

Models for Multiplication

READ: Multiplication and Division of Whole Numbers (pp. 120-124)

Repeated addition model

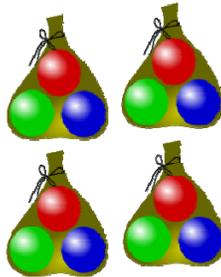
This model builds on previous knowledge of addition and skip counting.

EXAMPLE: repeated addition for 5×3 (five groups of 3) $\rightarrow 3 + 3 + 3 + 3 + 3 = 15$

EXAMPLE: skip counting to find 3×6 (three groups of 6) $\rightarrow 6, 12, 18$

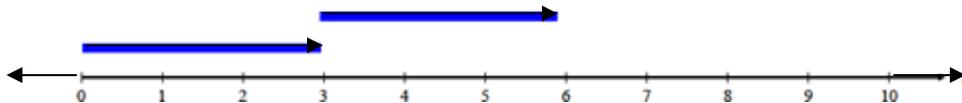
Set model

This model uses sets of objects (the same number in each set) to model multiplication. The following graphic demonstrates four sets (groups) of three, or $4 \times 3 = 12$.



Number line model

This model uses the number line to show repeated distances. The example below demonstrates $2 \times 3 = 6$ or two groups of three (two jumps that are +3 units long). This is an important way to show the measurement model for multiplication.



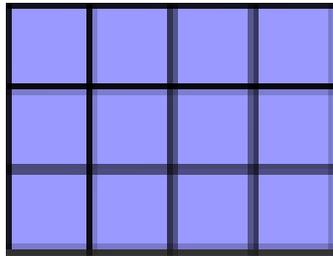
Array model

This model uses the arrangement of a series of objects to organize them into rows and columns. This example shows $2 \times 7 = 14$, or two rows (groups) of 7. Notice that the area model is an ordered pattern of rows and columns (kind of like a marching band).



Area model

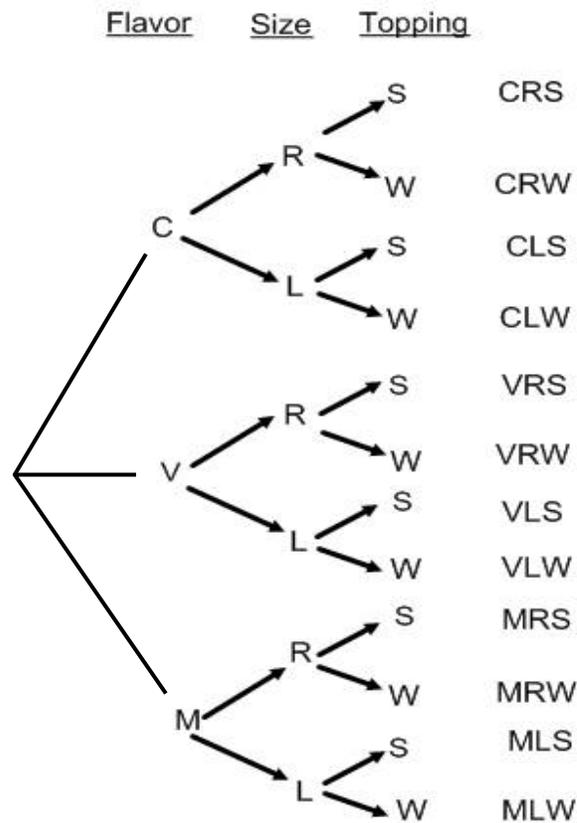
This model uses a grid to show rows and columns, often counting tiles are used. This model is foundational for learning about area in later grades. The example below demonstrates $4 \times 3 = 12$. Notice that the area model uses square tiles or graph paper grid to show the area of a rectangle that measures 3 units high and 4 units wide (see example below). In this case, the square tiles are pushed together to show area. This is an important foundation for later geometric concepts of area and perimeter.



Multiplication tree model

A tree diagram is a great way to show solutions for counting problems. This is foundational knowledge for learning about permutations later. Each “choice” level is shown on the tree. This example looks at all possible arrangements for an ice cream sundae. There are three ice cream flavors, CHOCOLATE, VANILLA, and MANGO. There are two sizes, REGULAR and LARGE. There are two toppings, WHIPPED CREAM and SPRINKLES.

How many different ways can we create a sundae?



Cartesian product model

This multiplication model uses a matching table to show the number of ways two characteristics can happen. For example, a car lot may offer 3 different types of vehicles in 3 different colors. The total number of combinations of color and model would be $3 \times 3 = 9$ vehicles.