Name Date Time

STUDY LINK 7•1

Exponents

In exponential notation, the **exponent** tells how many times the **base** is used as a factor. For example, $6^4 = 6 * 6 * 6 * 6 = 1,296$. The base is 6, and the exponent is 4. The product is written as 1,296 in standard notation.

SRB 6

1. Complete the table.

Exponential Notation	Base	Exponent	Repeated Factors	Standard Notation
9^3	9	3	$9 * 9 * 9$	729
	4	5		
			$7 * 7 * 7 * 7$	
			$10 * 10 * 10 * 10 * 10 * 10$	
				262,144

Describe the mistake. Then find the correct solution.

2. $6^3 = 6 + 3 = 9$

Mistake: ______

Correct solution: ______

3. $2^9 = 9 + 9 = 18$

Mistake: ______

Correct solution: ______

4. $4^7 = 4 * 7 = 28$

Mistake: ______

Correct solution: ______

Practice

5. $351.82 + n = 366.52$

$n =$ ______

6. $100 - r = 99.52$

$r =$ ______

7. $\frac{4}{7} + u = \frac{19}{7}$

$u =$ ______

Name Date Time

LESSON 7•1

Exploring Exponents

The number sentences below contain **exponents.** Find the pattern, and complete the number sentences.

1. $3 * 3 = 3^2$ $3 * 3 * 3 = 3^3$ $3 * 3 * 3 * 3 = 3^4$

2. $5 * 5 = 5^2$ $5 * 5 * 5 = 5^3$ $5 * 5 * 5 * 5 = 5^4$

3. $18 * 18 = 18^2$ $18 * 18 * 18 = 18^3$ $18 * 18 * 18 * 18 = 18^4$

4. $7 * 7 =$ _____ _______________ $= 7^3$ $7 * 7 * 7 * 7 =$ _____

5. $4 * 4 * 4 * 4 * 4 * 4 * 4 =$ _____

6. $2^6 =$ ______________________________

7. If you were going to explain to someone how to use exponents to write a number, what would you say?

____

____

____

____

____

____

____

Try This

Write the repeated-factor expression or the exponential notation.

8. $28^6 =$ ______________________________

9. $309 * 309 * 309 * 309 * 309 =$ ______________________________

10. $2^3 * 2^3 =$ ______________________________

Name Date Time

LESSON 7•1

Patterns with Fibonacci Numbers

1. The sequence of numbers 1, 1, 2, 3, 5, 8, 13, … is called the **Fibonacci sequence.** In the Fibonacci sequence, every number, starting with the third number, is equal to the sum of the two numbers that come before it.

Examples:

Third number: $1 + 1 = 2$ Fourth number: $1 + 2 = 3$

Fill in the next three Fibonacci numbers. 1, 1, 2, 3, 5, 8, 13, ______, ______, ______

2. Study the following pattern:

$$1^2 + 1^2 = 1 * 2$$
$$1^2 + 1^2 + 2^2 = 2 * 3$$
$$1^2 + 1^2 + 2^2 + 3^2 = 3 * 5$$
$$1^2 + 1^2 + 2^2 + 3^2 + 5^2 = 5 * 8$$

a. Write the next two number sentences in the pattern.

____

____

b. Describe the pattern in words.

____

____

____

3. a. Solve the following problems: $2^2 - (1 * 3) =$ ______ $3^2 - (2 * 5) =$ ______

$5^2 - (3 * 8) =$ ______ $8^2 - (5 * 13) =$ ______

b. Write the next two number sentences in the pattern.

____

c. Describe the pattern in words.

____

____

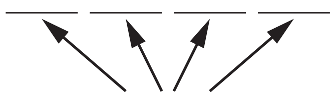
____

Name Date Time

LESSON 7·1

Counting Computer Passwords

The computer at a local library provides a different computer password for every library card. The passwords can include letters, numbers, or a combination of letters and numbers. Both lower-case and upper-case letters can be used. This results in 62 choices for each character in the password.



62 choices for each character

A	a	B	b	C	c	D	d	E	e	F	f
G	g	H	h	I	i	J	j	K	k	L	l
M	m	N	n	O	o	P	p	Q	q	R	r
S	s	T	t	U	u	V	v	W	w	X	x
Y	y	Z	z	0	1	2	3	4	5	6	7
8	9										

1. List three possible 4-character passwords.

a. ____ ____ ____ ____

b. ____ ____ ____ ____

c. ____ ____ ____ ____

2. The total number of possible passwords can be found by using 62 as a factor 4 times.

$$62 * 62 * 62 * 62, \text{ or } 62^4$$

Use your calculator to find the number of different possible 4-character computer passwords. ____

Name Date Time

STUDY LINK 7•2

Guides for Powers of 10

There are prefixes that name powers of 10. You know some of them from the metric system; for example, *kilo-* in kilometer (1,000 meters). It's helpful to memorize the prefixes for every third power of 10 through one trillion.

SRB 4–6 376

Memorize the table below. Have a friend quiz you. Then cover the table, and try to complete the statements below.

Standard Notation	Number-and-Word Notation	Exponential Notation	Prefix
1,000	1 thousand	10^3	kilo-
1,000,000	1 million	10^6	mega-
1,000,000,000	1 billion	10^9	giga-
1,000,000,000,000	1 trillion	10^{12}	tera-

1. More than 10^9, or one ______________, people live in China.
2. One thousand, or $10^{\square}$, feet is a little less than $\frac{1}{5}$ of a mile.
3. Astronomers estimate that there are more than 10^{12}, or one ______________, stars in the universe.
4. More than one million, or $10^{\square}$, copies of *The New York Times* are sold every day.
5. A kiloton equals one ______________, or $10^{\square}$, metric tons.
6. A megaton equals one ______________, or $10^{\square}$, metric tons.

Practice

Find the prime factorization of each number, and write it using exponents.

7. 48 = ______________
8. 60 = ______________

Write each number in expanded notation.

9. 3,264 = ______________
10. 675,511 = ______________

Name Date Time

LESSON 7·2

Powers of 10

Find the patterns and complete the table below. Do not use your *Student Reference Book.*

1,000,000	100,000	10,000	1,000	100	10	1
				hundreds		ones
10[100,000s]			10[100s]			10[tenths]
		10 ∗ 10 ∗ 10 ∗ 10		10 ∗ 10		
	10^5				10^1	10^0

Describe at least three patterns that you see in the table.

1. ______________________________

2. ______________________________

3. ______________________________

Name Date Time

LESSON 7•2

Negative Powers of 10

Our base-ten place-value system works for decimals as well as for whole numbers.

Tens	Ones	.	Tenths	Hundredths	Thousandths
10s	1s	.	0.1s	0.01s	0.001s

Negative powers of 10 can be used to name decimal places.

Example: $10^{-2} = \frac{1}{10^2} = \frac{1}{10 * 10} = \frac{1}{10} * \frac{1}{10} = 0.1 * 0.1 = 0.01$

Very small decimals can be hard to read in standard notation, so people often use number-and-word notation, exponential notation, or prefixes instead.

Guides for Small Numbers

Number-and-Word Notation	Exponential Notation	Standard Notation	Prefix
1 tenth	$10^{-1} = \frac{1}{10}$	0.1	deci-
1 hundredth	$10^{-2} = \frac{1}{10 * 10}$	0.01	centi-
1 thousandth	$10^{-3} = \frac{1}{10 * 10 * 10}$	0.001	milli-
1 millionth	$10^{-6} = \frac{1}{10 * 10 * 10 * 10 * 10 * 10}$	0.000001	micro-
1 billionth	$10^{-9} = \frac{1}{10 * 10 * 10 * 10 * 10 * 10 * 10 * 10 * 10}$	0.000000001	nano-
1 trillionth	$10^{-12} = \frac{1}{10*10*10*10*10*10*10*10*10*10*10*10}$	0.000000000001	pico-

Use the table above to complete the following statements.

1. A fly can beat its wings once every 10^{-3} seconds, or once every one thousandth of a second. This is one ______________ second.

2. Earth travels around the sun at a speed of about one inch per microsecond. This is $10^{\square}$ second, or a ______________ of a second.

3. Electricity can travel one foot in a nanosecond, or one ______________ of a second. This is $10^{\square}$ second.

4. In $10^{\square}$ second, or one picosecond, an air molecule can spin once. This is one ______________ of a second.

Name Date Time

STUDY LINK 7•3

Interpreting Scientific Notation

SRB 8

Scientific notation is a short way to represent large and small numbers. In scientific notation, a number is written as the product of two factors. One factor is a whole number or a decimal. The other factor is a power of 10.

Scientific notation: $4 * 10^4$

Meaning: Multiply 10^4 (10,000) by 4.

$4 * 10^4 = 4 * 10{,}000 = 40{,}000$

Number-and-word notation: 40 thousand

Scientific notation: $6 * 10^6$

Meaning: Multiply 10^6 (1,000,000) by 6.

$6 * 10^6 = 6 * 1{,}000{,}000 = 6{,}000{,}000$

Number-and-word notation: 6 million

Guides for Powers of 10	
10^3	one thousand
10^6	one million
10^9	one billion
10^{12}	one trillion

Complete the following statements.

1. The area of Alaska is about $6 * 10^5$, or ____________ thousand, square miles.

The area of the lower 48 states is about $3 * 10^6$, or ____________ million, square miles.

2. There are about $6 * 10^9$, or ____________ billion, people in the world.

3. It is estimated that about $5 * 10^8$, or ____________________, people speak English as their first or second language.

4. In Bengal, India, and Bangladesh there are about $2.6 * 10^8$, or ____________________, people who speak Bengali.

5. At least 1 person in each of $1 * 10^7$ households, or __________________, watches the most popular TV shows.

Source: *The World Almanac and Book of Facts, 2000*

Practice

6. $5 * (3^2 + 4^2) =$ ____________

7. $3 * (9 + 16) =$ ____________

8. $2 * (9 + h) = 20$ ____________

9. $g = (7^2 - 2^2)$ ____________

Name Date Time

LESSON 7·3

Using Place Value to Rename Numbers

Write the numbers from the name-collection box tag in the place-value chart.
Then follow the pattern in Problem 1 to complete each name-collection box.

	Billions			Millions			Thousands			Ones		
	100	10	1	100	10	1	100	10	1	100	10	1
1.									1	3	0	0
2.												
3.												
4.												

Example:

1,300
1,000 + 300
1 thousand 3 hundred
13 hundred
$1\frac{300}{1000}$ thousands
$1\frac{3}{10}$ thousands
1.3 thousands

1.

1,800

2.

1,400,000

3.

1,600,000

Name Date Time

LESSON 7·3

Writing in Expanded Notation

A Standard Notation: 325

B Expanded Notation as an addition expression: 300 + 20 + 5

C Expanded Notation as the sum of multiplication expressions:
$(3 * 100) + (2 * 10) + (5 * 1)$

D Expanded Notation as the sum of multiplication expressions using powers of 10: $(3 * 10^2) + (2 * 10^1) + (5 * 10^0)$

Write each number below in the other three possible ways, as shown above.

1. a. 5,314

b. ______________________

c. ______________________

d. ______________________

2. a. ______________________

b. 2,000 + 700 + 50 + 6

c. ______________________

d. ______________________

3. a. ______________________

b. ______________________

c. $(9 * 100) + (8 * 10) + (3 * 1)$

d. ______________________

4. a. ______________________

b. ______________________

c. ______________________

d. $(7 * 10^3) + (4 * 10^2) + (5 * 10^1) + (2 * 10^0)$

Name Date Time

STUDY LINK 7•4

Using Parentheses

SRB 222 223

Make each sentence true by inserting parentheses.

1. 2 = 3 * 2 − 4 / 1 **2.** 3 = 4 + 3 − 1 / 2 **3.** 4 = 3 − 1 + 4 / 2

4. Write seven names for 8. Use only numbers less than 10, and use at least three different operations in each name. Use parentheses. Follow the directions in Problem 7 to fill in the last two rows.

8

Make each sentence true by inserting parentheses.

> **Reminder:** When you have a pair of parentheses inside another pair, the parentheses are called **nested parentheses.**
>
> **Example:** 8 = ((5 * 6) + 2) / 4

5. 1 = 4 + 1 − 3 / 2 **6.** 7 = 4 * 3 / 2 + 1

7. Add two names to your name-collection box in Problem 4. Use nested parentheses.

Practice

Find the number that each variable represents.

8. $2\frac{5}{12} = (1\frac{1}{12} + a)$ ____________ **9.** $(1\frac{1}{2} + p) * 2^2 = 12$ ____________

10. $6\frac{5}{8} + d = 7\frac{15}{8}$ ____________ **11.** $6.4 - y = 6\frac{2}{5}$ ____________

Name Date Time

LESSON 7•4

Reviewing Parentheses

1. Read the following sentence. Mary Grace the lizard ate three crickets.

This sentence could have multiple meanings.

1. The speaker is telling someone named Mary Grace that the lizard ate three crickets.

2. The lizard, named Mary Grace, ate three crickets.

3. The speaker is telling someone named Mary that the lizard, named Grace, ate three crickets.

Without commas, it's hard to tell which meaning was intended. Write the number of the meaning next to each sentence below.

a. ________ Mary Grace, the lizard, ate three crickets.

b. ________ Mary Grace, the lizard ate three crickets.

c. ________ Mary, Grace the lizard, ate three crickets.

By adding commas, the meaning of a sentence becomes clear. In number sentences, parentheses are used to indicate what to calculate first.

2. Insert parentheses in each sentence to make the sentence true.

a. $3 * 4 + 7 = 33$ ____________________

b. $6 + 9 * 5 = 51$ ____________________

c. $27 / 4 + 5 + 6 = 9$ ____________________

3. Insert parentheses in the expressions below, and find their solutions.

a. $7 * 5 - 4 =$ ____________________

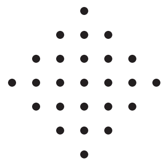
b. $6 + 9 \div 3 =$ ____________________

Name Date Time

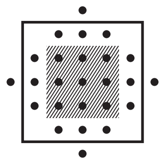
LESSON 7•4

Describing Dot Patterns

The total dots in this dot array can be found by using patterns.

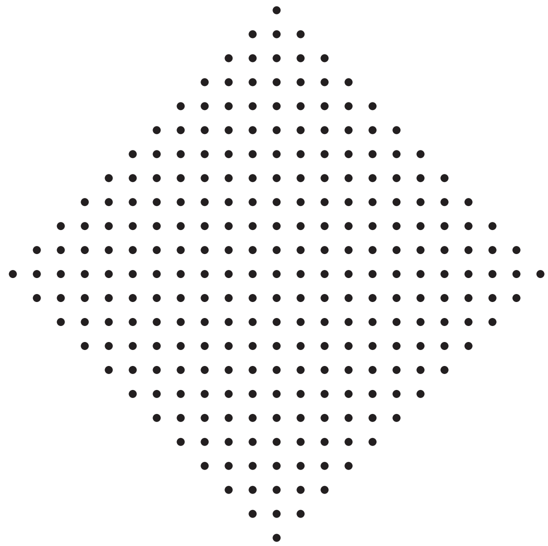


Here is one way to find the total:



((3 * 3) + (4 * 3) + 4)

Use shape outlines or colors to identify a pattern on this dot array. Write a number model for your pattern. Then write a number story that matches your number model.



Number model: ______________________

Number story:

____

____

____

____

____

____

____

Name Date Time

STUDY LINK 7•5

Order of Operations

SRB 223

Rules for Order of Operations

1. Do operations inside **parentheses.**
2. Calculate all expressions with **exponents.**
3. **Multiply** and **divide** in order, from left to right.
4. **Add** and **Subtract** in order, from left to right.

Solve.

1. $4 + 5 * 6 =$ ______

2. $(2 + 3)^2 =$ ______

3. $12 * 2 + 8 \div 2 =$ ______

4. $115 - 10^2 + 3 * 5 =$ ______

5. $6 * (3 + 2^2) \div 2 =$ ______

6. $7 + 9 * 7 \div 3 =$ ______

Write true or false for each number sentence. Follow the rules for order of operations.

7. $3 + 4 * 5 = 35$ ______

8. $(3 + 4) * 5 = 35$ ______

9. $0 = 3 * 4 - 12$ ______

10. $0 = (3 * 4) - 12$ ______

11. $36 = 12 - 3 * 4$ ______

12. $36 = (12 - 3) * 4$ ______

13. $8 \div 2 + 6 = 1$ ______

14. $8 \div (2 + 6) = 1$ ______

Practice

Find the number that each variable represents.

15. $354 * 26 = z$ ______

16. $907 * 86 = r$ ______

17. $3.000 - 1.75 = s$ ______

18. $0.006 + 3.2 + 0.75 + 4 = h$ ______

Name Date Time

LESSON 7•5

Evaluating Expressions

Janet and Alisha are using their calculators to evaluate expressions. Janet has a four-function calculator, and Alisha has a scientific calculator. They both enter the same key sequence, but their calculator displays are different.

1. Study the key sequence and calculator displays below.

Key Sequence	Janet's Display	Alisha's Display
3 + 5 × 2 =	16	13

2. Decide the order that each calculator used to perform the operations. Use parentheses to write a number sentence that models each order.

a. Number model for Janet's calculator: ____________________

b. Number model for Alisha's calculator: ____________________

3. Use your number models in Problem 2 to evaluate the following key sequence. Then complete the table for each calculator.

Key Sequence	Janet's Display	Alisha's Display
5 × 3 + 7 − 8 ÷ 2 =		

Try This

4. Write number models that show what each calculator did in Problem 3.

a. Number model for Janet's calculator:

____

b. Number model for Alisha's calculator:

____

Name ________________ Date ________________ Time ________________

LESSON 7•5

Discovering Exponent Patterns

Look for a pattern in the number sentences below. Then use the pattern to solve Problems 1–3.

$$7^2 \ast 7^3 = 7^5$$

$$12^7 \ast 12^3 = 12^{10}$$

$$34^6 \ast 34^6 = 34^{12}$$

1. $2^2 \ast 2^3 =$ ________

Explain how you can prove your answer to Problem 1 is correct.

____

____

____

2. $5^5 \ast 5^7 =$ ________

3. $94^8 \ast 94^2 =$ ________

Describe the pattern you are using to solve the problems.

____

____

4. Circle the problem below for which the pattern does *not* work.

$28^5 \ast 5^3$ $\quad$ $14^8 \ast 14^9$ $\quad$ $22^5 \ast 22^2$

Try This

5. What do you think happens when two numbers with the same base are divided?

____

____

____

6. Solve this problem to check your prediction.

$2^5 / 2^3 =$ ________

Name Date Time

STUDY LINK 7•6

Making Line Graphs

SRB 124

Bar graphs, circle graphs, and line graphs display information in a way that makes it easy to show comparisons, but line graphs can also show trends.

1. Use the information in the line graph to write two true statements about movie ticket sales.

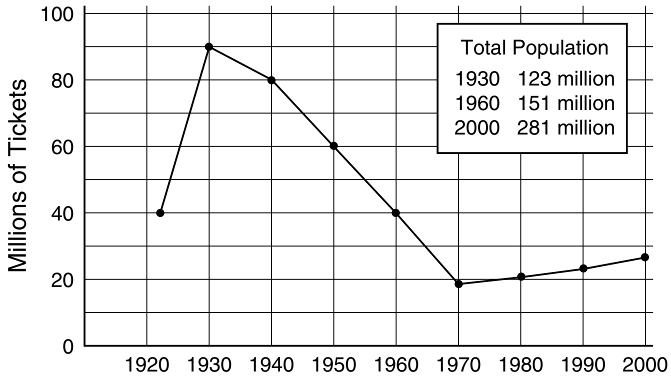
____

____

____

____

Average Number of Movie Tickets Sold per Week (in Millions), 1922–2000

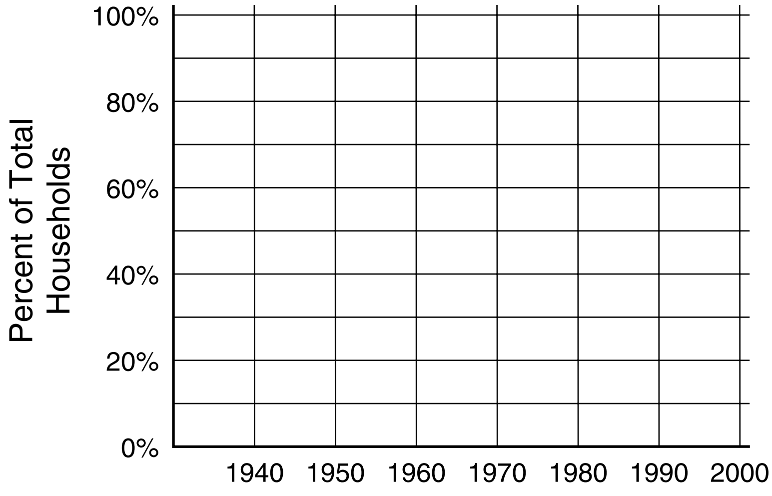


2. The table data lists the estimated percent of households with television sets from 1940 to 2000. Plot the data on the line graph below.

Estimated Percent of Households with Television Sets, 1940–2000

Year	1940	1950	1960	1970	1980	1990	2000
Percentage	0%	12%	88%	96%	98%	98%	98%

Estimated Percent of Households with Television Sets, 1940–2000



3. Compare the information in the line graphs from Problems 1 and 2. What relationships do you see?

____

____

LESSON 7·6

Looking at Line Graphs

Look closely at the graph you have. List each of the following features for your graph. If any of the features are missing from your graph, make up one that is appropriate.

1. Title of the graph: ______________________

2. Label for the horizontal axis: ______________________

3. Label for the vertical axis: ______________________

4. Range of the data: ______________________

5. Write three questions that can be answered by looking at your graph.

____

____

____

____

6. Line graphs are often used to show trends—how things change over time. If your graph shows a trend, describe what it shows. If not, explain what you think the graph tells you.

____

____

____

____

____

Name Date Time

LESSON 7•6

Graphing Sets of Data on a Line Graph

The following table shows the average high and low temperatures (°F) of a city in the Midwest United States.

Average Temperatures (°F)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	33	36	46	59	72	80	85	82	75	62	49	38
Low	20	22	29	39	51	60	65	64	56	45	36	25

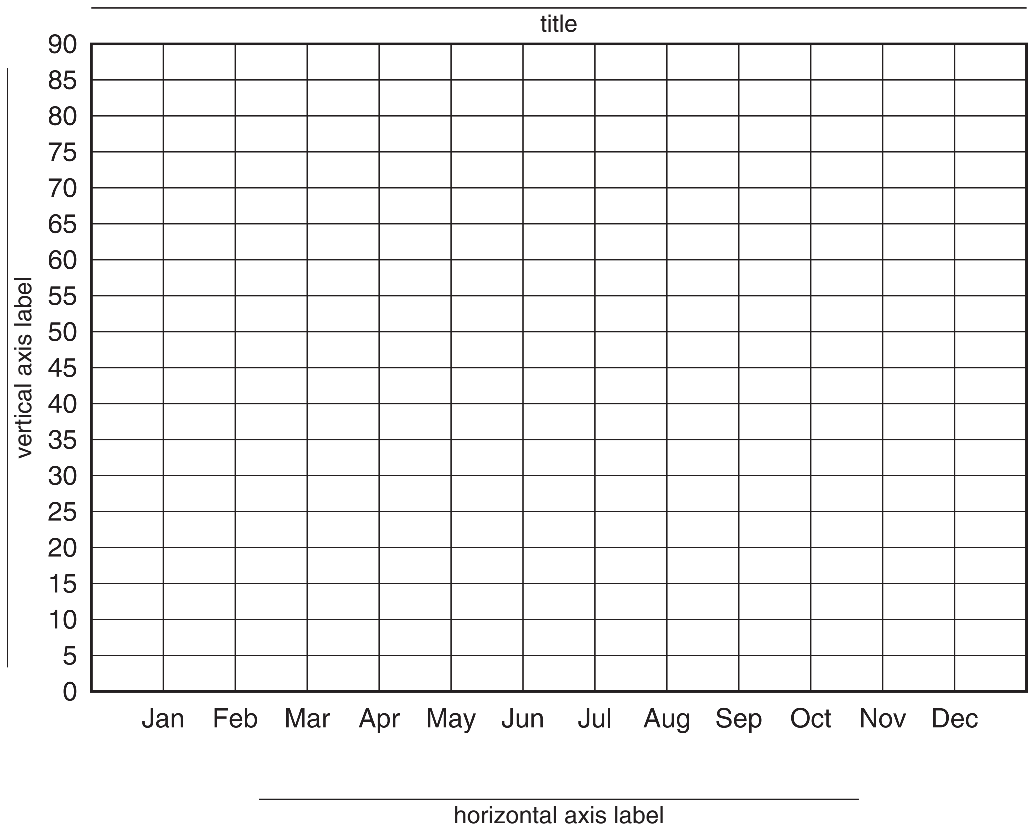
Make a line graph for this data using the grid below. Use a different colored pencil to connect the points for each data set.

1. Choose and write a title for the graph.

2. Label each axis.

3. Plot all the points for the high temperatures. Connect the data points. Write the words *High Temperature* above the line formed.

4. Plot all the points for the low temperatures. Connect the data points. Write the words *Low Temperature* under the line formed.



Name Date Time

STUDY LINK 7•7

Greater Than or Less Than?

SRB 32 66 67 91

Name a number between each pair of numbers.

1. 2 and 3 ______________ **2.** 1.5 and 2 ______________

3. -5 and -6 ______________ **4.** -9.5 and -10 ______________

Order each set of numbers from *least* to *greatest.*

5. $5\frac{1}{4}$, 3.8, -1.2, -1, $5\frac{3}{8}$ ______________________________

6. -6, $-4\frac{1}{2}$, -0.5, -7, 0 ______________________________

True or false? Write T for true and F for false.

7. $-6 > 5$ __________

8. $5\frac{1}{2} < 5\frac{3}{6}$ __________

9. $-2.5 > -3.5$ __________

10. -4 is less than 0 __________

Write one true and one false number sentence. In each sentence, use at least one negative number and one of the $>$, $<$, or $=$ symbols. Label each sentence T or F.

11. ______________________________ __________

12. ______________________________ __________

Practice

Find the number that each variable represents.

13. $92.47 + f = 105$ ______________

14. $32 + 15 + 25 + 8 + s = 10^2$ ______________

15. $4\frac{3}{12} + n = 5$ ______________

16. $4\frac{3}{12} - r = 3\frac{6}{12}$ ______________

Name Date Time

LESSON 7•7

Change in Price

A local store is changing the price of some popular items. Listed below are the items with the new changes. Complete the table.

Item	Original Price	Change in Price (Fraction)	Change in Price (Dollars)	Price After Change
Gloves	\$5.00	$-\frac{1}{5}$	−\$1.00	\$4.00
Hats	\$7.50	$-\frac{1}{10}$		\$6.75
Belts	\$10.00	$+\frac{1}{4}$		
Socks	\$1.50	$+\frac{1}{2}$		
Pants	\$12.00	$-\frac{1}{20}$		
Shirts	\$8.50	$+\frac{3}{10}$		

1. Which item has the largest price increase? ______________

2. Which item has the largest price decrease? ______________

3. Which item has a 20% change? ______________

4. If you were to purchase a hat and belt after the price change, would you pay more or less than the original price? ______________

   How much more or less? ______________

5. If you purchased one each of the items before the price changes and one of each item after the price changes, what would be the total change in cost? State your answer as a positive or negative number. Explain your solution.

____

____

____

____

Name Date Time

STUDY LINK 7•8

Positive and Negative Numbers

SRB 81 91–94

Write $<$ or $>$.

1. -7 ______ 6

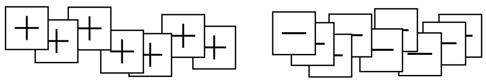
2. 0.01 ______ -32

3. 8.5 ______ -10^3

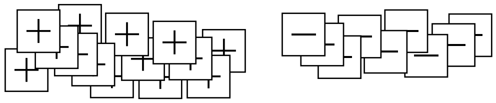
4. $-\frac{3}{4}$ ______ -1.6

Find the account balance. $\boxed{+}$ = \$1 cash. $\boxed{-}$ = \$1 debt.

5. Balance = \$ ____________



6. Balance = \$ ____________



Solve these addition problems.

7. $-15 + 6 =$ ______

8. $17 + (-5) =$ ______

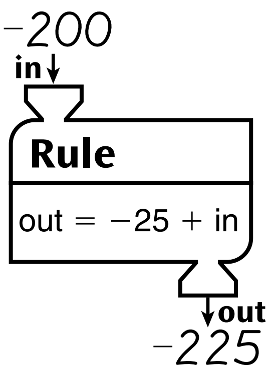
9. $-56 + (-32) =$ ______

10. $90 + (-20) =$ ______

11. $18 + (-15) =$ ______

12. $-987 + 987 =$ ______

13. Use the rule to complete the table.



in	out
25	
50	
−25	
−100	
100	
0	

Practice

Find the number that each variable represents.

14. $3\frac{2}{3} = \frac{j}{3}$ ______

15. $7\frac{9}{3} = \frac{a}{3}$ ______

16. $\frac{19}{25} * \frac{y}{y} = \frac{57}{75}$ ______

17. $\frac{75}{100} \div \frac{p}{p} = \frac{15}{20}$ ______

Name Date Time

STUDY LINK 7•9

Addition and Subtraction Problems

Solve each problem. Be careful. Some problems involve addition, and some involve subtraction.

Reminder:
To subtract a number, you can add the opposite of that number.

SRB 92–94

1. $-25 + (-16) =$ ________
2. $0 - (-43) =$ ________
3. $-4 - (-4) =$ ________
4. $-4 - 4 =$ ________
5. $29 - (-11) =$ ________
6. $9 - (-11) =$ ________
7. $-100 + 15 =$ ________
8. $10 - 10.5 =$ ________
9. $4\frac{1}{2} + (-2\frac{1}{2}) =$ ________
10. $10 -$ ________ $= 20$
11. For each temperature change in the table, two number models are shown in the Temperature after Change column. Only one of the number models is correct. Cross out the incorrect number model. Then complete the correct number model.

Temperature before Change	Temperature Change	Temperature after Change	
40°	up 7°	$40 + 7 =$ ______	$40 + (-7) =$ ______
10°	down 8°	$10 - (-8) =$ ______	$10 - 8 =$ ______
−15° (15° below zero)	up 10°	$-15 + 10 =$ ______	$15 + 10 =$ ______
−20° (20° below zero)	down 10°	$-20 - 10 =$ ______	$20 - (-10) =$ ______

Practice

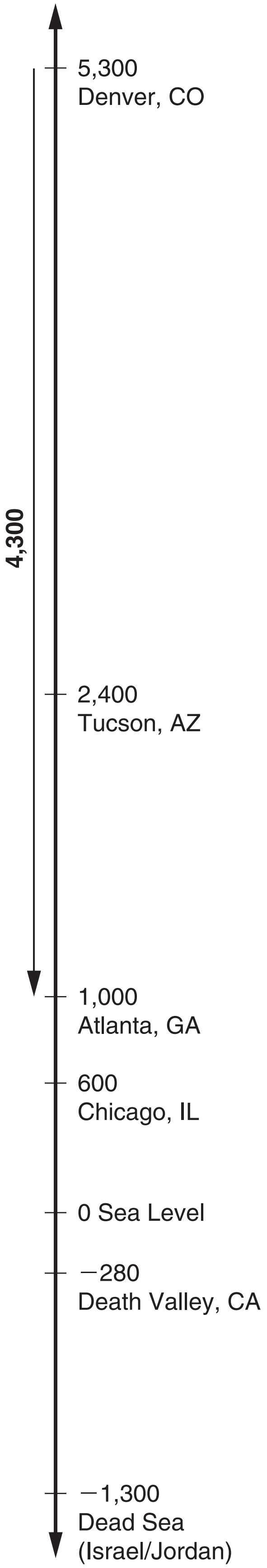
Find the number that each variable represents.

12. $684 * 96 = u$ ________
13. $69 \div e = 23$ ________
14. $32.486 - 1.645 = w$ ________
15. $9.45 - m = 3.99$ ________

Name Date Time

LESSON 7•9

Comparing Elevations



This number line shows the elevation of several places. Elevation measures how far above or below sea level a location is. For example, an elevation of 5,300 for Denver means that Denver is 5,300 feet above sea level. An elevation of −280 for Death Valley means that some point in Death Valley is 280 feet below sea level.

Fill in the table below. Use the example as a guide.

Example:

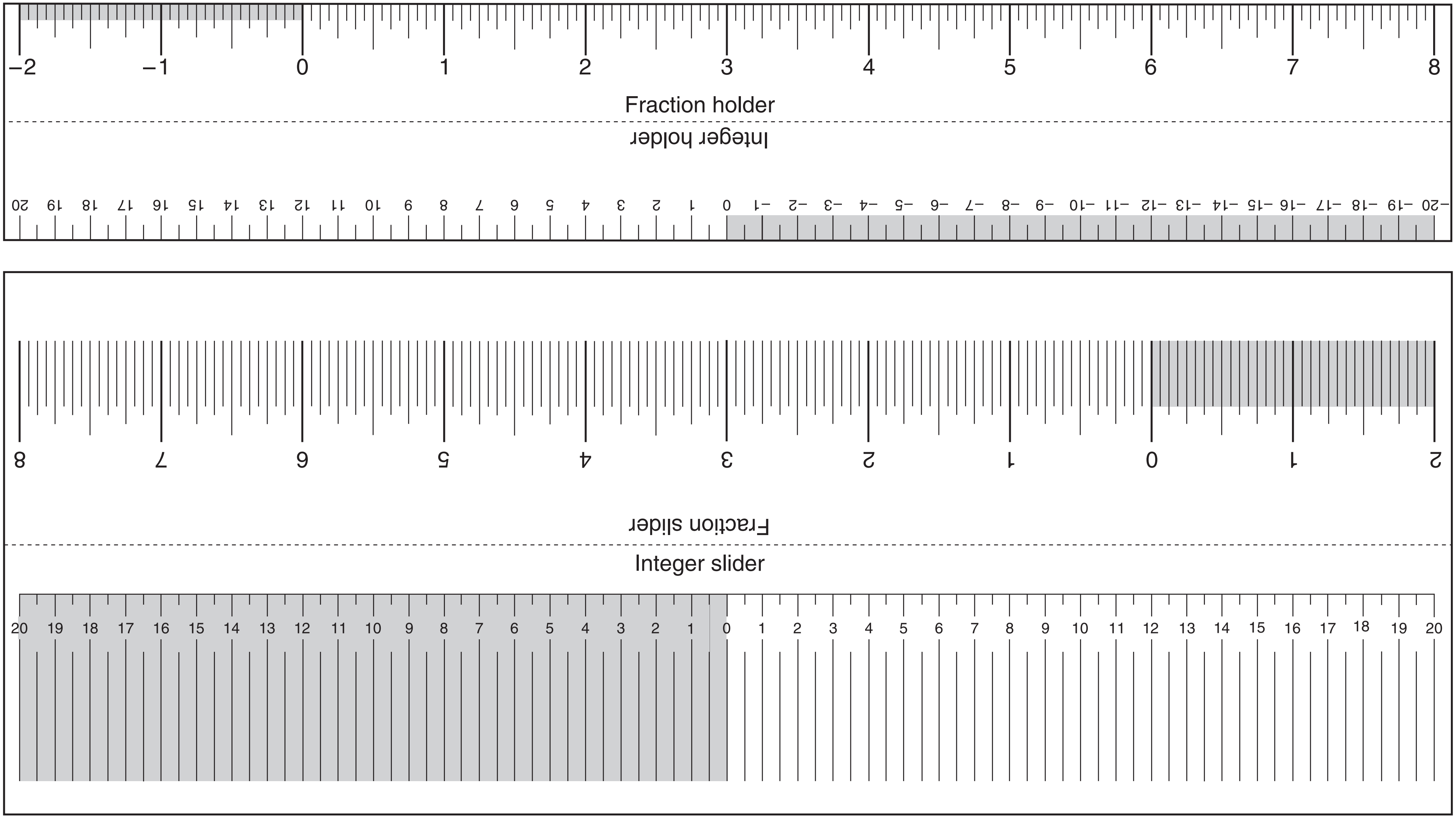
If you start at Denver and travel to Atlanta, what is your change in elevation?

Solution:

Draw an arrow next to the number line. Start it at the elevation for Denver (5,300 feet). End it at the elevation for Atlanta (1,000 feet). Use the number line to find the length of the arrow (4,300 feet). Your final elevation is lower, so report the change in elevation as *4,300 feet down.* Write a number model for the problem: 5,300 − 1,000 = 4,300.

Start at	Travel to	Change in Elevation / Number Model
Denver	Atlanta	4,300 feet down 5,300 − 1,000 = 4,300
Chicago	Tucson	______ feet ______
Death Valley	Dead Sea	______ feet ______
Dead Sea	Death Valley	______ feet ______
Tucson	Death Valley	______ feet ______
Dead Sea	Atlanta	______ feet ______

Slide Rule


−2 −1 0 1 2 3 4 5 6 7 8
Fraction holder
Integer holder
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 −1 −2 −3 −4 −5 −6 −7 −8 −9 −10 −11 −12 −13 −14 −15 −16 −17 −18 −19 −20
8 7 6 5 4 3 2 1 0 1 2
Fraction slider
Integer slider
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Name Date Time

STUDY LINK 7•10

Positive and Negative Number Review

Write >, <, or =.

1. -8 ______ 5 **2.** -3 ______ -10 **3.** 10 ______ -20

4. 12 ______ -15 **5.** $-\frac{3}{4}$ ______ -1 **6.** 3^2 ______ 6

Add or subtract.

7. $-20 + 15 =$ ______

8. $-14 + (-7) =$ ______

9. $-8 + 12 =$ ______

10. $3 + (-9) =$ ______

11. $-4 - 7 =$ ______

12. $-10 - 16 =$ ______

13. $5 - (-11) =$ ______

14. $8 - 12 =$ ______

Some of the following number sentences are true because they follow the rules for the order of operations. Some of the sentences are false. Make a check mark next to the true number sentences. Insert parentheses in the false number sentences to make them true.

15. $3 + 7 * 5 = 38$

16. $-5 + 20 \div 5 = -1$

17. $-2 + 3 * 4 = 4$

18. $-2 + 3 * 4 = 10$

19. $-3 + 5 * 2 - (-6) = 37$

20. $4^2 + (-3) - (-5) * 2 = 20$

21. a. Julie arrived 20 minutes before the race began. She started right on time. It took her 24 minutes to finish the 6-kilometer race. She stayed 10 minutes after the race to cool off; then she left. If she arrived at the race at 9:10 A.M., what time was it when she left?

______

b. Explain how you found your answer.

______

______

______

______

Name Date Time

LESSON 7•10

Using a Slide Rule for Mixed Numbers

Use your slide rule to solve the problems below.

1. $13\frac{1}{2} + 3\frac{3}{4} =$ ____________

2. $18 - 1\frac{1}{2} =$ ____________

3. $11\frac{5}{8} + (-6\frac{3}{4}) =$ ____________

4. $-16\frac{1}{2} - 3\frac{3}{8} =$ ____________

5. $12\frac{3}{8} - (-4\frac{3}{4}) =$ ____________

6. $-5\frac{1}{8} + (-14\frac{1}{2}) =$ ____________

Write an explanation for how to use a slide rule to solve problems with multidigit mixed numbers.

Name Date Time

LESSON 7•10

Using a Slide Rule for Mixed Numbers

Use your slide rule to solve the problems below.

1. $13\frac{1}{2} + 3\frac{3}{4} =$ ____________

2. $18 - 1\frac{1}{2} =$ ____________

3. $11\frac{5}{8} + (-6\frac{3}{4}) =$ ____________

4. $-16\frac{1}{2} - 3\frac{3}{8} =$ ____________

5. $12\frac{3}{8} - (-4\frac{3}{4}) =$ ____________

6. $-5\frac{1}{8} + (-14\frac{1}{2}) =$ ____________

Write an explanation for how to use a slide rule to solve problems with multidigit mixed numbers.

Name Date Time

STUDY LINK 7•11

Unit 7 Review

SRB 5–9

1. Circle the number sentences that are true.

$25 + (-6) < -32$ $4^2 < 2^4$ $15 * 15 * 15 < 15^3$

$21 * 21 = 21^3$ $-5 - (-58) = 53$ $25 > 5^2 - (-2)$

Write each number as a power of 10.

2. 1,000,000 ______ **3.** 10,000 ______

4. 1 hundred-thousand ______ **5.** 1 billion ______

Match the number written in number-and-word notation with its standard notation. Fill in the oval next to the correct answer.

6. 3 million
- 0 300,000
- 0 30,000,000
- 0 3,000,000
- 0 30,000

7. 20 thousand
- 0 200,000
- 0 20,000
- 0 2,000,000
- 0 20,000,000

8. 640 thousand
- 0 6,400,000
- 0 64,000,000
- 0 640,000,000
- 0 640,000

9. 2.6 million
- 0 26,000,000
- 0 2,060,000
- 0 20,600,000
- 0 2,600,000

Write the following numbers in expanded notation.

10. 8,759 ______________________

11. 87.59 ______________________

STUDY LINK 7•11

Unit 7 Review *continued*

Write each number in scientific notation.

SRB 5–9

12. 8 million ____________ **13.** 7 billion ____________

14. 3 thousand ____________ **15.** 17 billion ____________

16. Louise bought three 6-pack containers of yogurt. She ate 5 individual containers of yogurt in one week. How many containers did she have left?

Number model: ____________ Answer: ____________

17. The water in Leroy's and Jerod's fish tank had evaporated so it was about $\frac{5}{8}$ inch below the level it should be. They added water and the water level went up about $\frac{3}{4}$ inch. Did the water level end up above or below where it should be?

____

How much above or below?

Number model: ____________ Answer: ____________

Find the number that each variable represents.

18. $2.4 + 62.8 + 3.752 = f$ ____________

19. $86.54 + b = 87$ ____________

20. $33\frac{1}{3}\% + p = 100\%$ ____________

21. $6{,}284 \div 4 = a$ ____________

22. $8{,}463 \div 8 = v$ ____________

23. $963 \div 7 = k$ ____________

Name Date Time

LESSON 7•11

Broken Calculator Problems

Change the display in the calculator without using the broken key. *You may only add and subtract negative numbers to reach the ending number.* The first one is done for you.

Starting Number	Ending Number	Broken Key	Keystrokes
38	48	0	38 [−] [(−)] 5 [−] [(−)] 5 [Enter]
24	70	6	
200	89	1	
351	251	0	
1,447	1,750	3	

Make up five problems of your own. When you have finished, trade papers with your partner, and solve each other's problems. *You may only add and subtract negative numbers to reach the ending number.*

Starting Number	Ending Number	Broken Key	Keystrokes

STUDY LINK 7•12

Unit 8: Family Letter

Fractions and Ratios

In Unit 4, your child reviewed equivalent fractions. In this unit, we will apply this knowledge to compute with fractions and mixed numbers. Students will learn that the key to fraction computation with unlike denominators is to find common denominators.

Unit 8 also introduces fraction multiplication. Students will use folded paper to represent fractions of a whole. Then the class will study fraction multiplication using area models, which are diagrams that show a *whole* divided into parts. This concept building will lead to a rule for multiplying fractions:

$$\frac{a}{b} * \frac{c}{d} = \frac{a * c}{b * d}$$

Example: $\frac{2}{5} * \frac{3}{4} = \frac{2 * 3}{5 * 4} = \frac{6}{20}$, or $\frac{3}{10}$

For mixed-number multiplication, students will rename the mixed numbers as fractions, then use the rule to multiply. Finally they rename the product as a mixed number.

Example: $2\frac{1}{2} * 1\frac{2}{3} = \frac{5}{2} * \frac{5}{3} = \frac{5 * 5}{2 * 3} = \frac{25}{6} = 4\frac{1}{6}$

Your child might want to use partial products to solve this problem: $2\frac{1}{2} * 1\frac{2}{3}$ can be thought of as $(2 + \frac{1}{2}) * (1 + \frac{2}{3})$. There are 4 partial products, as indicated by arrows:

$$(2+\tfrac{1}{2}) * (1+\tfrac{2}{3}) \qquad \begin{array}{l} 2 * 1 = 2 \\ 2 * \frac{2}{3} = \frac{4}{3} \\ \frac{1}{2} * 1 = \frac{1}{2} \\ \frac{1}{2} * \frac{2}{3} = \frac{2}{6} \end{array}$$

Add the partial products: $2 + \frac{4}{3} + \frac{1}{2} + \frac{2}{6} = 2 + \frac{8}{6} + \frac{3}{6} + \frac{2}{6} = 2 + \frac{13}{6} = 4\frac{1}{6}$

Your child will play several games such as, *Build-It* and *Fraction Action, Fraction Friction,* to practice sorting fractions and adding fractions with unlike denominators.

Finally, as part of the American Tour, students will explore data related to population distribution and household sizes.

Please keep this Family Letter for reference as your child works through Unit 8.

Vocabulary

Important terms in Unit 8:

area model A model for multiplication problems in which the length and width of a rectangle represent the factors and the area represents the product.

discount The amount by which a price of an item is reduced in a sale, usually given as a fraction or percent of the original price, or as a "percent off." For example, a $4 item on sale for $3 is discounted to 75% or $\frac{3}{4}$ of its original price. A $10.00 item at 10% off costs $9.00, or $\frac{1}{10}$ less than the usual price.

majority A number or amount that is more than half of a total number or amount.

quick common denominator The product of the denominators of two or more fractions. For example, the quick common denominator of $\frac{3}{4}$ and $\frac{5}{6}$ is $4 * 6 = 24$. In general, the quick common denominator of $\frac{a}{b}$ and $\frac{c}{d}$ is $b * d$.

unit fraction A fraction whose numerator is 1. For example, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{8}$, and $\frac{1}{20}$ are unit fractions. Unit fractions are especially useful in converting between measurement systems. For example, because 1 foot = 12 inches you can multiply a number of inches by $\frac{1}{12}$ to convert to feet.

unit percent One percent (1%).

Building Skills through Games

In Unit 8, your child will practice skills with fractions and other numbers by playing the following games. For detailed instructions of most games, see the *Student Reference Book*.

Build-It See *Student Reference Book,* p. 300. This game for partners requires a deck of 16 *Build-It* fraction cards. This game provides practice in comparing and ordering fractions.

Factor Captor See *Student Reference Book,* p. 306. Partners play this game with a calculator and paper and pencil. This game provides practice finding factors of a number.

Mixed-Number Spin See *Student Reference Book,* p. 322. Partners use a spinner to randomly select fractions and mixed numbers, used to complete number sentences. This game provides practice in adding and subtracting fractions and mixed numbers.

Frac-Tac-Toe See *Student Reference Book,* p. 274–276. This game for partners requires a deck of number cards 0–10 and a gameboard similar to a bingo card. The game provides practice converting between fractions, decimals, and percents.

Fraction Action, Fraction Friction See *Student Reference Book,* p. 312. This game for partners requires a set of 16 *Fraction Action, Fraction Friction* cards. The game provides practice adding fractions with unlike denominators.

Name That Number See *Student Reference Book,* p. 325. Partners play a card game. This game provides practice in using order of operations to write number sentences.

Do-Anytime Activities

To work with your child on the key concepts, try these rewarding activities.

1. Ask your child to measure the lengths of two objects using a ruler. Then ask him or her to calculate the sum and difference of their lengths.
2. Ask your child to explain how to use the fraction operation keys on his or her calculator. For example, ask your child to show you how to enter fractions and mixed numbers, simplify fractions, and convert between fractions and decimals.
3. Help your child identify advertisements in signs, newspapers, and magazines that use percents. Help your child find the sale price of an item that is discounted by a certain percent. For example, a $40 shirt reduced by 25% costs $30.

As You Help Your Child with Homework

As your child brings assignments home, you might want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through this unit's Study Links.

Study Link 8•1

1. $\frac{3}{6}$ **2.** $\frac{2}{3}$ **3.** $\frac{5}{6}$

4. $\frac{19}{20}$ **5.** $\frac{9}{17}$ **6.** $\frac{4}{7}$

7. Sample answer: The quick common denominator is 21 ∗ 17, or 357. $\frac{11}{21} = \frac{11 * 17}{21 * 17} = \frac{187}{357}$, and $\frac{9}{17} = \frac{9 * 21}{17 * 21} = \frac{189}{357}$.

So $\frac{9}{17}$ is greater.

8. 0.75 **9.** $0.\overline{6}$ **10.** 0.625

11. 0.7 **12.** 0.55 **13.** 0.84

14. Sample answer: $\frac{1}{8}$ is half of $\frac{1}{4}$ $\left(\frac{0.25}{2} = 0.125\right)$.

$\frac{5}{8} = \frac{4}{8} + \frac{1}{8} = 0.5 + 0.125$, or 0.625.

15. > **16.** = **17.** >

18. > **19.** > **20.** >

21. Sample answer: $\frac{6}{7} + \frac{1}{7} = 1$. $\frac{1}{8}$ is less than $\frac{1}{7}$, so $\frac{6}{7} + \frac{1}{8}$ is less than 1.

Study Link 8•2

2. 2 **3.** $10\frac{2}{3}$ **5.** $5\frac{1}{2}$

7. 6 **9.** 14 **11.** $5\frac{1}{4}$

13. $9\frac{3}{8}$ **15.** $8\frac{1}{4}$

Study Link 8•3

1. 11 **3.** 10 **6.** $6\frac{5}{3}$

7. $2\frac{1}{2}$ **9.** $2\frac{1}{5}$ **11.** $5\frac{4}{9}$

13. $2\frac{1}{4}$ **15.** $\frac{1}{2}$

Study Link 8•4

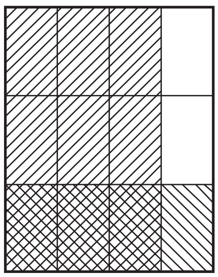
1. $\frac{4}{5}$; $\frac{155}{200}$ **2.** $< \frac{1}{2}$ **3.** $> \frac{1}{2}$

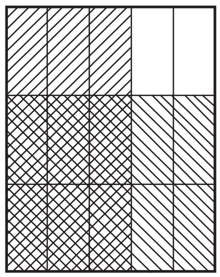
4. $= \frac{1}{2}$ **5.** $< \frac{1}{2}$

6. $\frac{\boxed{6}}{1} + \frac{5}{\boxed{6}} = \frac{41}{6} = 6\frac{5}{6}$

Study Link 8•5

1. $\frac{3}{12}$, or $\frac{1}{4}$ **2.** $\frac{6}{15}$, or $\frac{2}{5}$





5. Nina: $\frac{1}{2}$; Phillip: $\frac{1}{6}$; Ezra: $\frac{1}{6}$; Benjamin: $\frac{1}{6}$

Study Link 8•6

1. $\frac{1}{3} * \frac{2}{5} = \frac{2}{15}$

3. $\frac{7}{8} * \frac{1}{3} = \frac{7}{24}$

5. $\frac{10}{18}$, or $\frac{5}{9}$

7. $\frac{12}{25}$

9. $\frac{5}{63}$

11. 9; 3

Study Link 8•7

7.

Rule
$\triangle = \square * 4$

in ($\square$)	out ($\triangle$)
$\frac{2}{3}$	$\frac{8}{3}$, or $2\frac{2}{3}$
$\frac{4}{5}$	$\frac{16}{5}$, or $3\frac{1}{5}$
$\frac{8}{9}$	$\frac{32}{9}$, or $3\frac{5}{9}$
$\frac{5}{4}$	$\frac{20}{4}$, or 5
$\frac{7}{3}$	$\frac{28}{3}$, or $9\frac{1}{3}$

8.

Rule
$\triangle = \square * \frac{1}{4}$

in ($\square$)	out ($\triangle$)
2	$\frac{1}{2}$
3	$\frac{3}{4}$
$\frac{5}{6}$	$\frac{5}{24}$
$\frac{2}{3}$	$\frac{1}{6}$

9. Rules and tables vary.

Study Link 8•8

1. a. $\frac{46}{24}$, or $1\frac{11}{12}$ **b.** $\frac{10}{40}$, or $\frac{1}{4}$

c. $\frac{85}{24}$, or $3\frac{13}{24}$ **d.** $\frac{175}{24}$, or $7\frac{7}{24}$

e. $\frac{296}{60}$, or $4\frac{14}{15}$ **f.** $\frac{364}{40}$, or $9\frac{1}{10}$

2. a. $8\frac{5}{9}$ **b.** $5\frac{1}{2}$ **c.** $2\frac{1}{12}$

3. a. 5 **b.** $5\frac{5}{8}$

Study Link 8•9

1. $\frac{45}{100}$; 0.45; 45%

$\frac{3}{10}$; 0.3; 30%

$\frac{2}{10}$; 0.2; 20%

$\frac{15}{100}$; 0.15; 15%

2. Calculated discounts: \$100.00; \$1,600.00; \$7.84; \$0.75; \$8.70; \$5.28; \$810.00; \$385.00

Study Link 8•10

1. 4;20 **3.** 1,200 miles

5. 16 min. **6.** yes

Study Link 8•11

Sample answers for Problems 1–4:

1. $\frac{14}{16}, \frac{28}{32}, \frac{35}{40}$ **2.** $\frac{6}{8}, \frac{9}{12}, \frac{12}{16}$

3. $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}$ **4.** $\frac{4}{6}, \frac{6}{9}, \frac{8}{12}$

5. $\frac{3}{8}$ **6.** $\frac{5}{9}$

7. $\frac{7}{9}$ **8.** $\frac{7}{12}$

9. Sample answer: I changed $\frac{4}{10}$ and $\frac{7}{12}$ to fractions with a common denominator. $\frac{4}{10} = \frac{24}{60}$ and $\frac{7}{12} = \frac{35}{60}$. Because $\frac{1}{2} = \frac{30}{60}$, $\frac{7}{12}$ is $\frac{5}{60}$ away from $\frac{1}{2}$, and $\frac{4}{10}$ is $\frac{6}{60}$ away from $\frac{1}{2}$. So, $\frac{7}{12}$ is closer to $\frac{1}{2}$.

11. $\frac{11}{18}$ **13.** $\frac{17}{24}$

14. $\frac{3}{10}$ **15.** $3\frac{1}{3}$

Study Link 8•12

1. 5 **2.** 22

3. $3\frac{4}{5}$ **5.** $1\frac{5}{9}$

7. $8\frac{5}{12}$ **9.** $11\frac{1}{4}$

11. $4\frac{1}{2}$ **13.** $\frac{15}{2}$, or $7\frac{1}{2}$