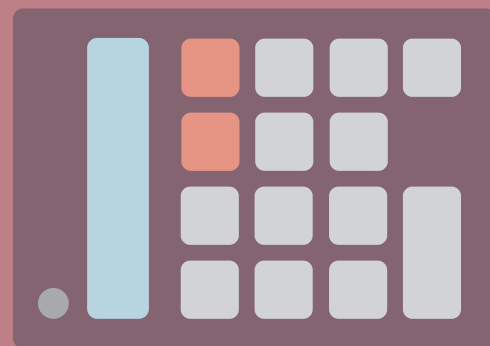




MATH

Student Book



► **5th Grade | Unit 2**

MATH 502

MULTIPLYING WHOLE NUMBERS AND DECIMALS

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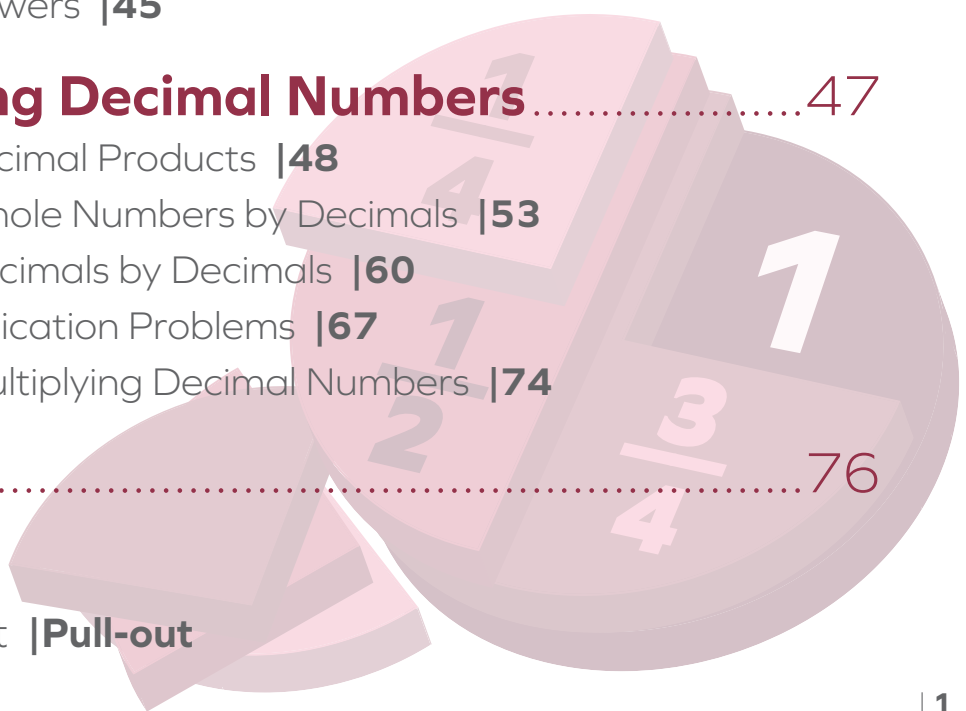
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Author:

Glynlyon Staff

Editor:

Alan Christopherson, M.S.

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MULTIPLYING WHOLE NUMBERS AND DECIMALS

In this unit, students will explore multiplication with whole numbers and decimal numbers. They will use estimation, grids, the properties of multiplication, and pencil and paper to find products. In addition, they will study exponents and powers of ten. They will learn how to multiply whole numbers and decimals by powers of ten. Finally, they will apply their multiplication skills to solve one- and two-step word problems.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAAC. When you have finished this LIFEPAAC, you should be able to:

- Estimate whole number and decimal products.
- Use the properties of multiplication.
- Multiply whole numbers and decimals by powers of ten.
- Multiply whole numbers and decimal numbers.
- Solve multiplication word problems.

1. MULTIPLYING WHOLE NUMBERS



Is Nutmeg right? Pepper was going to add 5 eight times. Is that the same as just multiplying 5 and 8? Yes! In this lesson, we'll begin looking at multiplication. We'll also estimate the product of two or more numbers.

Objectives

Read these objectives. When you have completed this section, you should be able to:

- Review basic math facts.
- Estimate the product of two numbers.
- Know the Commutative, Associative, and Identity Properties of Multiplication.
- Know the Zero Property of Multiplication.
- Use the Distributive Property to multiply numbers mentally.
- Multiply whole numbers using a pencil and paper.

Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAAC.

Associative Property of Multiplication. A property of numbers that states that how numbers are grouped in a product does not change the value of the product.

Commutative Property of Multiplication. A property of numbers that states that the order in which numbers are multiplied does not change the value of the product.

Distributive Property. A number multiplied by a sum is the same as the sum of the number multiplied by each addend; $a(b + c) = ab + ac$.

factor. A number to be multiplied.

Identity Property of Multiplication. A property of numbers that states that multiplying a number by 1 does not change the value of the number.

overestimate. An estimate that is higher than the actual value.

partial product. The product of one digit of a factor and one digit of the other factor.

product. The result of multiplying two or more numbers.

underestimate. An estimate that is lower than the actual value.

Zero Property of Multiplication. A property of numbers that states that the product of any number and zero is zero.

Note: All vocabulary words in this LIFEPAAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

Review: Basic Math Facts

As we saw in the cartoon, multiplication is just repeated addition. Nutmeg and Pepper had two different ways to find the same answer.

Pepper: $5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40$ Adding 5 eight times.

Nutmeg: $5 \times 8 = 40$ Multiplying 5 and 8.

Both methods get the same result, but multiplying is usually much faster (and takes less bark!). Nutmeg's answer is called a **product**. A product is the result of multiplying two or more numbers, which are called **factors**. You're probably very good at finding the product of two factors that are each 12 or less. Take a look at the following multiplication table to help you review your math facts.

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Estimating Larger Multiplication Products

Because you already have your multiplication facts for smaller numbers mastered, we're going to learn how to multiply with larger numbers. In this lesson, we'll learn how to estimate products. Remember that an estimate is a value that is close to the actual value. Estimates are easier to make than the actual calculation, and they're useful for making a prediction or checking if an answer is reasonable.

Let's try making some estimates. To estimate a product, round two-digit factors to the nearest ten, and round three-digit factors to the nearest hundred. One-digit factors stay the same. Then, multiply the rounded numbers.

Example:

Estimate. 3×37

Solution:

Round 37 to the nearest ten, which is 40. Now, multiply.

$$3 \times 40 = 120$$

Example:

Estimate. 23×81

Solution:

Round 23 to the nearest ten, which is 20. Round 81 to the nearest ten, which is 80. Now, multiply.

$$20 \times 80 = 1,600$$

Example:

Estimate. 78×114

Solution:

Round 78 to the nearest ten, which is 80. Round 114 to the nearest hundred, which is 100. Now, multiply.

$$80 \times 100 = 8,000$$

Are you noticing a pattern for multiplying large numbers that end in zeros? Multiply the front digits together. Then, count the total number of zeros in the factors. That same number of zeros will be in the product. Take a look again at the examples we just did:

$$3 \times 40 = 120$$

One zero is in the factors, so one zero is in the product.

$$20 \times 80 = 1,600$$

Two zeros are in the factors, so two zeros are in the product.

$$80 \times 100 = 8,000$$

Three zeros are in the factors, so three zeros are in the product.

Let's try another one.

Example:

Estimate. 345×278

Solution:

Round 345 to the nearest hundred, which is 300. Round 278 to the nearest hundred, which is also 300. Now, multiply.

$$300 \times 300 = 90,000$$

This might help!

3 multiplied by 3 is 9. And, there are a total of four zeros in the factors. So, the product is 9 with four zeros, or 90,000.

When estimating, it is very helpful to determine whether our estimate is higher than the actual value or lower than the actual value. When the estimate is higher than the actual value, it's called an **overestimate**. When the estimate is lower than the actual value, it's called an **underestimate**.

S-T-R-E-T-C-H

Can you think of a situation where it would be better to have an overestimate, rather than an underestimate? Or, where it would be better to have an underestimate, rather than an overestimate?

How do you know if an estimate is an overestimate or underestimate? If factors are only rounded up, then the estimate is an overestimate. If factors are only rounded down, then the estimate is an underestimate. When some factors are rounded up and some are rounded down, it is harder to tell whether the estimate is an overestimate or an underestimate.

Let's look back at a couple of our earlier examples. In the first example, we had to estimate the product of 3×37 . We left the factor 3 alone and rounded 37 up to 40. So, our estimate was 3×40 , or 120. Since we only rounded factors up, 120 is an overestimate. That means that we would expect the actual product of 3×37 to be a little less than 120.

In the second example, we had to estimate the product of 23×81 . We rounded 23 down to 20 and 81 down to 80. So, our estimate was 20×80 , or 1,600. Since we only rounded factors down, 1,600 is an underestimate. That means that we would expect the actual product of 23×81 to be a little more than 1,600.

Example:

Mrs. June is buying Christmas gifts for her five grandchildren. She found a movie for each grandchild. If each movie is \$19, about how much will it cost for all five? Is this an overestimate or an underestimate?

Solution:

We need to estimate the product of $5 \times \$19$. Leave the factor 5 alone. Round \$19 to the nearest ten, which is \$20. Now, estimate.

$$5 \times \$20 = \$100$$

So, Mrs. June can expect to pay about \$100 for the five movies. Since we only rounded factors up, this estimate is an overestimate. The actual total will be a little less than \$100.

**This might help!**

Notice that the product of 5 and 2 is 10, which already has one zero. Then, since there is one zero in the factors, *another* zero is in the product. If the product of the front digits has a zero in it, make sure to include that first!

Let's Review!

Before going on to the practice problems, make sure you understand the main points of this lesson.

- ✓ Multiplication is another way to represent repeated addition.
- ✓ To estimate a product, round the factors and then multiply.
- ✓ An overestimate is greater than the actual value. An underestimate is less than the actual value.



Complete this activity.

1.1

Match the terms with their definitions.

- | | |
|------------------------|---|
| a. _____ factor | 1. the result of multiplying two or more numbers |
| b. _____ overestimate | 2. a number to be multiplied |
| c. _____ product | 3. an estimate that is lower than the actual value |
| d. _____ underestimate | 4. an estimate that is higher than the actual value |



Find the product.

- | | | |
|------|----------------|-------|
| 1.2 | 7×4 | _____ |
| 1.3 | 9×6 | _____ |
| 1.4 | 6×3 | _____ |
| 1.5 | 4×9 | _____ |
| 1.6 | 5×7 | _____ |
| 1.7 | 3×8 | _____ |
| 1.8 | 2×12 | _____ |
| 1.9 | 10×11 | _____ |
| 1.10 | 11×5 | _____ |



Fill in the blank.

1.11 Multiplication is a faster way to do repeated _____.



Answer true or false.

1.12 _____ The product of 80 and 700 will have four zeros.



Circle the correct letter and answer.

- 1.13** Clara estimates that the product of 32 and 41 is about 1,200. Her estimate is an _____.
- a. underestimate b. overestimate
- 1.14** Mei estimates that the product of 7 and 178 is about 1,400. Her estimate is an _____.
- a. underestimate b. overestimate
- 1.15** Estimate the product. 509×36
- a. 15,000 b. 24,000 c. 20,000 d. 2,000
- 1.16** Estimate the product. 110×298
- a. 30,000 b. 40,000 c. 2,000 d. 3,000
- 1.17** Estimate the product. 8×572
- a. 4,000 b. 4,800 c. 48,000 d. 40,000
- 1.18** Ricardo can type 39 words per minute. Estimate the number of words he can type in 18 minutes.
- a. 300
b. 400
c. 600
d. 800



Estimate the product.

- 1.19** 73×64 _____
- 1.20** 3×92 _____
- 1.21** 51×688 _____



Circle the correct letter and answer.

- 1.22** Round each factor in order to estimate. 96×25
- a. 90×20 b. 100×20 c. 90×30 d. 100×30
- 1.23** Using your rounded factors, estimate the product.
- a. 3,000 b. 1,800 c. 2,000 d. 2,700
- 1.24** Is your estimate an overestimate or an underestimate?
- a. undersestimate b. overestimate

SELF TEST 1: MULTIPLYING WHOLE NUMBERS

Each numbered question = 6 points

Write *true* or *false*.

- 1.01** _____ If all factors are rounded up before estimating, then the estimate is an underestimate.
- 1.02** _____ The Associative Property of Multiplication says that the way in which factors are grouped does not change the value of the product.

Circle the correct letter and answer.

- 1.03** Multiply. 1×15
 a. 1 b. 15 c. 115 d. 0
- 1.04** Multiply. 36×0
 a. 360 b. 36 c. 1 d. 0
- 1.05** How many zeros will the product of 700 and 300 have?
 a. 1 b. 2 c. 3 d. 4
- 1.06** Katrina has 12 more car payments that are each \$178. About how much money does she have left to pay?
 a. \$200 b. \$2,000 c. \$1,000 d. \$4,000
- 1.07** Which of the following shows the Commutative Property of Multiplication?
 a. $4 \times 5 = 5 \times 4$ b. $4 \times (5 + 8) = (4 \times 5) + (4 \times 8)$
 c. $(3 \times 2) \times 7 = 3 \times (2 \times 7)$ d. $9 \times 7 = 63$
- 1.08** Brandon wants to use the Distributive Property to solve the problem $8 \times (10 + 7)$. What should be his next step?
 a. $(8 \times 10) + 7$ b. $(8 + 10) \times (8 + 7)$
 c. $(8 \times 10) + (8 \times 7)$ d. $10 + (8 \times 7)$
- 1.09** Multiply 26×107 . What is the value of the first partial product?
 a. 642 b. 624 c. 702 d. 602
- 1.010** Multiply 26×107 . What is the value of the second partial product?
 a. 2,240 b. 224 c. 2,140 d. 234

- 1.011** Multiply 26×107 . What is the value of the final product?
 a. 856 b. 2,782 c. 2,882 d. 2,742

Complete these activities.

- 1.012** Estimate.
 91×47 _____

- 1.013** Multiply.

$$\begin{array}{r} 91 \\ \times 47 \\ \hline \end{array}$$

- 1.014** Estimate.
 56×324 _____

- 1.015** Multiply.

$$\begin{array}{r} 324 \\ \times 56 \\ \hline \end{array}$$

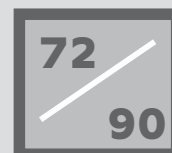


Teacher check:

Score _____

Initials _____

Date _____





804 N. 2nd Ave. E.
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