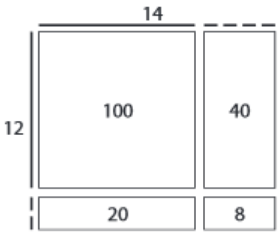
Fairfield Elementary
Mathematics
Grade 4 Unit 3

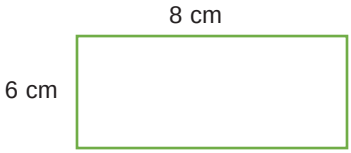
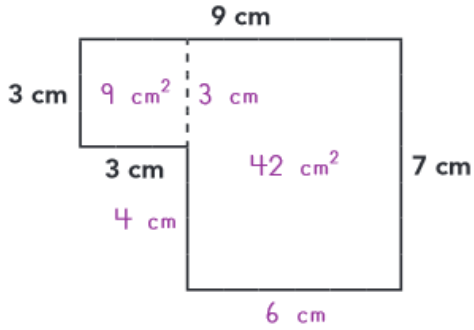
Multi-Digit Multiplication & Early Division

In this unit your child will:

- Multiply by 10, 100, and 1,000
- Multiply 2-digit numbers
- Represent multiplication with arrays and ratio tables
- Divide with and without remainders
- Solve multiplication and division story problems
- Calculate the area and perimeter of rectangles

Your child will learn and practice these skills by solving problems like those shown below. Keep this sheet for reference when you're helping with homework. Use the free Math Vocabulary Cards app for additional support: mathlearningcenter.org/apps.

PROBLEM	COMMENTS
	Students multiply by 10, 100, and 1,000. Using the array helps them see, for example, that 8 × 10 = 80 or 8 tens. They also solve problems involving centimeters and meters, as well as dimes. These models illustrate the place value shifts that occur when multiplying by powers of 10.
 $12 \times 14 = 168$ $10 \times 10 = 100$ $10 \times 2 = 20$ $10 \times 4 = 40$ $2 \times 4 = 8$ $100 + 60 + 8 = 168$ 12 × 14 = 48 + 120 = 168	Students use the array to model multiplication of larger numbers. The array model makes visible the partial products that are an important part of the standard algorithm for multiplication and of many other multiplication strategies. Students will use this model for division as well.
Use a ratio table to find the product. $32 \times 16 = 512$ 1 | 32 10 | 320 5 | 160 16 | 512 320 + 160 + 32 = 512	Students use ratio tables to solve multiplication problems. In the ratio table in this example, each number at left is multiplied by 32 to produce the number at right. Students working with the ratio table use what they know to calculate products they don't know. In this case, the student easily calculated both 10 × 32 and 5 × 32 (half of 320) and added the partial products (10 × 32, 5 × 32, and 1 × 32) to find the product of 16 and 32. Students will use ratio tables to divide multi-digit numbers as well.

PROBLEM	COMMENTS
Fill in the blanks to complete the equation. $70 \times 6 = 7 \times \underline{10} \times 6$	Students complete equations by determining what number is missing. We expect that instead of completing all the calculations, students will look at the relationships among the numbers. In this example, we want students to see that 70 is the product of 7 and 10 and then determine that 10 is the missing number. This kind of reasoning is important for computational fluency and for success in algebra.
Find the area and perimeter of this rectangle. Include the units.  area: $\underline{48\ cm^2}$ perimeter: $\underline{28\ cm}$	In this unit, students practice calculating area and perimeter. What they tend to find challenging is remembering the difference between the two. Area is the total number of square units that can cover a shape, while perimeter is the total number of linear units around the shape. They can calculate the area of a rectangle by multiplying the side lengths. They can calculate the perimeter of a rectangle by adding the side lengths. As you will see, however, students are not always working with simple rectangles. The more complicated shapes they encounter later in the unit will require them to apply their understanding of both area and perimeter in flexible ways.
 	Students find the area and perimeter of a variety of rectilinear shapes. A rectilinear shape can be decomposed into rectangles. The student in this example decomposed the shape into a 3-by-3 cm square and a 6-by-7 cm rectangle. Another student might have thought about a 7-by-9 cm rectangle with a 3-by-4 cm rectangle cut out of it. Students use their understanding of and ability to calculate area and perimeter to solve problems like this one. They also use what they understand about rectilinear shapes to determine the missing side lengths: one is 6 cm, because 3 cm + 6 cm = 9 cm, and the other is 4 cm, because 3 cm + 4 cm = 7 cm.
Mr. Flores bought a rug for his classroom. One side is 5 feet long. The total area of the rug is 45 square feet. What is the perimeter of the rug?  5 x 9 = 45, so the other side must be 9 ft. 9 + 9 + 5 + 5 18 + 10 28 ft. The perimeter is 28 ft.	When solving problems like this one, students use what they know about the relationships among a rectangle's dimensions, area, and perimeter. They also use algebraic thinking skills. For example, they determine they must first find the unknown dimension and then work from there to calculate the perimeter.

FREQUENTLY ASKED QUESTIONS ABOUT UNIT 3

Q: Why do students use arrays and ratio tables to solve multiplication problems?

A: Using arrays and ratio tables helps students see why different strategies, including the standard algorithm, work. The array also shows why multiplying two 2-digit numbers yields an answer that is so much bigger than the two original numbers. This understanding, along with mastery of basic facts and a good sense of place value, ensures that students carry out the calculations accurately, efficiently, and with understanding.

In addition to using arrays and ratio tables, students will learn and practice the standard algorithm for multiplication in grade 5. The standard algorithm is a reliable, efficient, and elegant way to multiply multi-digit numbers. It also works every time, no matter what pair of numbers you're multiplying, as long as it is performed correctly. Problems arise when students attempt to use the algorithm without having mastered the basic multiplication facts, when they don't understand why the algorithm works, when they forget the steps, and when they can carry out the steps yet are unable to use their estimation skills to judge whether their final answer is reasonable. The work students do in grade 4 will help them avoid these potential pitfalls.

Q: The homework includes problems that ask students to write equations but not find answers. Why?

A: When students are asked to write an expression or equation to represent a situation—or to select the expression that best represents the situation—they focus on the relationships among the numbers and the actions in the situation. The relationships and actions suggest one operation rather than another and help students answer questions like, "Is this a multiplication problem or a division problem?" This kind of thinking helps students develop a deeper understanding of what it means to multiply, divide, add, and subtract.