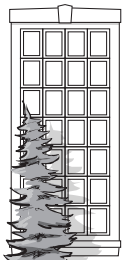
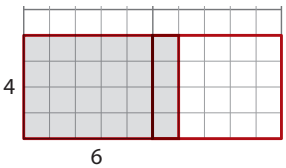
Bridges in Mathematics
Grade 3 Unit 2

Introduction to Multiplication

In this unit your child will:

- Solve story problems involving multiplication
- Represent problems involving multiplication using skip counting, number lines, arrays, and ratio tables
- Develop efficient strategies for multiplication facts through 10 × 10

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
How many stamps are there? What is the total cost of these stamps?  *"Two rows of 4 is 8 stamps in all."* *"If each stamp is 2¢, the 8 stamps together cost 16¢."* *"I counted by 2 to find the total cost: 2, 4, 6, 8, 10, 12, 14, 16 cents."*	Students solve problems that invite them to use helpful models, like the array or the number line, for multiplication. For example, early in the unit, they solve problems about sheets of stamps. They calculate the total number of stamps in an arrangement of equal rows and columns that is called an array. The array model invites students to skip-count and recognize equal groups.
How many panes are in this window, including the ones hidden behind the tree? 	A little later in the unit, students solve problems in which arrays of objects—like windowpanes or walls of mailboxes—are partially hidden. This encourages students to visualize how many are hidden and think in terms of multiples. By making it impossible for students to count the objects one by one, such problems make it necessary for students to multiply.
4 × 6 = ___  4 × 6 = (4 × 5) + (4 × 1) = 20 + 4 = 24	Students spend time developing ways to multiply by each number from 1 to 10. For example, they can multiply any number by 6 by first multiplying that number by 5 and by 1 and then adding (as shown for 4 × 6 at left). They might also multiply the number by 3 and then double the result. Eventually, students will likely recall from memory that 4 × 6 = 24, but they can quickly calculate the product of 6 and any number using these strategies. The array model provides a visual justification for why such strategies work.

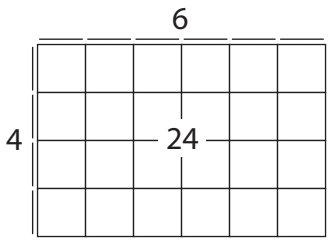
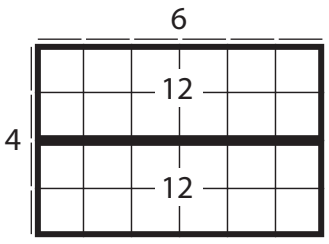
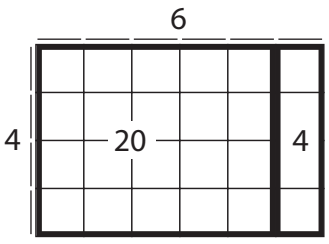
PROBLEM	COMMENTS
There are 6 dog treats in each bag. How many dog treats are in 7 bags? Bags | Treats 1 | 6 2 | 12 3 | 18 4 | 24 5 | 30 6 | 36 7 | 42	Students also solve problems with a ratio table. In the problem at left, there is a constant ratio of 6 treats per 1 bag. The ratio table for this problem shows the number of treats for different numbers of bags. For example, to determine how many treats are in 7 bags, they can simply count by 6 seven times. To determine how many treats are in 14 bags, they might simply double 42: if you double the number of bags, you also double the number of treats. Students will continue to use ratio tables as they multiply larger numbers.

FREQUENTLY ASKED QUESTIONS ABOUT UNIT 2

Q: Why does this unit emphasize the array model so much?

A: We do not expect students to use pictures of rectangles to calculate forever. However, the pictures illustrate relationships among numbers and show why certain properties of operations make sense and why certain strategies work. The understandings these models help to develop are the foundations of students' computational skills.

In the array model, the dimensions (length and width) of the rectangle represent the two numbers being multiplied. The total area of the rectangle represents the product of those two numbers. When multiplication problems are represented this way, it is easy for students to see the relationships among the numbers and to see why a variety of strategies for finding the total area (product) make sense.

The Array Model	One Way to Find the Product	Another Way to Find the Product
 Here 4 and 6 are the dimensions (numbers being multiplied). Tthe area (product) is 24.	 This model shows 2 groups of 12 in the array. $4 \times 6 = 2 \times 6 + 2 \times 6$ $12 + 12 = 24$	 This model shows a group of 20 and 1 more group of 4. $4 \times 6 = 4 \times 5 + 4 \times 1$ $20 + 4 = 24$

Q: Why do students solve multiplication problems with different strategies instead of memorizing the facts?

A: Students are expected to recall basic multiplication facts from memory by the end of third grade. Strategies allow them to quickly compute the answers when needed. The strategies also build students' understandings of the properties of multiplication and permit them to calculate mentally with larger numbers.