



Big Numbers, Estimation, and Computation

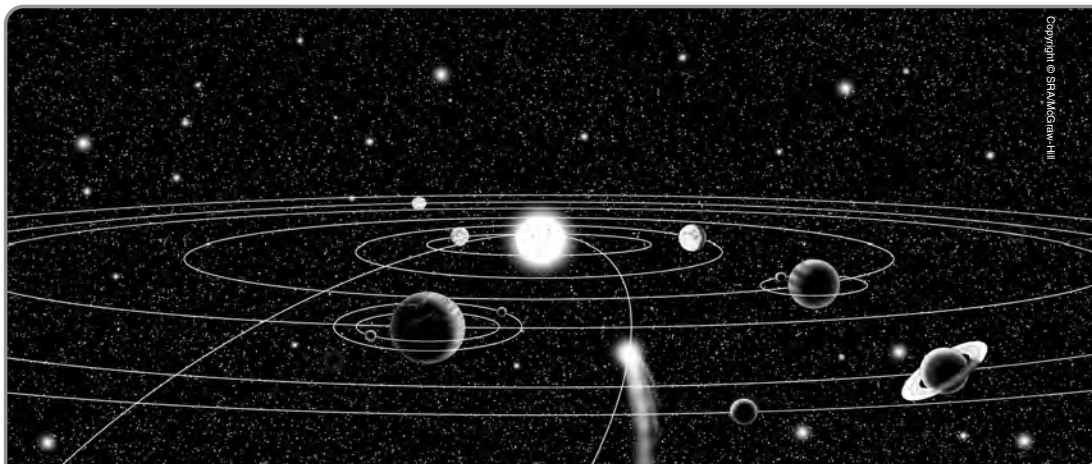
In this unit, your child will begin to multiply 1- and 2-digit numbers using what we call the **partial-products method**. In preparation for this, students will learn to play the game *Multiplication Wrestling*. Ask your child to explain the rules to you and play an occasional game together. While students are expected to learn the partial-products method, they will also investigate the **lattice multiplication method**, which students have often enjoyed in the past.

If your child is having trouble with multiplication facts, give short (five-minute) reviews at home, concentrating on the facts he or she finds difficult.

Another important focus in this unit is on reading and writing big numbers. Students will use big numbers to solve problems and make reasonable estimates. Help your child locate big numbers in newspapers and other sources, and ask your child to read them to you. Or, you can read the numbers and have your child write them.

Sometimes it is helpful to write big numbers in an abbreviated form so that they are easier to work with. One way is to use **exponents**, which tell how many times a number, called the base, is used as a factor. For example, 100,000 is equal to $10 * 10 * 10 * 10 * 10$. So 100,000 can be written as 10^5 . The small raised 5 is called an exponent, and 10^5 is read as "10 to the fifth power." This will be most students' first experience with exponents, which will be studied in depth during fifth and sixth grades.

The class is well into the World Tour. Students are beginning to see how numerical information about a country helps them get a better understanding of the country—its size, climate, location, and population distribution—and how these characteristics affect the way people live. The next stop on the World Tour will be Budapest, Hungary, the starting point for an exploration of European countries. Encourage your child to bring to school materials about Europe, such as articles in the travel section of your newspaper, magazine articles, and travel brochures.



Vocabulary

Important terms in Unit 5:

billion 1,000,000,000, or 10^9 ; 1,000 million.

estimate A close, rather than exact, answer; an approximate answer to a computation; a number close to another number.

exponent See *exponential notation*.

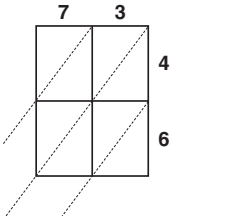
exponential notation A way to show repeated multiplication by the same factor. For example, 2^3 is exponential notation for $2 * 2 * 2$. The small, raised 3 is the exponent. It tells how many times the number 2, called the base, is used as a factor.

$$\begin{array}{l} 2^3 \leftarrow \text{exponent} \\ \uparrow \\ \text{base} \end{array}$$

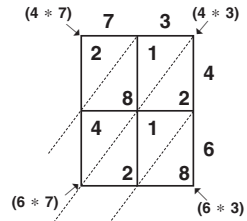
extended multiplication fact A multiplication fact involving multiples of 10, 100, and so on. In an extended multiplication fact, each factor has only one digit that is not 0. For example, $400 * 6 = 2,400$ and $20 * 30 = 600$ are extended multiplication facts.

lattice multiplication A very old way to multiply multidigit numbers. The steps below show how to find the product $46 * 73$ using lattice multiplication.

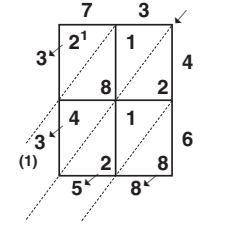
Step 1: Write the factors on the outside of the lattice.



Step 2: Multiply each digit in one factor by each digit in the other factor.



Step 3: Add the numbers inside the lattice along each diagonal.



$46 * 73 = 3,358$

magnitude estimate A rough estimate of whether a number is in the 1s, 10s, 100s, 1,000s, and so on.

million 1,000,000, or 10^6 ; 1,000 thousand.

partial-products multiplication A way to multiply in which the value of each digit in one factor is multiplied by the value of each digit in the other factor. The final product is the sum of the partial products. The example shows how to use the method to find $73 * 46$.

Partial-Products Multiplication

Multiply each part of one factor by each part of the other factor. Then add the partial products.

$$\begin{array}{r} 73 \\ * 46 \\ \hline 40 * 70 \rightarrow 2,800 \\ 40 * 3 \rightarrow 120 \\ 6 * 70 \rightarrow 420 \\ 6 * 3 \rightarrow + 18 \\ \hline 3,358 \end{array}$$

power of 10 A whole number that can be written as a product using only 10s as factors. For example, 100 is equal to $10 * 10$, or 10^2 . 100 is 10 to the second power or the second power of 10 or 10 squared.

round a number To approximate a number to make it easier to work with or to make it better reflect the precision of data. Often, numbers are rounded to a nearest *power of 10*. For example, 12,964 rounded to the nearest thousand is 13,000.

Do-Anytime Activities

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

1. To help your child practice handling big numbers, have him or her look up the distances from Earth to some of the planets in the solar system, such as the distance from Earth to Mars, to Jupiter, to Saturn, and so on.
2. Have your child look up the box-office gross of one or more favorite movies.
3. Help your child look up the populations and land areas of the state and city in which you live and compare them with the populations and areas of other states and cities.
4. Have your child locate big numbers in newspapers and other sources and ask him or her to read them to you. Or, you can read the numbers and have your child write them.

Building Skills through Games

In Unit 5, your child will practice multiplication skills and build his or her understanding of multidigit numbers by playing the following games. For detailed instructions, see the *Student Reference Book*.

Beat the Calculator See *Student Reference Book* page 233.

This game develops automaticity with extended multiplication facts.

High-Number Toss See *Student Reference Book* page 252.

This game reinforces understanding of place value.

Multiplication Wrestling See *Student Reference Book* page 253.

This game reinforces understanding of the partial-products method for multiplication.

Number Top-It See *Student Reference Book* page 255.

This game strengthens understanding of place value.

Product Pile Up See *Student Reference Book* page 259.

This game develops automaticity with multiplication facts.

As You Help Your Child with Homework

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

Study Link 5•1

9. 1.48 10. 1.13 11. 8.17

Study Link 5•2

1. 42; 420; 420; 4,200; 4,200; 42,000
 2. 27; 270; 270; 2,700; 2,700; 27,000
 3. 32; 320; 320; 3,200; 3,200; 32,000
 4. 3; 5; 50; 3; 3; 500
 5. 6; 6; 60; 9; 900; 9,000
 6. 5; 500; 50; 8; 80; 800
 7. 15 8. 9.5 9. 4.26

Study Link 5•3

Sample answers:

1. $850 + 750 = 1,600$; 1,601
 2. $400 + 1,000 + 500 = 1,900$; 1,824
 3. $400 + 750 = 1,150$
 4. $600 + 650 + 350 = 1,600$; 1,595
 5. $300 + 300 + 500 = 1,100$
 6. $800 + 700 = 1,500$; 1,547
 7. $700 + 200 + 400 = 1,300$
 8. $100 + 700 + 800 = 1,600$; 1,627
 9. $750 + 400 + 200 = 1,350$
 10. $600 + 800 = 1,400$
 11. 4,800 12. 2,100 13. 45,000

Study Link 5•4

Sample answers:

1. $20 * 400 = 8,000$; 1,000s
 2. $10 * 20 = 200$; 100s
 3. $5 * 400 = 2,000$; 1,000s
 4. $2 * 20 * 10,000 = 400,000$; 100,000s
 5. Either 3 or 4 digits; $10 * 10 = 100$ and $90 * 90 = 8,100$

Study Link 5•5

1. 392 2. 2,200 3. 11,916
 4. a. $7 * 200 = 1,400$; 1,000s b. 1,267 hours
 5. less 6. 7,884 7. 11,436
 8. 1,258 9. 4,689

Study Link 5•6

1. 4,074 2. 1,680 3. 2,100 4. 486
 5. 3,266 6. 17,000 7. 7,471 8. 37,632
 9. 5,722 10. 10,751 11. 916 12. 2,769

Study Link 5•7

7. 6,552

	7	8	
	5 ¹	6 ¹	
6	6	4	8
	2	3	
5	8	2	4
	5	2	

	84
	* 78
	5,600
	280
	640
	+ 32
	6,552

9. 39.57 10. 74.22 11. 33.77 12. 71.15

Study Link 5•8

- 92,106,954,873
 12. 92 billion, 106 million, 954 thousand, 873
 13. 370 14. 3,168 15. 1,656 16. 2,632

Study Link 5•9

7. 441 8. 2,970 9. 5,141

Study Link 5•10

2. Phoenix Mercury and San Antonio Stars;
 Sacramento Monarchs and Seattle Storm
 4. 4,152 5. 798 6. 3,212

Study Link 5•11

1. China 2. France 4. Italy and the United States