

MULTIPLICATION

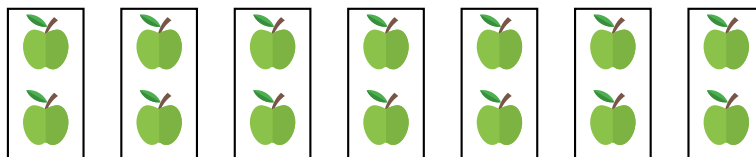
Multiplication is a very important concept in mathematics. It's a way of adding the same number together many times.

A DEFINITIONS

Discover: Louis loves apples and eats exactly 2 apples every day. He never misses a day because he knows how healthy and tasty apples are.



If Louis eats 2 apples every day, how many apples will he eat in one week (7 days)?



Answer: If we want to know how many apples Louis eats in a week (7 days), we add 2 apples for each day:

$$2 + 2 + 2 + 2 + 2 + 2 + 2$$

We find 14 apples. In this chapter, we will introduce multiplication to make it quicker and easier. When we say 7 groups of 2 apples, we can write it as 7×2 . The symbol $\times$ means **multiplied by** or **times**.

$$7 \times 2 = 2 + 2 + 2 + 2 + 2 + 2 + 2$$

Definition Multiplication

Multiplication is the process of repeated addition. When we multiply, we calculate the total by adding a number to itself a specified number of times.

The $\times$ symbol is called the multiplication or times sign, indicating that the numbers should be multiplied together. Multiplication can be represented in several ways:

- Numbers:

$$4 \times 3 = 12$$

- Groups:

$$4 \text{ groups of } 3 = 12$$

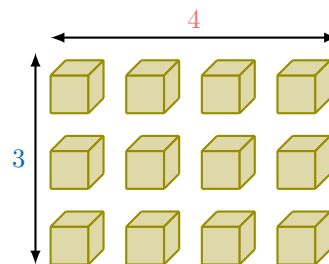
- Repeated addition:

$$3 + 3 + 3 + 3 = 12$$

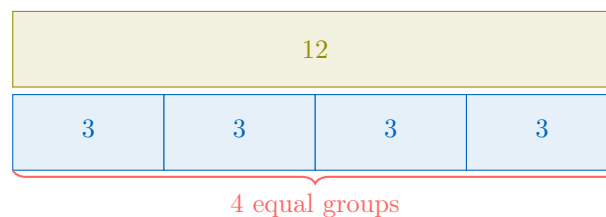
- Words:

four times three equals twelve

- Items:



- Part-whole model:



Ex: Write the repeated addition $5 + 5 + 5$ as a multiplication.

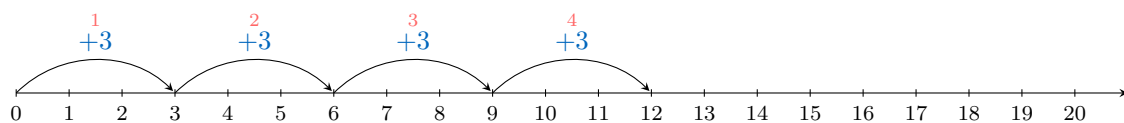
Answer: $5 + 5 + 5 = 3 \times 5$

B IN NUMBER LINE

Discover: Let's consider the multiplication: 4×3 that is

$$3 + 3 + 3 + 3$$

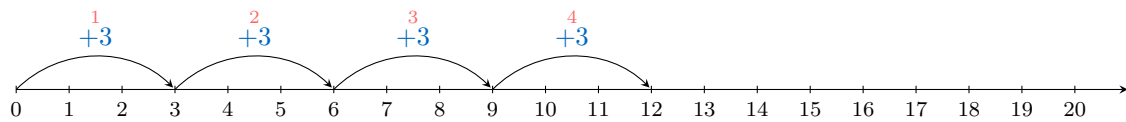
We can visualize this on a number line:



Starting from 0, we move 3 ones to the right 4 times. Each move represents addition: $0 + 3$, $3 + 3$, $6 + 3$, $9 + 3$. As you can see, we end up at 12, which is the result of the multiplication 4×3 .

Method Multiplication in number line

To evaluate 4×3 , we start from 0 and we move 3 ones to the right 4 times.



We end up at 12, which is the result of the multiplication 4×3 .

C REPRESENTATION OF MULTIPLICATION IN WORD PROBLEMS

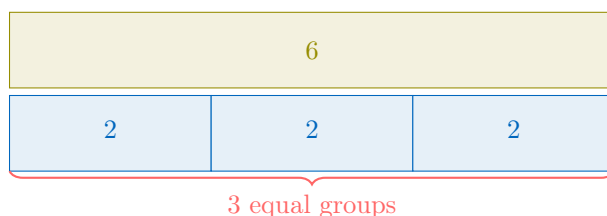
Method Groups of items

When we multiply, we often think about groups and the number of items in each group.

$$\text{number of groups} \times \text{number of items in each group} = \text{total}$$

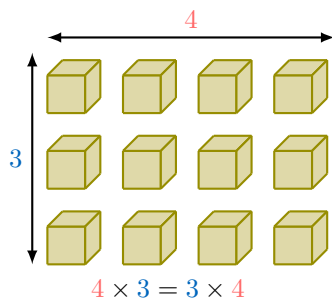
For example, there are 3 bags, and each bag contains 2 apples. The total number of apples is:

$$3 \times 2 = 2 + 2 + 2 \\ = 6$$



D COMMUTATIVE

Proposition Commutative



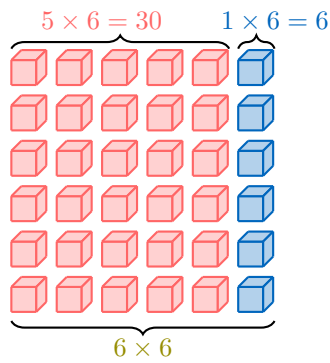
E DISTRIBUTIVE WITH ADDITION

Discover: A child has a collection of colorful cubes for a school project. Each cube is placed in sets of 6 on the table. The child wants to find out how many cubes there are in total for 6 sets.

The child's calculator is not working, but they remember two simple multiplication facts:

- 5 sets have a total of 30 cubes (because $5 \times 6 = 30$).
- 1 set has a total of 6 cubes (because $1 \times 6 = 6$).

But what about 6 sets? How many cubes will there be altogether?



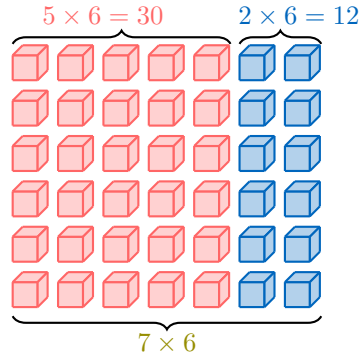
Answer: You can calculate:

$$\begin{aligned} 6 \times 6 &= (5 \times 6) + (1 \times 6) \\ &= 30 + 6 \\ &= 36 \end{aligned}$$

Proposition Distributive with Addition

When multiplying, we can break one of the numbers into smaller parts to make it easier. Then, we multiply each part and add the results. For example:

$$\begin{aligned} 7 \times 6 &= (5 \times 6) + (2 \times 6) \\ &= 30 + 12 \\ &= 42 \end{aligned}$$



Or:

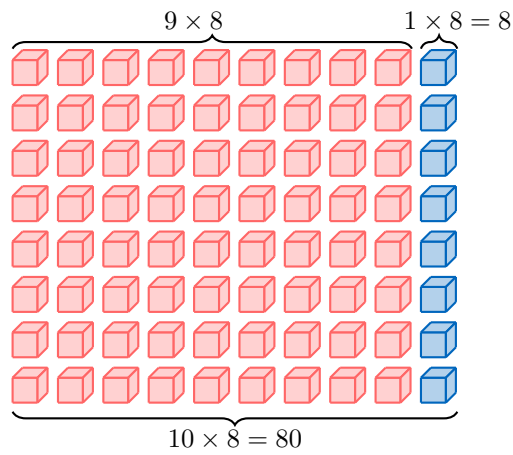
$$\begin{aligned} 6 \times 7 &= (6 \times 5) + (6 \times 2) \\ &= 30 + 12 \\ &= 42 \end{aligned}$$

F DISTRIBUTIVE WITH SUBTRACTION

Discover: A child has a collection of colorful cubes for a school project. This time, the cubes are arranged in groups of 8 on the table. The child wants to find out how many cubes there are in total for 9 groups. The child's calculator still doesn't work, but they remember this multiplication fact:

- 10 groups have a total of 80 cubes (because $10 \times 8 = 80$).

How can the child find the total number of cubes for 9 groups?



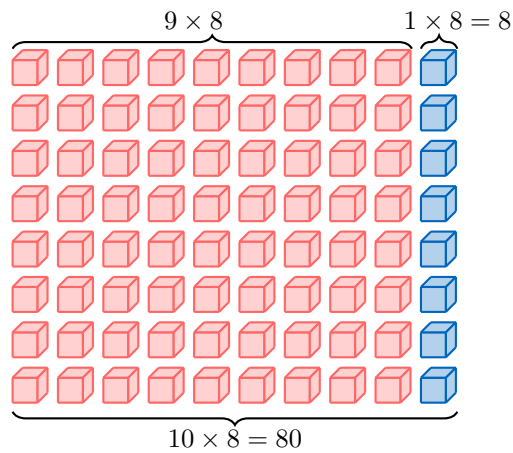
Answer: To find the total, you can calculate:

$$\begin{aligned} 9 \times 8 &= (10 \times 8) - (1 \times 8) \\ &= 80 - 8 \\ &= 72 \end{aligned}$$

Proposition Distributive with Subtraction

When multiplying, you can break numbers apart in a way that makes subtraction easier. For example:

$$\begin{aligned} 9 \times 8 &= (10 \times 8) - (1 \times 8) \\ &= 80 - 8 \\ &= 72 \end{aligned}$$



Or:

$$\begin{aligned} 8 \times 9 &= (8 \times 10) - (8 \times 1) \\ &= 80 - 8 \\ &= 72 \end{aligned}$$