

Grade 5 - Multiplying Multi-Digit Whole Numbers - Lesson

Common Core 5.NBT.B.5 · maths-pdf.fr/en/

To multiply multi-digit whole numbers, use the standard algorithm. Multiply the top number by each digit of the bottom number, writing a placeholder zero for each place after the ones. These results are partial products. Add the partial products to find the answer, and estimate first so you can check that the answer is reasonable.

Grade 5 · Common Core State Standards: **5.NBT.B.5**

Key facts

- A partial product comes from multiplying by one digit of the bottom number.
- Write a placeholder zero when you multiply by tens, hundreds and so on.
- Add all partial products to get the final product.
- Estimate by rounding each factor to its greatest place before you multiply.
- An area model splits each factor by place value and shows the same partial products.

What is the standard algorithm for multiplication?

The **standard algorithm** is a short way to multiply big numbers. Multiply the top number by each digit of the bottom number. Each result is a **partial product**. Then add the partial products to get the answer.

Key words

- **Factor:** a number you multiply.
- **Partial product:** the result of multiplying by one digit of the bottom number.
- **Placeholder:** a zero that keeps digits in the right place.
- **Product:** the final answer to a multiplication.

How do you multiply by a two-digit number?

Multiply 412×38 .

1. Estimate first: $400 \times 40 = 16,000$.

2. Multiply by the 8 ones: $412 \times 8 = 3,296$.
3. Write a 0 in the ones place as a placeholder. Then multiply by the 3 tens: $412 \times 30 = 12,360$.
4. Add the partial products: $3,296 + 12,360 = 15,656$.
5. Compare with the estimate. 15,656 is close to 16,000, so the answer makes sense.

The product is **15,656**.

$$\begin{array}{r}
 412 \\
 \times 38 \\
 \hline
 3296 \quad 412 \times 8 \\
 12360 \quad 412 \times 30 \\
 \hline
 15656
 \end{array}$$

Two partial products add to 15,656.

Why do we write a zero in the second row?

The 3 in 38 stands for 3 tens, or 30. So the second row is 412×30 , not 412×3 . The zero is a **placeholder**. It keeps every digit in its correct place.

$$412 \times 3 = 1,236 \rightarrow \times 10 \rightarrow 412 \times 30 = 12,360$$

The placeholder zero shifts the row one place left.

How does an area model match the algorithm?

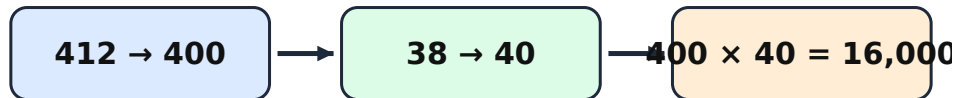
Split each factor by place value: $412 = 400 + 10 + 2$ and $38 = 30 + 8$. Draw a rectangle with six parts. Each small rectangle is one partial product. When you add all six, you get the same total, 15,656. The area model shows *why* the algorithm works.

	400	10	2
30	12,000	300	60
8	3,200	80	16

Add all six: 15,656.

How do you estimate a product?

Round each factor to its greatest place. Then multiply the rounded numbers. Here 412 rounds to 400 and 38 rounds to 40. The estimate is $400 \times 40 = 16,000$. If your exact answer is far from the estimate, check your work for a missing placeholder zero or a carrying mistake. For example, if a friend says $412 \times 38 = 1,566$, you can see right away that this is far too small, because the estimate is about 16,000.



The estimate is 16,000.

Questions about multiplying multi-digit whole numbers

What is a partial product?

A partial product is the answer you get when you multiply the top number by one digit of the bottom number. In 412×38 , the partial products are $412 \times 8 = 3,296$ and $412 \times 30 = 12,360$. You add them at the end.

Why do I write a zero in the second row?

The second row multiplies by tens, so the answer must be 10 times larger. The zero holds the ones place so the other digits shift one place left. Without it, you get an answer that is far too small.

How do I estimate a product?

Round each factor to its greatest place value, then multiply the rounded numbers. For 58×31 use $60 \times 30 = 1,800$. The exact answer should be close to your estimate.

Does the order of the factors matter?

No. 23×45 and 45×23 both equal 1,035. Many students put the number with fewer digits on the bottom because it gives fewer rows to add.

How can I check my answer?

First compare it with an estimate. Then multiply again with the factors switched, or draw an area model. If both methods give the same product, your answer is very likely right.