

Multiplying Multi-Digit Whole Numbers: math lesson, Grade 4 – download the PDF

Big multiplication problems can look scary, but there is a secret: you can always break a large number into smaller, friendlier pieces. In this chapter you will multiply with tens, hundreds, and thousands, draw area models, and use partial products to multiply a 4-digit number by a 1-digit number or two 2-digit numbers. You will also learn to check your answer with a quick estimate.

1. Multiplying by multiples of 10, 100, and 1,000

A **multiple of 10** is a number like 20, 70, or 90. Multiples of 100 are numbers like 300 or 800, and multiples of 1,000 are numbers like 4,000 or 6,000. Multiplying by these numbers is easy because you only need a basic multiplication fact and some zeros.



Method: multiply with zeros

1. Cover the zeros at the end of both factors.
2. Multiply the numbers that are left, using a basic fact.
3. Count all the zeros you covered and write them at the end of the product.

Look at the pattern when the factor 7 becomes ten times bigger each time:

Multiplication	Basic fact	Product
6×7	$6 \times 7 = 42$	42
6×70	$6 \times 7 = 42$, one zero	420
6×700	$6 \times 7 = 42$, two zeros	4,200
$6 \times 7,000$	$6 \times 7 = 42$, three zeros	42,000

E Example 1: two factors with zeros

Find 40×300 .

Cover the zeros: $4 \times 3 = 12$. There is one zero in 40 and two zeros in 300, so write three zeros after 12.

$$40 \times 300 = 12,000.$$

A Careful with the basic fact

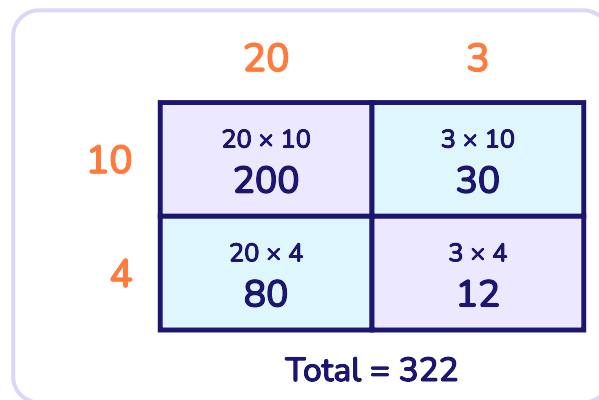
Sometimes the basic fact already ends in a zero. For 50×60 , the basic fact is $5 \times 6 = 30$. Then add the two extra zeros: $50 \times 60 = 3,000$, not 300.

2. The area model

D Area model

An **area model** is a rectangle split into smaller rectangles. The sides of the big rectangle are the two factors, broken into place-value parts. The area of each small rectangle is a **partial product**, and the area of the whole rectangle is the product.

To multiply 23×14 , split 23 into $20 + 3$ and 14 into $10 + 4$. Draw a rectangle with four boxes, one for every pair of parts.



E Example 2: area model

From the figure, the four boxes are $20 \times 10 = 200$, $20 \times 4 = 80$, $3 \times 10 = 30$, and $3 \times 4 = 12$.

Add them: $200 + 80 + 30 + 12 = 322$. So $23 \times 14 = 322$.

3. Partial products

D Partial products

Partial products are the smaller products you get when you multiply each part of one number by each part of the other. The final product is the sum of all the partial products.

The area model and partial products are the same idea. The model is a picture, and the partial products are the numbers written in a list. Splitting numbers by place value is called using **expanded form**: for example, $58 = 50 + 8$.

M Method: partial products

1. Write each factor in expanded form.
2. Multiply every part of the first factor by every part of the second factor.
3. Add all the partial products.

For 6×58 , use $58 = 50 + 8$. Then $6 \times 50 = 300$ and $6 \times 8 = 48$, so $6 \times 58 = 300 + 48 = 348$.

4. Multiplying a 4-digit number by a 1-digit number

A 4-digit number has thousands, hundreds, tens, and ones. Multiply each place by the 1-digit number and add the results. The area model has only one row, because the second factor is not split.

	3,000	400	20	6
4	$3,000 \times 4$ 12,000	400×4 1,600	20×4 80	6×4 24
Total = 13,704				

E**Example 3: 3,426 times 4**

Partial products: $3,000 \times 4 = 12,000$, $400 \times 4 = 1,600$, $20 \times 4 = 80$, and $6 \times 4 = 24$.

Add: $12,000 + 1,600 + 80 + 24 = 13,704$.

The **standard algorithm** does the same work in a shorter way, from right to left, and regroups ("carries") when a product is 10 or more:

- $6 \times 4 = 24$: write 4 and carry 2.
- $2 \times 4 = 8$, plus 2 is 10: write 0 and carry 1.
- $4 \times 4 = 16$, plus 1 is 17: write 7 and carry 1.
- $3 \times 4 = 12$, plus 1 is 13: write 13.

The answer is again 13,704.

5. Multiplying two 2-digit numbers

When both factors have two digits, split *both* of them. You get four partial products. You can also group them into two lines: first multiply by the tens digit, then by the ones digit.

	40	7
30	40×30 1,200	7×30 210
6	40×6 240	7×6 42
Total = 1,692		

E**Example 4: 47 times 36**

Four partial products: $40 \times 30 = 1,200$, $40 \times 6 = 240$, $7 \times 30 = 210$, and $7 \times 6 = 42$.

Total: $1,200 + 240 + 210 + 42 = 1,692$.

Two-line version: $47 \times 30 = 1,410$ and $47 \times 6 = 282$. Then $1,410 + 282 = 1,692$.

**Do not forget the tens**

When you multiply by the 3 in 36, you are really multiplying by 30. Writing $47 \times 3 = 141$ instead of $47 \times 30 = 1,410$ makes the answer ten times too small.

6. Properties of multiplication

Properties are rules that always work. They let you change the order or the grouping of a multiplication to make it easier.

P**Properties of multiplication**

- **Commutative property:** the order does not change the product, $a \times b = b \times a$.
- **Associative property:** the grouping does not change the product, $(a \times b) \times c = a \times (b \times c)$.
- **Distributive property:** $a \times (b + c) = a \times b + a \times c$.
- **Identity property:** $a \times 1 = a$.
- **Zero property:** $a \times 0 = 0$.

The distributive property is the engine behind the area model and partial products.

E Example 5: using properties for mental math

Find $4 \times 7 \times 25$. Group the factors that make 100: $(4 \times 25) \times 7 = 100 \times 7 = 700$.

Find 6×104 . Use $104 = 100 + 4$: $6 \times 100 + 6 \times 4 = 600 + 24 = 624$.

7. Estimating products

An **estimate** is a number that is close to the exact answer. To estimate a product, round each factor to a number that is easy to multiply, usually by keeping only the first digit and using zeros for the rest. Then multiply the rounded numbers.

E Example 6: estimating

Estimate 38×52 . Round 38 to 40 and 52 to 50. Then $40 \times 50 = 2,000$.

The exact product is $38 \times 52 = 1,976$, which is very close to 2,000. Estimate $4,812 \times 6$: round to $5,000 \times 6 = 30,000$. The exact answer, 28,872, is a little smaller because 4,812 was rounded up.



Zyro's tip

On my planet we always estimate first! If your exact answer is far from your estimate, a digit or a zero went missing. Go back and check your partial products.

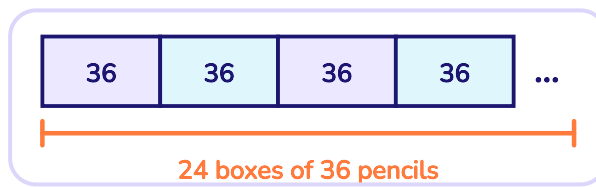
8. Multi-step word problems

A **multi-step word problem** needs more than one operation. Draw a picture or a tape diagram to see what is happening.

M

Method: solve a word problem

1. Read the problem and find the question.
2. Draw a diagram and write down the numbers you know.
3. Solve one step at a time and label each answer with its unit.
4. Check that your answer makes sense with an estimate.



E

Example 7: pencils for the school store

The school store buys 24 boxes with 36 pencils in each box. It then gives away 150 pencils as prizes. How many pencils are left?

Step 1: $24 \times 36 = 24 \times 30 + 24 \times 6 = 720 + 144 = 864$ pencils.

Step 2: $864 - 150 = 714$ pencils.

Check: $20 \times 40 = 800$, close to 864. There are **714 pencils** left.

Key takeaways

- To multiply by multiples of 10, 100, or 1,000, multiply the basic facts and then write all the zeros at the end.
- An area model splits a rectangle into boxes. Each box is a partial product, and the total area is the product.
- For a 4-digit number times a 1-digit number, multiply each place value and add, or use the standard algorithm with regrouping.
- For two 2-digit numbers, find four partial products and add them. Remember that the tens digit stands for tens.
- The commutative, associative, and distributive properties make multiplication easier.
- Estimate by rounding each factor, and compare your exact answer with the estimate.
- In multi-step word problems, solve one step at a time and check that the final answer makes sense.



Test yourself: quick challenge for Grade 4

[Change level](#)

Level : **Grade 4**

6 random questions, instant feedback.



Start the challenge



 **Speed drill for Grade 4: how many in 60 seconds?**

 Keep exploring with Zyro

 Math practice

Multiplying Multi-Digit Whole Numbers:
math practice, Grade 4

 Math tests

Multiplying Multi-Digit Whole Numbers:
math test, Grade 4

 Math quizzes

Multiplying Multi-Digit Whole Numbers:
math quiz, Grade 4

 Math practice

Dividing Multi-Digit Whole Numbers:
math practice, Grade 4

 Math practice

Equivalent Fractions and Comparing:
math practice, Grade 4

 Math tests

Dividing Multi-Digit Whole Numbers:
math test, Grade 4

Zyro vous emmène sur nos sites partenaires

Embarquez pour d'autres planètes du savoir et leurs applis.

Décollage