

Name \_\_\_\_\_

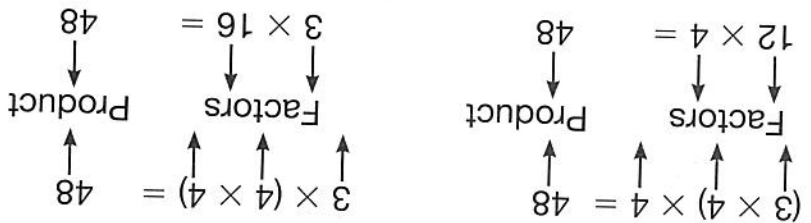
# Multiplication Properties

3-1  
Reteaching

You can use multiplication properties to help you multiply more easily.

## Associative Property of Multiplication

You can change the grouping of the factors. The product stays the same.



## Commutative Property of Multiplication

You can change the order of the factors. The product stays the same.



## Zero Property of Multiplication

When one of the factors is 0, the product is always 0.



## Identity Property of Multiplication

When one of the factors is 1, the product is always the other factor.

Identify the multiplication property or properties used in each equation.

- $100 \times 0 = 0$  \_\_\_\_\_
- $7 \times 2 = 2 \times 7$  \_\_\_\_\_
- $1 \times 55 = 55$  \_\_\_\_\_
- $(6 \times 7) \times 9 = 6 \times (7 \times 9)$  \_\_\_\_\_

Use the multiplication properties to determine what number must be in the box.

- $5 \times 4 = \square \times 5$
- $5 \times 4 = \square \times 5$
- $(3 \times 12) \times \square = 3 \times (12 \times 8)$
- $\square \times 2 = 2 \times 50$
- $99 \times \square = 99$
- $\square \times 1 = 0$
- $(16 \times \square) \times 25 = 16 \times (33 \times 25)$

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# Multiplication Properties

In 1 through 5, write the multiplication property used in each equation.

1.  $53 \times 6 = 6 \times 53$

\_\_\_\_\_

2.  $0 \times 374,387 = 0$

\_\_\_\_\_

3.  $5 \times (11 \times 4) = (5 \times 11) \times 4$

\_\_\_\_\_

4.  $42 \times 1 = 42$

\_\_\_\_\_

5.  $14 \times 5 = 5 \times 14$

\_\_\_\_\_

6. Chan bought 2 large frozen yogurts at \$1.50 each and 1 small bottle of water for \$1.00. How much did she pay in total?

7. Dan has 4 shelves. He has exactly 10 books on each shelf. Judy has 10 shelves. She has exactly 4 books on each shelf. Who has more books? Explain.

\_\_\_\_\_

\_\_\_\_\_

8. If  $3 \times 8 \times 12 = 8 \times 3 \times n$ , what is the value of  $n$ ?  
A 3      B 8      C 12      D 18

9. Write a definition for the Associative Property of Multiplication in your own words and explain how you would use it to compute  $4 \times 25 \times 27$  mentally.

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# Using Mental Math to Multiply

Name \_\_\_\_\_

You can also use patterns to multiply mentally.

Fact:  $6 \times 8 = 48$

$60 \times 8 = 480$

$600 \times 8 = 4,800$

$6,000 \times 8 = 48,000$

$60,000 \times 8 = 480,000$

Pattern: Notice that the product is always the digits 48 followed by the total number of zeros that are in the factors.

$6 \times 80 = 480$

$60 \times 80 = 4,800$

$600 \times 80 = 48,000$

$6,000 \times 80 = 480,000$

Find  $30 \times 3 \times 50$ .

Use the Commutative and Associative Properties of Multiplication to regroup.

$(30 \times 50) \times 3$

$1,500 \times 3 = 4,500$

<b>Commutative Property of Multiplication</b>	You can multiply factors in any order. $15 \times 9 = 9 \times 15$
<b>Associative Property of Multiplication</b>	You can change the grouping of factors. $(8 \times 20) \times 5 = 8 \times (20 \times 5)$

Find each product. Use patterns and properties to compute mentally.

1.  $80 \times 90 =$  \_\_\_\_\_

2.  $40 \times 800 =$  \_\_\_\_\_

3.  $5 \times 10 \times 20 =$  \_\_\_\_\_

4.  $4 \times 30 \times 25 =$  \_\_\_\_\_

5. You know that  $6 \times 7 = 42$ . How can you find  $60 \times 700$ ?

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Name \_\_\_\_\_

## Using Mental Math to Multiply

Use mental math to find each product.

1.  $150 \times 20 =$

2.  $0 \times 50 \times 800 =$

3.  $500 \times 40 =$

4.  $120 \times 50 =$

5.  $60 \times 70 \times 1 =$

6.  $9,000 \times 80 =$

7.  $100 \times 10 \times 1 =$

8.  $1,800 \times 20 \times 0 =$

9.  $30 \times 20 =$

10.  $1,400 \times 2,000 =$

11.  $7,000 \times 50 \times 1 =$

12.  $1,000 \times 200 \times 30 =$

13. A googol is a large number that is the digit one followed by one hundred zeros. If you multiply a googol by 100, how many zeros will that product have?

14. Gregorios drives 200 miles per day for 10 days. How many miles did he drive in all?

15. If  $a \times b \times c = 0$ , and  $a$  and  $b$  are integers greater than 10, what must  $c$  equal?

- A 0      B 1      C 2      D 10

16. SungHee empties her piggy bank and finds that she has 200 quarters, 150 dimes, and 300 pennies. How much money does she have? Explain.

Name \_\_\_\_\_

# Estimating Products

Reaching  
3-3

A bus service drives passengers between Milwaukee and Chicago every day. They travel from city to city a total of 8 times each day. The distance between the two cities is 89 mi. In the month of February, there are 28 days. The company's budget allows for 28,000 total miles for February. Is 28,000 mi a reasonable budget mileage amount?

## One Way to Estimate

$$\text{Estimate } 28 \times 8 \times 89.$$

Use rounding.

You can round 89 to 100 and 8 to 10. Then multiply.

$$28 \times 10 \times 100 = 280 \times 100 = 28,000$$

Because this is an overestimate, there are enough miles.

## Another Way to Estimate

$$\text{Estimate } 28 \times 8 \times 89.$$

Use compatible numbers.

Replace 28 with 30, 89 with 90, and 8 with 10. 30,

90, and 10 are compatible numbers because they

are close to the actual numbers in the problem

and they are easier to multiply. Now the problem

$$\text{becomes } 30 \times 90 \times 10.$$

$$30 \times 90 = 2,700$$

Multiply  $3 \times 9$ , then place two

zeros after the product.

$$2,700 \times 10 = 27,000$$

Multiply  $27 \times 1$  using

the Identity Property of  
Multiplication, then place  
three zeros after the product.

In the estimate, we used numbers greater than the  
original numbers, so the answer is an overestimate.

28,000 total miles is a reasonable budget amount.

Estimate each product. Use rounding or compatible numbers.

1.  $42 \times 5 \times 90 =$  \_\_\_\_\_

2.  $27 \times 98 \times 4 =$  \_\_\_\_\_

Mrs. Carter ordered new supplies for Memorial Hospital.

- 3. About how much will it cost to purchase 48 electronic thermometers?
- 4. About how much will it cost to purchase 96 pillows?

Supplies	
Electronic thermometers	\$19 each
Pulse monitors	\$189 each
Pillows	\$17 each
Telephones	\$19 each

Name \_\_\_\_\_

## Estimating Products

Estimate each product.

1.  $68 \times 21 =$       2.  $5 \times 101 =$       3.  $151 \times 21 =$

4.  $99 \times 99 =$       5.  $87 \times 403 =$       6.  $19 \times 718 =$

7.  $39 \times 51 =$       8.  $47 \times 29 \times 11 =$       9.  $70 \times 27 =$

10.  $69 \times 21 \times 23 =$       11.  $7 \times 616 =$       12.  $8,880 \times 30 =$

13. Give three numbers whose product is about 9,000.

### Electronics Prices

CD player	\$ 74.00
MP3 player	\$ 99.00
CD/MP3 player	\$199.00
AM/FM radio	\$ 29.00

14. About how much would it cost to buy 4 CD/MP3 players and 3 MP3 players?

15. Which is the closest estimate for the product of  $2 \times 19 \times 5$ ?

- A 1,150      B 200      C 125      D 50

16. Explain how you know whether an estimate of a product is an overestimate or an underestimate.

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# Exponents

Name \_\_\_\_\_

3-4  
Reteaching

You can use exponential notation to write a number that is being multiplied by itself.

There are two parts in exponential notation. The **base** tells you what factor is being multiplied. The **exponent** tells you how many of that factor should be multiplied together. The exponent is *not* a factor.

↑  
exponent

$8^2 = 8 \times 8$  The base is 8, so 8 is the factor to be multiplied.

↓  
The exponent is 2, so 2 factors of 8 should be

multiplied together.

base

You can write  $8^2$  in two other forms.

In **expanded** form, you write out your factors. Since  $8^2$  means you multiply two factors of 8,  $8^2$  in expanded form is  $8 \times 8$ .

In **standard** form, you write down the product of the factors. Since  $8 \times 8 = 64$ ,  $64$  is the standard form of  $8^2$ .

Write in exponential notation.

1.  $2 \times 2 \times 2$  \_\_\_\_\_

Write in expanded form.

3.  $1^4$  \_\_\_\_\_

Write in standard form.

5.  $2 \times 2 \times 2 \times 2$  \_\_\_\_\_

6.  $8^3$  \_\_\_\_\_

7. A used car lot has 9 lanes for cars and 9 rows for cars in each lane. What is the exponential notation for the number of spaces on the lot? Can the owner fit 79 cars on the lot?

Name \_\_\_\_\_

# Distributive Property

Use the Distributive Property to multiply mentally.

- 1.  $5 \times 607 =$  \_\_\_\_\_
- 2.  $16 \times 102 =$  \_\_\_\_\_
- 3.  $7 \times 420 =$  \_\_\_\_\_
- 4.  $265 \times 5 =$  \_\_\_\_\_
- 5.  $44 \times 60 =$  \_\_\_\_\_
- 6.  $220 \times 19 =$  \_\_\_\_\_
- 7.  $45 \times 280 =$  \_\_\_\_\_
- 8.  $341 \times 32 =$  \_\_\_\_\_

9. Fill in the blanks to show how the Distributive Property can be used to find  $10 \times 147$ .

$$10 \times (150 - 3) = (10 \times 150) - (\quad \times 3) =$$

$$1,500 - \quad = \quad$$

10. In 1990, there were 1,133 tornadoes in the U.S. If there were the same number of tornadoes for 10 years in a row, what would be the 10-year total?

11. There were 1,071 tornadoes in the U.S. in 2000. What is the number of tornadoes multiplied by 20?

12. If  $4 \times 312 = 4 \times 300 + n$ , which is the value of  $n$ ?  
A 4      B 12      C 48      D 300

13. Margaret said that she used the Distributive Property to solve  $4 \times 444$ . Is her answer shown below correct? Explain.

$$4 \times 444 = 4 \times (400 + 40 + 4) =$$

$$(4 \times 400) + (4 \times 40) + (4 \times 4) =$$

$$1,600 + 160 + 16 = 1,776$$



Name \_\_\_\_\_

# Multiplying by 1-Digit Numbers

Retaching  
3-6

Mr. McGuire drives his truck 275 miles each day. How far does he drive in 3 days?

Find  $275 \times 3$ .

**Step 1:** Multiply the ones. Regroup if necessary.

**What You Think**  
 $3 \times 5$  ones = 15 ones  
 Regroup 15 ones as 1 ten and 5 ones.

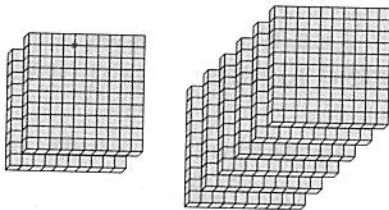
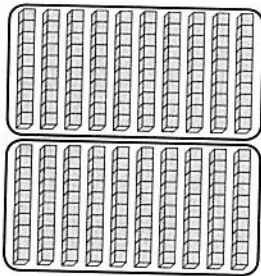
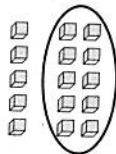
**Step 2:** Multiply the tens. Regroup if necessary.

**What You Think**  
 $3 \times 7$  tens = 21 tens  
 $21$  tens + 1 ten = 22 tens  
 Regroup as 2 hundreds and 2 tens.

**Step 3:** Multiply the hundreds. Regroup if necessary.

**What You Think**  
 $3 \times 2$  hundreds = 6 hundreds  
 6 hundreds + 2 hundreds = 8 hundreds  
 No need to regroup.

Mr. McGuire drives 825 miles in 3 days.



What You Write

$$\begin{array}{r} 1 \\ 275 \\ \times 3 \\ \hline 5 \end{array}$$

What You Write

$$\begin{array}{r} 21 \\ 275 \\ \times 3 \\ \hline 25 \end{array}$$

What You Write

$$\begin{array}{r} 21 \\ 275 \\ \times 3 \\ \hline 825 \end{array}$$

Find each product. Estimate to check that your answer is reasonable.

1.  $31 \times 7$  \_\_\_\_\_
  2.  $29 \times 4$  \_\_\_\_\_
  3.  $88 \times 6$  \_\_\_\_\_
  4.  $25 \times 9$  \_\_\_\_\_
  5.  $102 \times 8$  \_\_\_\_\_
  6.  $211 \times 7$  \_\_\_\_\_
  7.  $552 \times 3$  \_\_\_\_\_
  8.  $471 \times 9$  \_\_\_\_\_
  9.  $73 \times 4$  \_\_\_\_\_
  10.  $266 \times 8$  \_\_\_\_\_
  11.  $390 \times 2$  \_\_\_\_\_
  12.  $514 \times 6$  \_\_\_\_\_
- 13. Estimation** Estimate the product of 48 and 7. Do you have an underestimate or overestimate?

# Multiplying by 1-Digit Numbers

Name \_\_\_\_\_

Practice  
3-6

Find each product. Estimate to check that your answer is reasonable.

1.  $58 \times 3 =$  \_\_\_\_\_

3.  $83 \times 5 =$  \_\_\_\_\_

5.  $273 \times 4 =$  \_\_\_\_\_

7.  $789 \times 6 =$  \_\_\_\_\_

2.  $49 \times 8 =$  \_\_\_\_\_

4.  $95 \times 6 =$  \_\_\_\_\_

6.  $35 \times 8 =$  \_\_\_\_\_

8.  $643 \times 7 =$  \_\_\_\_\_

9. 
$$\begin{array}{r} 68 \\ \times 2 \\ \hline \end{array}$$

10. 
$$\begin{array}{r} 582 \\ \times 5 \\ \hline \end{array}$$

11. 
$$\begin{array}{r} 84 \\ \times 4 \\ \hline \end{array}$$

12. 
$$\begin{array}{r} 926 \\ \times 7 \\ \hline \end{array}$$

13. Xavier painted five portraits and wants to sell them for 36 dollars each. How much money will he make if he sells all five?

\_\_\_\_\_

14. A farmer wants to build a square pigpen. The length of one side of the pen is 13 ft. How many feet of fencing should the farmer buy?

\_\_\_\_\_

15. Jasmine wants to buy 4 green bags for 18 dollars each and 3 purple bags for 15 dollars each. She has 100 dollars. How much more money does she need?

\_\_\_\_\_

16. A regular octagon is a figure that has eight sides with equal lengths. If one side of a regular octagon is 14 inches long, what is the perimeter of the entire octagon?

- A 148 in.      B 140 in.      C 112 in.      D 84 in.

17. Why is 2,482 not a reasonable answer for  $542 \times 6$ ?

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# Multiplying 2-Digit by 2-Digit Numbers

Name \_\_\_\_\_

Find  $43 \times 26$ .

**Step 1:**  
Multiply by the ones.  
Regroup if necessary.

**What You Think**  
 $6 \times 3$  ones = 18 ones  
Regroup 18 ones as 1 ten  
and 8 ones.

$6 \times 4$  tens = 24 tens  
 $24$  tens + 1 ten = 25 tens  
Regroup 25 tens as 2 hundreds  
and 5 tens.

**What You Think**  
 $20 \times 3$  ones = 60 ones  
Regroup 60 ones as 6 tens.

$20 \times 4$  tens = 80 tens  
Regroup 80 tens as 8 hundreds.

**Step 2:**  
Multiply by the tens.  
Regroup if necessary.

**What You Think**  
 $6 \times 43 = 258$   
 $20 \times 43 = 860$

**Step 3:**  
Add the partial products.

**What You Write**

$$\begin{array}{r} 1 \\ 43 \\ \times 26 \\ \hline 258 \\ 860 \\ \hline 1,118 \end{array}$$

partial products  $\rightarrow$   $258$  and  $860$

Find the product.

- |    |  |    |  |    |  |    |  |
|----|--|----|--|----|--|----|--|
| 1. | $\begin{array}{r} 38 \\ \times 12 \\ \hline \end{array}$ | 2. | $\begin{array}{r} 64 \\ \times 33 \\ \hline \end{array}$ | 3. | $\begin{array}{r} 49 \\ \times 27 \\ \hline \end{array}$ | 4. | $\begin{array}{r} 85 \\ \times 15 \\ \hline \end{array}$ |
| 5. | $\begin{array}{r} 26 \\ \times 21 \\ \hline \end{array}$ | 6. | $\begin{array}{r} 73 \\ \times 19 \\ \hline \end{array}$ | 7. | $\begin{array}{r} 57 \\ \times 28 \\ \hline \end{array}$ | 8. | $\begin{array}{r} 91 \\ \times 86 \\ \hline \end{array}$ |

9. In the problem  $62 \times 45$ , what are the partial products?

Name \_\_\_\_\_

## Multiplying 2-Digit by 2-Digit Numbers

Find each product. Estimate to check that your answer is reasonable.

1. 
$$\begin{array}{r} 56 \\ \times 34 \\ \hline \end{array}$$

2. 
$$\begin{array}{r} 45 \\ \times 76 \\ \hline \end{array}$$

3. 
$$\begin{array}{r} 35 \\ \times 15 \\ \hline \end{array}$$

4. 
$$\begin{array}{r} 47 \\ \times 94 \\ \hline \end{array}$$

5. 
$$\begin{array}{r} 64 \\ \times 51 \\ \hline \end{array}$$

6. 
$$\begin{array}{r} 47 \\ \times 30 \\ \hline \end{array}$$

7. 
$$\begin{array}{r} 56 \\ \times 19 \\ \hline \end{array}$$

8. 
$$\begin{array}{r} 92 \\ \times 49 \\ \hline \end{array}$$

9. To pay for a sofa, Maddie made a payment of 64 dollars each month for one year. How much did the sofa cost ?

10. Katie is in charge of buying juice for the teachers' breakfast party. If one teacher will drink between 18 and 22 ounces of juice, and there are 32 teachers, which is the best estimate for the amount of juice Katie should buy?

- A about 200 ounces
- B about 400 ounces
- C about 600 ounces
- D about 800 ounces

11. Is 7,849 a reasonable answer for  $49 \times 49$ ? Why or why not?

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Name \_\_\_\_\_

# Multiplying Greater Numbers

3-8  
Retaching

Find  $128 \times 23$ .

Estimate:  $100 \times 20 = 2,000$

<p><b>Step 1</b> Multiply by the ones. Regroup as needed.</p> $\begin{array}{r} 128 \\ \times 23 \\ \hline 128 \\ 256 \\ \hline 2,944 \end{array}$	<p><b>Step 2</b> Multiply by the tens. Regroup as needed.</p> $\begin{array}{r} 128 \\ \times 20 \\ \hline 2,560 \end{array}$	<p><b>Step 3</b> Add the products.</p> $\begin{array}{r} 2,944 \\ + 2,560 \\ \hline 5,504 \end{array}$
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Because the answer is close to the estimate, the answer is reasonable.

Find the product. Estimate to check if your answer is reasonable.

<p><b>Problem</b></p> $\begin{array}{r} 282 \\ \times 19 \\ \hline 2,538 \\ + \\ \hline \end{array}$	<p><b>Multiply by the Ones</b></p> $\begin{array}{r} 282 \\ \times 9 \\ \hline 2,538 \end{array}$	<p><b>Multiply by the Tens</b></p> $\begin{array}{r} 282 \\ \times 10 \\ \hline \end{array}$	<p><b>Add the Products</b></p>
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3. Is 2,750 a reasonable answer for  $917 \times 33$ ? Explain.

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Name \_\_\_\_\_

## Problem Solving: Draw a Picture and Write an Equation

Draw a picture and write an equation. Then solve.

1. When Mary was born, she weighed 8 pounds. When she was 10 years old, she weighed 10 times as much. How much did she weigh when she was 10 years old?

2. Sandi is 13 years old. Karla is 3 times Sandi's age. How old is Karla?

3. Hwong can fit 12 packets of coffee in a small box and 50 packets of coffee in a large box. Hwong has 10 small boxes and would like to reorganize them into large boxes. Which boxes should he use? Explain.

4. Daniel has 12 tennis balls. Manuel has twice as many tennis balls as Daniel. Kendra has twice as many balls as Manuel. How many tennis balls do they have in all?

- A 24      B 36      C 84      D 96

5. William travels only on Saturdays and Sundays and has flown 400 miles this month. Jason travels every weekday and has flown 500 miles this month. Who travels more miles *per day* for this month? Explain.

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