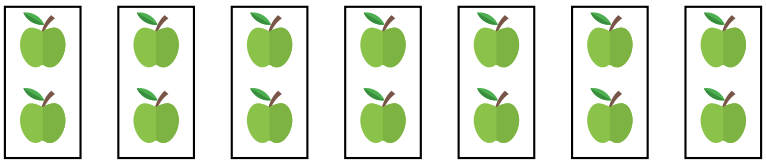
MULTIPLICATION

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**:

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

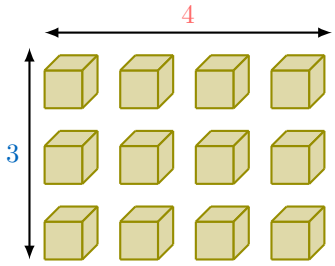
- **Repeated addition**:

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

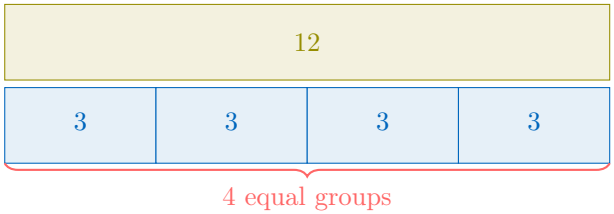
- **Words**:

four times **three** equals **twelve**

- **Items**:



- **Part-whole model**:



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

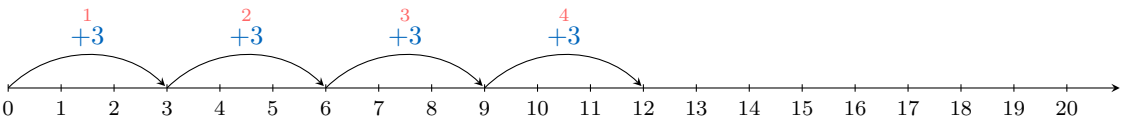
Answer: $5 + 5 + 5 = 3 \times 5$

B IN NUMBER LINE

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

$$3 + 3 + 3 + 3$$

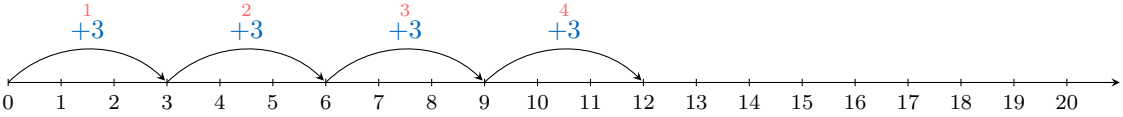
We can visualize this on a number line:



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

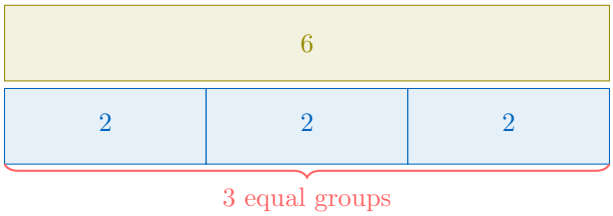
Method **Groups of items**

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

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

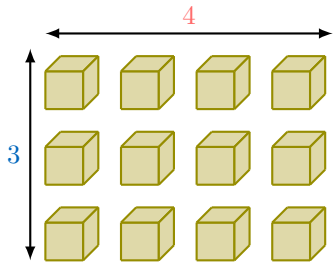
For example, there are 3 bags, and each bag contains 2 apples. The total number of apples is:

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



D COMMUTATIVE

Proposition **Commutative**



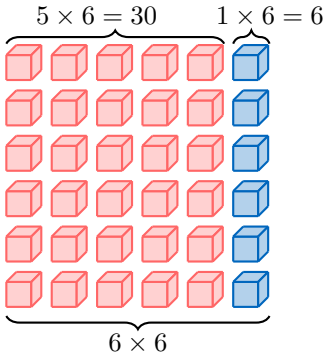
$$4 \times 3 = 3 \times 4$$

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?



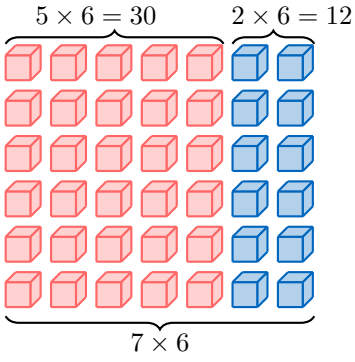
Answer: You can calculate:

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

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:

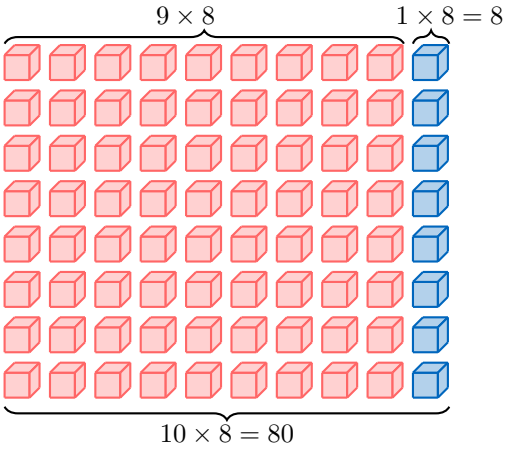
$$\begin{aligned} 6 \times 7 &= (6 \times 5) + (6 \times 2) \\ &= 30 + 12 \\ &= 42 \end{aligned}$$

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?



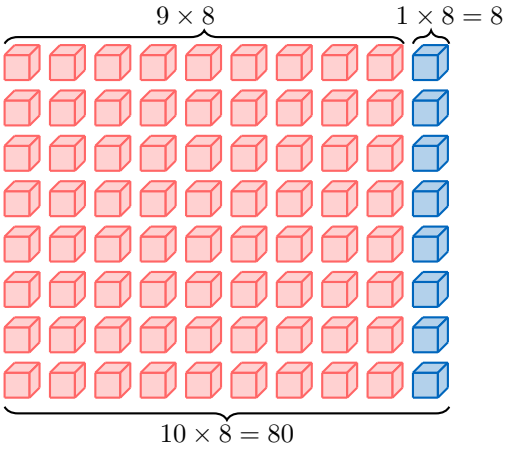
Answer: To find the total, you can calculate:

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

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:

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