

# GRADE 3 • MODULE 1

## Properties of Multiplication and Division and Solving Problems with Units of 2–5 and 10

This module covers:

### Topic A: Multiplication and the Meaning of the Factors

This module begins the year by building on students' fluency with addition and knowledge of arrays. Topic A initially uses repeated addition to find the total from a number of equal groups. As students notice patterns, they let go of longer addition sentences in favor of more efficient multiplication facts. Students understand familiar repeated addition from Grade 2 in the form of array models, which become a cornerstone of the module. Students use the language of multiplication as they understand what factors are and differentiate between the size of groups and the number of groups within a given context.

### Topic B: Division as an Unknown Factor Problem

Students understand division as an unknown factor problem, and relate the meaning of unknown factors to either the number or the size of groups. By the end of Topic B students are aware of a connection between multiplication and division.

### Topic C: Analyze Arrays to Multiply Using Units of 2 and 3

In Topic C, students use the array model and familiar skip-counting strategies to solidify their understanding of multiplication and practice related facts of 2 and 3. They become fluent enough with arithmetic patterns to “add” or “subtract” groups from known products to solve more complex multiplication. They apply their skills to word problems using drawings and equations with a symbol to find the unknown factor. This culminates in students using arrays to model the distributive property as they decompose units to multiply.

### Topic D: Division Using Units of 2 and 3

In Topic D students model, write and solve partitive and measurement division problems with 2 and 3. Consistent skip-counting strategies and the continued use of array models are pathways for students to naturally relate multiplication and division. Modeling advances as students use tape diagrams to represent multiplication and division.

### Topic E: Multiplication and Division Using Units of 4

Topic E shifts students from simple understanding to analyzing the relationship between multiplication and division. Practice of both operations is combined. Skip-counting, the distributive property, arrays, number bonds and tape diagrams are tools for both operations. A final lesson invites students to explore their work with arrays and related facts through the lens of the commutative property as it relates to multiplication

### Topic F: Distributive Property and Problem Solving Using Units of 2–5 and 10

Topic F introduces the factors 5 and 10. Students apply the multiplication and division strategies they have used to mixed practice with all of the factors included in Module 1. Students model relationships between factors, analyzing the arithmetic patterns that emerge to compose and decompose numbers as they further explore the relationship between multiplication and division. In the final lesson of the module, students apply the tools, representations, and concepts they have learned to problem-solving with multi-step word problems using all four operations.

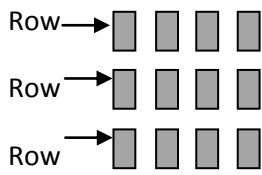
## Vocabulary

### New or Recently Introduced Terms

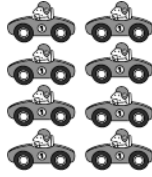
- Array (a set of numbers or objects that follow a specific pattern, a matrix)
- Column (e.g., in an array)
- Commutative Property/Commutative (e.g., rotate a rectangular array 90 degrees to demonstrate that factors in a multiplication sentence can switch places)
- Equal groups (with reference to multiplication and division; one factor is the number of objects in a group and the other is a multiplier that indicates the number of groups)
- Equation (a statement that 2 expressions are equal. E.g.,  $3 \times 4 = 12$ )
- Distribute (with reference to the Distributive Property; e.g. In  $12 \times 3 = (10 \times 3) + (2 \times 3)$  the 3 is multiplier for each part of the decomposition)
- Divide/division (partitioning a total into equal groups to show how many equal groups add up to a specific number. E.g.,  $15 \div 5 = 3$ )
- Fact (used to refer to multiplication facts, e.g.,  $3 \times 2$ )
- Factors (i.e., numbers that are multiplied to obtain a product)
- Multiplication/multiply (an operation showing how many times a number is added to itself e.g.,  $5 \times 3 = 15$ )
- Number of groups (factor in a multiplication problem that refers to the total equal groups)
- Parentheses (e.g., ( ) used around a fact or numbers within an equation)
- Quotient (the answer when one number is divided by another)
- Rotate (turn, used with reference to turning arrays 90 degrees)
- Row/column (in reference to rectangular arrays)
- Size of groups (factor in a multiplication problem that refers to how many in a group)
- Unit (i.e., one segment of a partitioned tape diagram)
- Unknown (i.e., the “missing” factor or quantity in multiplication or division)
- Add 1 unit, subtract 1 unit (add or subtract a single unit of two, ten, etc.)
- Number bond (shows part-part-whole relationship)
- Number sentence (similar to an equation, but not necessarily having equal sides.)
- Ones, twos, threes, etc. (units of one, two, or three)
- Repeated addition (adding equal groups together, e.g.,  $2 + 2 + 2 + 2$ )
- Tape Diagram (a method for modeling problems)
- Value (how much)

## Suggested Tools and Representations

**Array** – An array is an arrangement of objects in a regular pattern, usually in rows and columns.



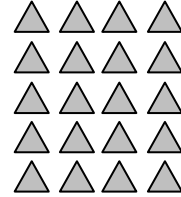
$$3 \times 4 = 12$$



$$4 \times 2 = 8$$



$$2 \times 4 = 8$$



$$4 \times 4 = 16$$

Here is a video about arrays: <http://commoncore.org/maps/math/video-gallery/array-patterns>

### Math Properties in this module:

The Distributive Property shown in an array model

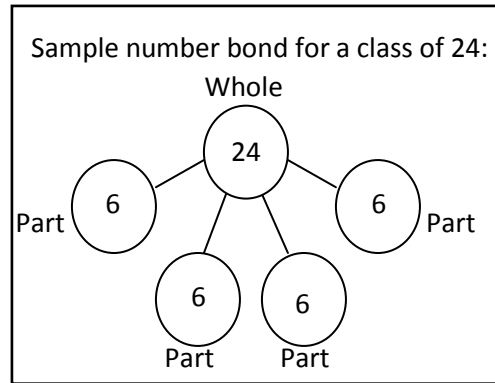
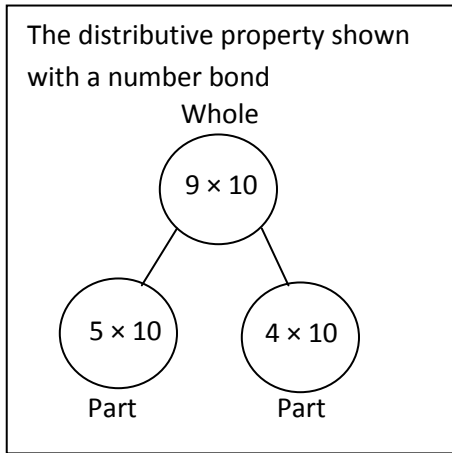
$6 \times 4 = \underline{\quad}$

$(6 \times 4) = (5 \times 4) + (1 \times 4)$   
 $= 20 + 4$

The Commutative Property shown in an array model

$3 \times 5 = 5 \times 3$

**Number Bond - A number bond shows a part-part-whole relationship**

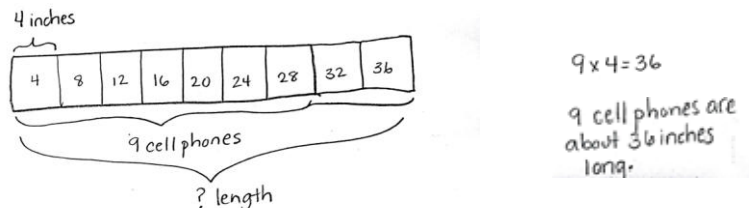


Here is a video about number bonds, number paths and number towers: <http://commoncore.org/maps/math/video-gallery/numbers-through-10-number-towers-number-path-number-bond>

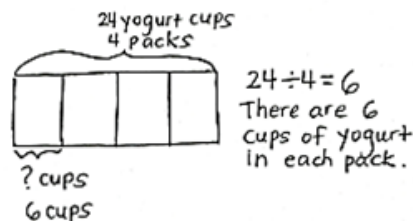
Here is a video about number bonds and multiplication: <http://commoncore.org/maps/math/video-gallery/number-bond-multiplication>

**Tape Diagram – A tape diagram is a method for modeling problems with parts and wholes.**

A cell phone is about 4 inches long. About how long are 9 cell phones laid end to end?



Mrs. Peacock bought 4 packs of yogurt. She had exactly enough to give each of her 24 students 1 yogurt cup. How many yogurt cups are there in 1 pack?



Here is a video about Tape Diagrams: <http://commoncore.org/maps/math/video-gallery/solving-word-problems-with-tape-diagrams>

For an online modeling tool, interactive problems for students to try and free apps:

<http://www.mathplayground.com/thinkingblocks.html>