**STUDY LINK
6·11**

Unit 7: Family Letter

Exponents and Negative Numbers

In Unit 7, your child will learn to write exponential and scientific notation for naming very large and very small numbers. These topics become increasingly important later on when your child begins algebra. If you have enjoyed playing math games in the past, you might want to play *Exponent Ball* during these lessons.

Your child will also review how parentheses make expressions unambiguous and will learn rules that determine the order for performing operations in a mathematical expression.

Finally, your child will learn to work with positive and negative numbers, using a variety of tools. For example, your child will use number lines and red and black "counters" to model addition and subtraction problems.

The counter activities are especially helpful. Students use counters to represent an account balance. The red counters (−$1) represent a debit, and the black counters (+$1) represent a credit. If there are more red counters than black ones, the account is "in the red," that is, the balance is negative. On the other hand, if there are more black counters than red ones, the account is "in the black," that is, the balance is positive. By adding or subtracting red and black counters from an account, your child can model addition and subtraction of positive and negative numbers. To assist your child, you might want to explain how a checking or savings account works. Students will practice their new skills in the *Credits/Debits Game*.

Please keep this Family Letter for reference as your child works through Unit 7.

Vocabulary

Important terms in Unit 7:

account balance An amount of money that you have or that you owe.

exponential notation A way to show repeated multiplication by the same factor. For example, 2^3 is exponential notation for $2 * 2 * 2$.

expression A mathematical phrase made up of numbers, variables, operation symbols, and/or grouping symbols. An expression does not contain symbols such as $=$, $>$, and $<$.

**in the black** Having a positive balance; having more money than is owed.

in the red Having a negative balance; owing more money than is available.

negative number A number less than zero.

nested parentheses Parentheses within parentheses in an *expression.* Expressions are evaluated from within the innermost parentheses outward following the *order of operations.*

Example:

$((6 * 4) - 2) / 2$
$(24 - 2) / 2$
$22 / 2 = 11$
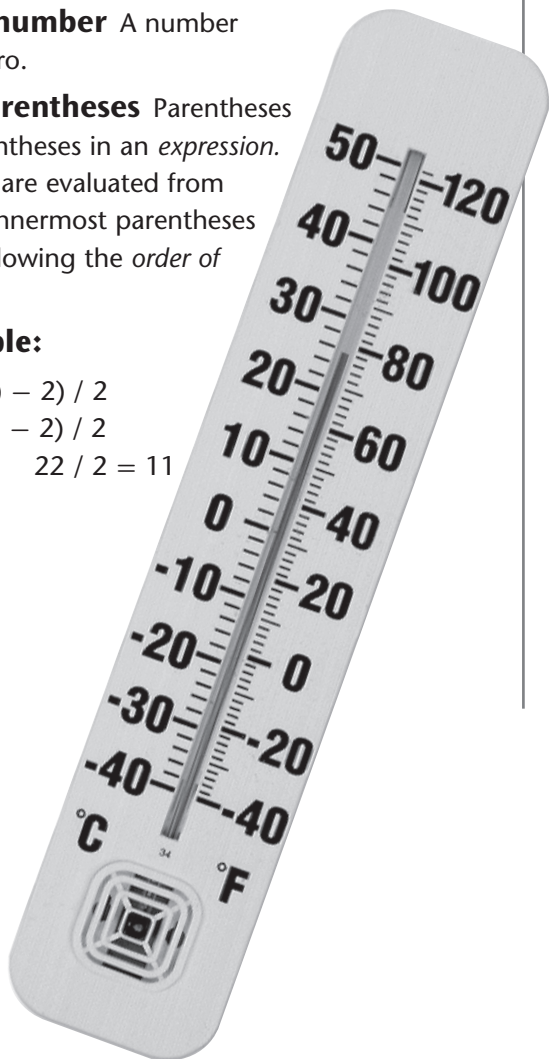
number-and-word notation A way of writing a large number using a combination of numbers and words. For example, 27 *billion* is number-and-word notation for 27,000,000,000.

opposite of a number A number that is the same distance from 0 on the number line as a given number but on the opposite side of 0. For example, the opposite of $+3$ is -3; the opposite of -5 is $+5$.

order of operations Rules that tell the order in which operations in an *expression* should be carried out. The order of operations is:

1. Do operations inside grouping symbols first. (Use rules 2–4 inside the grouping symbols.)

2. Calculate all the expressions with exponents.

3. Multiply and divide in order from left to right.

4. Add and subtract in order from left to right.

parentheses ( ) Grouping symbols used to indicate which operations in an expression should be done first.

scientific notation A system for writing numbers in which a number is written as the product of a power of 10 and a number that is at least 1 and less than 10. Scientific notation allows you to write big and small numbers with only a few symbols. For example, $4 * 10^{12}$ is scientific notation for 4,000,000,000,000.

standard notation Our most common way of representing whole numbers, integers, and decimals. Standard notation is base-ten, place-value numeration. For example, standard notation for three hundred fifty-six is 356.

Do-Anytime Activities

To work with your child on the concepts taught in this unit and in previous units, try these interesting and rewarding activities:

1. Have your child pick out a stock from the stock-market pages of a newspaper. Encourage your child to watch the stock over a period of time and to report the change in stock prices daily, using positive and negative numbers.

2. Using the same stock in Activity 1, have your child write the high and low of that stock for each day. After your child has watched the stock over a period of time, have him or her find. . .

    ◆ the *maximum* value observed.
    ◆ the *mode,* if there is one.
    ◆ the *minimum* value observed.
    ◆ the *median* value observed.
    ◆ the *range* in values.

3. Review tessellations with your child. Encourage your child to name the regular tessellations and to draw and name the 8 semiregular tessellations. Challenge your child to create Escher-type translation tessellations. You might want to go to the library first and show your child examples of Escher's work.

4. Practice finding perimeters of objects and circumferences of circular objects around your home.

Building Skills through Games

In Unit 7, your child will practice operations and computation skills by playing the following games. For detailed instructions, see the *Student Reference Book.*

Credits/Debits Game See *Student Reference Book,* page 301. Two players use a complete deck of number cards, cash and debt cards, and a record sheet to tally a balance. This game helps students add and subtract signed numbers.

Exponent Ball See *Student Reference Book,* page 305. This game involves two players and requires a gameboard, 1 six-sided die, a penny or counter, and a calculator. This game develops skills dealing with forming and comparing exponential values.

Name That Number See *Student Reference Book,* page 325. This is a game for two or three players using the Everything Math Deck or a complete deck of number cards. Playing *Name That Number* helps students review operations with whole numbers.

Scientific-Notation Toss See *Student Reference Book,* page 329. Two players will need 2 six-sided dice to play this game. This game develops skill in converting numbers from scientific notation to standard notation.

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 7·1

2. Should be $6^3 = 6 * 6 * 6$; 216

3. Should be $2^9 = 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2$; 512

4. Should be $4^7 = 4 * 4 * 4 * 4 * 4 * 4 * 4$; 16,384

5. 14.7   6. 0.48   7. $\frac{15}{7}$, or $2\frac{1}{7}$

Study Link 7·2

1. billion   2. 10^3 3. trillion

4. 10^6 5. thousand; 10^3 6. million; 10^6

7. $2^4 * 3$ 8. $2^2 * 3 * 5$

9. $3,000 + 200 + 60 + 4$

Study Link 7·3

1. 600; 3   2. 6   3. 500 million

4. 260 million 5. 10 million   6. 125

Study Link 7·4

1. $2 = (3 * 2) - (4 / 1)$ 2. $3 = (4 + 3 - 1) / 2$

3. $4 = (3 - 1) + (4 / 2)$ 5. $1 = ((4 + 1) - 3) / 2$

6. $6 = (1 + (4 * 2)) - 3$

7. $(4^2 - ((3 * 3)) + 1((2 + 1)^4 \div 9) -1$

8. $a = 1\frac{4}{12}$, or $1\frac{1}{3}$ 9. $p = 1\frac{1}{2}$

10. $d = 2\frac{2}{8}$, or $2\frac{1}{4}$ 11. $y = 0$

Study Link 7·5

1. 34   2. 25   3. 28   4. 30

5. 21   6. 28   7. false   8. true

9. true   10. true   11. false   12. true

13. false   14. true   15. $z = 9,204$

16. $r = 78,002$ 17. $s = 1.25$

Study Link 7·6

1. Sales were at their highest in 1930. Sales dropped by 60 million from 1940 to 1970.

3. Before TV sets were common, more people went to the movies.

Study Link 7·7

1. 2.6   2. 1.58   3. -5.5

4. -9.8 5. $-1.2, -1, 3.8, 5\frac{1}{4}, 5\frac{3}{8}$

7. F   8. F   9. T

10. T   11. $-1 < 1$; T   13. $f = 12.53$

15. $n = \frac{3}{4}$
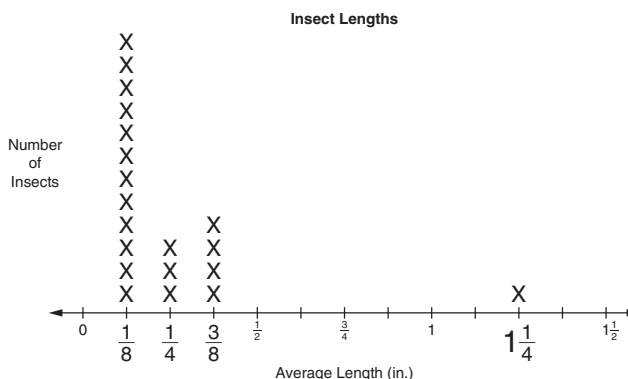
Study Link 7·8

1. $<$ 2. $>$ 3. $>$ 4. $>$

5. 2 debt   6. 5 cash   7. -9 9. -88

11. 3   15. $a = 30$ 17. $p = 5$

Study Link 7·9

1. -41 2. 43   3. 0   4. -8

5. 40   6. 20   7. -85 8. -0.5

9. 2   10. (-10) 12. $u = 65, 664$

13. $e = 3$ 14. $w = 30.841$ 15. $m = 5.46$

Study Link 7·10

1. $\frac{1}{8}$ 2. $1\frac{1}{4}$ 3. $1\frac{1}{8}$ 4. $\frac{1}{8}$ 5. $\frac{1}{4}$

Insect Lengths

Study Link 7·11

1. $-5 - (-58) = 53$ 3. 10^4

7. 20,000   13. $7 * 10^9$ 19. $b = 0.46$

21. $a = 1,571$ 23. $137\frac{4}{7}$, or 137 R4