

Bridges in Mathematics

Grade 5 Unit 4

Multiplying & Dividing Whole Numbers & Decimals



In this unit your child will:

- Use a variety of strategies for multiplying and dividing multi-digit whole numbers
- Practice using the standard algorithm to multiply multi-digit whole numbers
- Begin multiplying and dividing with decimal numbers

Your child will learn and practice these skills by solving problems like those shown below. Use the free Math Vocabulary Cards app for additional support: mathlearningcenter.org/apps.

PROBLEM	COMMENTS																		
<p>Write the following number in expanded notation: three hundred six and twenty-five hundredths.</p> $300 + 6 + 0.20 + 0.05$	<p>Reviewing the place value concepts associated with decimal numbers helps students compare different numbers and compute with decimal numbers. The words and expression (in expanded form) in this example are two ways of representing the number 306.25 that make the place value of the digits clear.</p>																		
<p>Solve the problems in the string below. Use the answers from the first few combinations to help solve the rest.</p> $28 \times 10 = 280$ $28 \times 5 = 140$ $28 \times 15 = 420$ $28 \times 100 = 2,800$ $28 \times 50 = 1,400$ $1,456 \div 28 = 52$	<p>This series of calculations is closely related to the work with ratio tables (see next example) and resembles the problem string exercises that students do frequently in the classroom. The purpose is to use combinations that are easy to solve mentally to help solve problems that aren't so easy at first. In this example, students can halve 28×10 (280) to solve 28×5 (140) and then add the products to solve 28×15 (420). Once they calculate that $28 \times 50 = 1,400$, they may also see that 1,456 is 2 groups of 28 more than 1,400, so $1,456 \div 28$ must be 52. These strings build a strong sense of number and mental computation strategies.</p>																		
<p>Janelle was getting ready for a big party. She bought 13 bottles of juice for \$3.25 per bottle. How much did she spend on juice?</p> <table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="border: 1px solid black; padding: 2px;">bottles</th> <th style="border: 1px solid black; padding: 2px;">cost</th> <th style="padding: 2px;"></th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border: 1px solid black; text-align: center;">\$3.25</td> <td style="padding: 2px;">$\\$32.50 + \\9.75</td> </tr> <tr> <td style="border: 1px solid black; text-align: center;">10</td> <td style="border: 1px solid black; text-align: center;">\$32.50</td> <td style="padding: 2px;">$32 + 9 + 0.50 + 0.75$</td> </tr> <tr> <td style="border: 1px solid black; text-align: center;">2</td> <td style="border: 1px solid black; text-align: center;">\$6.50</td> <td style="padding: 2px;">$41 + 1.25$</td> </tr> <tr> <td style="border: 1px solid black; text-align: center;">3</td> <td style="border: 1px solid black; text-align: center;">\$9.75</td> <td style="padding: 2px;">$\\$42.25$</td> </tr> <tr> <td style="border: 1px solid black; text-align: center;">13</td> <td style="border: 1px solid black; text-align: center;">\$42.25</td> <td></td> </tr> </tbody> </table>	bottles	cost		1	\$3.25	$\$32.50 + \9.75	10	\$32.50	$32 + 9 + 0.50 + 0.75$	2	\$6.50	$41 + 1.25$	3	\$9.75	$\$42.25$	13	\$42.25		<p>When you were a math student, you might have seen a problem like this solved as shown below. Using a ratio table to keep track of partial products (like $10 \times \\$3.25 = \\32.50) helps students solve such problems with greater ease, while also building their number sense and ability to use strategies that lead to mental computation.</p> $ \begin{array}{r} 3.25 \\ \times 13 \\ \hline 1975 \\ \times 3250 \\ \hline \$42.25 \end{array} $
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<p>Fill in the blanks to complete the problems. Use the standard algorithm to solve the problem.</p> $\begin{array}{r} \overset{2}{2}7 \\ \times 14 \\ \hline 108 \\ \times 270 \\ \hline 378 \end{array}$ $\begin{array}{r} \overset{3}{3}4 \\ \times 28 \\ \hline 1272 \\ \times 680 \\ \hline 952 \end{array}$	<p>Students are expected to be able to use the standard algorithm for multiplication, and toward the end of the unit they will encounter problems that require it. Some are only partially completed using the algorithm, and then students are asked to finish the work. This prepares students for assessment items shown this way. Other prompts ask students to examine a fictional student's work and identify how and why that student made errors in their use of the algorithm. Those prompts are meant to help students think carefully about how the algorithm works and to help them avoid making common errors when they use the algorithm.</p>												
<p>Julissa bought her mom some flowers. Each flower cost \$0.65, and Julissa spent \$11.70 in all. How many flowers did she get for her mom?</p> <table border="1" data-bbox="175 693 730 840"> <tr> <td>flowers</td> <td>1</td> <td>10</td> <td>20</td> <td>2</td> <td>18</td> </tr> <tr> <td>cost</td> <td>\$0.65</td> <td>\$6.50</td> <td>\$13.00</td> <td>\$1.30</td> <td>\$11.70</td> </tr> </table> <p style="text-align: center;"> $20 - 2$ $13 - 1.30$ </p> <p style="text-align: center;"> She bought 18 flowers because $\\$0.65 \times 18 = \\11.70. (That also means $\\$11.70 \div \\$0.65 = 18$) </p>	flowers	1	10	20	2	18	cost	\$0.65	\$6.50	\$13.00	\$1.30	\$11.70	<p>The ratio table can also be used to solve division problems. You might recall solving problems like this one by first converting the divisor (0.65) to a whole number, multiplying the dividend by the corresponding power of 10, and then carrying out the long division algorithm, using a process of informed trial and error to figure out the maximum number of times the divisor goes into each part of the dividend.</p> $0.65 \overline{)11.70}$ $\begin{array}{r} 18 \\ 65 \overline{)1170} \\ \underline{-65} \\ 520 \\ \underline{-520} \\ 0 \end{array}$ $\begin{array}{r} 65 \\ \times 7 \\ \hline 455 \end{array}$ $\begin{array}{r} 65 \\ \times 8 \\ \hline 520 \end{array}$ <p>The ratio table gives students a way to keep track of related facts that can help them solve the problem, reinforces the inverse relationship between multiplication and division, and preserves the actual magnitude of the numbers in the problem.</p>
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cost	\$0.65	\$6.50	\$13.00	\$1.30	\$11.70								

FREQUENTLY ASKED QUESTIONS ABOUT UNIT 4

Q: I don't remember how to use the multiplication algorithm. The examples above don't help enough, because I can't see where to start or what order to do the steps.

A: The algorithm works every time when carried out correctly, but many people have difficulty remembering how to carry out the steps. Take a look online for videos that will take you through the algorithm step by step. Some are much clearer than others, so watch different videos if the first isn't helpful for you.

Q: This approach to multiplication and division is new to me. Why have kids use so many different strategies when they can use the algorithms instead?

A: An algorithm is a set of steps used to perform a particular calculation with specific kinds of numbers. Algorithms are important because when they are used accurately and with understanding, they are reliable, efficient, and universally applicable. Difficulties arise when students attempt to use an algorithm for multiplying or dividing without having mastered the basic facts, when they don't understand why the algorithm works, when they forget the steps, or when they can carry out the steps yet are unable to use their estimation skills to judge whether their final answer is reasonable. This unit employs the array model and additional strategies to help students build a strong sense of number and an understanding of how different strategies, including the algorithms, work. The goal is to help students develop many effective computational strategies, a strong sense of number, and the ability to use algorithms with understanding and accuracy.