

Grade 5 - Numerical Expressions and Order of Operations - Lesson

Common Core 5.OA.A.1, 5.OA.A.2 · maths-pdf.fr/en/

The order of operations is the set of rules that tells you which part of an expression to calculate first. Work inside parentheses, brackets and braces first, then multiply and divide from left to right, then add and subtract from left to right. Following the same order gives everyone the same answer.

Grade 5 · Common Core State Standards: **5.OA.A.1, 5.OA.A.2**

Key facts

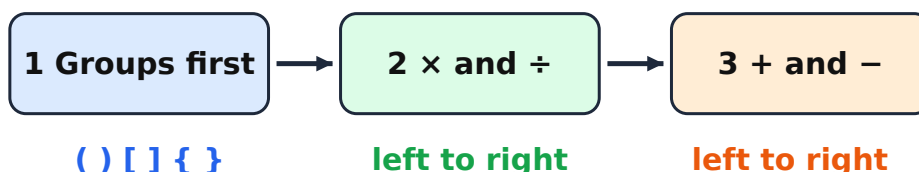
- Do grouping symbols (), [] and { } first, from the inside out.
- Multiplication and division share one level: work left to right.
- Addition and subtraction share one level: work left to right.
- Words like add first, then multiply need parentheses when you write them as an expression.
- An expression like $3 \times (5 + 7)$ is 3 times as large as $5 + 7$.

What is the order of operations?

When an expression has more than one operation, everyone needs the same rule so everyone gets the same answer. That rule is the **order of operations**. It works like the steps of a recipe: follow them in order every time.

Order of operations

1. Do the work inside parentheses (), brackets [] and braces { }. Start with the innermost group.
2. Multiply and divide, working from left to right.
3. Add and subtract, working from left to right.



Always follow the steps in this order.

What do parentheses, brackets and braces do?

Grouping symbols tell you what to do first. When one group sits inside another, we change the symbols to see the groups better: parentheses go inside brackets, and brackets go inside braces. Always work from the inside out.

Compare $3+4\times 2$ and $(3+4)\times 2$. The first one equals 11, because $4\times 2=8$ comes first. The second one equals 14, because the parentheses make you add first.

How do you evaluate an expression step by step?

Evaluate $30-2\times[4+(9-6)]$.

1. Find the innermost group: $9-6=3$. Now the expression is $30-2\times[4+3]$.
2. Finish the brackets: $4+3=7$. Now it is $30-2\times 7$.
3. Multiply: $2\times 7=14$.
4. Subtract: $30-14=16$.

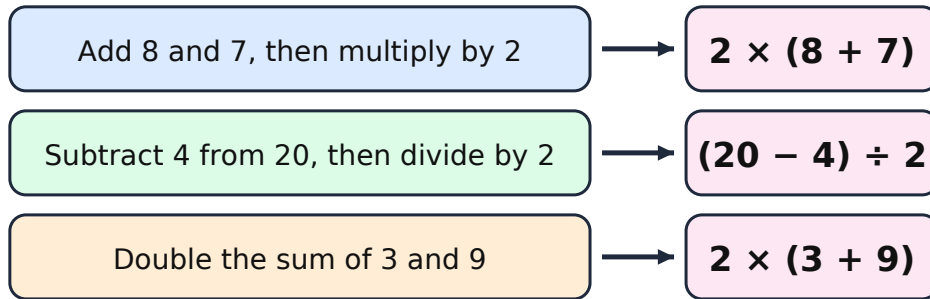
The answer is **16**.

$30 - 2 \times [4 + (9 - 6)]$	start
$30 - 2 \times [4 + 3]$	do $(9 - 6) = 3$
$30 - 2 \times 7$	do $[4 + 3] = 7$
$30 - 14$	multiply $2 \times 7 = 14$
16	subtract $30 - 14$

Each line finishes one step. The answer is 16.

How do you write an expression from words?

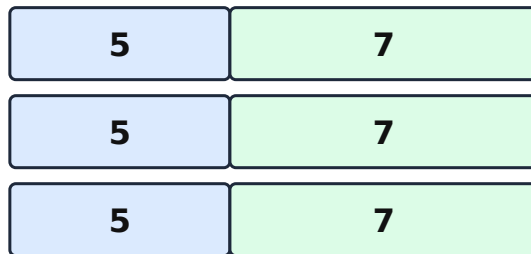
Words like sum, difference, product and then tell you the operations. If the words say add first and multiply second, the addition needs parentheses. You only write the expression. You do not have to find its value.



Words that say do this first become parentheses.

Can you compare an expression without calculating?

Yes. The expression $3 \times (5 + 7)$ means three groups of $5 + 7$. So it is 3 times as large as $5 + 7$, and it is greater. You can know this without multiplying.



Three groups of $5 + 7$ make $3 \times (5 + 7)$, which is 3 times as large as $5 + 7$.

Questions about numerical expressions and order of operations

What does PEMDAS stand for?

PEMDAS stands for Parentheses, Exponents, Multiplication and Division, Addition and Subtraction. In Grade 5 you use grouping symbols first, then multiply and divide, then add and subtract. Exponents are added in later grades.

Do I always multiply before I divide?

No. Multiplication and division are on the same level, so you work from left to right. For example, $24 \div 4 \times 3$ is $6 \times 3 = 18$.

What is the difference between parentheses, brackets and braces?

They do the same job: they tell you what to calculate first. We use different shapes so nested groups are easy to see. Parentheses go inside brackets, and brackets go inside braces.

Do I have to find the answer when I write an expression?

No. An expression like $2 \times (8 + 7)$ is a complete answer when the task says to write it. You only calculate when the task says to evaluate or find the value.

Why are $8 + 2 \times 5$ and $(8 + 2) \times 5$ different?

In the first one you multiply first, so you get $8 + 10 = 18$. In the second one the parentheses make you add first, so you get $10 \times 5 = 50$. Grouping symbols change the order.