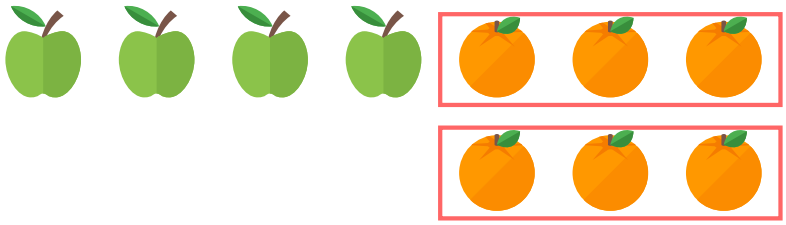
ORDER OF OPERATIONS

In math, we often solve problems that use more than one operation, like addition, subtraction, multiplication, or division. The order in which we do these steps matters. That's why mathematicians made a rule called the **Order of Operations**.

A WHY THE ORDER MATTERS

Discover: Hugo has 4 apples and 2 baskets. Each basket contains 3 oranges.



To find the total number of fruits, Hugo writes the expression:

$$4 + 2 \times 3$$

- His brother Louis calculates it like this: *"I'll do $4 + 2$ first, which is 6. Then I'll multiply by 3. The answer is 18 fruits!"*
- Hugo replies: *"No, you have to do 2×3 first, which is 6. Then you add my 4 apples. The answer is 10 fruits."*

Who is right? How can we be sure?

Answer: Hugo is right! The picture shows 4 apples and a separate group of $2 \times 3 = 6$ oranges, making 10 fruits in total.
To prevent this kind of confusion, the rules of math state that some operations are more powerful than others and must be done first.

Rule: Always do multiplication before addition.

Let's solve $4 + 2 \times 3$ using the correct order:

- **Step 1 (Multiply):** First, find the total number of oranges.

$$2 \times 3 = 6$$

- **Step 2 (Add):** Now, add the apples to that total.

$$4 + 6 = 10$$

Following the Order of Operations gives us the correct answer of 10.

Method **Order of operations**

To evaluate an expression, we follow these steps in order:

1. **Parentheses ()**: Always solve what's inside parentheses first.
2. **Multiplication ($\times$) and Division ($\div$)**: Do them next, working from left to right.
3. **Addition ($+$) and Subtraction (-)**: Do them last, also working from left to right.

Ex: Calculate $4 + 2 \times 3$

Answer: We follow the order:

$$\begin{aligned} 4 + 2 \times 3 &= 4 + 6 \quad \text{(Do the multiplication } 2 \times 3\text{)} \\ &= 10 \quad \text{(Do the addition } 4 + 6\text{)} \end{aligned}$$

B SOLVING PROBLEMS

Method **A Procedure for Solving Word Problems**

To solve a word problem systematically, the following five-step procedure can be applied:

1. **Understand the Goal**: Read the problem carefully to identify the main question and the information provided.

2. **Plan the Steps**: Determine the sequence of mathematical operations required to reach the solution.
3. **Write the Expression**: Translate the planned steps into a single mathematical expression, using parentheses where necessary to ensure the correct order of operations.
4. **Calculate the Solution**: Evaluate the expression to find the numerical answer.
5. **State the Conclusion**: Write a final sentence that directly answers the question asked in the problem.

Ex: Hugo is planning his birthday party and needs to purchase a cake and juice.The items on his list are:

1. **Cakes**: 2 cakes at a cost of $10 each.
2. **Juice**: 4 cans of juice at a cost of $3 each.

Hugo has a budget of $30. Determine if he can afford to purchase all the items.

Answer: We will apply the five-step procedure to solve Hugo's problem.

- **1. Understand the Goal**: We need to calculate the total cost of the cakes and juice, and then compare that total to Hugo's budget of $30.
- **2. Plan the Steps**:
  1. Calculate the cost of the cakes (multiplication).
  2. Calculate the cost of the juice (multiplication).
  3. Add the two costs together to find the total cost (addition).
  4. Compare the total cost to $30.
- **3. Write the Expression**: The total cost can be represented as:

$$(2 \times 10) + (4 \times 3)$$

- **4. Calculate the Solution**:

$$\begin{aligned} \text{Total cost} &= (2 \times 10) + (4 \times 3) \\ &= 20 + 12 \\ &= 32 \end{aligned}$$

- **5. State the Conclusion**: The total cost is $32. Since $32 is greater than $30, Hugo cannot afford to buy everything.