# Unit 6 Family Support Materials

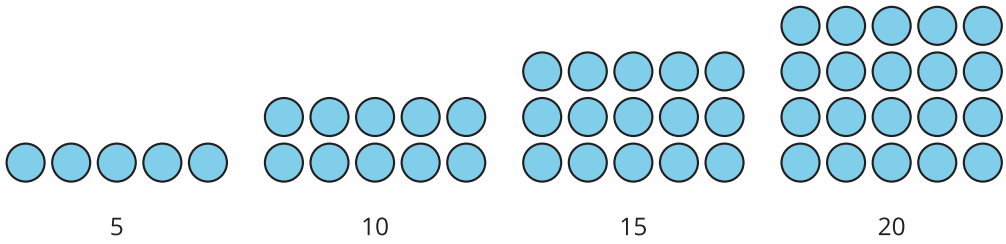
# Multiplying and Dividing Multi-digit Numbers

In this unit, students deepen their understanding of multiplication and division and expand their ability to perform these operations on multi-digit numbers.

## Section A: Features of Patterns

In this section, students generate and analyze patterns that follow a given rule. They notice features (such as odd and even digits) and describe ideas related to multiplication (such as factors, multiples, and doubles). They use these features to predict future terms in a pattern sequence. To make predictions, students use their understanding of operations and place value.

*Rule: Start with 5, keep adding 5.*

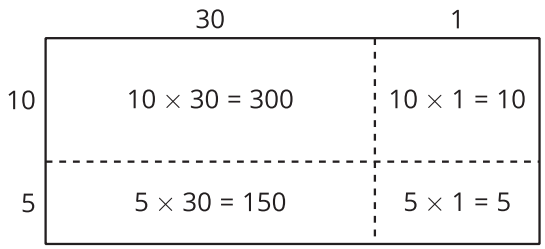



## Section B: Multi-digit Multiplication

In this section, students multiply one-digit numbers and numbers up to four digits, and pairs of two-digit numbers. They learn to use increasingly more efficient methods to multiply.

Students begin by using visual representations—arrays, base-ten diagrams, and grids—to help them find products. They recall that rectangles can be used to represent multiplication, with the side lengths representing the factors and the area representing the product.

Students see that it helps to decompose (break apart) the factors by place value. For example, to multiply 31 and 15, we can think of the 31 as $30 + 1$ and the 15 as $10 + 5$. We can then label these values on a diagram, multiply the parts separately, and add the partial products.




$$300 + 150 + 10 + 5 = 465$$

$$\begin{array}{rrr|l} & 3 & 1 & \\ \times & & 1 & 5 \\ \hline & & & 5 & 5 \times 1 \\ & 1 & 5 & 0 & 5 \times 30 \\ & & 1 & 0 & 10 \times 1 \\ + & 3 & 0 & 0 & 10 \times 30 \\ \hline & 4 & 6 & 5 & \end{array}$$

Later, students use an algorithm that lists partial products vertically. This work prepares them to make sense of the standard algorithm for multiplication, to be studied closely in grade 5.

## Section C: Multi-digit Division

In this section, students divide greater numbers (up to four digits), explore new division strategies, and interpret division situations that involve remainders.

Students begin by solving various problems that involve division, including those about equal groups and areas of rectangles. They recall that a division expression such as $96 \div 8$, can be used to find the number of groups of the divisor, 8, that are in the dividend, 96, or to find the size of a group if the dividend, 96, is split by the divisor into 8 equal groups.

Students see that just as they can multiply two numbers by decomposing the factors and finding partial products, they can divide by decomposing the dividend (the number being divided) and finding partial quotients. Thinking about place value can help us as well.

Students then learn to organize partial quotients, using equations and an algorithm that records division vertically.

$$\begin{aligned} 400 \div 5 &= 80 \\ 60 \div 5 &= 12 \\ 5 \div 5 &= 1 \\ \hline 465 \div 5 &= 93 \end{aligned}$$

$$\begin{array}{rl} \boxed{93} & \\ 1 & \\ 12 & \\ 80 & \\ 5\overline{)465} & \\ -\ 400 & 5 \times 80 \\ \hline 65 & \\ -\ 60 & 5 \times 12 \\ \hline 5 & \\ -\ 5 & 5 \times 1 \\ \hline 0 & \end{array}$$

## Section D: Let's Put It To Work: Problem Solving with Large Numbers

Students solve a variety of problems that involve all four operations (addition, subtraction, multiplication, and division) on multi-digit numbers. The problems can be approached in

many ways, allowing students to choose their methods and representations strategically. Many of the problems also involve multiple steps.

## Try it at home!

Near the end of the unit, ask your fourth grader to solve the following problems:

- $16 \times 48$
- $324 \div 6$

Questions that may be helpful as they work:

- Can you draw a diagram to help you solve the problem?
- Can you explain the steps of your algorithm?

Solution:

- $16 \times 48 = 768$
- $324 \div 6 = 54$

Sample responses:

- A diagram similar to the one shown above can be used to solve the multiplication expression.
- First, I divided 300 by 6 to get 50. Then I divided 24 by 6 to get 4. Then I added 50 and 4 to get a quotient of 54.