

5.NBT.5

Fluently multiply multi-digit whole numbers using the standard algorithm.



Understand the Standards

Sal owns a pizza shop. He orders 212 cases of tomato sauce. Each case contains 24 cans of tomato sauce. How many cans of tomato sauce are in the order? Multiply to find the answer: $212 \text{ cases} \times 24$ cans per case. The two numbers you multiply are called **factors**. The answer is called the **product**.

Words to Know

factors
product
partial product

Sal knows that $212 = 200 + 10 + 2$. He also knows how to multiply by 10s. He says he can multiply 212×24 mentally.

- Sal multiplies by 4 ones.
 $4 \times 212 = 848$
- Then by 2 tens.
 $212 \times 20 =$
 $(212 \times 10) \times 2 =$
 $2,120 \times 2 = 4,240$
- He adds the two *partial products*.
 $848 + 4,240 = 5,088$

A **partial product** is the result of multiplying *one factor* by only *one digit of the second factor*. Sal multiplied *one factor* (212) by *one digit of the second factor* (2). This makes the first partial product. Then he multiplied by the other digit in the second factor (4). This makes the second partial product.

Sal's method works for his problem because the numbers are easy to work with. Here is another way to do the same multiplication. This method will work for numbers that are more difficult or impossible to multiply mentally.

- Multiply 212 by 4 ones.
- Write a placeholder zero in ones place. Then multiply 24 by 2 tens.
- Add the partial products.

$$\begin{array}{r} 212 \\ \times 24 \\ \hline 848 \end{array} \leftarrow 4 \text{ ones} \times 212$$

848 ← partial product

$$\begin{array}{r} 212 \\ \times 24 \\ \hline 848 \\ 4240 \end{array} \leftarrow 2 \text{ tens} \times 212$$

4240 ← partial product

$$\begin{array}{r} 212 \\ \times 24 \\ \hline 848 \\ 4240 \\ \hline 5,088 \end{array}$$

848 ← partial product
4240 ← partial product
5,088 ← product

You can reverse the order of the factors in multiplication and the product will be the same:

$$212 \times 24 = 24 \times 212$$



Guided Instruction

Use these steps to multiply a three-digit number by a two-digit number.

Step 1 Multiply by the ones to find the first partial product.

$$4 \times 3 = 12 \text{ Regroup.}$$

$$5 \times 3 = 15 + 1 = 16 \text{ Regroup.}$$

$$7 \times 3 = 21 + 1 = 22$$

$$\begin{array}{r} 11 \\ 754 \\ \times 23 \\ \hline 2262 \end{array} \leftarrow \text{partial product}$$

Step 2 Write a placeholder zero in ones place. Multiply by the tens to find the second partial product.

$$4 \times 2 = 8$$

$$5 \times 2 = 10 \text{ Regroup.}$$

$$7 \times 2 = 14 + 1 = 15$$

$$\begin{array}{r} 1 \qquad \qquad 754 \\ 11 \qquad \qquad \times 23 \\ 754 \qquad \qquad \hline 2262 \\ \times 23 \\ \hline 15080 \\ \hline 17,342 \end{array} \leftarrow \text{product}$$

Step 3 Add the partial products.

$$15080 \leftarrow \text{partial product}$$

You can use same the method to multiply by a three-digit number.

- The factor 128 is a three-digit number, so there are three partial products.
- The first multiplication, 623×8 , requires regrouping.
- Notice the pattern of placeholder zeros in the partial products.

$$\begin{array}{r} 12 \\ 623 \\ \times 128 \\ \hline 4984 \leftarrow 8 \text{ ones} \times 623 \\ 12460 \leftarrow 2 \text{ tens} \times 623 \\ + 62300 \leftarrow 1 \text{ hundred} \times 623 \\ \hline 79,744 \end{array}$$



On Your Own

Use the steps above to find each product. If it's helpful, use grid paper to keep your columns straight. Use a calculator to check your answers. Divide the final product by one of the factors. The quotient should be the other factor.

$$\begin{array}{r} 1. \ 821 \\ \times 42 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \ 503 \\ \times 66 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \ 748 \\ \times 35 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \ 692 \\ \times 278 \\ \hline \end{array}$$

Use what you now know about multiplying whole numbers to find each product.

5.
$$\begin{array}{r} 732 \\ \times 13 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 420 \\ \times 52 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 396 \\ \times 80 \\ \hline \end{array}$$

8.
$$\begin{array}{r} 304 \\ \times 64 \\ \hline \end{array}$$

9.
$$\begin{array}{r} 562 \\ \times 47 \\ \hline \end{array}$$

10.
$$\begin{array}{r} 683 \\ \times 209 \\ \hline \end{array}$$

11.
$$\begin{array}{r} 274 \\ \times 858 \\ \hline \end{array}$$

12.
$$\begin{array}{r} 503 \\ \times 466 \\ \hline \end{array}$$

13.
$$\begin{array}{r} 321 \\ \times 239 \\ \hline \end{array}$$

Answer the questions. Share your ideas with a classmate.

14. Which multiplication above might be easier if the factors are reversed? Explain your choice.

15. You know you can use division to check multiplication. Explain how you could use multiplication to check multiplication. Use a simple example.

16. A store is having a sale on HD televisions. They sell 115 televisions at an average price of \$328. What is the dollar amount of the total sales? Show your work. Remember to set up your problem in a way that makes the multiplication easier.

Answer the questions below.

17. Find the product.

$$\begin{array}{r} 853 \\ \times 27 \\ \hline \end{array}$$

- A. 7,677 B. 7,748
C. 22,292 D. 23,031

18. Find the product.

$$\begin{array}{r} 217 \\ \times 485 \\ \hline \end{array}$$

- A. 3,698 B. 11,501
C. 105,245 D. 886,445

19. Rajeev used a zero as a placeholder in the problem on the right. Explain its purpose.

$$\begin{array}{r} 35 \\ \times 12 \\ 70 \\ \hline 350 \end{array}$$

Elevate 20. Anita did the multiplication on the right. The answer seems too large. She thinks something is wrong, but she isn't sure what. Identify where Anita made an error and correct her mistake.

$$\begin{array}{r} 465 \\ \times 208 \\ 3720 \\ 000 \\ \hline + 930000 \end{array}$$

Elevate 21. The flight distance between Miami, Florida, and Buenos Aires, Argentina, is about 4,364 miles. One businessman estimates that he has made this flight 28 times.

- How many miles has he flown on these trips? Show your work.

- Describe a way to check your answer.



Critical Thinking

22. Instead of multiplying numbers beginning with the least digit, you can multiply beginning with the greatest digit. Work with a partner to find a method of multiplying backwards. Start your multiplication with the greatest digit and work from left to right. Make a poster that explains each step of your method and give a clear example. Present your poster to the class and be prepared to answer questions.