Foundations of Multiplication and Division

Module 6 lays the conceptual foundation for multiplication and division in Grade 3 and the idea that numbers other than 1, 10, and 100 can serve as units.

Students learn to make equal groups, moving from concrete work with objects to more abstract pictorial representations. Finally, they learn about even and odd numbers.

We are learning to make equal groups!

Moving from concrete objects to more abstract representations of equal groups

What Came Before this Module:
Students extended their work with addition and subtraction algorithms to numbers up to 1,000. They also worked with word problems with numbers up to 100.

What Comes After this Module:
In Module 7, students work on their addition and subtraction skills using units for length, as well as money. They also collect and represent data in various ways, including bar graphs, picture graphs, and line plots.

New Terms in this Module:

Array—arrangement of objects in rows and columns

Columns—the vertical groups in a rectangular array

Even number—a whole number whose last digit is 0, 2, 4, 6, or 8

Odd number—a number that is not even
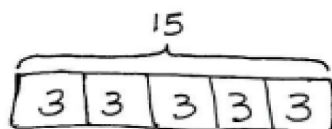
Repeated addition—e.g., 2 + 2 + 2

Rows—the horizontal groups in a rectangular array

Tessellation—tiling of a plane using one or more geometric shapes with no overlaps and no gaps

Whole number—e.g., 0, 1, 2, 3,…

Familiar Terms:
Addend	Double
Equation	Pair
Rectangle	Skip Counting
Square	Sum
Tape Diagram	Total

+ How You Can Help at Home:

- Using any number of small objects, challenge your student to sort them into equal groups.

- Practice skip-counting by 2s. This will help as students work with odd and even numbers in this module.

Key Common Core Standards:

- *Work with equal groups of objects to gain foundations for multiplication.*
  - Determine whether a group of objects (up to 20) has an odd or even number of members; write an equation to express an even number as a sum of two equal addends.
  - Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns.
- *Reason with shapes and their attributes.*
  - Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
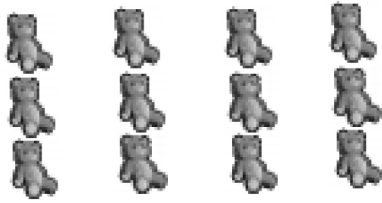
Two different arrays of teddy bears: Above, we see 3 rows with 4 in each row. To the right, we see 4 rows with three in each row. Students will build these arrays and understand that both equal a total of 12 and why that is so.

Spotlight on Math Strategies:

Arrays

Students will use this model in Module 6 of *A Story of Units,* as well as throughout their elementary years.

A *Story of Units* has several key mathematical "models" that will be used throughout a student's elementary years.

An array is an arrangement of objects organized into equal groups in rows and columns. Arrays help make counting easy. Students are reminded in this module that counting by equal groups is more efficient than counting objects one by one. This module focuses on establishing a strong connection between the array and repeated addition (e.g., 3 rows of 4 can be expressed as 4 + 4 + 4 = 12). Beginning in kindergarten, arrays are used as students organize objects into groups to make 10. Now, in Grade 2, we introduce the idea that equal groups can be made of numbers other than 1, 10, or 100.

In Module 6, students build arrays and then use them to write equations showing the repeated addition represented by the array. This lays important groundwork for understanding multiplication as repeated addition in Grade 3. As students progress through their elementary years, arrays will be frequently used to reinforce the relationship between multiplication and division.

Sample Problem from Module 6:

Redraw the following sets of dots as columns of two or as two equal rows.

(This problem shows how students will be learning about odd and even numbers in Module 6.)

Sample taken from Module 6, Lesson 18

a.

There are _____ dots.

Is _____ an even number? _____

b.

There are _____ dots.

Is _____ an even number? _____