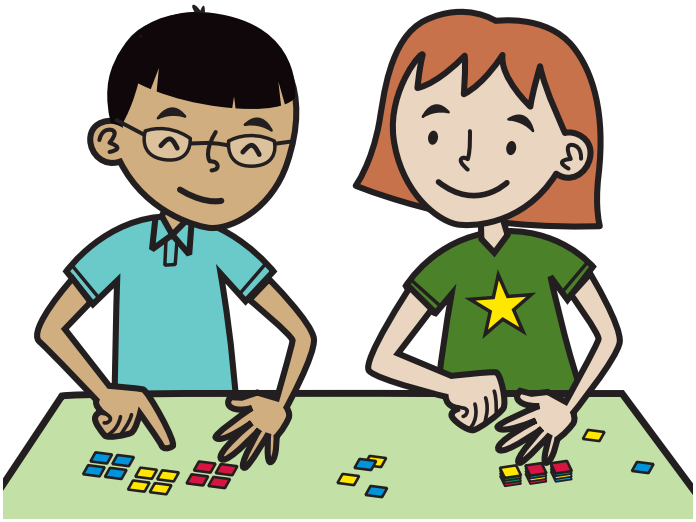
Bridges in Mathematics
Grade 3 Unit 5

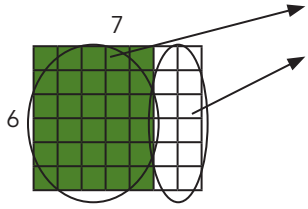
Multiplication, Division & Area



In this unit your child will:

- Solve multiplication and division problems
- Calculate the area of rectangles
- Use rectangular arrays to model and solve multiplication and division problems

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
Franklin and his cousin Maya are counting their stickers. Maya has 23 stickers. If Franklin had 5 more stickers, he would have double the number of stickers Maya has. How many stickers does Franklin have? 23 + 23 = 46. If he had 5 more, he would have 46. That means right now he has 41 because 46 − 5 = 41.	Problems like this challenge students to use multiple steps, different operations, and logical reasoning. They need to think carefully about the relationships among the numbers in the problem and compute with precision.
Write an equal (=), greater than (>), or less than (<) sign to complete the mathematical statement. 6 × 8 ___ 3 × 12	Students might simplify each side to demonstrate that 48 (6 × 8) is greater than 36 (3 × 12). They might also recognize that since 3 is half of 6, we would have to multiply 3 by 16 (double 8) to get a product equal to 6 × 8. Since 12 < 16, 3 × 12 must be less than 6 × 8.
Shade in 1/4 of the circles. 	When students consider fractions as part of a set ($\frac{1}{4}$ of a set of 24), their understanding of fractions and division come together. In this case, students divide 24 by 4 to find that $\frac{1}{4}$ of 24 is equal to 6. They can also use the structure of the array to see 1 of 4 equal parts (1 of 4 equal rows in this example).
Label the dimensions of the array. Then find the total area. Write an equation that shows the dimensions and area.  6 × 5 = 30 6 × 2 = 12 30 + 12 = 42 6 × 7 = 42	Arrays are a useful way to represent multiplication. 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. In this example, the student broke the array (the problem 6 × 7) into smaller parts that made it easier to solve.

FREQUENTLY ASKED QUESTIONS ABOUT UNIT 5

Q: Why do the homework questions talk about, for example, Doubles facts instead of just saying, "Multiply by 2?"

A: We expect students to recall basic multiplication facts from memory by the end of third grade. Strategies help students quickly compute the answers, and some strategies also make it possible for them to calculate mentally with larger numbers. We have categorized the multiplication facts from 0 × 0 to 10 × 10 and assigned each category a name that suggests the strategy used to solve them. This table shows all of those categories.

CATEGORIES BASED ON THE ZERO AND IDENTITY PROPERTIES OF MULTIPLICATION	
Zero facts (× 0) $n \times 0 = 0$ The product of any number and 0 is 0.	$7 \times 0 = 0$ $0 \times 4 = 0$
Ones facts (× 1) $n \times 1 = n$ The product of any number and 1 is that number.	$6 \times 1 = 6$ $1 \times 2 = 2$
DOUBLES AND RELATED FACTS	
Doubles facts (× 2) To multiply by 2, double the other number. This isn't a strategy so much as a category of facts that tend to come more easily for students.	$7 \times 2 = 14$ $2 \times 3 = 6$
Doubles Plus One Set facts (× 3) $3 \times n = (2 + 1) \times n = 2 \times n + 1 \times n = 2 \times n + n$ To multiply by 3, double the number then add that number one time.	$3 \times 4 = (2 \times 4) + 4 = 12$ $3 \times 7 = (2 \times 7) + 7 = 21$
Double-Doubles facts (× 4) $4 \times n = (2 \times 2) \times n = 2 \times (2 \times n)$ To multiply any number by 4, double it, and then double the result.	$4 \times 7 = 2 \times (2 \times 7) = 2 \times 14 = 28$ $4 \times 6 = 2 \times (2 \times 6) = 2 \times 12 = 24$
Double-Double-Doubles facts (× 8) $8 \times n = 2 \times 2 \times 2 \times n = ((2 \times n) \times 2) \times 2$ To multiply any number by 8, double it, double the result, and then double that result one last time.	$8 \times 5 = ((2 \times 5) \times 2) \times 2 =$ $((10 \times 2) \times 2) = 20 \times 2 = 40$ $8 \times 9 = ((2 \times 9) \times 2) \times 2 =$ $(18 \times 2) \times 2 = 36 \times 2 = 72$
TENS AND RELATED FACTS	
Tens facts (× 10) This category of facts comes easily to students because of our base ten place value system.	$10 \times 5 = 50$ $8 \times 10 = 80$
Half-Tens facts (× 5) $5 \times n = 10 \times 1/2 \times n = (10 \times n) \times 1/2 = (10 \times n) \div 2$ or $5 \times n = 10 \times 1/2 \times n = 10 \times (n \times 1/2) = 10 \times (n \div 2)$ To multiply any number by 5, multiply the number by 10 and then divide the result in half. Or, divide the number in half and then multiply by 10.	$5 \times 7 = (10 \times 7) \div 2 = 70 \div 2 = 35$ or $5 \times 7 = 10 \times (7 \div 2) = 10 \times 3.5 = 35$ $5 \times 8 = (10 \times 8) \div 2 = 80 \div 2 = 40$ or $5 \times 8 = 10 \times (8 \div 2) = 10 \times 4 = 40$
Half-Tens Plus One Set facts (× 6) $6 \times n = (5 + 1) \times n = 5 \times n + 1 \times n = 10 \div 2 \times n + 1 \times n = (10 \times n) \div 2 + n$ To multiply any number by 6, carry out the procedure for multiplying the number by 5 and then add the number to the result.	$6 \times 7 = ((10 \times 7) \div 2) + 7 =$ $(70 \div 2) + 7 = 35 + 7 = 42$ $6 \times 9 = ((10 \times 9) \div 2) + 9 =$ $(90 \div 2) + 9 = 45 + 9 = 54$
Tens Minus One Set facts (× 9) $9 \times n = (10 - 1) \times n = 10 \times n - 1 \times n = 10 \times n - n$ To multiply any number by 9, multiply it first by 10 and then subtract the number from the result.	$9 \times 7 = 10 \times 7 - 7 = 70 - 7 = 63$ $9 \times 9 = 10 \times 9 - 9 = 90 - 9 = 81$