

STUDY LINK
4•11

Unit 5: Family Letter



Big Numbers, Estimation, and Computation

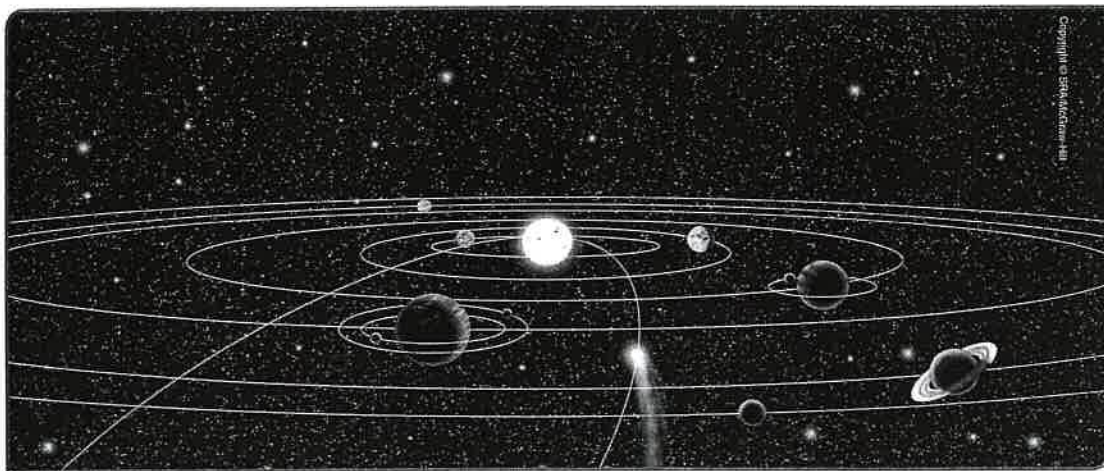
In this unit, your child will begin to multiply 1- and 2-digit numbers using what we call the **partial-products method**. In preparation for this, students will learn to play the game *Multiplication Wrestling*. Ask your child to explain the rules to you and play an occasional game together. While students 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*.

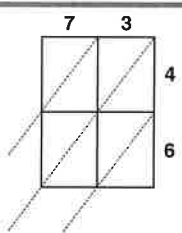
exponential notation A way to show repeated multiplication by the same factor. For example, 2^3 is exponential notation for $2 * 2 * 2$. The small, raised 3 is the exponent. It tells how many times the number 2, called the base, is used as a factor.

| | |
|-------|------------|
| 2^3 | ← exponent |
| ↑ | base |

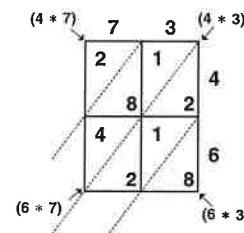
extended multiplication fact A multiplication fact involving multiples of 10, 100, and so on. In an extended multiplication fact, each factor has only one digit that is not 0. For example, $400 * 6 = 2,400$ and $20 * 30 = 600$ are extended multiplication facts.

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

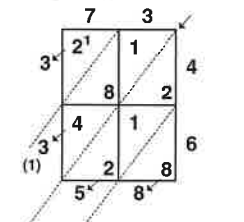
Step 1: Write the factors on the outside of the lattice.



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.

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 | |
| 6 | 5 ¹ | 6 ¹ | 8 |
| | 6 | 4 | |
| 5 | 2 | 3 | 4 |
| | 8 | 2 | |
| | 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

STUDY LINK
5•1**Multiplication/Division Puzzles**

Solve the multiplication/division puzzles mentally. Fill in the blank boxes.

**Examples:**

| | | |
|------|-----|-------|
| *, / | 300 | 2,000 |
| 2 | 600 | 4,000 |
| 3 | 900 | 6,000 |

| | | |
|------|-----|-----|
| *, / | 80 | 50 |
| 4 | 320 | 200 |
| 8 | 640 | 400 |

1.

| | | |
|------|----|-----|
| *, / | 70 | 400 |
| 8 | | |
| 9 | | |

2.

| | | |
|------|---|---|
| *, / | 5 | 7 |
| 80 | | |
| 600 | | |

3.

| | | |
|-------|---|---|
| *, / | 9 | 4 |
| 50 | | |
| 7,000 | | |

4.

| | | |
|------|-------|-------|
| *, / | | 600 |
| 7 | 3,500 | |
| | | 2,400 |

5.

| | | |
|------|-------|--------|
| *, / | | 80 |
| 30 | 2,700 | |
| | | 56,000 |

6.

| | | |
|------|--------|--------|
| *, / | 4,000 | |
| | 36,000 | |
| 20 | | 10,000 |

Make up and solve some puzzles of your own.

7.

| | | |
|------|--|--|
| *, / | | |
| | | |
| | | |

8.

| | | |
|------|--|--|
| *, / | | |
| | | |
| | | |

Practice

9. _____ = 0.56 + 0.92

10. _____ = 2.86 - 1.73

11. 19.11 - 10.94 = _____

12. _____ = 0.52 + 0.25

STUDY LINK
5•2

Extended Multiplication Facts



Solve mentally.

- 1.** $6 * 7 =$ _____
 $6 * 70 =$ _____
 $60 * 7 =$ _____
 $60 * 70 =$ _____
 $600 * 7 =$ _____
 $60 * 700 =$ _____

- 2.** $9 * 3 =$ _____
 $9 * 30 =$ _____
 $90 * 3 =$ _____
 $90 * 30 =$ _____
 $900 * 3 =$ _____
 $90 * 300 =$ _____

- 3.** $4 * 8 =$ _____
 $4 * 80 =$ _____
 $40 * 8 =$ _____
 $40 * 80 =$ _____
 $400 * 8 =$ _____
 $40 * 800 =$ _____

- 4.** $5 * \underline{\hspace{2cm}} = 15$
 $30 * \underline{\hspace{2cm}} = 150$
 $30 * \underline{\hspace{2cm}} = 1,500$
 $\underline{\hspace{2cm}} * 50 = 150$
 $\underline{\hspace{2cm}} * 500 = 1,500$
 $30 * \underline{\hspace{2cm}} = 15,000$

- 5.** $\underline{\hspace{2cm}} * 9 = 54$
 $\underline{\hspace{2cm}} * 90 = 540$
 $\underline{\hspace{2cm}} * 90 = 5,400$
 $60 * \underline{\hspace{2cm}} = 540$
 $6 * \underline{\hspace{2cm}} = 5,400$
 $6 * \underline{\hspace{2cm}} = 54,000$

- 6.** $8 * \underline{\hspace{2cm}} = 40$
 $8 * \underline{\hspace{2cm}} = 4,000$
 $80 * \underline{\hspace{2cm}} = 4,000$
 $\underline{\hspace{2cm}} * 50 = 400$
 $\underline{\hspace{2cm}} * 5 = 400$
 $\underline{\hspace{2cm}} * 500 = 400,000$

Practice

- 7.** _____ = $6.3 + 8.7$ **8.** $7.36 + 2.14 =$ _____
9. _____ = $9.74 - 5.48$ **10.** _____ = $4.6 - 2.8$

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Estimating Sums



For all problems, write a number model to estimate the sum.

- ◆ If the estimate is greater than or equal to 1,500, find the exact sum.
- ◆ If the estimate is less than 1,500, **do not** solve the problem.

1. $867 + 734 =$ _____

Number model:

2. $374 + 962 + 488 =$ _____

Number model:

3. $382 + 744 =$ _____

Number model:

4. $581 + 648 + 366 =$ _____

Number model:

5. $318 + 295 + 493 =$ _____

Number model:

6. $845 + 702 =$ _____

Number model:

7. $694 + 210 + 386 =$ _____

Number model:

8. $132 + 692 + 803 =$ _____

Number model:

9. $756 + 381 + 201 =$ _____

Number model:

10. $575 + 832 =$ _____

Number model:

Practice

11. $60 * 80 =$ _____

12. $30 * 70 =$ _____

13. $50 * 900 =$ _____

14. $40 * 800 =$ _____

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Estimating Products



Estimate whether the answer will be in the tens, hundreds, thousands, or more. Write a number model to show how you estimated. Then circle the box that shows your estimate.

1. A koala sleeps an average of 22 hours each day. About how many hours does a koala sleep in a year?

Number model: _____

| | | | | | |
|-----|------|--------|---------|----------|------------|
| 10s | 100s | 1,000s | 10,000s | 100,000s | 1,000,000s |
|-----|------|--------|---------|----------|------------|

2. A prairie vole (a mouselike rodent) has an average of 9 babies per litter. If it has 17 litters in a season, about how many babies are produced?

Number model: _____

| | | | | | |
|-----|------|--------|---------|----------|------------|
| 10s | 100s | 1,000s | 10,000s | 100,000s | 1,000,000s |
|-----|------|--------|---------|----------|------------|

3. Golfers lose, on average, about 5 golf balls per round of play. About how many golf balls will an average golfer lose playing one round every day for one year?

Number model: _____

| | | | | | |
|-----|------|--------|---------|----------|------------|
| 10s | 100s | 1,000s | 10,000s | 100,000s | 1,000,000s |
|-----|------|--------|---------|----------|------------|

4. In the next hour, the people in France will save 12,000 trees by recycling paper. About how many trees will they save in two days?

Number model: _____

| | | | | | |
|-----|------|--------|---------|----------|------------|
| 10s | 100s | 1,000s | 10,000s | 100,000s | 1,000,000s |
|-----|------|--------|---------|----------|------------|

Try This

5. How many digits can the product of two 2-digit numbers have? Give examples to support your answer.

Practice

6. $60 * 7 =$ _____ 7. $4 * 80 =$ _____ 8. _____ $= 200 * 9$

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5•5

Multiplication



Multiply using the partial-product method. Show your work in the grid below.



1. $56 * 7 =$ _____ 2. $8 * 275 =$ _____ 3. _____ = $1,324 * 9$

4. Maya goes to school for 7 hours each day. If she does not miss any of the 181 school days, how many hours will Maya spend in school this year?

- a. Estimate whether the answer will be in the tens, hundreds, thousands, or more. Write a number model to show how you estimated. Circle the box that shows your estimate.

Number model: _____

| | | | | | |
|-----|------|--------|---------|----------|------------|
| 10s | 100s | 1,000s | 10,000s | 100,000s | 1,000,000s |
|-----|------|--------|---------|----------|------------|

b. Exact answer: _____ hours

5. The average eye blinks once every 5 seconds. Is that more than or less than a hundred thousand times per day? Explain your answer.

| | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
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Practice

6. _____ = $495 + 7,389$ 7. $5,638 + 5,798 =$ _____

8. $3,007 - 1,749 =$ _____ 9. _____ = $8,561 - 3,872$

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5•6

More Multiplication



Multiply using the partial-products algorithm. Show your work.

1. $582 * 7 =$ _____
2. $56 * 30 =$ _____
3. $42 * 50 =$ _____
4. _____ = $27 * 18$
5. _____ = $46 * 71$
6. $340 * 50 =$ _____

Try This

7. _____ = $241 * 31$
8. _____ = $768 * 49$

| | | | | | | | | | | | | | | | |
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Practice

9. _____ = $283 + 5,439$
10. $6,473 + 4,278 =$ _____
11. $5,583 - 4,667 =$ _____
12. _____ = $9,141 - 6,372$

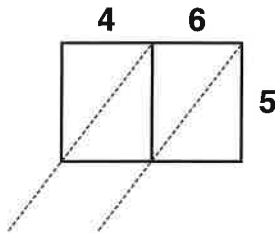
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Lattice Multiplication

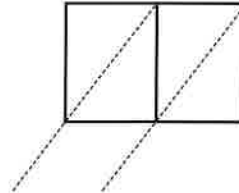


Use the lattice method to find the following products.

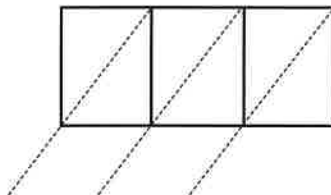
1. $5 * 46 =$ _____



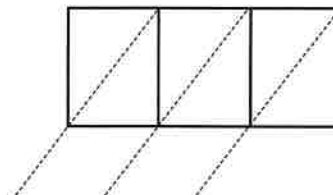
2. $8 * 67 =$ _____



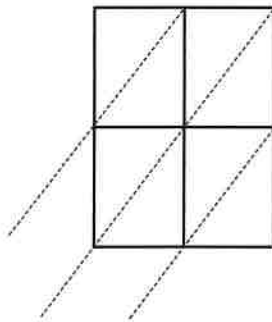
3. $7 * 836 =$ _____



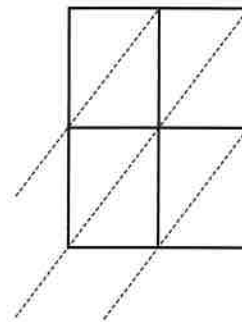
4. $4 * 329 =$ _____



5. $25 * 31 =$ _____



6. $49 * 52 =$ _____



7. Use the lattice method and the partial-products method to find the product.

$84 * 78 =$ _____

Practice

8. _____ = $33.67 + 5.9$

9. $68.4 + 5.82 =$ _____

10. $71.44 - 37.67 =$ _____

11. _____ = $101.06 - 29.91$

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Place-Value Puzzle



Use the clues below to fill in the place-value chart.

| Billions | | | | Millions | | | | Thousands | | | | Ones | | |
|----------|-----|----|---|----------|-----|----|---|-----------|------|-----|---|------|----|---|
| 100B | 10B | 1B | , | 100M | 10M | 1M | , | 100Th | 10Th | 1Th | , | 100 | 10 | 1 |
| | | | | | | | | | | | | | | |

- Find $\frac{1}{2}$ of 24. Subtract 4. Write the result in the hundreds place.
- Find $\frac{1}{2}$ of 30. Divide the result by 3. Write the answer in the ten-thousands place.
- Find $30 \div 10$. Double the result. Write it in the one-millions place.
- Divide 12 by 4. Write the answer in the ones place.
- Find $9 * 8$. Reverse the digits in the result. Divide by 3. Write the answer in the hundred-thousands place.
- Double 8. Divide the result by 4. Write the answer in the one-thousands place.
- In the one-billions place, write the even number greater than 0 that has not been used yet.
- Write the answer to $5 \div 5$ in the hundred-millions place.
- In the tens place, write the odd number that has not been used yet.
- Find the sum of all the digits in the chart so far. Divide the result by 5, and write it in the ten-billions place.
- Write 0 in the empty column whose place value is less than billions.
- Write the number in words. For example, 17,450,206 could be written as "17 million, 450 thousand, 206."

Practice

13. $74 * 5 =$ _____

14. _____ = $396 * 8$

15. _____ = $92 * 18$

16. $56 * 47 =$ _____

STUDY LINK
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Many Names for Powers of 10



Below are different names for powers of 10. Write the names in the appropriate name-collection boxes. Circle the names that do not fit in any of the boxes.



| | | |
|--------------|--------------------------|---------------|
| 1,000,000 | 10,000 | 1,000 |
| 100 | 10 | 10 [100,000s] |
| 10 [10,000s] | 10^6 | 10 [1,000s] |
| 10^3 | $10 * 10 * 10 * 10$ | one thousand |
| 10^5 | $10 * 10 * 10 * 10 * 10$ | 10 [10s] |
| $10 * 10$ | ten | 10^1 |
| 10 [tenths] | 10^0 | 1 |

1. **100,000**

| |
|--|
| |
| |
| |

2. **10^2**

| |
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| |
| |
| |

3. **1 million**

| |
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4. **one**

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5. **$10 * 10 * 10$**

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6. **10^4**

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Practice

7. $63 * 7 =$ _____ 8. _____ = $495 * 6$ 9. _____ = $97 * 53$

STUDY LINK
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Rounding



1. Round the seating capacities in the table below to the nearest thousand.

| Women's National Basketball Association Seating Capacity of Home Courts | | |
|--|-------------------------|-------------------------------------|
| Team | Seating Capacity | Rounded to the Nearest 1,000 |
| Charlotte Sting | 24,042 | |
| Cleveland Rockers | 20,562 | |
| Detroit Shock | 22,076 | |
| New York Liberty | 19,763 | |
| Phoenix Mercury | 19,023 | |
| Sacramento Monarchs | 17,317 | |
| San Antonio Stars | 18,500 | |
| Seattle Storm | 17,072 | |

2. Look at your rounded numbers. Which stadiums have about the same capacity?
- _____

3. Round the population figures in the table below to the nearest million.

| U.S. Population by Official Census from 1940 to 2000 | | |
|---|-------------------|---------------------------------------|
| Year | Population | Rounded to the Nearest Million |
| 1940 | 132,164,569 | |
| 1960 | 179,323,175 | |
| 1980 | 226,542,203 | |
| 2000 | 281,421,906 | |

Source for both tables: *The World Almanac and Book of Facts 2004*

Practice

4. _____ = 692×6 5. _____ = 38×21 6. $44 \times 73 =$ _____

STUDY LINK
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Comparing Data



This table shows the number of pounds of fruit produced by the top 10 fruit-producing countries in 2001. Read each of these numbers to a friend or a family member.

| Country | Pounds of Fruit |
|---------------|-----------------|
| Brazil | 77,268,294,000 |
| China | 167,046,420,000 |
| France | 26,823,740,000 |
| India | 118,036,194,000 |
| Iran | 28,599,912,000 |
| Italy | 44,410,538,000 |
| Mexico | 34,549,912,000 |
| Philippines | 27,028,556,000 |
| Spain | 36,260,392,000 |
| United States | 73,148,598,000 |

1. Which country produced the most fruit?

2. Which country produced the least fruit?

3. For each pair, circle the country that produced more fruit.

- a. India Mexico b. United States Iran
- c. Brazil Philippines d. Spain Italy

4. Which two countries together produced about as much fruit as India?

Practice

Estimate the sum. Write a number model.

5. $687 + 935$ _____

6. $2,409 + 1,196 + 1,327$ _____

7. $11,899 + 35,201$ _____