

# Grade 5 · Numerical Expressions · Lesson

Common Core 5.OA.A.1, 5.OA.A.2 · mathovore.fr

A numerical expression uses numbers and operations without an equal sign. Grouping symbols (parentheses, brackets, and braces) show which part to calculate first, starting with the innermost pair. For example,  $2 \times (3 + 4)$  means add 3 and 4 to get 7, then multiply by 2 to get 14.

## Grade 5 Common Core: 5.OA.A.1 · 5.OA.A.2

### Key facts:

- Parentheses ( ), brackets [ ], and braces { } are grouping symbols that mean "do this first."
- Work inside the innermost pair first, then multiply and divide, then add and subtract.
- A numerical expression has no equal sign; evaluating it gives one number.
- Phrases such as "the sum of" or "the difference of" name a chunk that needs parentheses.
- You can compare  $3 \times (18 + 5)$  with  $18 + 5$  without calculating: it is 3 times as large.

## What are grouping symbols in a numerical expression?

A numerical expression is a math phrase made of numbers and operations, such as  $8 + 7$  or  $2 \times (8 + 7)$ . It has no equal sign. Grouping symbols tell you which part to calculate first, so they can change the value of an expression.

### Grouping symbols

Three kinds of symbols are used in pairs: **parentheses** ( ), **brackets** [ ], and **braces** { }. When one pair sits inside another, work in the **innermost** pair first and move outward.

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

↓ Step 1: group first

$$2 \times 7$$

↓ Step 2: then multiply

$$2 \times 7 = 14$$

Work inside the parentheses first, then multiply:  $2 \times (3 + 4) = 2 \times 7 = 14$ .

## How do you evaluate an expression with grouping symbols?

Follow the same order every time. Different orders can give different answers, so the order is a rule that everyone shares.

| Order | What to do                              |
|-------|-----------------------------------------|
| 1st   | Grouping symbols, innermost pair first  |
| 2nd   | Multiply and divide, from left to right |
| 3rd   | Add and subtract, from left to right    |

$$30 \div \{ 2 \times [ 1 + ( 6 - 4 ) ] \}$$

  ( ) parentheses    
   [ ] brackets    
   { } braces

Each pair of grouping symbols is a layer. Start with the innermost layer.

Worked method for  $30 \div \{ 2 \times [ 1 + ( 6 - 4 ) ] \}$ :

1. Find the innermost pair:  $(6 - 4)$ . Subtract to get 2.
2. The brackets now hold  $[1 + 2]$ . Add to get 3.
3. The braces now hold  $\{2 \times 3\}$ . Multiply to get 6.
4. Divide:  $30 \div 6 = 5$ .

|                                         |                  |
|-----------------------------------------|------------------|
| 1. $30 \div \{2 \times [1 + (6 - 4)]\}$ | start            |
| 2. $30 \div \{2 \times [1 + 2]\}$       | $6 - 4 = 2$      |
| 3. $30 \div \{2 \times 3\}$             | $1 + 2 = 3$      |
| 4. $30 \div 6$                          | $2 \times 3 = 6$ |
| 5. <b>5</b>                             | $30 \div 6 = 5$  |

Each line replaces the innermost finished group with its value (orange).

## How do you write an expression that records a calculation?

Read the words in order and ask which part is a single chunk. Phrases such as "the sum of" or "the difference of" name a chunk, so put that chunk in parentheses. The words "add 8 and 7, then multiply by 2" become  $2 \times (8 + 7)$ .

| Words                                | Expression          |
|--------------------------------------|---------------------|
| Subtract 6 from 20, then divide by 7 | $(20 - 6) \div 7$   |
| Triple the sum of 12 and 9           | $3 \times (12 + 9)$ |
| Add 5 to the product of 4 and 6      | $4 \times 6 + 5$    |

$$8 + 7 \quad \boxed{8} \quad \boxed{7} = 15$$

$$2 \times (8 + 7) \quad \boxed{8} \quad \boxed{7} \quad \boxed{8} \quad \boxed{7} = 30$$

$2 \times (8 + 7)$ : the group  $8 + 7$  is one chunk, and there are two of them.

## How do you interpret an expression without evaluating it?

Look at the structure. In  $3 \times (18 + 5)$  the group  $18 + 5$  is multiplied by 3, so the expression is 3 times as large as  $18 + 5$ . You can say this without finding either value. In the same way,  $\frac{1}{2} \times (36 + 18)$  is half as large as  $36 + 18$ .

$$18 + 5 \quad \boxed{18} \quad \boxed{5} \quad \text{one group}$$

$$3 \times (18 + 5) \quad \boxed{18} \quad \boxed{5} \quad \boxed{18} \quad \boxed{5} \quad \boxed{18} \quad \boxed{5}$$

$3 \times (18 + 5)$  is three copies of  $18 + 5$ , so it is 3 times as large.

## Numerical Expressions: frequently asked questions

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### What is the difference between parentheses, brackets, and braces?

They are three shapes of grouping symbols: ( ) are parentheses, [ ] are brackets, and { } are braces. All three mean "do this part first." Different shapes make nested groups easier to read.

### Which grouping symbols do you work on first?

Start with the innermost pair, the one with no other symbols inside it. Finish it, then move to the next pair outward until no grouping symbols are left.

### Does an expression have an equal sign?

No. An expression such as  $4 \times (6 + 3)$  is only a phrase. An equation says two expressions are equal. When you evaluate an expression, you find its single value.

### How can you tell that $5 \times (12 + 9)$ is 5 times as large as $12 + 9$ ?

The sum  $12 + 9$  is one chunk, and the 5 multiplies that whole chunk. You do not need to add first. The structure alone tells you the expression is 5 times the sum.

### Do parentheses always change the answer?

No. In  $2 + (3 \times 4)$  the multiplication happens first anyway, so the value is 14 with or without them. They matter when they override the usual order, as in  $(2 + 3) \times 4 = 20$ .