

• Multiplying Three Factors and Missing Factors

Power Up

facts

Power Up C

count aloud

Count up and down by 5s between 1 and 51. Count up and down by 200s between 0 and 2000.

mental math

- Number Sense:** 3×30 plus 3×2
- Number Sense:** 4×20 plus 4×3
- Number Sense:** 5×30 plus 5×4
- Money:** $6 \times \$700$
- Measurement:** One meter is 1000 millimeters. How many millimeters is 1 meter minus 100 millimeters?
- Measurement:** Liliana hit the baseball 320 feet. Then the ball rolled 32 feet until it stopped. How far did the baseball travel?
- Money:** $\$3.75 - \1.25
- Number Sense:** $6 \times 4 + 1 + 10 - 5 + 3$

problem solving

All of the digits 1 through 9 are used in this addition problem. Copy the problem and fill in the missing digits.

$$\begin{array}{r} 3__ \\ + 452 \\ \hline ___ \end{array}$$

Focus Strategy: Guess and Check

Understand We are shown an addition problem and asked to find the missing digits. We are told that all of the digits 1 through 9 are used in the problem. There are 9 total digits in the problem, so each digit is used only once.

Plan We already know where the digits 2, 3, 4, and 5 appear. This means we must find places for the digits 1, 6, 7, 8, and 9. We can try using the strategy *guess and check*.

Solve We think, “Which two digits could go in the ones column?” Six plus 2 equals 8, so we guess 6 for the top addend and 8 for the sum. Now, we check our guess by trying to place the digits 1, 7, and 9 in the remaining blanks. In the hundreds column, we try placing the digit 7. This leaves us with the digits 1 and 9 for the tens column. However, we cannot place the 1 and 9 and get a valid addition problem ($316 + 452 \neq 798$ and $396 + 452 \neq 718$).

Our initial guess was incorrect, so we try another guess. We again try to find two digits for the ones column. We try placing 7 in the addend and 9 in the sum. Now we must place the digits 1, 6, and 8. The only possibility for the hundreds column is 8. This leaves us with the digits 1 and 6 for the tens column. We think, “6 plus 5 equals 11, which ends with a 1.” So we put 6 on top and 1 in the sum, and we know that by regrouping, the 8 in the hundreds column is correct. So we have $367 + 452 = 819$.

$$\begin{array}{r} 367 \\ + 452 \\ \hline 819 \end{array}$$

Check We find that our answer is reasonable by adding the numbers 367 and 452 to get a total of 819. We made educated guesses for two of the digits to get us started in finding the other missing digits. When we discovered that our initial guess was incorrect, we revised our guess and tried again until we found the correct answer.

New Concept

In this lesson we will learn how to multiply three numbers together. Remember that numbers multiplied together are called *factors*. In the problem below we see three factors.

$$9 \times 8 \times 7$$

To multiply three factors, we first multiply two of the factors together. Then we multiply the product we get by the third factor.

First we multiply 9 by 8 to get 72.

$$9 \times 8 \times 7 =$$

Then we multiply 72 by 7 to get 504.

$$72 \times 7 = 504$$

Since multiplication is commutative, we may multiply numbers in any order. Sometimes changing the order of the factors can make a multiplication problem easier, as we see in example 1.

Example 1

Find the product: $6 \times 3 \times 5$

To find the product of three factors, we first multiply two of the factors. Then we multiply the product we get by the third factor. We may choose to rearrange the factors to make the problem easier. In this problem we choose to multiply 6 and 5 first. Then we multiply the resulting product by 3.

$6 \times 3 \times 5$	Given problem
$6 \times 5 \times 3$	Commutative Property
30×3	Multiplied 6×5
90	Multiplied 30×3

Analyze How did changing the order of the factors make the multiplication easier?

Example 2

Show how to rearrange the factors to more easily find the product: $5 \times 7 \times 12$

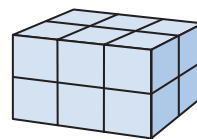
The order in which we choose to multiply can affect the difficulty of the problem. If we multiply 5 by 7 first, we must then multiply 35 by 12. But if we multiply 5 by 12 first, we would multiply 60 by 7 next. The second way is easier and can be done mentally. Using the Commutative Property, we rearrange the factors 7 and 12. Then we multiply 5 and 12 first.

$$\begin{array}{c} 5 \times 12 \times 7 \\ \swarrow \quad \searrow \\ 60 \times 7 = 420 \end{array}$$

Example 3

How many blocks were used to build this shape?

We may count all the blocks, or we may multiply three numbers. We can see that the top layer has 2 rows of 3 blocks. So we know there are 2×3 blocks in each layer. Since there are two layers, we multiply the number in each layer by 2.



$$2 \times 3 \times 2 = 12$$

The shape was built with **12 blocks**.

Now we will practice finding missing factors in multiplication problems. In this type of problem we are given one factor and a product.

Example 4

Find each missing factor:

a.
$$\begin{array}{r} w \\ \times 3 \\ \hline 18 \end{array}$$

b. $3n = 24$

c. $6 \times 5 = 3 \times y$

Reading Math

An **expression** is a number, a letter, or a combination of both. $3n$ is an expression that can also be written as $3 \times n$.

Before we start, we must understand what each equation means. In **a**, the equation means “some number times 3 equals 18.” In **b**, $3n$ means “3 times n .” In **c**, if we multiply 6 and 5, we see that the equation means $30 = 3 \times y$. Now we are ready to find the missing factors.

Multiple Methods There are many ways to do this.

Method 1: We could count how many 3s add up to 18, to 24, and to 30.

Method 2: We could use a multiplication table.

In the table below, look across the 3s row to 18, 24, and 30, and then look to the top of each column for the missing factor. We see that the missing factors are 6, 8, and 10.

	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30

Columns

↓ ↓ ↓

Row →

Method 3: The fastest way to find missing factors is to recall the multiplication facts. Since $3 \times 6 = 18$, $3 \times 8 = 24$, and $3 \times 10 = 30$, we know the missing factors are $w = 6$, $n = 8$, and $y = 10$.

Lesson Practice

For problems **a–d**, copy each problem and then multiply. Show which numbers you chose to multiply first.

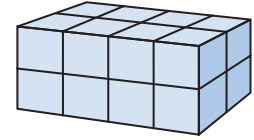
a. $5 \times 7 \times 6$

b. $10 \times 9 \times 8$

c. $3 \times 4 \times 25$

d. **Connect** There are 12 inches in a foot and 3 feet in a yard. How many inches long is a wall that is 5 yards long? Show how you ordered the factors to multiply.

- e. How many blocks were used to build this figure? Give a multiplication problem that provides the answer.



Find each missing factor:

f. $5m = 30$

g. $3b = 21$

h. $3 \times 4 = n \times 2$

$$\begin{array}{r} i. \quad p \\ \times 4 \\ \hline 24 \end{array}$$

$$\begin{array}{r} j. \quad 9 \\ \times q \\ \hline 81 \end{array}$$

$$\begin{array}{r} k. \quad w \\ \times 9 \\ \hline 0 \end{array}$$

Written Practice

Distributed and Integrated

1. **Represent** Draw a horizontal line and a vertical line. Then write the words *horizontal* and *vertical* to label each line.

Formulate Formulate For problems 2–4, write an equation and find the answer.

- *2. Once Reggie started exercising regularly, his resting heart rate dropped from 86 beats per minute to 68 beats per minute. By how many beats per minute did Reggie’s resting heart rate drop?
- *3. In one class there are 33 students. Fourteen of the students are boys. How many girls are in the class?
- *4. In another class there are 17 boys and 14 girls. How many students are in the class?

For problems 5–8, find each product mentally. Then check using pencil and paper.

*5. $6 \times 4 \times 5$

*6. $5 \times 6 \times 12$

*7. $5 \times 10 \times 6$

*8. $9 \times 7 \times 10$

$$\begin{array}{r} 9. \quad \$407 \\ (17) \quad \times \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 375 \\ (17) \quad \times \quad 6 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad \$4.86 \\ (17) \quad \times \quad 9 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 308 \\ (17) \quad \times \quad 7 \\ \hline \end{array}$$

$$13. \quad 9g = 36$$

(18)

$$\begin{array}{r} 14. \quad \$573 \\ (17) \quad \times \quad 9 \\ \hline \end{array}$$

$$15. \quad 8h = 48$$

(18)

$$\begin{array}{r} 16. \quad \$7.68 \\ (17) \quad \times \quad 4 \\ \hline \end{array}$$

$$17. \quad 456 + 78 + f = 904$$

(10)

$$18. \quad 34 + 75 + 123 + 9$$

(6)

$$19. \quad \$36.70 - \$7.93$$

(13)


$$20. \quad h - 354 = 46$$

(14)

21. What is the eleventh term in this counting sequence?

(1)

9, 18, 27, 36, ...

*22.  **Verify** Think of a one-digit odd number and a one-digit even number. Multiply them. Is the product odd or even? Explain how you know.

(2, 15)

23. Find the missing factor:

(18)

$$6 \times 4 = 8 \times n$$

*24. **Represent** Use digits and symbols to write this comparison:
Eight times eight is greater than nine times seven.

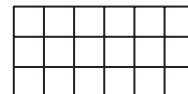
(4, 15)

25. **Connect** For the fact family 7, 8, and 15, write two addition facts and two subtraction facts.

(8)

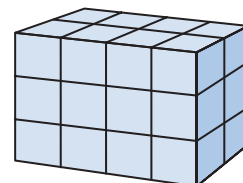
26. Write a multiplication fact that shows the number of squares in this rectangle.

(13)



*27. Write a three-factor multiplication fact that shows the number of blocks in this figure.

(18)



28. **Conclude** What are the next three integers in this counting sequence?
(1, 12)

8, 6, 4, 2, ...

- *29. **Analyze** Taydren and his friend each purchased a bookcase. The friend's bookcase is half the height of Taydren's bookcase. If his friend's bookcase is 3 feet tall, how tall is Taydren's bookcase?
(2)
- *30. Masoud bought four folders for \$0.37 each. Altogether, how much money did the folders cost?
(13, 17)

Early Finishers
Real-World Connection

A card store needs to order 120 note cards. The cards come packaged in groups of 10. Then packages are placed in boxes and shipped. Show three different ways the 120 cards can be shipped.

$$\underline{\quad} \text{ boxes} \times \underline{\quad} \text{ packages} \times 10 \text{ cards} = 120 \text{ cards}$$