would surely be very cold, or you would lose your way, or grow so tired that you could not return before night, and you must not go out to hunt rabbits."

"Why, certainly not," insisted the old man, rubbing his lean knees and shaking his head over the days that were gone. "No, no; let us live in poverty rather than that you should run such risks as these, O my daughter."

But, say what they would, the girl was determined. And the old man said at last, "'Very well! You will not be turned from your course. Therefore, O daughter, I will help you as best I may." He hobbled into another room, and found there some old deerskins covered thickly with fur; and drawing them out, he moistened and carefully softened them, and cut out for the maiden long stockings, which he sewed up with sinew and the fiber of the yucca[2] leaf. Then he selected for her from among the old possessions of his brothers and sons, who had been killed or perished otherwise, a number of rabbit sticks and a fine, heavy stone ax. Meanwhile, the old woman busied herself in preparing a lunch for the girl, which was composed of little cakes of cornmeal, spiced with pepper and wild onions, pierced through the middle, and baked in the ashes. When she had made a long string of these by threading them like beads on a rope of yucca fiber, she laid them down not far from the ladder on a little bench, with the rabbit sticks, the stone ax, and the deerskin stockings.

That night the maiden planned and planned, and early on the following morning, even before the young men had gone out from the town, she had put on a warm, short-skirted dress, knotted a mantle over her shoulder and thrown another and larger one over her back, drawn on the deerskin stockings, had thrown the string of corncakes over her shoulder, stuck the rabbit sticks in her belt, and carrying the stone ax in her hand sallied[3] forth eastward through the Gateway of Zuñi and into the plain of the valley beyond, called the Plain of the Burnt River, on account of the black, roasted-looking rocks along some parts of its sides. Dazzlingly white the snow stretched out before her—not deep, but unbroken—and when she came near the cliffs with many little canyons in them, along the northern side of the valley, she saw many a trail of rabbits running out and in among the rocks and between the bushes.

Warm and excited by her unwonted exercise, she did not heed a coming snowstorm, but ran about from one place to another, following the trails of the rabbits, sometimes up into the canyons where the forests of pine and cedar stood, and where

2. yucca (yuk' ə), *n.*: A desert plant with stiff leaves and white flowers.

3. sallied (sal' ēd), *v.*: Set out energetically.



here and there she had the good fortune sometimes to run two, three, or four rabbits into a single hollow log. It was little work to split these logs, for they were small, as you know, and to dig out the rabbits and slay them by a blow of the hand on the nape of the neck, back of the ears; and as she killed each rabbit she raised it reverently to her lips, and breathed from its nostrils its expiring breath[4] and, tying its legs together, placed it on the string, which after a while began to grow heavy on her shoulders. Still she kept on, little heeding the snow which was falling fast; nor did she notice that it was growing darker and darker, so intent was she on the hunt, and so glad was she to capture so many rabbits. Indeed, she followed the trails until they were no longer visible, as the snow fell all around her, thinking all the while, "How happy will be my poor old father and mother that they shall now have flesh to eat! How strong will they grow! And when this meat is gone, that which is dried and preserved of it also, lo! another snowstorm will no doubt come, and I can go out hunting again."

At last the twilight came, and, looking

4. **expiring** (ik spīr' ing) **breath:** Air breathed out as the rabbit dies.

around, she found that the snow had fallen deeply, there was no trail, and that she had lost her way. True, she turned about and started in the direction of her home, as she supposed, walking as fast as she could through the soft, deep snow. Yet she reckoned not rightly, for instead of going eastward along the valley, she went southward across it, and entering the mouth of the Descending Plain of the Pines, she went on and on, thinking she was going homeward, until at last it grew dark and she knew not which way to turn.

"What harm," thought she, "if I find a sheltered place among the rocks? What harm if I remain all night, and go home in the morning when the snow has ceased falling, and by the light I shall know my way?"

So she turned about to some rocks which appeared, black and dim, a short distance away. Fortunately, among these rocks is the cave which is known as Taiuma's[5] Cave. This she came to, and peering into that black hole, she saw in it, back some distance, a little glowing light. "Ha, ha!" thought she, "perhaps some rabbit hunters like myself, belated yesterday, passed the night here and left the fire burning. If so, this is greater good fortune than I could have looked for." So, lowering the string of rabbits which she carried on her shoulder, and throwing off her mantle, she crawled in, peering well into the darkness, for fear of wild beasts; then, returning, she drew in the string of rabbits and the mantle.

Behold! there was a bed of hot coals buried in the ashes in the very middle of the cave, and piled up on one side were fragments of broken wood. The girl, happy in her good fortune, issued forth and gathered more sticks from the cliffside, where dead pines are found in great numbers, and bringing them in little armfuls one after another, she finally succeeded in gathering a store sufficient to keep the fire burning brightly all the night through. Then she drew off her snow-covered stockings of deerskin and the bedraggled mantles, and, building a fire, hung them up to dry and sat down to rest herself. The fire burned up and glowed brightly, so that the whole cave was as light as a room at night when a dance is being celebrated. By and by, after her clothing had dried, she spread a mantle on the floor of the cave by the side of the fire, and, sitting down, dressed one of her rabbits and roasted it, and, untying the string of corncakes her mother had made for her, feasted on the roasted meat and cakes.

She had just finished her evening meal, and was about to recline and watch the fire for awhile, when she heard away off in the distance a long, low cry of distress—*"Ho-o-o-o thlaia-a!"*

"Ah!" thought the girl, "someone, more belated than myself, is lost; doubtless one of the rabbit-hunters." She got up, and went nearer to the entrance of the cavern.

"Ho-o-o-o thlaia-a!" sounded the cry, nearer this time. She ran out, and, as it was repeated again, she placed her hand to her mouth, and cried, as loudly as possible, *"Li-i thlaia-a!"* ("Here!")

The cry was repeated near at hand, and presently the maiden, listening first, and then shouting, and listening again, heard the clatter of an enormous rattle. In dismay and terror she threw her hands into the air, and, crouching down, rushed into the cave and retreated to its farthest limits, where she sat shuddering with fear, for she knew that one of the Cannibal Demons of those days, perhaps the renowned Atahsaia[6] of

5. Taiuma's (tī o͞o′ məz).

6. Atahsaia (ah′tə sī′ ə).

the east, had seen the light of her fire through the cave entrance, with his terrible staring eyes, and assuming it to be a lost wanderer, had cried out, and so led her to guide him to her place of concealment.

On came the Demon, snapping the twigs under his feet and shouting in a hoarse, loud voice, *"Ho lithlsh tâ ime!"* ("Ho, there! So you are in here, are you?") *Kothl!* clanged his rattle, while, almost fainting with terror, closer to the rock crouched the maiden.

The old Demon came to the entrance of the cave and bawled out, "I am cold, I am hungry! Let me in!" Without further ado, he stooped and tried to get in; but, behold! the entrance was too small for his giant shoulders to pass. Then he pretended to be wonderfully civil, and said, "Come out, and bring me something to eat."

"I have nothing for you," cried the maiden. "I have eaten my food."

"Have you no rabbits?"

"Yes."

"Come out and bring me some of them."

But the maiden was so terrified that she dared not move toward the entrance.

"Throw me a rabbit!" shouted the old Demon.

The maiden threw him one of her precious rabbits at last, when she could rise and go to it. He clutched it with his long, horny hand, gave one gulp and swallowed it. Then he cried out, "Throw me another!" She threw him another, which he also immediately swallowed; and so on until the poor maiden had thrown all the rabbits to the voracious old monster. Every one she threw him he caught in his huge, yellow-tusked mouth, and swallowed, hair and all, at one gulp.

"Throw me another!" cried he, when the last had already been thrown to him.

So the poor maiden was forced to say, "I have no more."

"Throw me your overshoes!" cried he.

She threw the overshoes of deerskin, and these like the rabbits he speedily devoured. Then he called for her moccasins, and she threw them; for her belt, and she threw it; and finally, wonderful to tell, she threw even her mantle, and blanket, and her overdress, until, behold, she had nothing left!

Now, with all he had eaten, the old Demon was swollen hugely at the stomach, and, though he tried and tried to squeeze himself through the mouth of the cave, he could not by any means succeed. Finally, lifting his great flint ax, he began to shatter the rock about the entrance to the cave, and slowly but surely he enlarged the hole and the maiden now knew that as soon as he could get in he would devour her also, and she almost fainted at the sickening thought. Pound, pound, pound, pound, went the great ax of the Demon as he struck the rocks.

In the distance the two war-gods were sitting in their home at the Shrine amid the Bushes beyond Thunder Mountain, and though far off, they heard thus in the middle of the night the pounding of the Demon's hammer ax against the rocks. And of course they knew at once that a poor maiden, for the sake of her father and mother, had been out hunting—that she had lost her way and, finding a cave where there was a little fire, entered it, rebuilt the fire, and rested herself; that, attracted by the light of her fire, the Cannibal Demon had come and besieged her retreat,[7] and only a little time hence would he so enlarge the entrance to the cave that he could squeeze even his great overfilled paunch through it and come at the maiden to destroy her. So, catching up their wonderful weapons, these two

---

7. besieged (bi sējd') **her retreat:** Attacked her place of refuge.

war-gods flew away into the darkness and in no time they were approaching the Descending Plain of the Pines.

Just as the Demon was about to enter the cavern, and the maiden had fainted at seeing his huge face and gray shock of hair and staring eyes, his yellow, protruding tusks, and his horny, taloned hand, they came upon the old beast. Each one hitting him a blow with his war club, they "ended his daylight," and then hauled him forth into the open space. They opened his huge paunch and withdrew from it the maiden's garments, and even the rabbits which had been slain. The rabbits they cast away among the soap-weed plants that grew on the slope at the foot of the cliff. The garments they spread out on the snow, and cleansed and made them perfect, even more perfect than they had been before. Then, flinging the huge body of the giant Demon down into the depths of the canyon, they turned them about and, calling out gentle words to the maiden, entered and restored her. She, seeing in them not their usual ugly persons, but handsome youths, was greatly comforted; and bending low, and breathing upon their hands, thanked them over and over for the rescue they had brought her. But she crouched herself low with shame that her garments were but few, when, behold! the youths went out and brought in to her the garments they had cleaned, restoring them to her.

Then, spreading their mantles by the door of the cave, they slept there that night, in order to protect the maiden, and on the morrow wakened her. They told her many things, and showed her many things which she had not known before, and counseled her thus, "It is not fearful that a maiden should marry; therefore, O maiden, return unto thy people in the Village of the Gateway of the River of Zuñi. This morning we will slay rabbits unnumbered for you, and start you on your way, guarding you down the snow-covered valley. When you are in sight of your home we will leave you, telling you our names."

So, early in the morning the two gods went forth, flinging their sticks among the soap-weed plants. Behold! as though the soap-weed plants were rabbits, so many lay killed on the snow before these mighty hunters. And they gathered together great numbers of these rabbits, a string for each one of the party. When the Sun had risen clearer in the sky, and his light sparkled on the snow around them, they took the rabbits to the maiden and presented them, saying, "We will carry each one of us a string of these rabbits." Then taking her hand, they led her out of the cave and down the valley, until, beyond on the high black mesas[8] at the Gateway of the River of Zuñi, she saw the smoke rise from the houses of her village. Then turned the two war-gods to her, and they told her their names. And again she bent low, and breathed on their hands. Then, dropping the strings of rabbits which they had carried close beside the maiden, they swiftly disappeared.

Thinking much of all she had learned, she continued her way to the home of her father and mother. As she went into the town, staggering under her load of rabbits, the young men and the old men and women and children beheld her with wonder; and no hunter in that town thought of comparing himself with the Maiden Hunter of Zuñi River. The old man and the old woman, who had mourned the night through and sat up anxiously watching, were overcome with happiness when they saw their daughter had returned.

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8. mesas (mā′ səz), *n.*: Small mountains with flat tops and steep sides.

THINKING ABOUT THE SELECTION

Recalling

1. For what reasons does the girl go hunting?
2. Why do the girl's parents at first resist her plans?
3. How does the girl become lost?
4. Explain the Cannibal Demon's plan to get the girl out of the cave.
5. How is the girl rescued?
6. How do the villagers regard the girl when she returns?

Interpreting

7. Why do the girl's parents help her when they really do not want her to go?
8. Why does the war god help the girl?
9. Why does the girl see the two "usually ugly" war gods as handsome youths?
10. What does the girl learn from the war gods? Do you think what she learns will affect the way she behaves in the future? Explain your answer.

Applying

11. In this legend the girl demonstrates bravery. Select one other character you have read about who is brave. Compare and contrast the girl and this character.

ANALYZING LITERATURE

Understanding a Legend

Legends are imaginative stories that are based on real people or real events. As the story is passed from generation to generation it often changes. Sometimes the retelling may result in downplaying the factual and highlighting the imaginative. "The Girl Who Hunted Rabbits" is probably based on a real incident.

1. What details of the legend could be based on fact?
2. What parts seem purely imaginative?

CRITICAL THINKING AND READING

Making Inferences from a Legend

An **inference** is a reasonable conclusion that can be drawn from evidence. In "The Girl Who Hunted Rabbits" you can infer that Zuñi girls were not expected to hunt based on the girl's statement, "O that I were a man and could go forth, as do these young men, hunting rabbits!"

1. Find evidence in this legend that suggests that young girls were expected to get married.
2. Find evidence that the Zuñi placed high value on children taking care of their parents.

UNDERSTANDING LANGUAGE

Choosing Meaning to Fit Context

Context is the surrounding words and ideas that can help you understand the meaning of an unfamiliar word.

From the context of the following sentences, figure out the meanings of the words in italics.

1. "But, as in those days of our ancients, we had neither sheep nor cattle, the hunt was depended upon to supply the meat; or sometimes it was *procured* by barter of the products of the fields to those who hunted mostly."
2. "Of these things this little family had barely enough for their own *subsistence;* hence, they could not procure their supplies of meat in this way."

THINKING AND WRITING

Retelling a Legend

Imagine you are the girl in this legend. Think about your feelings when the demon tried to devour you. Retell this episode from the girl's point of view. Use the pronoun *I* to identify yourself as the girl. Revise, making sure you have told events through the girl's eyes. Finally, proofread your story and share it with your classmates.

Name _____ Date _____

The Girl Who Hunted Rabbits Zuñi Indian Legend (text page 635)

Language Worksheet

Choosing Meaning To Fit Context

Context is the surrounding words and ideas that can help you to understand the meaning of an unfamiliar word. For example, the word *dressed* often means "putting on clothes." In the legend, the maiden *dressed* a rabbit before roasting it, which suggests that the word means "to prepare for cooking."

For each sentence choose the meaning that best fits the context of the *italicized* word. Circle the letter of your answer.

1. "She saw the young men *issue* forth the next morning in great numbers, their feet protected by long stockings of deerskin. . . ."

   a. publish b. go c. distribute officially

2. " 'Then my poor old mother and father would not lack for flesh with which to duly *season* their food and nourish their lean bodies.' "

   a. add in order to improve the flavor

   b. soften or make less severe

   c. keep for a time in order to make fit for use

3. "The maiden threw him one of her *precious* rabbits at last, when she could rise and go to it."

   a. too nice b. very great c. valuable

4. "The rabbits they *cast* away among the soap-weed plants that grew on the slope at the foot of the cliff."

   a. threw b. directed c. assigned parts in a play

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Name _____ Date _____

The Girl Who Hunted Rabbits Zuni Indian Legend (text page 635)

Selection Test

A. Thinking About the Selection. On the line at the right, write the letter of the answer that best completes the sentence.

1. The young men's feelings toward the young maiden are not friendly because 1. _____
   a. there are no men in her parents' house.
   b. she will accept none of them as a husband.
   c. she hunts rabbits by herself.
   d. the two war-gods have offered her protection.

2. As the young maiden hunts, she does not pay attention to the 2. _____
   a. trails of rabbits she sees.
   b. demon that stands on the cliffs.
   c. other hunters looking for rabbits.
   d. approaching darkness and the falling snow.

3. The demon is able to find the young maiden because 3. _____
   a. she calls out, thinking he is another lost hunter.
   b. she builds a fire in the cave.
   c. her trail is clearly visible in the snow.
   d. he smells the rabbits she has killed.

4. One piece of advice the war-gods have for the maiden is 4. _____
   a. not to hunt for rabbits alone.
   b. to be careful not to call out in the darkness.
   c. never to leave her home again.
   d. not to be fearful about marrying.

5. The people of the town are amazed to see 5. _____
   a. the two war-gods bring the maiden home.
   b. the body of the demon lying in the canyon.
   c. the huge load of rabbits the maiden has.
   d. how happy the old man and old woman are to see the maiden.

B. Understanding a Legend. Decide whether the following statements about the story are factual or imaginative. For each statement, write "factual" or "imaginative" on the line at the right.

1. The young Zuñi maiden decided to hunt rabbits by herself. 1. _____

2. When she was lost, the maiden found a small cave in which there were the glowing remains of a fire. 2. _____

3. The demon demanded that the maiden bring him something to eat. 3. _____

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Name _____ Date _____

4. The war-gods restored the maiden's clothes. 4. _____

5. The people bartered their harvested crops for supplies of meat. 5. _____

C. Making Inferences From a Legend. Decide what details in the story would help you make the inferences stated in the sentences below. Write your answers on the lines.

1. Zuñi families put great value on sons.

_____

2. The maiden did not marry because she was fearful of marriage.

_____

3. To the Zuñi, breathing on the hands is a sign of respect.

_____

4. The demons in Zuñi legends are not easily satisfied.

_____

5. The war-gods are the protectors of the Zuñi people.

_____

D. Choosing Meaning to Fit Context. One word in each of the following sentences is in *italics*. Using context clues, figure out what the *italicized* word means. Write the letter of your answer on the line at the right.

1. ". . . early on the following morning . . . she had put on a warm, short-skirted dress, knotted a *mantle* over her shoulder. . . ." 1. _____
   a. a long, loose cloak b. a layer of the earth

2. "Then he pretended to be wonderfully *civil*. . . ." 2. _____
   a. having to do with citizens b. polite

3. "*Pound*, pound, pound, pound, went the great ax of the Demon. . . ." 3. _____
   a. a unit of weight b. to hit again and again

4. ". . . attracted by the light of her fire, the Cannibal Demon had come and besieged her *retreat*. . . ." 4. _____
   a. a safe place b. to move back

5. ". . . the maiden had fainted at seeing his huge face and gray *shock* of hair and staring eyes. . . ." 5. _____
   a. upsetting disturbance b. bushy mass

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GUIDE FOR READING



Paul Bunyan of the North Woods

Paul Bunyan is a legendary frontiersman—a gigantic lumberjack known for his tremendous strength and fantastic logging feats. According to folklore, Paul Bunyan invented the idea of logging in the Pacific Northwest. He created the Great Lakes—to provide drinking water for his enormous blue ox, Babe.

Folktales about Paul Bunyan have been recorded by numerous writers, among them **Carl Sandburg** (1878–1967). (For more information on Carl Sandburg, see also page 630.)

Folktale

Folktales, like legends and myths, are stories that have been passed down orally, but today have been preserved in written form. They are not about gods and goddesses but often involve a hero who performs amazing feats of strength or daring or solves problems. Folktales often may last because they highlight qualities that a culture values.

Look For

As you read "Paul Bunyan of the North Woods," look for the traits about Paul Bunyan—strength, size, and cleverness—that make people enjoy hearing tales about him. Notice that this selection summarizes several folktales about Paul Bunyan. Which of the tales about him do you like the most?

Writing

Create an imaginary hero, such as the greatest football player or the most brilliant scientist. Brainstorm and write down your ideas about folktales that you could tell about that person.

Vocabulary

Knowing the following words will help you as you read "Paul Bunyan of the North Woods."

lumberjack (lum′ bər jak′) *n.*: A person employed to cut down timber (p. 643)

shanties (shan′ tēz) *n.*: Huts or shacks in which loggers lived (p. 643)

granite (gran′ it) *adj.*: Made of a type of very hard rock (p. 643)

hobnailed (häb′ nāld′) *adj.*: Having short nails put on the soles to provide greater traction (p. 643)

commotion (kə mō′ shən) *n.*: Noisy movement (p. 644)

bellowing (bel′ ō iŋ) *adv.*: Roaring (p. 644)

Paul Bunyan of the North Woods

Carl Sandburg

Who made Paul Bunyan, who gave him birth as a myth, who joked him into life as the Master Lumberjack, who fashioned him forth as an apparition[1] easing the hours of men amid axes and trees, saws and lumber? The people, the bookless people, they made Paul and had him alive long before he got into the books for those who read. He grew up in shanties, around the hot stoves of winter, among socks and mittens drying, in the smell of tobacco smoke and the roar of laughter mocking the outside weather. And some of Paul came overseas in wooden bunks below decks in sailing vessels. And some of Paul is old as the hills, young as the alphabet.

The Pacific Ocean froze over in the winter of the Blue Snow and Paul Bunyan had long teams of oxen hauling regular white snow over from China. This was the winter Paul gave a party to the Seven Axmen. Paul fixed a granite floor sunk two hundred feet deep for them to dance on. Still, it tipped and tilted as the dance went on. And because the Seven Axmen refused to take off their hobnailed boots, the sparks from the nails of their dancing feet lit up the place so that Paul didn't light the kerosene lamps. No women being on the Big Onion river at that time the Seven Axmen had to dance



PAUL BUNYAN CARRYING A TREE ON HIS SHOULDER AND AN AX IN HIS HAND
The Bettmann Archive

1. **apparition** (ap'ə rish'ən), *n.*: A strange figure appearing suddenly or in an extraordinary way.

with each other, the one left over in each set taking Paul as a partner. The commotion of the dancing that night brought on an earthquake and the Big Onion river moved over three counties to the east.

One year when it rained from St. Patrick's Day till the Fourth of July, Paul Bunyan got disgusted because his celebration on the Fourth was spoiled. He dived into Lake Superior and swam to where a solid pillar of water was coming down. He dived under this pillar, swam up into it and climbed with powerful swimming strokes, was gone about an hour, came splashing down, and as the rain stopped, he explained, "I turned the dam thing off." This is told in the Big North Woods and on the Great Lakes, with many particulars.

Two mosquitoes lighted on one of Paul Bunyan's oxen, killed it, ate it, cleaned the bones, and sat on a grub shanty picking their teeth as Paul came along. Paul sent to Australia for two special bumblebees to kill these mosquitoes. But the bees and the mosquitoes intermarried; their children had stingers on both ends. And things kept getting worse till Paul brought a big boatload of sorghum[2] up from Louisiana and while all the bee-mosquitoes were eating at the sweet sorghum he floated them down to the Gulf of Mexico. They got so fat that it was easy to drown them all between New Orleans and Galveston.

Paul logged on the Little Gimlet in Oregon one winter. The cookstove at that camp covered an acre of ground. They fastened the side of a hog on each snowshoe and four men used to skate on the griddle while the cook flipped the pancakes. The eating table was three miles long; elevators carried the cakes to the ends of the table where boys on bicycles rode back and forth on a path down the center of the table dropping the cakes where called for.

Benny, the Little Blue Ox of Paul Bunyan, grew two feet every time Paul looked at him, when a youngster. The barn was gone one morning and they found it on Benny's back; he grew out of it in a night. One night he kept pawing and bellowing for more pancakes, till there were two hundred men at the cook-shanty stove trying to keep him fed. About breakfast time Benny broke loose, tore down the cook-shanty, ate all the pancakes piled up for the loggers' breakfast. And after that Benny made his mistake; he ate the red hot stove; and that finished him. This is only one of the hot-stove stories told in the North Woods.

2. sorghum (sor'gəm), *n.*: Tropical grasses bearing flowers and seeds that are grown for use as grain or syrup.

THINKING ABOUT THE SELECTION

Recalling

1. How did Paul Bunyan show his cleverness?
2. How did Paul Bunyan use his strength?
3. How did Paul Bunyan solve the problem of serving pancakes at a table three miles long?
4. How often did Benny, the Little Blue Ox of Paul Bunyan, grow when a youngster?

Interpreting

5. Interpret the following statement: "And some of Paul is old as the hills, young as the alphabet"?
6. What qualities and abilities seem to be valued in this selection?

Applying

7. Explain how Paul's qualities of strength, cleverness, and size might be valuable for real lumberjacks.

ANALYZING LITERATURE

Understanding a Folktale

Before **folktales** were preserved in written form, they were simply stories retold whenever a group of people with the same interests gathered. Many times, the storyteller would claim to have witnessed the tale in order to make it seem more authentic. The tales that people chose to recount indicate something about what their lives were like. For example, this selection shows you the rugged lives that loggers lived.

1. Find three other details that indicate the ruggedness of the loggers' lives.
2. Find two details that indicate the need for courage.
3. Think about the landscape of the Pacific Northwest. Why would the people telling these folktales make Paul so big?

CRITICAL THINKING AND READING

Making Generalizations About a Folktale

A **generalization** is a general idea or statement derived from particular instances. For example, if every book you have read by a certain author is about science fiction, you can generalize that the author is a science-fiction writer.

1. What generalization do you make about the folktales based on "Paul Bunyan of the North Woods"?
2. Give the particular instances on which this generalization is based.

UNDERSTANDING LANGUAGE

Appreciating Homophones

Homophones are words that have the same sound, but differ in spelling and meaning. For example, *bough* sounds like *cow* and means "the branch of a tree." A homophone of *bough* is *bow*, which sounds the same, but is spelled differently and means "to bend the head or body in respect."

Write the homophone for each of the following words.

1. meet
2. site
3. pane
4. know

THINKING AND WRITING

Writing a Response to Critical Comment

A writer has said that the Paul Bunyan folktales were told matter-of-factly, as if by an eyewitness of commonly known events. This gives the tales a feeling of truthfulness. Choose which tales in this selection are told in a matter-of-fact manner. Then write an essay for your classmates explaining in what ways they seem matter-of-fact. Use examples to support your view. Revise your paragraphs to make sure your opinion is stated clearly. Finally, proofread your essay and share it with your classmates.

Name _____ Date _____

Paul Bunyan of the North Woods Carl Sandburg (text page 643)

Selection Test

A. Thinking About the Selection. On the line at the right, write the letter of the answer that best completes the sentence.

1. Paul Bunyan is made to ease the hours of 1. _____
   a. the Seven Axmen.
   b. people who read.
   c. men amid axes and trees, saws and lumber.
   d. those who celebrate the Fourth of July.

2. The dancing of the Seven Axmen causes an earthquake and moves the 2. _____
   a. Big Onion river.
   b. Pacific Ocean.
   c. Little Gimlet.
   d. Gulf of Mexico.

3. In order to enjoy his Fourth of July celebration, Paul has to 3. _____
   a. kill the mosquitoes.
   b. bring white snow from China.
   c. make sure Benny has plenty of pancakes.
   d. stop the pillar of water in Lake Superior.

4. On the three-mile eating table, pancakes are delivered by 4. _____
   a. elevators.
   b. boys on bicycles.
   c. four men on skates.
   d. the Seven Axmen.

5. Paul is able to get rid of the fat bee-mosquitoes by 5. _____
   a. roasting them on a red-hot stove.
   b. drowning them between New Orleans and Galveston.
   c. burying them under a granite floor.
   d. sending them to Australia.

B. Understanding a Folktale. Complete the following sentences by filling in the blanks with the appropriate words.

1. The people who first told the stories about Paul Bunyan probably worked as _____.
2. One of the favorite breakfasts in a logging camp was probably _____.
3. Paul Bunyan was angry about the pillar of water in Lake Superior because it had spoiled his _____ of the Fourth.
4. From the pets that Paul Bunyan had you can tell that loggers probably used _____ to haul logs.
5. One pest that was no doubt bothersome to loggers was the _____.

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Name _____ Date _____

Paul Bunyan of the North Woods Carl Sandburg (text page 643)

Language Worksheet

Appreciating Homophones

Homophones are words that have the same sound but differ in spelling and meaning. For example, the word *board* means "a length of lumber." The word *bored* is pronounced the same but is spelled differently. It also has a different meaning—"not interested."

A. On the line at the right, write a homophone for each of the listed words.

1. knight _____
2. ate _____
3. would _____
4. road _____
5. for _____

B. Decide which word from the pairs of homophones in A best completes each sentence. Write the word on the line.

1. The mosquitoes killed Paul Bunyan's ox and _____ it.
2. Paul Bunyan _____ not let a waterspout spoil his Fourth of July celebration.
3. The Seven Axmen danced so hard on the _____ of Paul Bunyan's party, they caused an earthquake.
4. The bacon was cooked by _____ men who skated on the griddle with the side of a hog fastened to each snowshoe.
5. The pancakes were delivered by boys who _____ back and forth down the center of the table.

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Name _____ Date _____

C. Making Generalizations About a Folktale. On the line following each sentence, write one particular instance from the selection on which each of the following generalizations might be based.

1. Paul Bunyan was a mythical figure who belonged to the working people.

_____

2. Paul Bunyan was important to those people who faced harsh weather.

_____

3. Paul Bunyan enjoyed a good party.

_____

4. Paul Bunyan solved problems in clever ways.

_____

5. Benny, the Little Blue Ox, was always hungry.

_____

D. Appreciating Homophones. Choose the homophone from the pair in parentheses that completes each of the following sentences. Write the homophone on the line at the right.

1. In one winter the Pacific Ocean froze and the snow was (blue, blew). 1. _____

2. The Seven Axmen would not take off (there, their) hobnailed boots. 2. _____

3. The pancakes were served by boys on bicycles who rode back and (forth, fourth) down the table. 3. _____

4. The ox made a great mistake when he ate the (red, read)-hot stove. 4. _____

5. When Paul went to Lake Superior he was gone about an (our, hour). 5. _____

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Name _____ Date _____

My Wild Irish Mother Jean Kerr (text page 445)

Vocabulary Check

A. Match each word in the left column with its definition in the right column. Write the letter of the definition on the line next to the word it defines.

_____ 1. languorous	a. pompous and self-consciously weighty
_____ 2. credo	b. generous
_____ 3. indulgent	c. secretive
_____ 4. portentous	d. set of personal beliefs
_____ 5. conviction	e. charmed
_____ 6. beguiled	f. slow and lazy
_____ 7. protestations	g. strong belief
_____ 8. conspiratorial	h. formal declarations or assertions

B. Read each sentence. Complete the sentence with the best word from the list in the box. Use each word only once.

conspiratorial	indulgent	beguiled	portentous
protestations	credo	languorous	conviction

1. "The youngest daughter of wealthy and _____ parents, Mother went to finishing schools in France. . . ."
2. "I remember my brother Hugh, . . . sitting on the foot of Mother's bed and giving her a half-hour lecture which began with the _____ question, . . ."
3. "Mother was born Kitty O'Neill . . . with bright red hair, bright blue eyes, and the firm _____ that it was wrong to wait for an elevator. . . ."
4. "For once, all of Mother's _____ that it was just like chicken were unavailing."
5. "Then she sits, staring into space, clearly lost in _____ memories."
6. "Without any preliminary word of greeting, she asked in hushed, _____ tones, 'Darling, have you pointed . . . ?' "
7. "I used to think that they were one and all _____ by her Irish accent."
8. "Mother's _____ , by the way, is that if you want something, anything, don't just sit there—pray for it."

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Name _____ Date _____

Debbie James Herriot (text page 439)

Vocabulary Check

A. Match each word in the left column with its definition in the right column. Write the letter of the definition on the line next to the word it defines.

_____ 1. ornate	a. decoratively arranged
_____ 2. knell	b. having fancy decorations
_____ 3. sage	c. moved lightly through the air
_____ 4. privations	d. urging to action
_____ 5. fretted	e. the sound of a bell slowly ringing
_____ 6. goading	f. lack of common comforts
_____ 7. wafted	g. a plant used to flavor food

B. Read each sentence. Complete the sentence with the best word from the list in the box. Use each word only once.

privations	knell	goading	wafted
ornate	fretted	sage	

1. "Mrs. Ainsworth's home was lavishly decorated with tinsel and holly, . . . and the rich aroma of turkey and sage and onion stuffing _____ from the kitchen."
2. "When I pulled down her eyelid and saw the dead white conjunctiva a _____ sounded in my mind."
3. "Driving through the marketplace I thought again that Darrowby on Christmas Day was like Dickens come to life; . . . the snow . . . hanging from the eaves of the _____ lines of roofs; . . ."
4. "Not for him the _____ of the secret outdoor life; . . ."
5. "He was dancing up to the youngest dog again, sideways this time, head on one side, _____ him."
6. "In the house there was all the festive cheer of last year and the same glorious whiff of _____ and onion. . . ."
7. ". . . he stalked the rich carpets of the Ainsworth home like a king and the _____ collar he always wore added something more to his presence."

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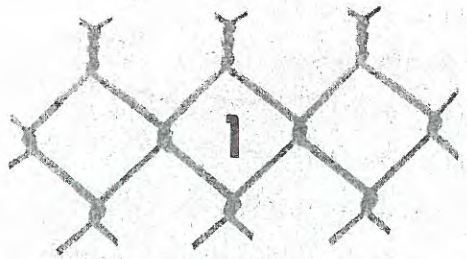
TWO WEEKS EARLIER . . .



SNEAKING OUT AT NIGHT – HELPFUL HINTS.

(i) When lying to your parents, maintain EYE CONTACT.

(ii) Make sure you ask permission to attend the correct FAKE SLEEPOVER. (Boys – Stan Winter's place. Girls – Karen Lobodzic's)

(iii) Meet at the OLD ROCKFORD HOUSE at 8:30 p.m. Friday. (You can't miss it; there's a CRANE with a giant WRECKING BALL parked in front.)

(iv) Enter through missing planks in BOARDED-UP WINDOW, first floor, east side.

(v) Bring your SLEEPING BAG. Remember: The old Rockford house is a CONDEMNED BUILDING that will be demolished TOMORROW MORNING. There will be no beds, no running water, no furniture, no lights, no TV. . .

When a plan came from Griffin Bing, even the tiniest detail had to be perfect. He'd agonized over every fine point and possibility. All except one: What if nobody showed up?

"We probably shouldn't have put in the part about no TV," Griffin's friend Ben Slovak said glumly.

Griffin and Ben sat cross-legged on their sleeping bags in what had once been an elegant living room. They were surrounded by shredded drapery, remnants of ancient furnishings, and mounds of dust. All around them, the cavernous old house creaked and groaned with hollow, eerie noises. Outside, a thunderstorm raged.

Griffin trained the beam of his flashlight on his wristwatch: 10:34 p.m. "I can't believe it," he seethed. "How could we get *nobody*? Twenty-eight people said they were coming!"

"Maybe they're just late," Ben offered lamely.

"Nine o'clock is late. Ten-thirty is a no-show. Don't they have any self-respect? This is like saying it's totally fine for the adults in this town to walk all over us."

Ben would have dearly loved to be No-Show #29. Only loyalty to his best friend had brought him here tonight. "Come on, Griffin," he reasoned. "What difference does it make if two people or two *hundred* people spend the last night in a condemned building? How does that show the adults that we're standing up for our rights? They're never even going to know about it."

"*We'll* know," Griffin said stoutly, sticking out his jaw. "Sometimes you have to prove to yourself that you're more than just a slab of meat under the shrink-wrap in your grocer's

freezer. Why do you think I came up with the fake sleepover idea? I wanted to make sure everybody had an excuse to be here. That was the whole point behind the plan."

The plan. Ben groaned inwardly. It was the best thing about Griffin, and also the worst. Griffin Bing was The Man With The Plan.

"Maybe the other kids wanted to come, but they were scared," Ben suggested.

"Of what?" Griffin challenged. "Dust? The rain? A whole night with no TV?"

"This house is supposed to be haunted," Ben insisted. "You know the rumors."

"What rumors?" Griffin scoffed.

"How do you think it got abandoned in the first place? Old Man Rockford was in jail for cutting up his wife with a chain saw — that's what Darren said."

"When's the last time Darren's said anything that's been worth the air it took to blow it out of his big fat head?" Griffin exploded. "He also says he's distantly related to the Rockfords — with no proof whatsoever.

Besides, they didn't even have chain saws back in Old Man Rockford's time."

"They had railroads, though," Ben noted. "According to Marcus, the real murder weapon was a railway spike pounded into her skull."

Griffin wasn't buying it. "He's just pulling your chain. You know how he loves messing with people."

"But Pitch doesn't, and you know what she heard? The house is haunted by the spirit of a dog that the old man brought home from Europe after World War One. Or maybe it wasn't a dog."

Griffin rolled his eyes. "Then what was it? A Komodo dragon?"

Ben shrugged. "Nobody knows. But just a few days after it got to town, pets started disappearing. At first it was just little kittens and puppies, but pretty soon full-grown Saint Bernards were vanishing into thin air. And there were bones buried all around the house — only Rockford wasn't feeding his dog any bones."

A flash of lightning cast strange angular shadows through the boarded-up windows. Ben paused to let his story sink in. "The townspeople took the law into their own hands. They put rat poison inside a big steak and left it on the doorstep. It never occurred to them that if an evil spirit could live inside a dog, it could live inside something else, too — like a house!" He peered around at the shadowed walls, as if expecting to see something supernatural and hideous coming through.

"Oh, come on!" Griffin refused to be shaken. "There's no such thing as a haunted house."

"Well, Marcus heard the same story," Ben said with a sniff.

"No, he didn't," Griffin reminded him. "He heard the one about the railway spike."

"He heard *both*. And so did Savannah. Only in her version, it wasn't a dog. It was a baby."

"Why would the townspeople poison a baby?"

"They didn't. It got carried off by a chicken

hawk. But the baby's ghost put a curse on the house to take back all the years it never got to live. There was this schoolteacher — the first non-Rockford ever to live here. No one saw her again after the day she moved in — or maybe they did. People talked about an old, old woman peering out an attic window. But here's the thing: That schoolteacher was only twenty-three."

A gust of wind blew through the eaves, and an unearthly moaning sound echoed around them. Ben's head retreated turtle-like into his collar, and even Griffin paled a little.

"No offense, Ben, but shut up. You're starting to creep me out." Griffin panned the crumbling walls with his flashlight. "It's almost eleven. Nobody's coming. Gutless wonders."

"It's the railway spike," said Ben nervously. "That's got to be a splitting headache. Literally."

Griffin spread out his bedroll and lay back, standing his flashlight on its base like a miniature floor lamp. "Let's try to get some

sleep. The sooner the sun rises, the sooner we can get out of this rat trap."

"Maybe we can leave now," Ben suggested hopefully. "Since nobody else came, they'll never know that we weren't here all night."

Griffin was horrified. "You mean *back down*?" These two words were not in his vocabulary.

"I don't want my years sucked away by some baby's ghost!"

"There's no such thing!" Griffin exclaimed.

"Who says you have to believe in ghosts to be afraid of them?" Ben challenged. "All right, fine. I'll sleep." He rolled over onto his side, pulling his knees to his chest. "But if I wake up eighty-five years old, you owe me twenty bucks."

"Deal."

They lay there in silence for what seemed like a long time, listening to the machine-gun rhythm of rain on the ancient slate roof.

Griffin stared up at a gaping hole in the ceiling that had once held a chandelier. "I hope you know how much I appreciate this. You're the only kid who had the guts to see it through."

His friend said nothing, so Griffin went on. "I mean it, man. The others — they talk a good game, but where are they? Darren dared half the sixth grade to come. He even made fun of us, said we'd wimp out. But who's the real wimp, huh, Ben?"

Ben's reply was slow, steady breathing. Almost like . . . snoring?

"Ben?"

Griffin sat up and peered at his friend. Ben was curled into a ball on his bedroll, fast asleep.

Griffin let out a low whistle of admiration. Creepy house, creepy night, and Ben was relaxed enough to doze off. He came off as a big chicken sometimes, but when it really counted, he was too cool for school.

It was harder for Griffin to settle down. Not because he was scared. Not at all.

Griffin stayed up because he was mulling over the reason he and Ben were camping out with dust bunnies and a century of supernatural speculation.

He was thinking about the *last* plan.



As soon as the town had announced the meeting to decide what would be done with the Rockford land, Griffin had spoken those five fateful words: "Let's work out a plan."

PROPOSAL FOR DEVELOPMENT
OF ROCKFORD SITE
Griffin Bing – Head Designer

(i) This PLAN, approved by the KIDS of CEDARVILLE, shows how the land of the old ROCKFORD HOUSE can be turned into a SKATE and ROLLER PARK, laid out according to DIAGRAM "A" below (Scale: 1 inch = 12 feet) . . .

With the help of Ben, a few classmates, and Mr. Martinez, their teacher, Griffin put together a formal presentation to make to the town council. But on the big night, the committee had refused even to hear their proposal. They had already decided on their own project: a Cedarville museum.

It still rankled Griffin. Not losing. Sure, that had been disappointing. But to be ignored completely, brushed off like a mosquito, just because you were young, was unbearable. That was why he was here now, in this ancient dying house. That was why *everybody* should have been here — every kid who was sick of counting for nothing in this town. It wasn't going to get a skate park built, but at least it would win them some pride.

Anyway, spooky, uncomfortable, and boring as this was for Griffin, it had to be better than lying in bed at home listening to Mom and Dad arguing about money.

He regarded Ben's slumbering form with



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envy. Try as he might, Griffin was too keyed up to fall asleep.

At last, he began to wander the empty husk of the Rockford house, his flashlight guiding him down hallways and through rooms. At least the thunder had passed, the storm settling into a steady rain. So much for a dark and stormy night.

And then the creature landed in Griffin's hair.

Full-on terror rocked him. The flashlight dropped from his hand, and the room was plunged into sudden darkness. He slapped desperately at his head as the attacker beat its scalloped wings, burrowing into Griffin's thick curls, squeaking and screeching. In his frenzy, Griffin tripped over his own flashlight and went down, wrapping himself in cobwebs as he rolled wildly around on the floor. He touched short fur, rubbery skin, and sharp clinging claws, but his slippery assailant resisted his grasping fingers.

It was over as unexpectedly as it had begun. The creature managed to disentangle itself and flew off, leaving Griffin writhing there. He retrieved his light just in time to see a large black bat fluttering up the open stairwell.

You're okay, he told himself, heart thumping. *Maximum gross, minimum danger.*

He frowned. There, illuminated in the cone-shaped beam, was a piece of furniture. Most of the house had been emptied prior to demolition day. Yet here was some kind of old-fashioned desk.

He scrambled to his feet and went over to investigate. It wasn't exactly *Antiques Roadshow* quality. It was beaten up and cracked, and the rolltop was stuck at an odd angle. By the glow of the flashlight, Griffin played with the many drawers and compartments. There was nothing of interest — just dust and the occasional dead spider.

One tiny drawer wouldn't budge. Griffin pulled and the knob came off in his hand. He

tried to pry his fingers behind the face of the drawer, but there was zero movement.

He perched on the edge of the blotter to catch his breath. The seat of his jeans pressed against a small button.

Snap! The locked drawer popped open.

A release switch! This must be some kind of hiding place!

Eagerly, he shone the light inside the narrow compartment. Empty.

No, wait —

At the very back of the drawer, a flash of color caught his eye. He reached in and drew out an old faded card. There was a picture of a loaf of bread in the center, surrounded by the message: TOP DOG BAKERY PRODUCTS — FOR THE SANDWICH OF CHAMPIONS.

He turned it over and examined the other side.

There was a color drawing of a baseball player shouldering a bat. The image wasn't detailed, but the face seemed familiar. Griffin read the name at the bottom:

GEORGE HERMAN (BABE) RUTH

A baseball card! And it had to be old, too, since Babe Ruth had played a very long time ago. Griffin was no expert, but everyone knew that some old baseball cards were worth a lot of money.

Money — just the thought of it brought a dull ache to his stomach. The Bing family was really struggling to make ends meet these days. It had gotten so bad that Mom and Dad were even talking about selling the house and moving to a more affordable neighborhood.

"No way," Griffin said aloud, teeth clenched. It had taken him eleven years to break in this town and these friends. He wasn't about to give that up without a fight.

And if this card turned out to be valuable . . .

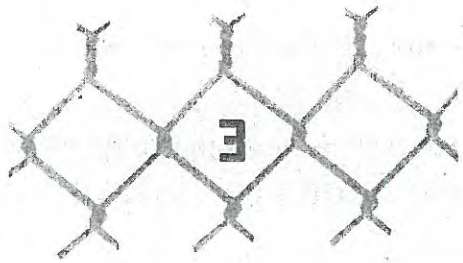
Get it out of your head, he admonished himself. What were the odds that someone would leave a priceless collectible to be destroyed inside a condemned building?

Still, it was possible. He could *hope* . . .

He made a face. Griffin was not a hoping kind of guy. His philosophy: If you want something, you *make* it happen. You don't sit around wishing for it to come true.

Yet the tantalizing image would not let go of him — his family's financial problems over, no more dark circles under his parents' eyes from staying up half the night, trying to squeeze money out of a bank account that had none to give. . . .

Even The Man With The Plan could be a dreamer when there was so much on the line.



The roar of a big motor jolted Ben out of a deep sleep. He sat bolt upright, rubbing eyes that seemed cemented shut. This wasn't his bed. Where was he?

The engine noise was so intense that he felt the churning in his stomach.

What makes a sound like that? A garbage truck? A semi? Or maybe . . .

He managed to focus enough to take in the sight of the dilapidated parlor around him.

. . . a crane carrying a giant wrecking ball!!

"Griffin!"

A shape stirred inside Griffin's sleeping bag.

Ben tore open the zipper to reveal his slumbering friend. "Griffin — wake up!"

"Wha —?"

"It's morning! *They're tearing down the building!*"

Griffin popped up like a champagne cork. "Let's get out of here!" he cried.

The two scrambled for the window. The entire house was vibrating with the clamorous thrum of the crane. Griffin got there first and stuffed the two sleeping bags and then Ben through the missing planks. He was halfway out himself, his stomach over the sill, when he realized he couldn't move forward or backward.

"I'm stuck!" he hissed.

Ben grabbed him by the wrists and hauled with all his might, but Griffin remained hung up in the opening.

A tremendous crash shook the structure and the very earth beneath Ben's feet. The impact pitched Griffin out the window, sending him

sprawling on top of Ben. The two scrambled up, dazed. Griffin was white with plaster dust from the waist down.

"Run!" he bellowed.

They fled, the sleeping bags trailing behind them. As they rounded the corner, a chilling sight met their eyes: the titanic wrecking ball, buried deep in the shattered front of the old Rockford house.

If they needed any more reason to get away from there, it came from the horrified job foreman. "Hey, you! This is an active demolition zone!"

Coach Nimitz would have been amazed by the speed and stamina of their escape, which were much greater than they ever showed in gym class. The two kept up a lung-searing sprint for several minutes, spurred on by a series of loud booms behind them. They were halfway across town before Griffin pronounced the coast clear enough to slow to a walk.

"The next time you get a brilliant idea like spending the night in a death trap," Ben panted,

"pretend my number is unlisted." In the distance, there was a long low rumble, followed by an earth-shaking thump. "That was almost us, you know. My mother didn't raise me to be rubble."

"No risk, no reward," said Griffin, catching his breath.

"Some reward. We got revenge on the town for our skate park — only nobody knows about it but us."

Griffin pulled the Babe Ruth card out of his pocket and waved it under his friend's nose. "Read it and weep." He gave Ben a quick recap of the discovery in the secret drawer.

"Babe Ruth — wow. Do you think it's real?"

Griffin shrugged. "It makes sense. Old house, old card. The question is, what's it worth?"

"But, Griffin — it's not yours," Ben whispered.

Griffin indicated the plume of dust that swirled in the air several blocks behind them. "When you knock down a house, you're

really just throwing it in the garbage. It's not stealing to take something out of the garbage, is it? Besides —" He regarded the card ruefully. "*The Sandwich of Champions*? It's probably not valuable. I never get *that* lucky."

"How can you find out for sure?" asked Ben.

"There are experts in this kind of thing."

Ben's eyes widened. "Palomino's Emporium?"

Griffin smiled bravely. "We'll get an appraisal."

Palomino's Emporium of Collectibles and Memorabilia was a fortress unto itself. It was located just past the main strip of town in a low building surrounded by a high chain-link fence that always made Griffin think of a prisoner-of-war camp. It had once been a stone-cutter's workshop. As young children, he and Ben had always been fascinated by the display of grave markers in the small courtyard. Now the

headstones had been replaced by sickly grass and a large dog, who was thankfully asleep.

Griffin indicated the front door.

VINTAGE ITEMS BOUGHT & SOLD
BEST PRICES GUARANTEED
S. WENDELL PALOMINO, OWNER AND PROPRIETOR

Although they lived less than a mile away, this was their first time inside the store. Kids almost never came here. It was more like a museum than a comic shop — a museum where you could look but not touch, and everything was under surveillance by grim-faced guards. There were no rows of shelves cluttered with books, toys, knickknacks, cards, and souvenirs. In Palomino's Emporium, everything was frozen into its own glass case, with harsh lighting and security wiring. The whole place felt about as welcoming and warm as a bank vault.

Ben leaned into one of the displays to see an action figure and gaped at the sticker. "Six hundred and forty bucks? Are they crazy?"

A tall, cadaverous man with a ring of white hair around a bald crown walked over to him. "That's because it's a genuine 1966 Mr. Spock doll from the classic *Star Trek* TV series, still in its original packaging."

Ben frowned. "What kid has six hundred dollars to spend on a toy?"

"Exactly," the man agreed. "This isn't a toy store. Rare collectibles aren't for kids. They're a serious investment."

"Are you Mr. Palomino?" Griffin asked him.

"I'm Tom Dufferin, the assistant manager." He stretched out a bony arm and indicated another man, who was behind a long counter, inserting comic books into precisely sized protective sleeves. "That's the big boss over there."

S. Wendell Palomino was short, stocky, and surprisingly young — in his mid-thirties,

Griffin guessed, not nearly as ancient as Tom Dufferin. His curly hair almost (but not quite) fit underneath a New York Rangers cap. Thick glasses made his eyes appear twice their size, like two eggs, sunny-side up. He turned those eggs on his sixth-grade visitors. "What can I do for you, young gentlemen?"

Griffin pulled out his Babe Ruth card. "I'm thinking of selling this. I hear you guarantee the best prices."

The owner extended a pudgy hand and accepted the last surviving piece of the Rockford estate. His bushy eyebrows shot straight up to the Rangers logo on his hat.

Griffin was immediately alert. "It's valuable?" he asked.

Palomino laughed shortly. "Well, it would be — if it was real. You see, a lot of the old card series were reissued in the sixties and seventies. This one — the Top Dog Bakery line — was knocked off in 1967. I've seen a couple of these before, but not in a long time. Excellent quality reproduction." He held the

card under a large magnifying glass attached to the counter. "You see this solid blue border? That was striped in the original. They weren't allowed to make an exact replica, because that would have violated counterfeiting laws. That's how we know it's a copy."

Ben took in the crestfallen look on Griffin's face. "Nineteen-sixty-seven was a long time ago," he said hopefully. "So it's still a little bit valuable, right?"

"Absolutely," the collectibles dealer confirmed. "Why, I saw a whole set of these once go for fifteen hundred dollars. But a single card like this — well, I'm a sucker for the Bambino. I'll give you a hundred bucks for it."

Griffin sighed, his visions of solving the family's money woes popping like soap bubbles. Still, he was a born negotiator. "A hundred and fifty," he said instantly.

Palomino chuckled. "You drive a hard bargain, sonny boy. Tell you what — one twenty."

"Sold."

The dealer counted out six crisp twenty-dollar bills from a thick roll and accepted the card in return. The boys peered over the counter as he stooped to turn the dial of a portable safe on the floor at his feet. He opened the door and locked his new acquisition inside.

Griffin frowned. "If the card isn't valuable, how come you need to keep it in a safe?"

"This isn't Toys 'R' Us, sonny boy," lectured Palomino, out of breath from the simple act of straightening up. "We take security seriously at Palomino's Emporium. A baseball card is the easiest thing in the world to swipe. Stick it in your pocket, and nobody even knows it's there. It stays in the lockbox until it's cataloged and ready for the display cases."

"Can't somebody just steal the whole safe?" Ben put in.

The dealer snorted. "You kids kill me. Steal the safe. That's funny."

Griffin spoke up for his friend. "He means it's not very big, and there's a handle



on top. You could pick it up and walk out the door."

Palomino beckoned the two boys behind the counter. "All right, you guys. Give it a try."

Griffin and Ben took firm hold of the handle and pulled. The lockbox didn't budge.

"Come on." The dealer was grinning at them now. "Put some muscle into it!"

Grunting with effort, they pulled with all their might. Nothing.

Palomino burst out laughing in their faces. "It's bolted to the floor!"

Embarrassed, Griffin and Ben slunk out from behind the counter and headed for the door.

Tom Dufferin offered a sympathetic smile as they passed by. "You're not the first to try it. I doubt you'll be the last."

"Pleasure doing business with you, young gentlemen," Palomino called after them. "Come back any time."

As they passed the sleeping dog and



5th

Name _____ Skill: Vocabulary

DIRECTIONS:
Read each sentence and the answer choices. Choose the word or phrase that best completes the sentence. Mark the answer you have chosen.

1. A word that means "as a result of" is

   a disclose
   b cope
   c hence
   d ignite

2. To step in or come between is to

   f agitate
   g agonize
   h intervene
   j complicate

3. When you take something for granted without proving it you

   a presume
   b overcrowd
   c negotiate
   d maroon

4. An exact copy of something is a

   f unison
   g tendon
   h replica
   j scribe

5. Half of one school year is a

   a semester
   b reviewer
   c noonday
   d kindergarten

6. A person who doesn't wait for anything is

   f dutiful
   g impatient
   h domestic
   j grievous

7. A small flute-like instrument is a

   a bandanna
   b portable
   c piccolo
   d inkling

8. Something that happens totally by chance happens at

   f random
   g mutiny
   h latitude
   j impractical

9. Having a fresh healthy red look is to be

   a restricted
   b unruly
   c subtle
   d ruddy

10. A short battle is called a

    f personification
    g pshaw
    h mutual
    j skirmish

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Name _____ Skill: Vocabulary

DIRECTIONS:
Read each sentence and the answer choices. Choose the word or phrase that best completes the sentence. Mark the answer you have chosen.

1. A high tower in a castle is a

   a legacy
   b turret
   c pun
   d outdistance

2. A word that means "to cancel out or get rid of" is

   f fray
   g dunk
   h void
   j fraud

3. To oversee something is to

   a delegate
   b holster
   c emit
   d supervise

4. A person who is regretful or sorry is

   f clogged
   g rueful
   h considerable
   j bribed

5. A word that means "to earn" is

   a recycle
   b merit
   c trodden
   d tidbits

6. To speak out loud is to be

   f jostled
   g vocal
   h persevering
   j loyal

7. A person who helps another learn is a

   a guidance
   b delusion
   c tutor
   d fireman

8. Half of a circle is a

   f fanfare
   g contemporary
   h algebra
   j semicircle

9. An ideal place is a

   a paradise
   b adjoining
   c victorious
   d tedious

10. Something that is useless is

    f unending
    g significant
    h futile
    j robust

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Name _____ Skill: Vocabulary

DIRECTIONS:
Read each sentence and the answer choices. Choose the word or phrase that best completes the sentence. Mark the answer.you have chosen

1. Disrespect or open disobedience for a rule is an example of

   a submerge
   b contempt
   c rebellious
   d recollection

2. An amount that is more than enough is

   f percentage
   g haughty
   h inseparable
   j ample

3. To make unfair or selfish use of is to

   a dishevel
   b exploit
   c domesticate
   d contradict

4. A person who breaks in where he is not expected or wanted is an

   f enthusiast
   g acrobat
   h intruder
   j enchantress

5. Anything that came before or happened earlier was

   a fertile
   b prior
   c limitless
   d potential

6. A person who helps another in some act is an

   f umpire
   g officer
   h inconvenience
   j accomplice

7. A deep opening or crack in the earth is a

   a hoax
   b iguana
   c electron
   d chasm

8. A person who keeps totally to themselves is called a

   f ballast
   g ailment
   h hermit
   j congregation

9. To be stubborn is to be

   a identical
   b obstinate
   c gorgeous
   d grotesque

10. A mixture of thought and tender feelings for something is

    f sentiment
    g protrude
    h unmistakable
    j strenuous

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Name _____ Skill: Vocabulary

DIRECTIONS:
Read each sentence and the answer choices. Choose the word or phrase that best completes the sentence. Mark the answer you have chosen.

1. When everyone votes the same way it is

   a reverent
   b unyielding
   c sarcasm
   d unanimous

2. To look like something or someone else is to have a

   f persecution
   g resemblance
   h lineage
   j grimace

3. A word that means "deep" is

   a delirious
   b profound
   c descriptive
   d corduroy

4. A sign of things to come is an

   f apprehension
   g awkwardness
   h overload
   j omen

5. Anything that is messy or unkempt is in

   a peril
   b moderate
   c disarray
   d closeness

6. To sleep lightly is to

   f slumber
   g perceive
   h lavish
   j induce

7. To have very strong feelings about something is to have

   a facility
   b fellowship
   c passion
   d discontent

8. Something that is left out is

   f circulation
   g omitted
   h consecutive
   j bearable

9. A person who doubts or is not ready to believe is

   a pompous
   b justified
   c incredulous
   d incorrect

10. A strong feeling or belief is a

    f attachment
    g conviction
    h convulsion
    j conflict

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Civics Weekday Breakdown Week 28

March 1st - March 5th

We will be watching CNN10 for the first 10 minutes of class! Here is the link you can follow to watch each day at the beginning of class: www.cnn.com/cnn10

Monday 3/1: Section 3: Court Proceedings in Criminal Cases + Section 3 Review

Tuesday 3/2: Section 4: Juveniles and the Court System + Section 4 Review

Wednesday 3/3: Chapter 17 Review- in class notes session

Thursday 3/4: Begin Chapter 17 Review

Friday 3/5: Complete Chapter 17 Review

★ SECTION 3 ★

Court Proceedings in Criminal Cases

FOCUS

TERMS TO KNOW

summons, arraignment, prosecution, testimony, cross-examination, acquittal, hung jury

OBJECTIVES

- Describe the procedure when **arresting a suspect** of a crime.
- Explain the **hearing, indictment, and arraignment** phases of a criminal case.
- Define **plea bargaining** and explain its importance.
- Outline the basic procedure of **the trial.**
- Explain what happens during **the verdict and sentencing** parts of a criminal case.

The justice system treats misdemeanor cases and felony cases quite differently. Misdemeanor cases are usually handled in a minor court, such as traffic court or municipal court. Most felony cases are tried in county courts. The police do not usually arrest misdemeanor suspects. Instead, they issue a ticket, requiring payment of a fine, or a **summons,** directing someone to appear in court for a hearing on the charge. For felony cases, the procedure is much more formal and involved.

Arresting a Suspect

Suppose an undercover police officer observes Hannah Jones exchanging packets of white powder for money on a downtown street. The officer immediately arrests her, searches her, and finds a large amount of cash and 30 small packets of what seems to be cocaine. The officer also informs Ms. Jones of her rights as soon as she is arrested.

Whenever the police arrest anyone, they are required to read the suspect his or her rights. These include the right to remain silent and the right to have an attorney present when being questioned by police. (For a detailed discussion of the "Miranda rights," see page 389.)

After her arrest, Ms. Jones is taken to the local police station, where she is booked, or charged with a crime. As part

Miranda Rights Police officers are required to read a suspect his or her rights. *What rights are included?*



of the booking procedure, Ms. Jones is photographed and fingerprinted. During this time she is also allowed to call an attorney, or lawyer. If she cannot afford a lawyer, the state will provide one.

Hearing, Indictment, and Arraignment

A few hours later, Ms. Jones and her attorney appear before a municipal judge for a preliminary hearing. The judge hears the charges against the suspect and sets bail. For minor offenses, the judge has the option of releasing suspects on their own recognizance. This means they are released without having to pay bail. Instead, they promise to appear in court when they are called.

After the preliminary hearing, the judge sends Ms. Jones's case to a grand jury, which hears the evidence against the suspect. The grand jury decides whether to indict the suspect—to issue a formal charge—or to dismiss the case if it feels there is not enough evidence for a trial.

The Supreme Court has not required the states to use grand juries. In many cases the prosecutor will present a formal accusation, and the judge will decide whether to indict the suspect.

After it is decided to charge a person with a crime, an arraignment is held. An **arraignment** is a hearing where the suspect pleads guilty or innocent to the charges. The judge at the arraignment will then set a court date for the trial.

Plea Bargaining

Sometimes after reviewing the charges and evidence against a suspect, a lawyer may urge the defendant to accept a plea bargain. A plea bargain is an agreement in which the accused person agrees to plead guilty, but to a lesser charge. Plea bargaining helps avoid a lengthy and expensive trial. It also ensures that a person will be punished for committing a crime.

The majority of criminal cases never go to trial but are handled through plea

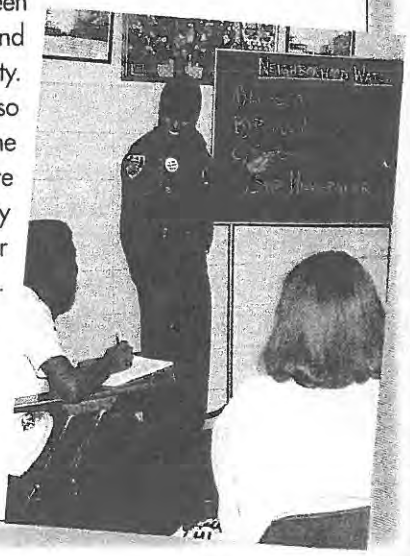
DID YOU KNOW?

Community Cops

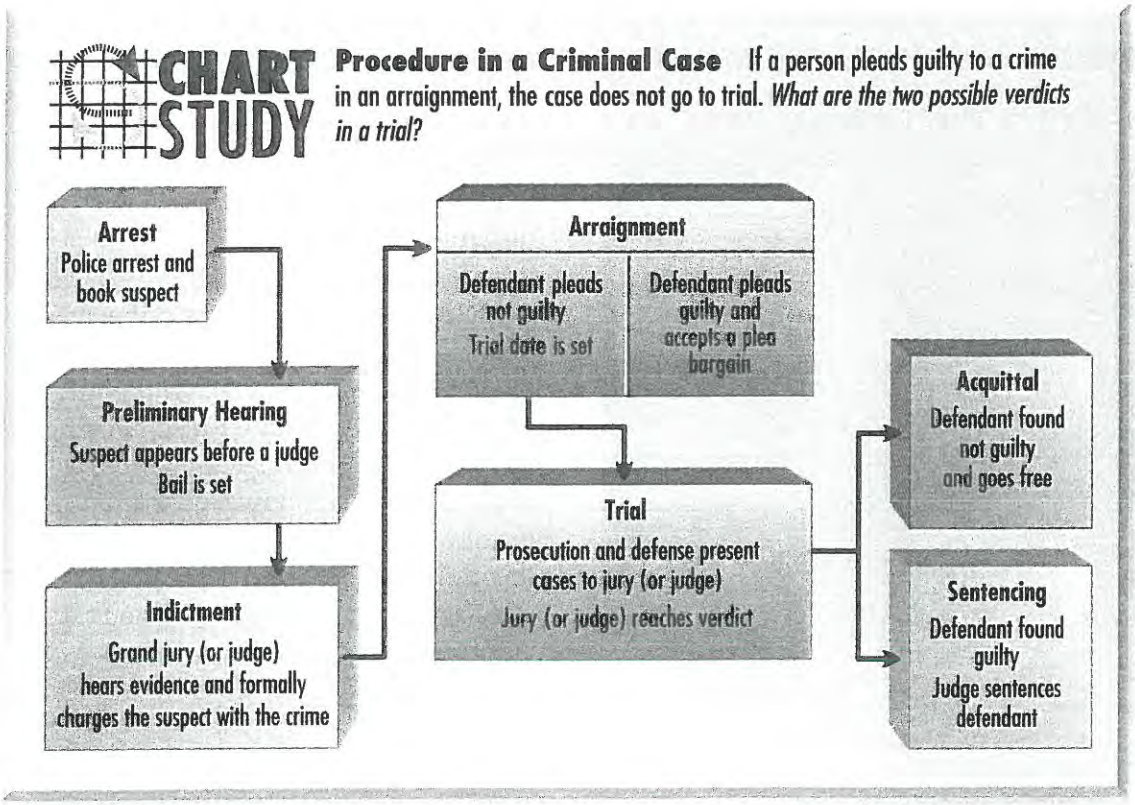
Years ago, police officers used to be part of the community. They knew everyone on the beats they walked. They could take the time to solve problems and catch criminals. Then police were put in squad cars, trained to be more objective, and required to answer many more calls each day.

Now police departments across the country are retraining law enforcement personnel to again become part of their communities. Police officers are being told to try to solve individual crimes rather than just take down information for a report and leave.

One officer might work with a storekeeper on ways to reduce shoplifting. Others may try to find rehabilitation programs for drug abusers who want to kick the habit. This kind of police work takes more time, but it builds bridges between the police and the community. It may also reduce crime much more successfully than other methods.



Community policing



bargaining. While plea bargaining saves the government a great deal of time and money, many people object to it. They criticize it because it often results in light sentences for serious crimes. Without plea bargaining, however, the criminal justice system would be even more backed up, and people accused of crimes would have very long waits before their cases came to trial.

The Trial

In preparing for her trial, Ms. Jones's lawyers interview witnesses, research the state's drug laws, and gather as much information about the case as possible. When the trial begins, the first step is selecting the jurors.

After the jury has been selected, the attorneys for each side make an opening statement in which they outline the case they will present. In criminal trials the state's side of the proceedings is called the **prosecution,** and the lawyer for the state is called the prosecutor. The accused person's, or defendant's, side is the defense, and his or her lawyer is the defense attorney.

After the opening statements, the prosecution presents its case first, followed by the defense. Each side calls witnesses, who take an oath to tell the truth about what they know. The statements a witness makes under oath are called **testimony.**

After a witness testifies for one side, the other side is allowed to cross-examine, or question, the witness. The questions asked in **cross-examination** are often designed to cast doubt on the truth or reliability of the witness's testimony. Finally, each side makes a closing



The Verdict The foreman of the jury delivers the jury's decision on whether the defendant is guilty or not guilty. *Who chooses the foreman?*

statement summarizing the testimony and evidence. The judge then "instructs" the jury, or explains the law that pertains to the case.

The Verdict and Sentencing

The last part of a trial begins when the jury withdraws to deliberate, or think over and discuss the case and reach a verdict. After choosing a foreman (who may be a man or a woman) to lead the discussion, the jurors review the evidence and legal arguments they have heard. Finally, they take a vote. In most states juries are required to reach a unanimous vote in finding a defendant guilty or not guilty.

If the jury feels that the prosecution has not proven its case, it can decide on **acquittal**—a vote of not guilty. To find a defendant guilty, a jury must believe that the evidence and testimony prove a suspect's guilt beyond a reasonable doubt. In the case of Hannah Jones, the jury finds her guilty of selling cocaine.

Sometimes a jury cannot agree on a verdict. When that happens, the judge declares a **hung jury** and rules the trial a mistrial. With a mistrial the prosecution must decide whether to drop the charges or ask for a retrial.

When a defendant is found guilty, the judge sets a court date for sentencing. In some cases a jury recommends a sentence. Most often, however, the judge determines the sentence after considering the defendant's family situation, previous criminal record, employment status, and other relevant information.

★ SECTION 3 REVIEW ★

UNDERSTANDING VOCABULARY

Define summons, arraignment, prosecution, testimony, cross-examination, acquittal, hung jury.

REVIEWING OBJECTIVES

1. What is the procedure when arresting a suspect of a crime?
2. What happens during the hearing, indictment, and arraignment phases of a criminal case?
3. What is plea bargaining, and how is it an important part of the legal process in criminal cases?
4. What is the basic procedure of a trial?
5. What happens during the verdict and sentencing parts of a criminal case?

★ CITIZENSHIP SKILLS ★

How to Make Decisions

People must make decisions every day. Some decisions, such as choosing what clothes to wear, are not of lasting importance. Other decisions, however, may have a long-term effect. For example, you may have to make some important choices about your courses and activities in school. You may have to decide how to help a friend who is involved with drugs.

Making such decisions is never easy. You can think through important decisions more clearly and logically, however, by following six basic steps.



Thinking carefully before making a decision

Steps in Decision Making

Step 1: *State the situation.* Ask yourself: Why do I have to make a decision on this matter? Why am I in this situation? Who else is involved?

Step 2: *List the options.* What are the different ways you might be able to deal with the situation?

Step 3: *Weigh the possible outcomes.* Think about any positive and negative results of each option. Then consider what the consequences of a decision might be to yourself or others.

Step 4: *Consider your values.* Values are the beliefs and ideas that are important to you. Your values should serve as your guidelines in making decisions.

Step 5: *Make a decision and act.* Use all the information gathered to make a decision. Then act on your decision knowing you have thought it through carefully.

Step 6: *Evaluate the decision.* Look at the results of your decision. How did the outcome affect you and others? Would you make the same decision again?

Taking Risks

Any decision involves some risk. By using the six steps outlined here, however, you can eliminate some of the risk and make a carefully thought out decision.

CITIZENSHIP IN ACTION

1. Why should you consider more than one option when making a decision?
2. How will using the six steps help lessen the possible risks involved in acting on a decision?
3. What can you learn from evaluating the results of a decision on which you have acted?

★ SECTION 4 ★

Juveniles and the Court System

FOCUS

TERMS TO KNOW
juvenile, juvenile delinquent, offender

OBJECTIVES

- Identify two factors that contribute to **juvenile delinquency.**
- Explain the primary role of **juvenile courts.**
- Describe the basic procedure in **dealing with juvenile offenders.**
- Identify several options judges have for **punishing juvenile offenders.**

Children and teenagers commit many crimes each year. Some of these crimes are misdemeanors such as shoplifting or driving without a license. Others, however, are serious crimes and felonies such as burglary, rape, and murder. Moreover, the number of serious crimes children and teenagers commit has increased dramatically.

Each state establishes a certain age when people are considered adults for the purposes of applying criminal laws. In some states the age is 16, in others 18. Anyone under that age limit is considered a **juvenile,** a person not yet legally an adult. Our justice system treats juveniles who commit crimes somewhat differently than it treats adults.

Juvenile Delinquency

A child or teenager who commits a serious crime or repeatedly breaks the law is often called a **juvenile delinquent.** Some researchers who have studied the problem of juvenile crime have explored ways of preventing juvenile delinquency and of preventing juvenile **offenders,** or lawbreakers, from becoming adult criminals. Their studies have shown that children who are abused or neglected or who suffer emotional or mental problems are more likely than others to get into trouble with the law. They have also shown that children who grow up in poverty, in overcrowded slums where drug and alcohol abuse are widespread, are more likely to become delinquents.

Although these factors may contribute to juvenile delinquency, they do not explain why some children commit crimes. Many children who grow up in poverty or are abused do not become criminals. Moreover, children from all backgrounds and levels of society can and do become juvenile delinquents.

Gangs Crimes committed by members of gangs are a growing problem. *At what age are people no longer considered juveniles?*



American Profiles

Marion Wright Edelman



Although children cannot vote or pay taxes, they have a powerful voice speaking for them—Marion Wright Edelman. She is the founder and president of the Children's Defense Fund, a group that works to get federal funding for children.

Edelman grew up in South Carolina, attended Yale Law School, and became the first African American woman to practice law in Mississippi. In the 1960s she worked with the NAACP Legal Defense Fund.

In 1973 she started the Children's Defense Fund (CDF). The CDF uses statistics to show how malnutrition, poverty, and poor education affect the nation's children. Through its reports, the CDF has helped convince Congress to increase funding for children's programs, even in years when other social programs were cut.

PROFILE REVIEW

1. How does the CDF seek to influence Congress to provide money for children's programs?
2. If Congress reduced or eliminated funds for these programs, how might that affect the nation's children?

Juvenile Courts

When juveniles are charged with committing crimes, their cases are handled in separate courts called juvenile courts. The primary goal of juvenile courts is to try to rehabilitate juvenile offenders and correct their behavior rather than to punish them.

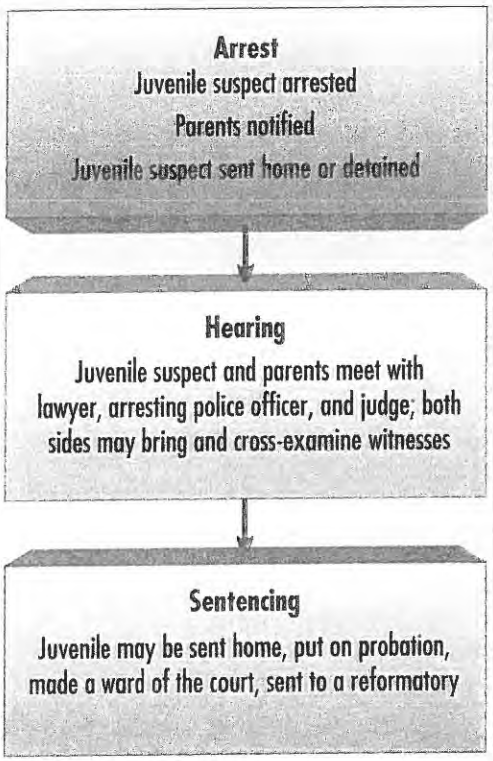
The juvenile court system was set up in the late 1800s as a result of reforms in the judicial system. Before that time, juvenile offenders over age 14 were treated like adults. They received the same sentences for crimes and were sent to the same prisons as adult criminals.

The guiding principle of juvenile courts is to do whatever is in the best interest of the children. The courts handle two kinds of cases: neglect and delinquency. Cases of neglect involve children who are neglected or abused by their

CHART STUDY

Court Procedure in Juvenile Cases

Juvenile cases go through three stages: arrest, hearing, and sentencing. *Which of these stages is like a trial?*



parents. A juvenile court has the power to place these children with other families in foster homes, where they will be protected and cared for.

Delinquency cases involve children who commit crimes. Juvenile courts also handle offenses that are considered illegal for juveniles but not for adults. These offenses include such things as running away from home, playing hooky from school, and violating local curfew ordinances.

Dealing With Juvenile Offenders

When a child is arrested, the police notify his or her parents. Depending on the crime, the child may be sent home or kept in a juvenile detention center until it is time to appear in court.

Juvenile Court System

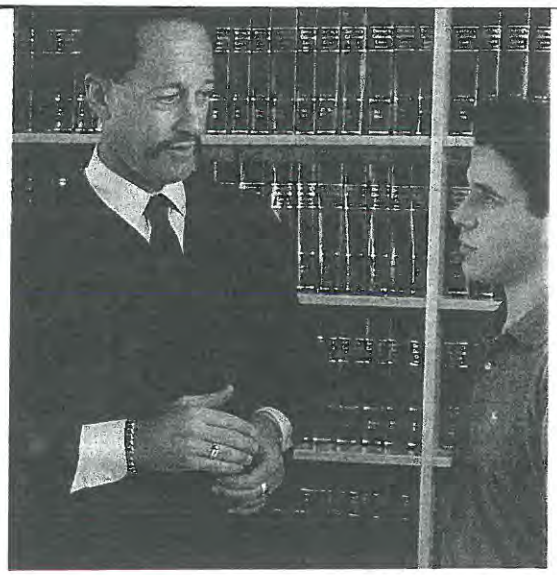
At the court appearance, the juvenile and his or her parents meet with their lawyer, the judge, the police officer who made the arrest, and the probation officer who investigated the case. This meeting, or hearing, is similar to a trial, but it is less formal. Only the parties involved are allowed to attend the hearing. As in a trial, both sides are allowed to call and cross-examine witnesses. There is no jury, however. Juveniles do not have the right to a jury trial. In most cases, a judge decides whether the juvenile is delinquent (guilty) or nondelinquent.

The juvenile court system provides several special protections for juveniles. First, the identity of juveniles is kept secret. Juveniles' criminal records are also kept from the public, and in some cases they may be erased when the offender becomes an adult. In addition, when juveniles are arrested, they are not fingerprinted or photographed.

Supreme Court Rules

In 1967 the Supreme Court established certain rules for juvenile cases.

- The parents or guardians of the juveniles must be notified of their arrest as soon as possible.
- Juveniles and their parents must be notified in writing of all the charges against them.
- Juveniles have the right to remain silent and have an attorney.



Sentencing If a juvenile is found guilty of committing a crime, the judge determines the punishment. *What does it mean to become a ward of the court?*

- Juveniles have the right to confront witnesses against them.

These rights were established by the Supreme Court in *In re Gault* (*in re* means in the matter of). In this case 15-year-old Gerald Gault of Phoenix, Arizona, was charged with making indecent telephone calls to a neighbor. His parents were not informed of his arrest. When his case came up for a hearing, Gerald Gault did not have an attorney, and the neighbor was not questioned. The judge sent Gault to a reformatory until age 21—a period of 6 years. If he had been an adult, the most he could have received was a $50 fine and a few months in jail. In overturning the decision, the Supreme Court ensured that juveniles would enjoy most of the legal rights of adults.

Punishing Juvenile Offenders

Juvenile court judges can sentence juvenile offenders in different ways. They may simply send young children or first offenders home with a stern lecture. Offenders with a previous history of delinquency may be placed in a special training school or in a reformatory.

Juveniles who have been neglected or have a poor home life may become wards of the court. The court becomes their guardian and can supervise their lives until adulthood. Judges may place juveniles with serious mental or emotional problems in a hospital or institution. Judges may also put juveniles on probation, which means that they can live at home and go to school as long as they obey the court's rules.

One criticism of the juvenile court system is that juveniles who commit major crimes sometimes receive very light sentences and are soon released. In many states juvenile court judges may now refer serious cases to the criminal courts, or prosecutors may ask the state courts to order a suspect to be tried as an adult.

★ SECTION 4 REVIEW ★

UNDERSTANDING VOCABULARY

Define juvenile, juvenile delinquent, offender.

REVIEWING OBJECTIVES

1. What are two factors that contribute to juvenile delinquency?
2. What is the primary role of juvenile courts?
3. What procedure do the police and the court system follow in dealing with juvenile offenders?
4. What options do judges have for punishing juvenile offenders?

★ CHAPTER 17 REVIEW ★

Identifying Key Terms

Choose the vocabulary term that best completes each of the sentences below. Write your answers on a separate sheet of paper.

complaint prosecution plea bargain
acquittal injunction arraignment

1. The injured woman's lawyer filed a(n) _____ against the city bus company.
2. After hours of deliberation, the jury felt the evidence was not convincing and voted for _____.
3. The _____ asked the jury to find the defendant guilty on all counts.
4. The defense attorney recommended that his client accept a(n) _____ in exchange for a lighter sentence.
5. At the _____ the defendant pleaded not guilty to the charge.
6. The judge issued a(n) _____ to stop construction of a new highway.

Reviewing the Main Ideas

SECTION 1

1. Identify and describe two types of lawsuits.
2. What is the purpose of a suit of equity?

SECTION 2

3. In what ways are victimless crimes harmful to others?
4. Describe the parole system.

SECTION 3

5. What are the main steps people accused of a crime go through in the legal process before a trial?
6. What is the main purpose of plea bargaining?

SECTION 4

7. Identify four rules the Supreme Court established for juvenile cases.
8. What special protections do the juvenile courts provide for juveniles?

Critical Thinking

SECTION 1

1. **Evaluating Information** Do you think that civil cases should be tried before a jury? Why or why not?

SECTION 2

2. **Determining a Point of View** Do you think that imposing longer prison sentences on people convicted of violent crimes would prevent others from committing similar crimes? Why or why not?

SECTION 3

3. **Analyzing Information** How does the idea of "guilty beyond a reasonable doubt" protect the rights of defendants?

SECTION 4

4. **Determining Cause and Effect** What are some factors that contribute to juvenile delinquency? What do you think could be done to help prevent juveniles from committing crimes?

Reinforcing Citizenship Skills

Describe a decision that a young person might face today, such as the choice to go to college or to get a job after high school. List the six steps of the decision-making process. Write the

Work for Week 03/01/21 8th Grade

Monday

Chapter 2 --Gravity and Motion Crossword Matter in Motion

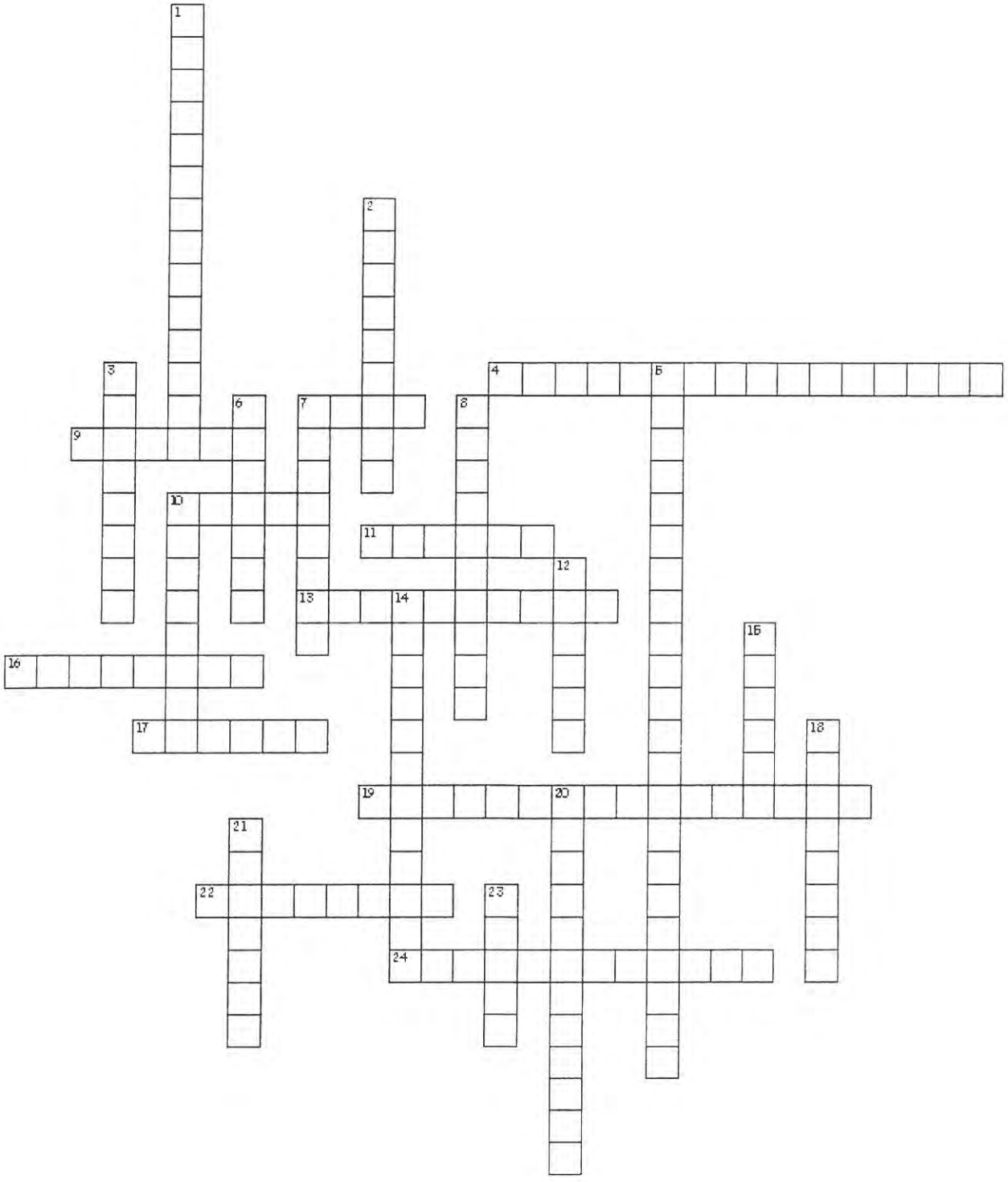
Tuesday
Chapter 2 –Free fall, terminal velocity and projectile motion

Wednesday
Chapter 2 -Newtons Laws of Motion- Review Page 51

Thursday
Chapter 2 -Worksheets ""Whose Law"

Friday
Inertia Rama -- Need twine weights, eggs (1 hard boiled), cup and playing card

Matter in Motion chap 1 and 2



Across
4. (2 words) the curved path an object follows when thrown
7. a measure of the amount of matter in an object
9. The unit for force
10. a push or a pull
11. an object's change in position relative to a reference point
13. when net force on an object is not 0 they are said to be this
16. The speed of an object in a particular direction
17. friction occurs because surfaces are this
19. (2 words) the velocity of a falling object when air resistance is equal to the force of gravity
22. What forces acting on an object have a net force of 0 Newtons they are this
24. also known as negative acceleration

Down
1. (2 words) The Earth's surface is a common one
2. Applies to all objects in the universe
3. (2 words) the motion of a body when only gravity is acting on it
5. (2 words) circular motion
6. the tendency of an object to resist change
7. the product of mass and velocity of an object
8. substances applied to surfaces to reduce friction
10. a force that opposed motion
12. a measure of gravitational force
14. (2 words) total distance over total time
15. not moving
18. (2 words) The combination of all forces acting on an object
20. the rate at which velocity changes over time
21. force of attraction between objects due to mass
23. distance traveled divided by time it took to travel the distance

Quickie Quiz

8th Grade

Chapter 2 Forces and Motion

1. A frog leaping off a lily pad is an example of _____ _____.
2. An object is in _____ _____ if the only force acting on it is gravity.
3. IF you drop a hammer and a feather on the moon, where there is no air, which would hit first? _____
4. _____ is the resistance to movement caused by microscopic peaks and valleys on all surfaces.
5. A _____ is simply and push or pull.
6. _____ is an objects resistance to change.
7. Name Newton's three laws
    a. _____
    b. _____
    c. _____

WHICH LAW?



We're told that Sir Isaac Newton discovered some things about motion when an apple dropped on his head. Whatever "force" was behind his discoveries, we have benefited from his discoveries.
Here are his three laws of motion. You should be familiar with them. Fill in the missing words in each of the three laws. Then tell which law fits each example below.

Which law? First, Second, or Third?

_____ 1. A frog leaping upward off his lily pad is pulled downward by gravity and lands on another lily pad instead of continuing on in a straight line.

_____ 2. As the fuel in a rocket ignites, the force of the gas expansion and explosion pushes out the back of the rocket and pushes the rocket forward.

_____ 3. When you are standing up in a subway train, and the train suddenly stops, your body continues to go forward.

_____ 4. After you start up your motorbike, as you give it more gas, it goes faster.

_____ 5. A pitched baseball goes faster than one that is gently thrown.

_____ 6. A swimmer pushes water back with her arms, but her body moves forward.

_____ 7. As an ice skater pushes harder with his leg muscles, he begins to move faster.

_____ 8. When Bobby, age 5, and his dad are skipping pebbles on the pond, the pebbles that Bobby's dad throws go farther and faster than his.

_____ 9. When you paddle a canoe, the canoe goes forward.

_____ 10. A little girl who has been pulling a sled behind her in the snow is crying because when she stopped to tie her hat on, the sled kept moving and hit her in the back of her legs.

NEWTON'S FIRST LAW OF MOTION:
An object at _____ stays at _____ or an object that is _____ at a _____ in a straight _____ keeps moving at that _____ unless another _____ acts on it.

NEWTON'S SECOND LAW OF MOTION:
The amount of _____ needed to make an object change its _____ depends on the _____ of the object and the _____ required.

NEWTON'S THIRD LAW OF MOTION:
For every _____ (or force), there is an _____ and _____ action (or force).

Name _____

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WHAT'S YOUR MOTION IQ?

Do you know the difference between velocity and inertia? . . . acceleration and rate? . . . speed and velocity? . . . gravity and centripetal force? . . . momentum and inertia? . . . friction and air resistance? If you have those all straight, you'll be able to tell which is operating in each of these examples. Choose from the list of terms. A term may be used more than once.

1. A car hits a tree and doesn't stop, but keeps going until it's severely damaged. Why? _____
2. When a space capsule returns to Earth after a mission, it glows red-hot as it enters the atmosphere because of _____ .
3. Mark and his friends love the Terminator roller coaster because of its two 360° loops. Nobody falls out when the cars are upside-down because of _____ .

rate
distance
inertia
centripetal force
gravity
friction
velocity
acceleration
air resistance
momentum



4. Josh and Ramon head toward each other on their rollerblades at the same, breakneck speed. But, because they are going opposite directions, they do not share the same _____ .
5. The blade of an ice skate melts the ice beneath it and reduces _____ .
6. Joleen shoots an arrow at a target many feet away, but the arrow curves toward the ground before it gets to the target, due to the force of _____ .
7. The sleek shape of a bobsled reduces _____ and allows greater speeds.
8. A pool player hits the eight ball which slams into a second ball. The eight ball stops, but the second ball goes forward, because of _____ .
9. Michael waxes his skis so they'll go faster. He's reducing the force of _____ .
10. Scott falls off his skateboard. He comes to a crashing stop against the sidewalk, but his skateboard rolls on because of _____ .
11. Showing off, Megan swings a bucket of water around in circles, upside-down. No water spills out. Why?_____
12. The snowboard sits at the bottom of the hill, unmoving, until Andrea gets on it and pushes it along. _____ kept it from moving.
13. Jim's little sister isn't swinging very high, so he gives her a huge push to get her higher. This shows an increase in _____ .
14. Kate drops her math paper out of her second floor bedroom window to share with her friend, Evan, who is waiting below. It takes a really long time for the paper to get down to him because of _____ .
15. Tom bragged to Tara that he watched a centipede crawl the whole length of his room in the time he did his homework. His room is 16 feet long and his homework took 2.5 hours, so he's saying the centipede traveled at 6.4 feet per hour. What characteristic of motion has he calculated?_____

Name _____

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SECTION 1

Gravity and Motion

Suppose you dropped a baseball and a marble at the same time from the top of a tall building. Which do you think would land on the ground first?

In ancient Greece around 400 BCE, a philosopher named Aristotle (AR is TAWT uhl) thought that the rate at which an object falls depended on the object's mass. If you asked Aristotle whether the baseball or the marble would land first, he would have said the baseball. But Aristotle never tried dropping objects with different masses to test his idea about falling objects.

READING WARM-UP

Objectives

- Explain the effect of gravity and air resistance on falling objects.
- Explain why objects in orbit are in free fall and appear to be weightless.
- Describe how projectile motion is affected by gravity.

Terms to Learn

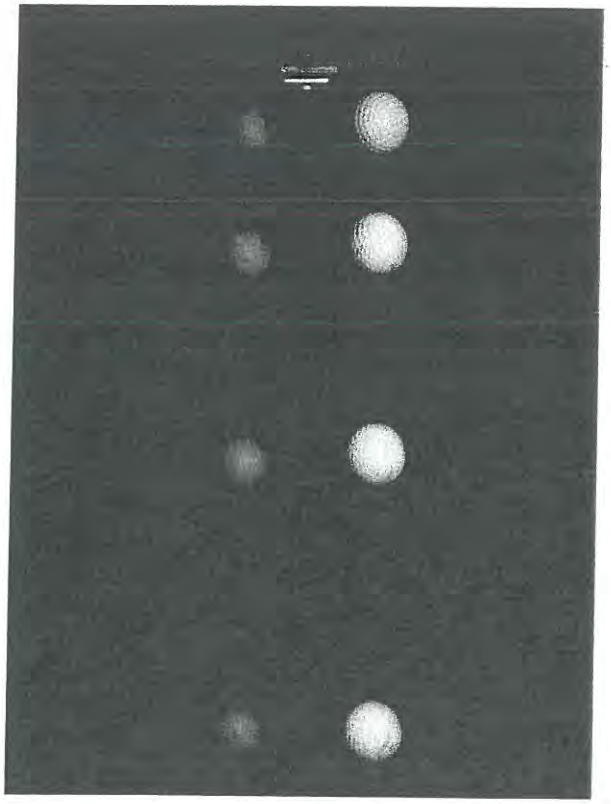
terminal velocity
free fall
projectile motion

READING STRATEGY

Reading Organizer As you read this section, create an outline of the section. Use the headings from the section in your outline.

Gravity and Falling Objects

In the late 1500s, a young Italian scientist named Galileo Galilei (GAL uh LAY oh GAL uh LAY) questioned Aristotle's idea about falling objects. Galileo argued that the mass of an object does not affect the time the object takes to fall to the ground. According to one story, Galileo proved his argument by dropping two cannonballs of different masses from the top of the Leaning Tower of Pisa in Italy. The people watching from the ground below were amazed to see the two cannonballs land at the same time. Whether or not this story is true, Galileo's work changed people's understanding of gravity and falling objects.



Gravity and Acceleration

Objects fall to the ground at the same rate because the acceleration due to gravity is the same for all objects. Why is this true? Acceleration depends on both force and mass. A heavier object experiences a greater gravitational force than a lighter object does. But a heavier object is also harder to accelerate because it has more mass. The extra mass of the heavy object exactly balances the additional gravitational force. **Figure 1** shows objects that have different masses falling with the same acceleration.

Figure 1 *This stop-action photo shows that a table-tennis ball and a golf ball fall at the same rate even though they have different masses.*

Acceleration Due to Gravity

Acceleration is the rate at which velocity changes over time. So, the acceleration of an object is the object's change in velocity divided by the amount of time during which the change occurs. All objects accelerate toward Earth at a rate of 9.8 meters per second per second. This rate is written as 9.8 m/s/s, or 9.8 m/s^2. So, for every second that an object falls, the object's downward velocity increases by 9.8 m/s, as shown in **Figure 2.**

Reading Check **What is the acceleration due to gravity?** (*See the Appendix for answers to Reading Checks.*)

Velocity of Falling Objects

You can calculate the change in velocity (Δv) of a falling object by using the following equation:

$$\Delta v = g \times t$$

In this equation, g is the acceleration due to gravity on Earth (9.8 m/s^2), and t is the time the object takes to fall (in seconds). The change in velocity is the difference between the final velocity and the starting velocity. If the object starts at rest, this equation yields the velocity of the object after a certain time period.

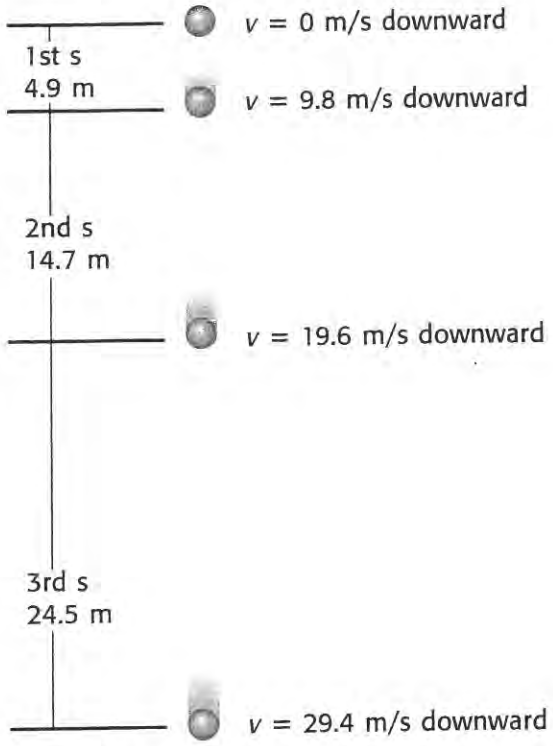


Figure 2 *A falling object accelerates at a constant rate. The object falls faster and farther each second than it did the second before.*

MATH FOCUS

Calculating the Velocity of Falling Objects A stone at rest is dropped from a cliff, and the stone hits the ground after a time of 3 s. What is the stone's velocity when it hits the ground?

Step 1: Write the equation for change in velocity.

$$\Delta v = g \times t$$

Step 2: Replace g with its value and t with the time given in the problem, and solve.

$$\Delta v = 9.8 \frac{\text{m/s}}{\text{s}} \times 3\,\text{s}$$
$$= 29.4 \text{ m/s}$$

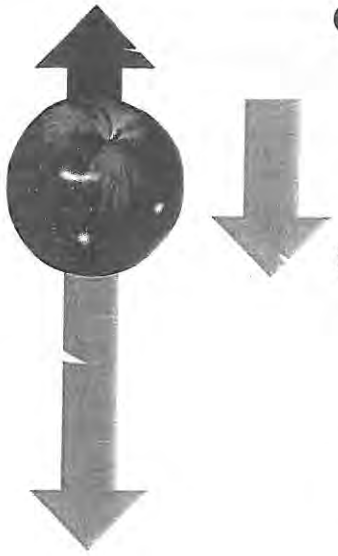
To rearrange the equation to find time, divide by the acceleration due to gravity:

$$t = \frac{\Delta v}{g}$$

Now It's Your Turn

1. A penny at rest is dropped from the top of a tall stairwell. What is the penny's velocity after it has fallen for 2 s?
2. The same penny hits the ground in 4.5 s. What is the penny's velocity as it hits the ground?
3. A marble at rest is dropped from a tall building. The marble hits the ground with a velocity of 98 m/s. How long was the marble in the air?
4. An acorn at rest falls from an oak tree. The acorn hits the ground with a velocity of 14.7 m/s. How long did it take the acorn to land?

Figure 3 **Effect of Air Resistance on a Falling Object**



a The **force of gravity** is pulling down on the apple. If gravity were the only force acting on the apple, the apple would accelerate at a rate of 9.8 m/s^2.

b The **force of air resistance** is pushing up on the apple. This force is subtracted from the force of gravity to yield the net force.

c The **net force** on the apple is equal to the force of air resistance subtracted from the force of gravity. Because the net force is not 0 N, the apple accelerates downward. But the apple does not accelerate as fast as it would without air resistance.

Air Resistance and Falling Objects

Try dropping two sheets of paper—one crumpled in a tight ball and the other kept flat. What happened? Does this simple experiment seem to contradict what you just learned about falling objects? The flat paper falls more slowly than the crumpled paper because of *air resistance*. Air resistance is the force that opposes the motion of objects through air.

The amount of air resistance acting on an object depends on the size, shape, and speed of the object. Air resistance affects the flat sheet of paper more than the crumpled one. The larger surface area of the flat sheet causes the flat sheet to fall slower than the crumpled one. **Figure 3** shows the effect of air resistance on the downward acceleration of a falling object.

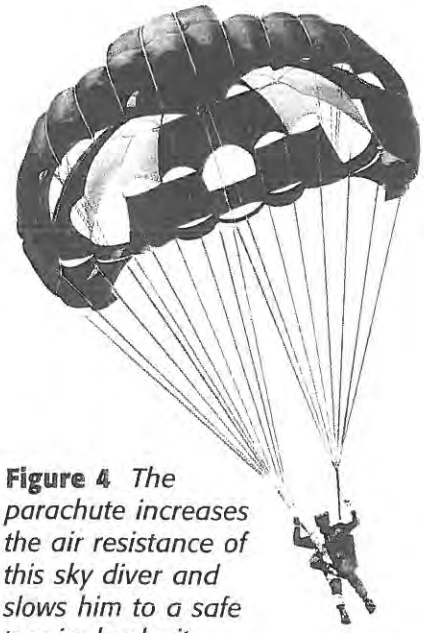


Figure 4 *The parachute increases the air resistance of this sky diver and slows him to a safe terminal velocity.*

Reading Check **Will air resistance have more effect on the acceleration of a falling leaf or the acceleration of a falling acorn?**

Acceleration Stops at the Terminal Velocity

As the speed of a falling object increases, air resistance increases. The upward force of air resistance continues to increase until it is equal to the downward force of gravity. At this point, the net force is 0 N and the object stops accelerating. The object then falls at a constant velocity called the **terminal velocity.**

Terminal velocity can be a good thing. Every year, cars, buildings, and vegetation are severely damaged in hailstorms. The terminal velocity of hailstones is between 5 and 40 m/s, depending on their size. If there were no air resistance, hailstones would hit the Earth at velocities near 350 m/s! **Figure 4** shows another situation in which terminal velocity is helpful.

terminal velocity the constant velocity of a falling object when the force of air resistance is equal in magnitude and opposite in direction to the force of gravity

Free Fall Occurs When There Is No Air Resistance

Sky divers are often described as being in free fall before they open their parachutes. However, that is an incorrect description, because air resistance is always acting on the sky diver.

An object is in **free fall** only if gravity is pulling it down and no other forces are acting on it. Because air resistance is a force, free fall can occur only where there is no air. Two places that have no air are in space and in a vacuum. A vacuum is a place in which there is no matter. **Figure 5** shows objects falling in a vacuum. Because there is no air resistance in a vacuum, the two objects are in free fall.

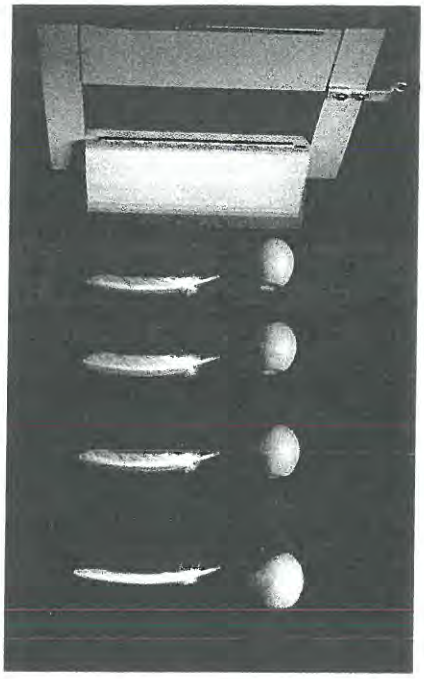


Figure 5 *Air resistance usually causes a feather to fall more slowly than an apple falls. But in a vacuum, a feather and an apple fall with the same acceleration because both are in free fall.*

Orbiting Objects Are in Free Fall

Look at the astronaut in **Figure 6.** Why is the astronaut floating inside the space shuttle? You may be tempted to say that she is weightless in space. However, it is impossible for any object to be weightless anywhere in the universe.

Weight is a measure of gravitational force. The size of the force depends on the masses of objects and the distances between them. Suppose you traveled in space far away from all the stars and planets. The gravitational force acting on you would be very small because the distance between you and other objects would be very large. But you and all the other objects in the universe would still have mass. Therefore, gravity would attract you to other objects—even if just slightly—so you would still have weight.

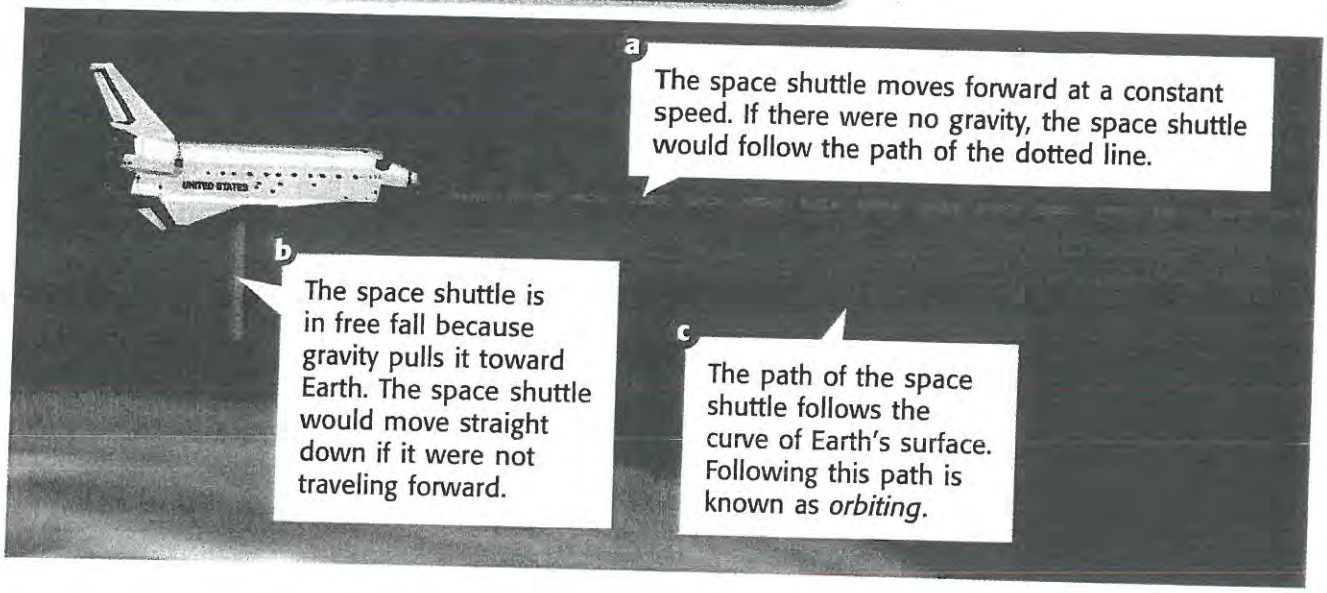
Astronauts float in orbiting spacecrafts because of free fall. To better understand why astronauts float, you need to know what *orbiting* means.

free fall the motion of a body when only the force of gravity is acting on the body



Figure 6 *Astronauts appear to be weightless while they are floating inside the space shuttle—but they are not weightless!*

Figure 7 How an Orbit Is Formed



Two Motions Combine to Cause Orbiting

An object is orbiting when it is traveling around another object in space. When a spacecraft orbits Earth, it is moving forward. But the spacecraft is also in free fall toward Earth. **Figure 7** shows how these two motions combine to cause orbiting.

As you can see in **Figure 7,** the space shuttle is always falling while it is in orbit. So why don't astronauts hit their heads on the ceiling of the falling shuttle? Because they are also in free fall—they are always falling, too. Because astronauts are in free fall, they float.

Orbiting and Centripetal Force

Besides spacecrafts and satellites, many other objects in the universe are in orbit. The moon orbits the Earth. Earth and the other planets orbit the sun. In addition, many stars orbit large masses in the center of galaxies. Many of these objects are traveling in a circular or nearly circular path. Any object in circular motion is constantly changing direction. Because an unbalanced force is necessary to change the motion of any object, there must be an unbalanced force working on any object in circular motion.

The unbalanced force that causes objects to move in a circular path is called a *centripetal force* (sen TRIP uht uhl FOHRS). Gravity provides the centripetal force that keeps objects in orbit. The word *centripetal* means "toward the center." As you can see in **Figure 8,** the centripetal force on the moon points toward the center of the moon's circular orbit.

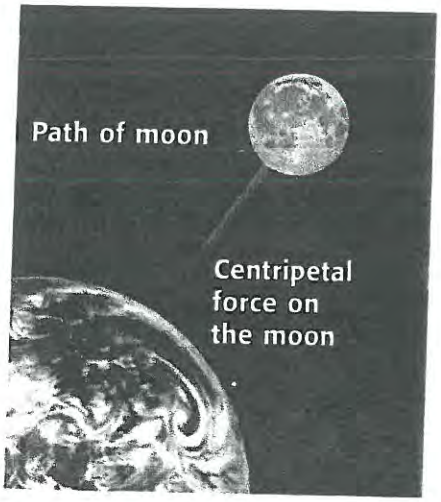


Figure 8 *The moon stays in orbit around Earth because Earth's gravitational force provides a centripetal force on the moon.*

Reading Check What does the word *centripetal* mean?

Projectile Motion and Gravity

The motion of a hopping grasshopper is an example of projectile motion (proh JEK tuhl MOH shuhn). **Projectile motion** is the curved path an object follows when it is thrown or propelled near the surface of the Earth. Projectile motion has two components—horizontal motion and vertical motion. The two components are independent, so they have no effect on each other. When the two motions are combined, they form a curved path, as shown in **Figure 9.** Some examples of projectile motion include the following:

projectile motion the curved path that an object follows when thrown, launched, or otherwise projected near the surface of Earth

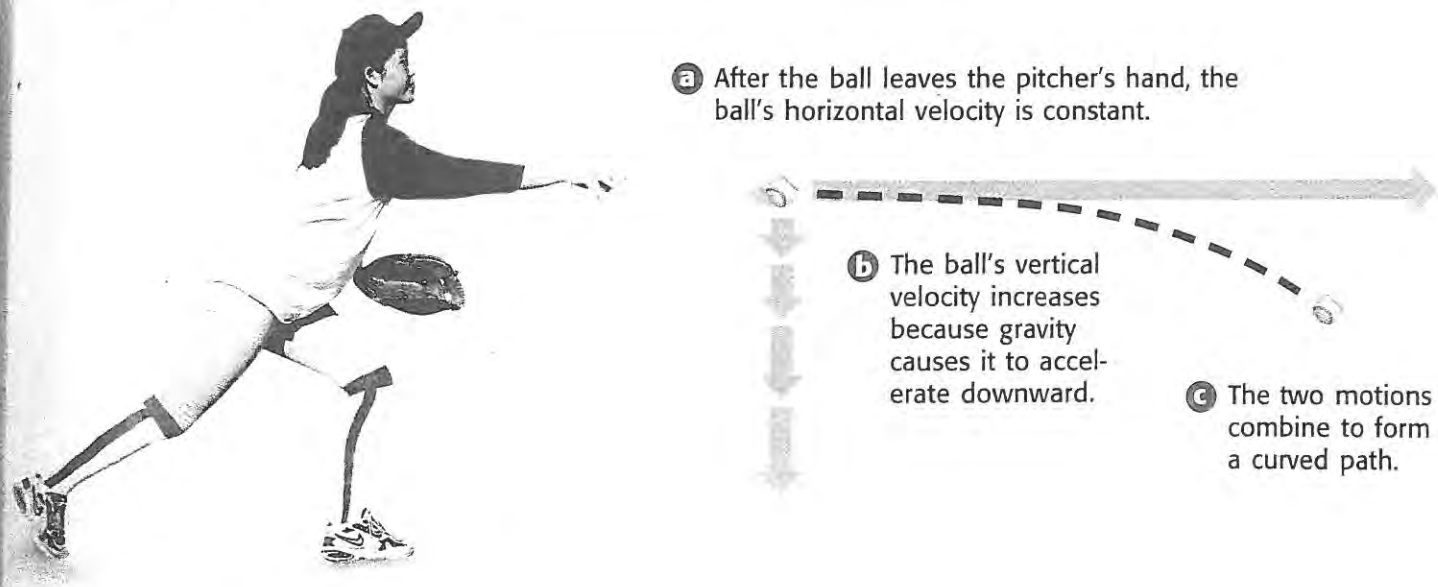
- a frog leaping
- water sprayed by a sprinkler
- a swimmer diving into water
- balls being juggled
- an arrow shot by an archer

Horizontal Motion

When you throw a ball, your hand exerts a force on the ball that makes the ball move forward. This force gives the ball its horizontal motion, which is motion parallel to the ground.

After you release the ball, no horizontal forces are acting on the ball (if you ignore air resistance). Even gravity does not affect the horizontal component of projectile motion. So, there are no forces to change the ball's horizontal motion. Thus, the horizontal velocity of the ball is constant after the ball leaves your hand, as shown in **Figure 9.**

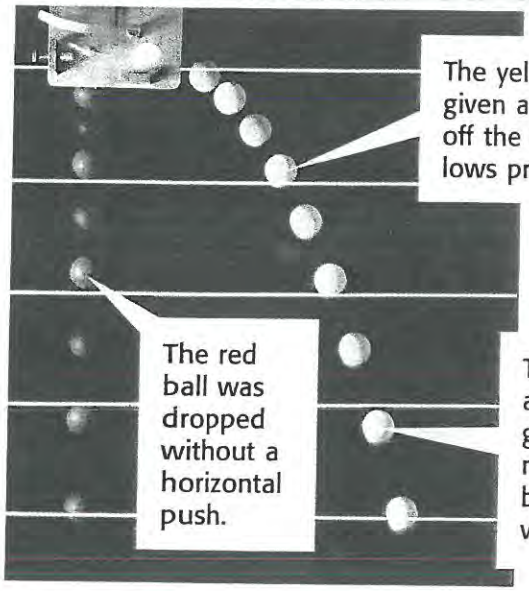
Figure 9 **Projectile Motion**



INTERNET ACTIVITY

For another activity related to this chapter, go to **go.hrw.com** and type in the keyword **HP5FORW.**

Figure 10 **Projectile Motion and Acceleration Due to Gravity**



Vertical Motion

Gravity pulls everything on Earth downward toward the center of Earth. A ball in your hand is prevented from falling by your hand. After you throw the ball, gravity pulls it downward and gives the ball vertical motion. Vertical motion is motion that is perpendicular to the ground. Gravity pulls objects in projectile motion down at an acceleration of 9.8 m/s^2 (if air resistance is ignored). This rate is the same for all falling objects. **Figure 10** shows that the downward acceleration of a thrown object and a falling object are the same.

Because objects in projectile motion accelerate downward, you always have to aim above a target if you want to hit it with a thrown or propelled object. That's why when you aim an arrow directly at a bull's-eye, your arrow strikes the bottom of the target rather than the middle of the target.

Reading Check **What gives an object in projectile motion its vertical motion?**

QUICK LAB

Penny Projectile Motion

1. Position a **flat ruler** and **two pennies** on a **desk or table** as shown below.



2. Hold the ruler by the end that is on the desk. Move the ruler quickly in the direction shown so that the ruler knocks the penny off the table and so that the other penny also drops. Repeat this step several times.
3. Which penny travels with projectile motion? In what order do the pennies hit the ground? Record and explain your answers.

SECTION
Review



Summary

- Gravity causes all objects to accelerate toward Earth at a rate of 9.8 m/s^2.
- Air resistance slows the acceleration of falling objects. An object falls at its terminal velocity when the upward force of air resistance equals the downward force of gravity.
- An object is in free fall if gravity is the only force acting on it.
- Objects in orbit appear to be weightless because they are in free fall.
- A centripetal force is needed to keep objects in circular motion. Gravity acts as a centripetal force to keep objects in orbit.
- Projectile motion is the curved path an object follows when thrown or propelled near the surface of Earth.
- Projectile motion has two components—horizontal motion and vertical motion. Gravity affects only the vertical motion of projectile motion.

Using Key Terms

1. Use each of the following terms in a separate sentence: *terminal velocity* and *free fall*.

Understanding Key Ideas

2. Which of the following is in projectile motion?
   - **a.** a feather falling in a vacuum
   - **b.** a cat leaping on a toy
   - **c.** a car driving up a hill
   - **d.** a book laying on a desk
3. How does air resistance affect the acceleration of falling objects?
4. How does gravity affect the two components of projectile motion?
5. How is the acceleration of falling objects affected by gravity?
6. Why is the acceleration due to gravity the same for all objects?

Math Skills

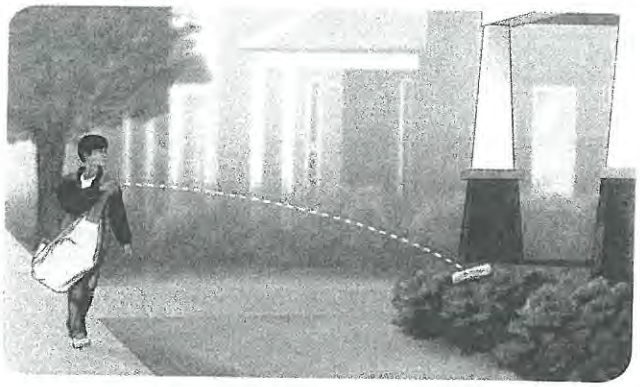
7. A rock at rest falls off a tall cliff and hits the valley below after 3.5 s. What is the rock's velocity as it hits the ground?

Critical Thinking

8. **Applying Concepts** Think about a sport that uses a ball. Identify four examples from that sport in which an object is in projectile motion.
9. **Making Inferences** The moon has no atmosphere. Predict what would happen if an astronaut on the moon dropped a hammer and a feather at the same time from the same height.

Interpreting Graphics

10. Whenever Jon delivers a newspaper to the Zapanta house, the newspaper lands in the bushes, as shown below. What should Jon do to make sure the newspaper lands on the porch?



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For a variety of links related to this chapter, go to www.scilinks.org

Topic: Gravity and Orbiting Objects; Projectile Motion

SciLinks code: HSM0692; HSM1223

SECTION 2

Newton's Laws of Motion

Imagine that you are playing baseball. The pitch comes in, and—crack—you hit the ball hard! But instead of flying off the bat, the ball just drops to the ground. Is that normal?

You would probably say no. You know that force and motion are related. When you exert a force on a baseball by hitting it with a bat, the baseball should move. In 1686, Sir Isaac Newton explained this relationship between force and the motion of an object with his three laws of motion.

READING WARM-UP

Objectives

- Describe Newton's first law of motion, and explain how it relates to objects at rest and objects in motion.
- State Newton's second law of motion, and explain the relationship between force, mass, and acceleration.
- State Newton's third law of motion, and give examples of force pairs.

Terms to Learn

inertia

READING STRATEGY

Paired Summarizing Read this section silently. In pairs, take turns summarizing the material. Stop to discuss ideas that seem confusing.

Newton's First Law of Motion

An object at rest remains at rest, and an object in motion remains in motion at constant speed and in a straight line unless acted on by an unbalanced force.

Newton's first law of motion describes the motion of an object that has a net force of 0 N acting on it. This law may seem complicated when you first read it. But, it is easy to understand when you consider its two parts separately.

Part 1: Objects at Rest

An object that is not moving is said to be at rest. A chair on the floor and a golf ball balanced on a tee are examples of objects at rest. Newton's first law says that objects at rest will stay at rest unless they are acted on by an unbalanced force. For example, objects will not start moving until a push or a pull is exerted on them. So, a chair won't slide across the room unless you push the chair. And, a golf ball won't move off the tee unless the ball is struck by a golf club, as shown in **Figure 1.**

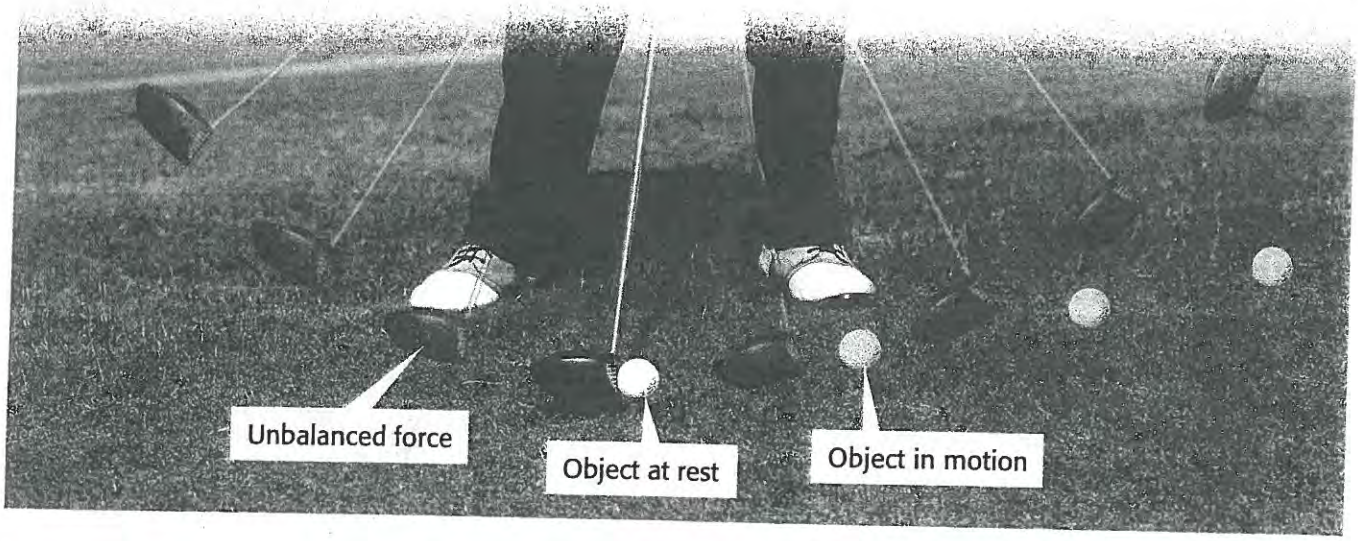


Figure 1 *A golf ball will remain at rest on a tee until it is acted on by the unbalanced force of a moving club.*

Part 2: Objects in Motion

The second part of Newton's first law is about objects moving with a certain velocity. Such objects will continue to move forever with the same velocity unless an unbalanced force acts on them.

Think about driving a bumper car at an amusement park. Your ride is pleasant as long as you are driving in an open space. But the name of the game is bumper cars! Sooner or later you are likely to run into another car, as shown in **Figure 2.** Your bumper car stops when it hits another car. But, you continue to move forward until the force from your seat belt stops you.



Figure 2 *Bumper cars let you have fun with Newton's first law.*

Friction and Newton's First Law

An object in motion will stay in motion forever unless it is acted on by an unbalanced force. So, you should be able to give your desk a push and send it sliding across the floor. If you push your desk, the desk quickly stops. Why?

There must be an unbalanced force that acts on the desk to stop its motion. That unbalanced force is friction. The friction between the desk and the floor works against the motion of the desk. Because of friction, observing the effects of Newton's first law is often difficult. For example, friction will cause a rolling ball to slow down and stop. Friction will also make a car slow down if the driver lets up on the gas pedal. Because of friction, the motion of objects changes.

Reading Check **When you ride a bus, why do you fall forward when the bus stops moving?** (*See the Appendix for answers to Reading Checks.*)



First Law Skateboard

1. Place an **empty soda can** on top of a **skateboard.**
2. Ask a friend to catch the skateboard after you push it. Now, give the skateboard a quick, firm push. What happened to the soda can?
3. Put the can on the skateboard again. Push the skateboard gently so that the skateboard moves quickly but so that the can does not fall.
4. Ask your friend to stop the skateboard after he or she allows it to travel a short distance. What happened to the can?
5. Explain how Newton's first law applies to what happened.

inertia the tendency of an object to resist being moved or, if the object is moving, to resist a change in speed or direction until an outside force acts on the object

Inertia and Newton's First Law

Newton's first law of motion is sometimes called th *law of inertia*. **Inertia** (in UHR shuh) is the tendency o all objects to resist any change in motion. Because o inertia, an object at rest will remain at rest until a forc makes it move. Likewise, inertia is the reason a movin object stays in motion with the same velocity unless force changes its speed or direction. For example, becaus of inertia, you slide toward the side of a car when th driver turns a corner. Inertia is also why it is impossibl for a plane, car, or bicycle to stop immediately.

Mass and Inertia

Mass is a measure of inertia. An object that has a smal mass has less inertia than an object that has a larg mass. So, changing the motion of an object that ha a small mass is easier than changing the motion of ar object that has a large mass. For example, a softball ha less mass and therefore less inertia than a bowling ball Because the softball has a small amount of inertia, it i easy to pitch a softball and to change its motion by hit ting it with a bat. Imagine how difficult it would be tc play softball with a bowling ball! **Figure 3** further show the relationship between mass and inertia.

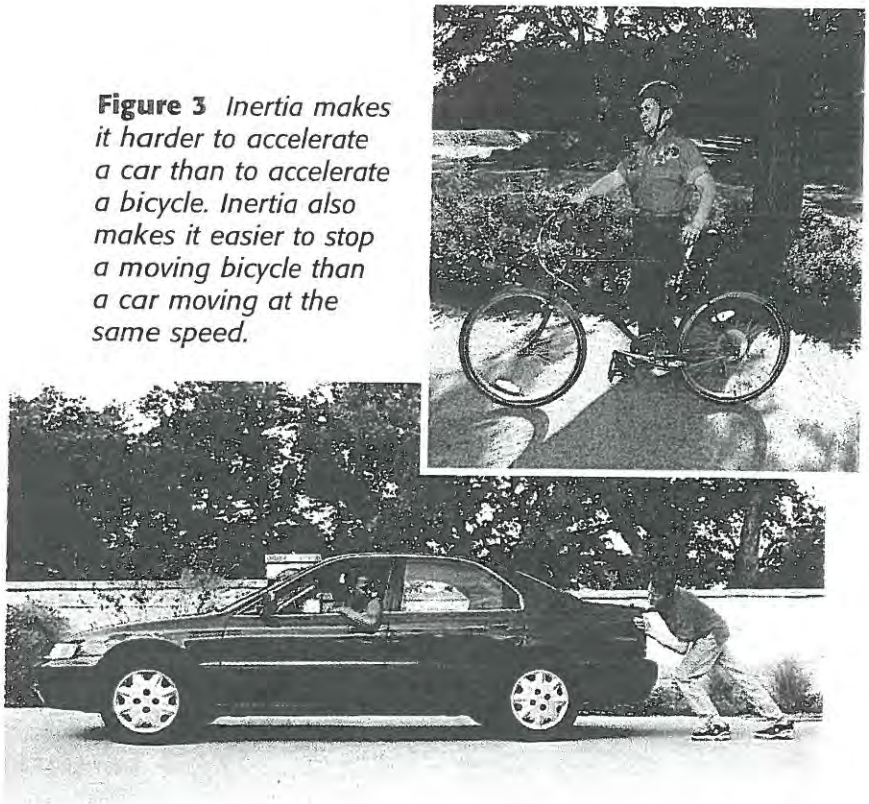


Figure 3 *Inertia makes it harder to accelerate a car than to accelerate a bicycle. Inertia also makes it easier to stop a moving bicycle than a car moving at the same speed.*

Quick Lab

First-Law Magic

1. On a **table or desk**, place a **large, empty plastic cup** on top of a **paper towel.**
2. Without touching the cup or tipping it over, remove the paper towel from under the cup. How did you accomplish this? Repeat this step.
3. Fill the cup half full with **water,** and place the cup on the paper towel.
4. Once again, remove the paper towel from under the cup. Was it easier or harder to do this time?
5. Explain your observations in terms of mass, inertia, and Newton's first law of motion.

Newton's Second Law of Motion

The acceleration of an object depends on the mass of the object and the amount of force applied.

Newton's second law describes the motion of an object when an unbalanced force acts on the object. As with Newton's first law, you should consider the second law in two parts.

Part 1: Acceleration Depends on Mass

Suppose you are pushing an empty cart. You have to exert only a small force on the cart to accelerate it. But, the same amount of force will not accelerate the full cart as much as the empty cart. Look at the first two photos in **Figure 4.** They show that the acceleration of an object decreases as its mass increases and that its acceleration increases as its mass decreases.

Part 2: Acceleration Depends on Force

Suppose you give the cart a hard push, as shown in the third photo in **Figure 4.** The cart will start moving faster than if you gave it only a soft push. So, an object's acceleration increases as the force on the object increases. On the other hand, an object's acceleration decreases as the force on the object decreases.

The acceleration of an object is always in the same direction as the force applied. The cart in **Figure 4** moved forward because the push was in the forward direction.

Reading Check **What is the relationship between the force on an object and the object's acceleration?**

CONNECTION TO Environmental Science

Car Sizes and Pollution

On average, newer cars pollute the air less than older cars do. One reason for this is that newer cars have less mass than older cars have. An object that has less mass requires less force to achieve the same acceleration as an object that has more mass. So, a small car can have a small engine and still have good acceleration. Because small engines use less fuel than large engines use, small engines create less pollution. Research three models of cars from the same year, and make a chart to compare the mass of the cars with the amount of fuel they use.

ACTIVITY

Figure 4 **Mass, Force, and Acceleration**



Acceleration

If the force applied to the carts is the same, the acceleration of the empty cart is greater than the acceleration of the loaded cart.



Acceleration



Acceleration

Acceleration will increase when a larger force is exerted.

Figure 5 Newton's Second Law and Acceleration Due to Gravity

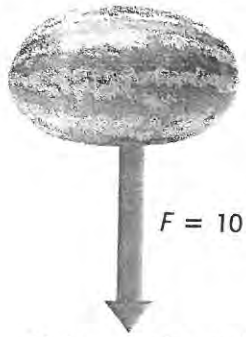


$m = 0.102$ kg

$F = 1$ N

1 N = 1 kg•m/s²

$$a = \frac{1\ \text{kg}\cdot\text{m/s}^2}{0.102\ \text{kg}} = 9.8\ \text{m/s}^2$$



$m = 1.02$ kg

$F = 10$ N

10 N = 10 kg•m/s²

$$a = \frac{10\ \text{kg}\cdot\text{m/s}^2}{1.02\ \text{kg}} = 9.8\ \text{m/s}^2$$

The apple has less mass than the watermelon does. So, less force is needed to give the apple the same acceleration that the watermelon has.

Expressing Newton's Second Law Mathematically

The relationship of acceleration (a) to mass (m) and force (F) can be expressed mathematically with the following equation:

$$a = \frac{F}{m}, \text{ or } F = m \times a$$

Notice that the equation can be rearranged to find the force applied. Both forms of the equation can be used to solve problems.

Newton's second law explains why objects fall to Earth with the same acceleration. In **Figure 5,** you can see how the large force of gravity on the watermelon is offset by its large mass. Thus, you find that the accelerations of the watermelon and the apple are the same when you solve for acceleration.

MATH FOCUS

Second-Law Problems What is the acceleration of a 3 kg mass if a force of 14.4 N is used to move the mass? (Note: 1 N is equal to 1 kg•m/s²)

Step 1: Write the equation for acceleration.

$$a = \frac{F}{m}$$

Step 2: Replace F and m with the values given in the problem, and solve.

$$a = \frac{14.4\ \text{kg}\cdot\text{m/s}^2}{3\ \text{kg}} = 4.8\ \text{m/s}^2$$

Now It's Your Turn

1. What is the acceleration of a 7 kg mass if a force of 68.6 N is used to move it toward Earth?
2. What force is necessary to accelerate a 1,250 kg car at a rate of 40 m/s²?
3. Zookeepers carry a stretcher that holds a sleeping lion. The total mass of the lion and the stretcher is 175 kg. The lion's forward acceleration is 2 m/s². What is the force necessary to produce this acceleration?

Newton's Third Law of Motion

Whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first.

Newton's third law can be simply stated as follows: All forces act in pairs. If a force is exerted, another force occurs that is equal in size and opposite in direction. The law itself addresses only forces. But the way that force pairs interact affects the motion of objects.

How do forces act in pairs? Study **Figure 6** to learn how one force pair helps propel a swimmer through water. Action and reaction force pairs are present even when there is no motion. For example, you exert a force on a chair when you sit on it. Your weight pushing down on the chair is the action force. The reaction force is the force exerted by the chair that pushes up on your body. The force is equal to your weight.

Reading Check **How are the forces in each force pair related?**

Force Pairs Do Not Act on the Same Object

A force is always exerted by one object on another object. This rule is true for all forces, including action and reaction forces. However, action and reaction forces in a pair do not act on the same object. If they did, the net force would always be 0 N and nothing would ever move! To understand how action and reaction forces act on objects, look at **Figure 6** again. The action force was exerted on the water by the swimmer's hands. But the reaction force was exerted on the swimmer's hands by the water. The forces did not act on the same object.

SCHOOL to HOME

Newton Ball

Play catch with an adult. As you play, discuss how Newton's laws of motion are involved in the game. After you finish your game, make a list in your **science journal** of what you discussed.

ACTIVITY

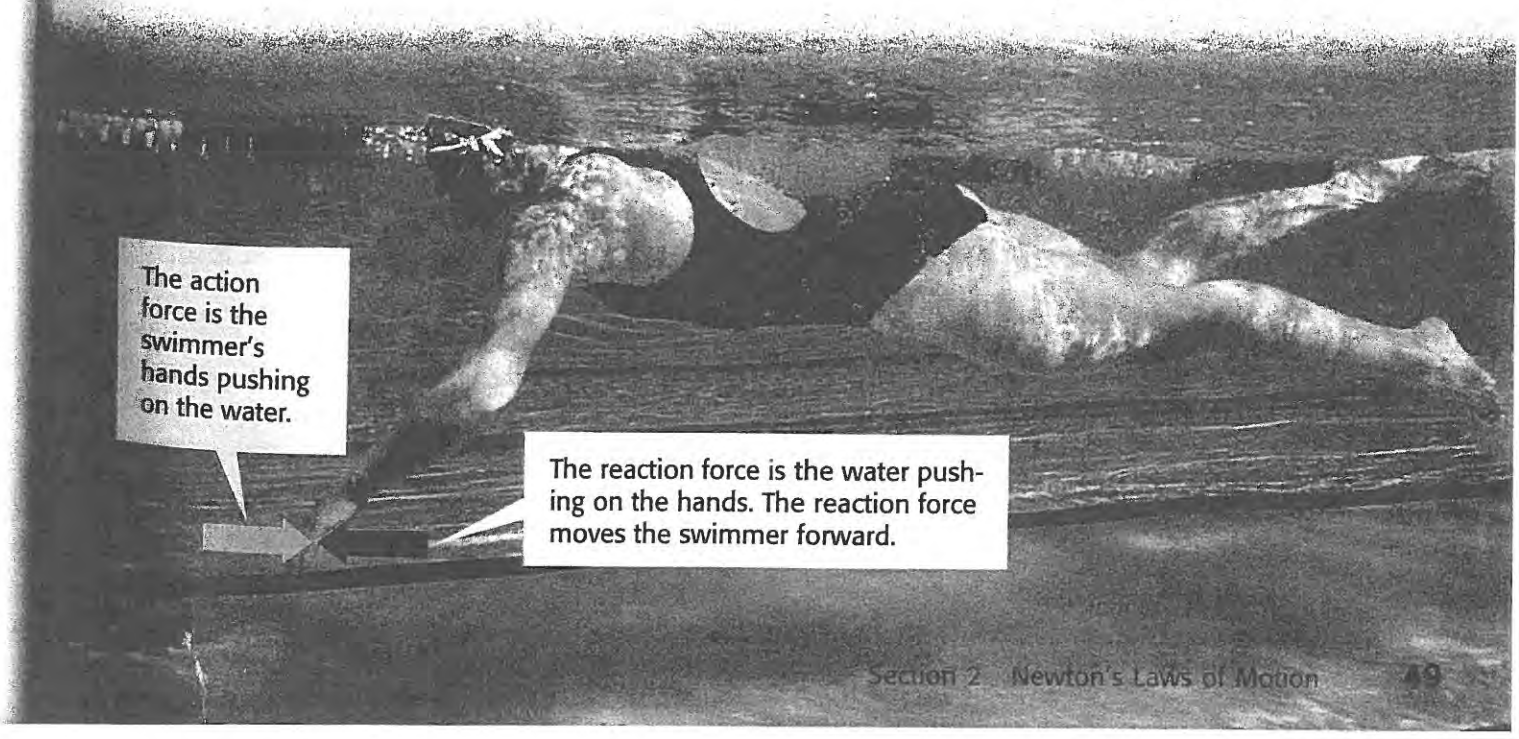
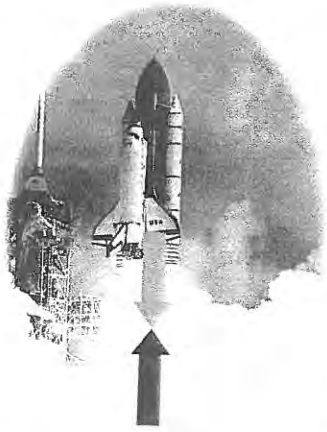


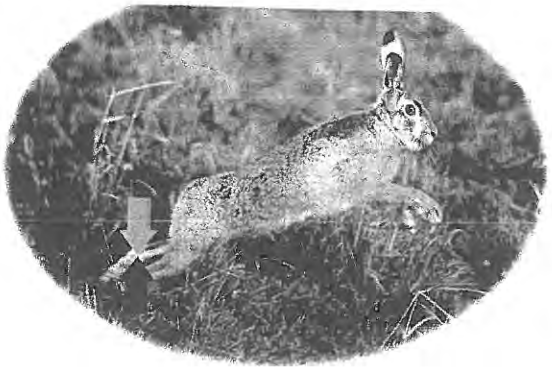
Figure 6 *The action force and reaction force are a pair. The two forces are equal in size but opposite in direction.*

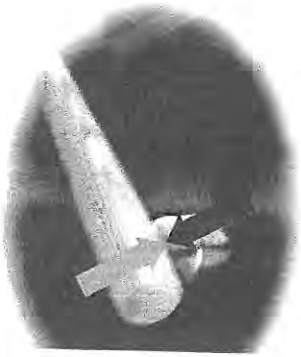
Figure 7 Examples of Action and Reaction Force Pairs



The space shuttle's thrusters push the exhaust gases downward as the gases push the shuttle upward with an equal force.

The rabbit's legs exert a force on Earth. Earth exerts an equal force on the rabbit's legs and causes the rabbit to accelerate upward.





The bat exerts a force on the ball and sends the ball flying. The ball exerts an equal force on the bat, but the bat does not move backward because the batter is exerting another force on the bat.

All Forces Act in Pairs–Action and Reaction

Newton's third law says that all forces act in pairs. When a force is exerted, there is always a reaction force. A force never acts by itself. **Figure 7** shows some examples of action and reaction force pairs. In each example, the action force is shown in yellow and the reaction force is shown in red.

The Effect of a Reaction Can Be Difficult to See

Another example of a force pair is shown in **Figure 8.** Gravity is a force of attraction between objects that is due to their masses. If you drop a ball, gravity pulls the ball toward Earth. This force is the action force exerted by Earth on the ball. But gravity also pulls Earth toward the ball. The force is the reaction force exerted by the ball on Earth.



Figure 8 *The force of gravity between Earth and a falling object is a force pair.*

It's easy to see the effect of the action force—the ball falls to Earth. Why don't you notice the effect of the reaction force—Earth being pulled upward? To find the answer to this question, think about Newton's second law. It states that the acceleration of an object depends on the force applied to it and on the mass of the object. The force on Earth is equal to the force on the ball. But the mass of Earth is much larger than the mass of the ball. Thus, the acceleration of Earth is much smaller than the acceleration of the ball. The acceleration of the Earth is so small that you can't see or feel the acceleration. So, it is difficult to observe the effect of Newton's third law on falling objects.

Reading Check Why do objects fall toward Earth?

SECTION
Review



Summary

- Newton's first law of motion states that the motion of an object will not change if no unbalanced forces act on it.
- Objects at rest will not move unless acted upon by an unbalanced force.
- Objects in motion will continue to move at a constant speed and in a straight line unless acted upon by an unbalanced force.
- Inertia is the tendency of matter to resist a change in motion. Mass is a measure of inertia.
- Newton's second law of motion states that the acceleration of an object depends on its mass and on the force exerted on it.
- Newton's second law is represented by the following equation: $F = m \times a$.
- Newton's third law of motion states that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first object.

Using Key Terms

1. In your own words, write a definition for the term *inertia*.

Understanding Key Ideas

2. Which of the following will increase the acceleration of an object that is pushed by a force?
   - **a.** decreasing the mass of the object
   - **b.** increasing the mass of the object
   - **c.** increasing the force pushing the object
   - **d.** Both (a) and (c)
3. Give three examples of force pairs that occur when you do your homework.
4. What does Newton's first law of motion say about objects at rest and objects in motion?
5. Use Newton's second law to describe the relationship between force, mass, and acceleration.

Math Skills

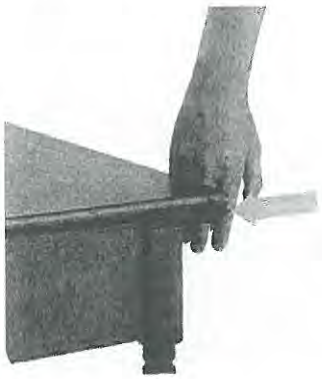
6. What force is necessary to accelerate a 70 kg object at a rate of 4.2 m/s^2?

Critical Thinking

7. **Applying Concepts** When a truck pulls a trailer, the trailer and truck accelerate forward even though the action and reaction forces are the same size but are in opposite directions. Why don't these forces balance each other?
8. **Making Inferences** Use Newton's first law of motion to explain why airbags in cars are important during head-on collisions.

Interpreting Graphics

9. Imagine you accidentally bumped your hand against a table, as shown in the photo below. Your hand hurts after it happens. Use Newton's third law of motion to explain what caused your hand to hurt.



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Topic: Newton's Laws of Motion
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SECTION 3

Momentum

Imagine a compact car and a large truck traveling with the same velocity. The drivers of both vehicles put on the brakes at the same time. Which vehicle will stop first?

You would probably say that the compact car will stop first. You know that smaller objects are easier to stop than larger objects. But why? The answer is momentum (moh MEN tuhm).

READING WARM-UP

Objectives

- Calculate the momentum of moving objects.
- Explain the law of conservation of momentum.

Terms to Learn

momentum

READING STRATEGY

Prediction Guide Before reading this section, write the title of each heading in this section. Next, under each heading, write what you think you will learn.

momentum a quantity defined as the product of the mass and velocity of an object

Momentum, Mass, and Velocity

The **momentum** of an object depends on the object's mass and velocity. The more momentum an object has, the harder it is to stop the object or change its direction. In the example above, the truck has more mass and more momentum than the car has. So, a larger force is needed to stop the truck. Similarly, a fast-moving car has a greater velocity and thus more momentum than a slow-moving car of the same mass. So, a fast-moving car is harder to stop than a slow-moving car. **Figure 1** shows another example of an object that has momentum.

Calculating Momentum

Momentum (p) can be calculated with the equation below:

$$p = m \times v$$

In this equation, m is the mass of an object in kilograms and v is the object's velocity in meters per second. The units of momentum are kilograms multiplied by meters per second, or kg•m/s. Like velocity, momentum has a direction. Its direction is always the same as the direction of the object's velocity.

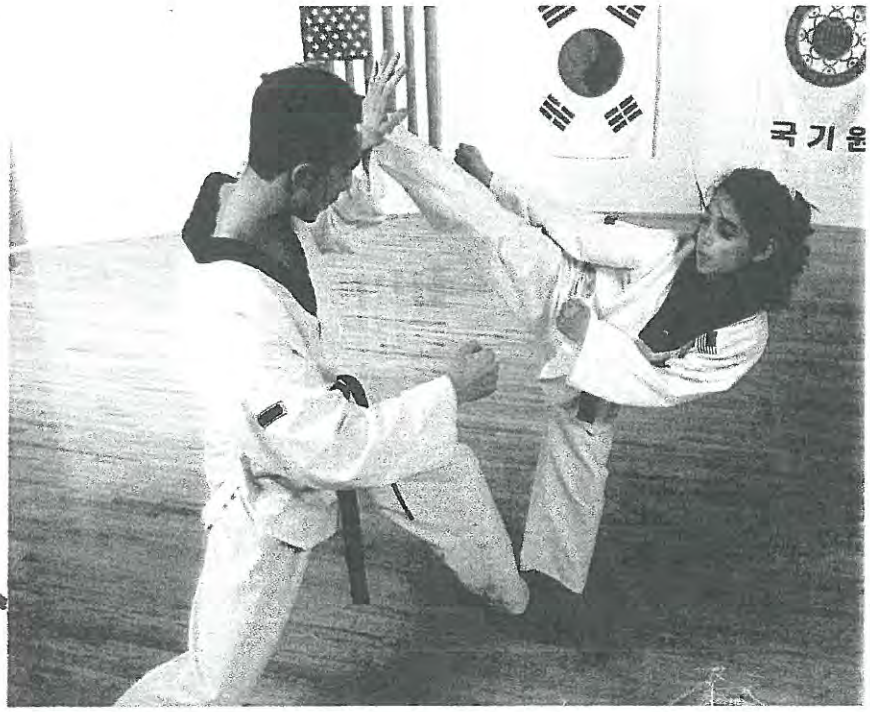


Figure 1 *The teen on the right has less mass than the teen on the left. But, the teen on the right can have a large momentum by moving quickly when she kicks.*

MATH FOCUS

Momentum Calculations What is the momentum of an ostrich with a mass of 120 kg that runs with a velocity of 16 m/s north?

Step 1: Write the equation for momentum.

$$p = m \times v$$

Step 2: Replace m and v with the values given in the problem, and solve.

$$p = 120 \text{ kg} \times 16 \text{ m/s north}$$

$$p = 19{,}200 \text{ kg•m/s north}$$

Now It's Your Turn

1. What is the momentum of a 6 kg bowling ball that is moving at 10 m/s down the alley toward the pins?
2. An 85 kg man is jogging with a velocity of 2.6 m/s to the north. Nearby, a 65 kg person is skateboarding and is traveling with a velocity of 3 m/s north. Which person has greater momentum? Show your calculations.

The Law of Conservation of Momentum

When a moving object hits another object, some or all of the momentum of the first object is transferred to the object that is hit. If only some of the momentum is transferred, the rest of the momentum stays with the first object.

Imagine that a cue ball hits a billiard ball so that the billiard ball starts moving and the cue ball stops, as shown in **Figure 2.** The white cue ball had a certain amount of momentum before the collision. During the collision, all of the cue ball's momentum was transferred to the red billiard ball. After the collision, the billiard ball moved away with the same amount of momentum the cue ball had. This example shows the *law of conservation of momentum.* The law of conservation of momentum states that any time objects collide, the total amount of momentum stays the same. The law of conservation of momentum is true for any collision if no other forces act on the colliding objects. This law applies whether the objects stick together or bounce off each other after they collide.

Reading Check **What can happen to momentum when two objects collide?** *(See the Appendix for answers to Reading Checks.)*

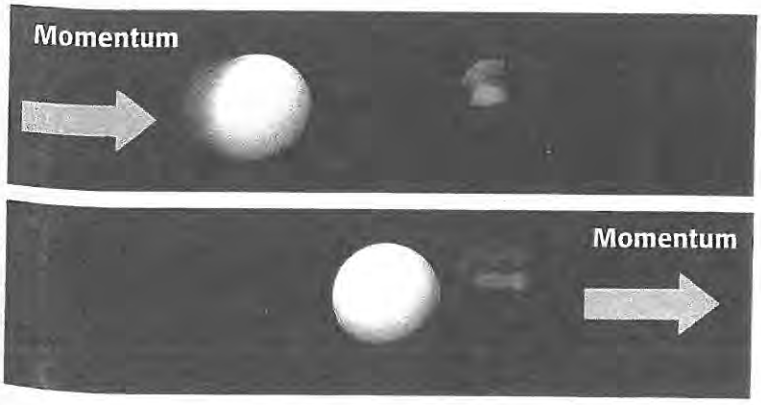


Figure 2 *The momentum before a collision is equal to the momentum after the collision.*

Objects Sticking Together

Sometimes, objects stick together after a collision. The football players shown in **Figure 3** are an example of such a collision. A dog leaping and catching a ball and a teen jumping on a skateboard are also examples. After two objects stick together, they move as one object. The mass of the combined objects is equal to the masses of the two objects added together. In a head-on collision, the combined objects move in the direction of the object that had the greater momentum before the collision. But together, the objects have a velocity that differs from the velocity of either object before the collision. The objects have a different velocity because momentum is conserved and depends on mass and velocity. So, when mass changes, the velocity must change, too.

CONNECTION TO Language Arts

WRITING SKILL **Momentum and Language**

The word *momentum* is often used in everyday language. For example, a sports announcer may say that the momentum of a game has changed. Or you may read that an idea is gaining momentum. In your **science journal,** write a paragraph that explains how the everyday use of the word *momentum* differs from momentum in science.

Objects Bouncing Off Each Other

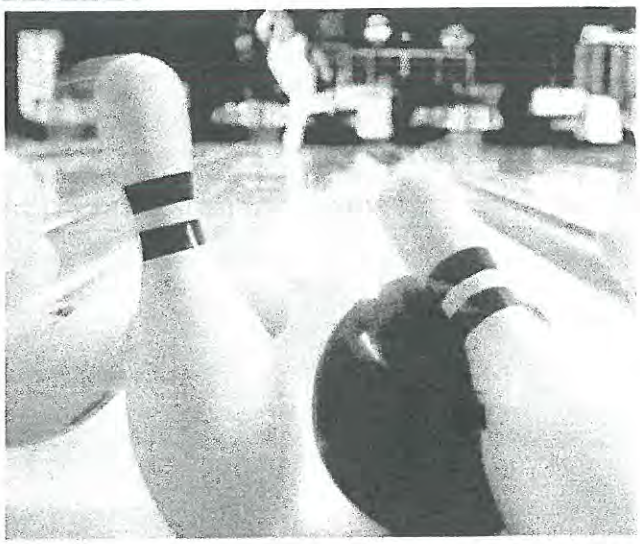
In some collisions, the objects bounce off each other. The bowling ball and bowling pins shown in **Figure 3** are examples of objects that bounce off each other after they collide. Billiard balls and bumper cars are other examples. During these types of collisions, momentum is usually transferred from one object to another object. The transfer of momentum causes the objects to move in different directions at different speeds. However, the total momentum of all the objects will remain the same before and after the collision.

Reading Check **What are two ways that objects may interact after a collision?**

Figure 3 **Examples of Conservation of Momentum**



When football players tackle another player, they stick together. The velocity of each player changes after the collision because of conservation of momentum.



Although the bowling ball and bowling pins bounce off each other and move in different directions after a collision, momentum is neither gained nor lost.

Conservation of Momentum and Newton's Third Law

Conservation of momentum can be explained by Newton's third law of motion. In the example of the billiard ball, the cue ball hit the billiard ball with a certain amount of force. This force was the action force. The reaction force was the equal but opposite force exerted by the billiard ball on the cue ball. The action force made the billiard ball start moving, and the reaction force made the cue ball stop moving, as shown in **Figure 4.** Because the action and reaction forces are equal and opposite, momentum is neither gained nor lost.

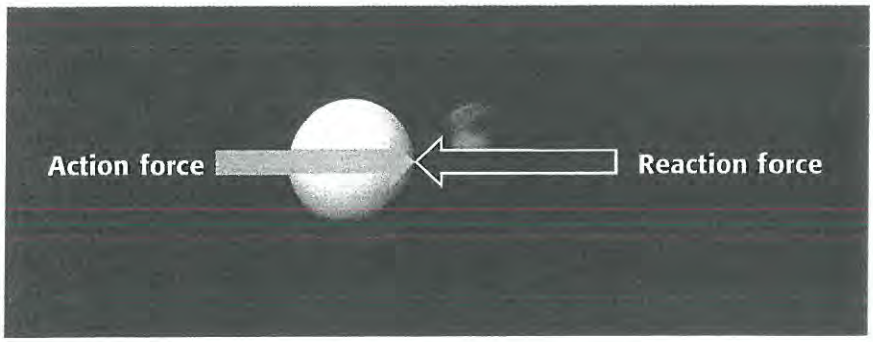


Figure 4 *The action force makes the billiard ball begin moving, and the reaction force stops the cue ball's motion.*

SECTION Review

Summary

- Momentum is a property of moving objects.
- Momentum is calculated by multiplying the mass of an object by the object's velocity.
- When two or more objects collide, momentum may be transferred, but the total amount of momentum does not change. This is the law of conservation of momentum.

Using Key Terms

1. Use the following term in a sentence: *momentum*.

Understanding Key Ideas

2. Which of the following has the smallest amount of momentum?
   - **a.** a loaded truck driven at highway speeds
   - **b.** a track athlete running a race
   - **c.** a baby crawling on the floor
   - **d.** a jet airplane being towed toward an airport
3. Explain the law of conservation of momentum.
4. How is Newton's third law of motion related to the law of conservation of momentum?

Math Skills

5. Calculate the momentum of a 2.5 kg puppy that is running with a velocity of 4.8 m/s south.

Critical Thinking

6. **Applying Concepts** A car and a train are traveling with the same velocity. Do the two objects have the same momentum? Explain your answer.
7. **Analyzing Ideas** When you catch a softball, your hand and glove move in the same direction that the ball is moving. Analyze the motion of your hand and glove in terms of momentum.

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PE Cover Sheet

4-8

Week 28

Monday-Friday we will be doing 20 jumping jacks,20 mountain climbers, and 20 burpees.

Please make sure to put your name on your paper, and drink lots of water.

Stretches for PE Monday,Tuesday, Wednesday, Thursday and Friday				
Monday	20 Jumping Jacks	20 Mountain Climbers	20 Burpees	Parent/Gardian/Teacher Signature:
Tuesday	20 Jumping Jacks	20 Mountain Climbers	20 Burpees	Parent/Gardian/Teacher Signature:
Wednesday	20 Jumping Jacks	20 Mountain Climbers	20 Burpees	Parent/Gardian/Teacher Signature:
Thursday	20 Jumping Jacks	20 Mountain Climbers	20 Burpees	Parent/Gardian/Teacher Signature:
Friday	20 Jumping Jacks	20 Mountain Climbers	20 Burpees	Parent/Gardian/Teacher Signature:
Name:		Week 28 4-8		