



Algebra 1

UNIT 1 - Interactive Notebook

1-3 Simplifying Numerical Expressions (Order of Operations)

Name:

Date:

**Common Core
Standards**

[CCSS.MATH.CONTENT.HSA.SSE.B.3](#)

Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

SIMPLIFYING NUMERICAL EXPRESSIONS

In Mathematics, to simplify means to make something its simplest form. For example:

$$(-6) + (-5) + 8 \text{ can be simplified as } -3$$

ORDER OF OPERATIONS

EXPRESSIONS INVOLVING THE FOUR OPERATIONS

Expressions involving addition, subtraction, multiplication and division, follows the **MDAS** rule.



- First, do all multiplications and/or divisions, whichever comes first, from left to right.
- Then, do all additions and/or subtractions, whichever comes first, from left to right.

Example 1: $(-8) + 10 \div (-2) - 5 \times 4$

$$(-8) + 10 \div (-2) - 5 \times 4$$

$$(-8) + (-5) - 5 \times 4$$

$$(-8) + (-5) - 20$$

$$-13 - 20$$

$$-33$$

Example 2: $(-6)(3) \div 9 - 10 - (-12)$

$$(-6)(3) \div 9 - 10 - (-12)$$

$$-18 \div 9 - 10 - (-12)$$

$$-2 - 10 - (-12)$$

$$-12 - (-12)$$

$$-12 + 12$$

$$0$$

EXPRESSIONS INVOLVING PARENTHESES, BRACKETS AND THE FOUR OPERATIONS

Expressions involving parentheses, brackets, braces, addition, subtraction, multiplication and division, follows the **PMDAS** rule.



- First, remove grouping symbols like (), [], { } by working on operations from the innermost part. Start with operations inside the parentheses, followed by the operations inside the brackets and then the operations inside the braces. These symbols disappear when you perform the all the operations (still following the MDAS rule) inside them.
- Then, do all multiplications and/or divisions, whichever comes first, from left to right.
- Lastly, do additions and/or subtractions, whichever comes first, from left to right.

Example 1: $-10[16 \div (-4) + 3] - 4$

$$-10[16 \div (-4) + 3] - 4$$

$$-10[-4 + 3] - 4$$

$$-10[-1] - 4$$

$$10 - 4$$

6

Example 2: $[(9 - 3) \div 2(-3)] - [5 + (3)(-2)]$

$$[(9 - 3) \div 2(-3)] - [5 + (3)(-2)]$$

$$[6 \div 2(-3)] - [5 + (-6)]$$

$$[3(-3)] - [-1]$$

$$[-9] - [-1]$$

$$-9 + 1$$

-8

EXPRESSIONS INVOLVING THE FOUR OPERATIONS AND EXPONENTS

Expressions involving exponents, addition, subtraction, multiplication and division, follows the **EMDAS** rule.



- First, simplify the numbers with exponents. Make sure that all numbers raised to a certain power are calculated.
- Then, do all multiplications and/or divisions, whichever comes first, from left to right.
- Lastly, do all additions and/or subtractions, whichever comes first, from left to right.

Example 1: $5^2 \div 5 + (-5)(5) - 5$

$$5^2 \div 5 + (-5)(5) - 5^2$$

$$25 \div 5 + (-5)(5) - 25$$

$$5 + (-5)(5) - 25$$

$$5 + (-25) - 25$$

$$-20 - 25$$

$$\mathbf{-45}$$

Example 2: $12 - (-2)^4 \div (-16) + 3^2 - (-1)^3$

$$12 - (-2)^4 \div (-16) + 3^2 - (-1)^3$$

$$12 - 16 \div (-16) + 9 - (-1)$$

$$12 - (-1) + 9 - (-1)$$

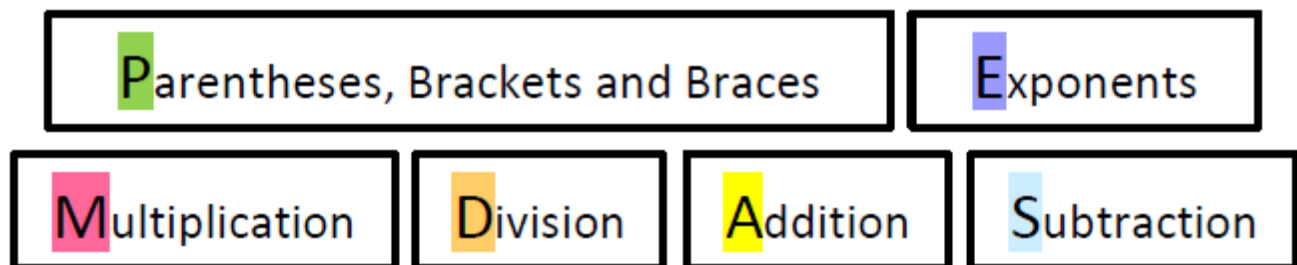
$$13 + 9 - (-1)$$

$$22 - (-1)$$

$$\mathbf{23}$$

EXPRESSIONS INVOLVING PARENTHESES, EXPONENTS AND THE FOUR OPERATIONS

Expressions involving parentheses, brackets, addition, subtraction, multiplication and division, follows the **PMDAS** rule.



- First, remove grouping symbols like (), [], { } by working on operations from the innermost part. Start with operations inside the parentheses, followed by the operations inside the brackets and then the operations inside the braces. These symbols disappear when you perform the all the operations (still following the MDAS rule) inside them.
- Next, simplify the numbers with exponents. Make sure that all numbers raised to a certain power are calculated.
- Then, do all multiplications and/or divisions, whichever comes first, from left to right.

- Lastly, do additions and/or subtractions, whichever comes first, from left to right.

Example 1: $(45 + 7) \div (12 \div 3) + 3^2$

$$(45 + 7) \div (12 \div 3) + 3^2$$

$$52 \div 4 + 3^2$$

$$52 \div 4 + 9$$

$$13 + 9$$

$$22$$

Example 2: $[(75 - 26) \div 7]^2 + [(-2)^2(84 \div 12)]$

$$[(75 - 26) \div 7]^2 + [(-2)^2(84 \div 12)]$$

$$[49 \div 7]^2 + [(-2)^2(7)]$$

$$[7]^2 + [(4)(7)]$$

$$49 + 28$$

$$77$$

The Order is Right!

The solution in simplifying the expression

$(8 - 10)^2[24 \div (6 - 2)] + 5$ is shown below. Describe the process used in each step.

Solution

$$(8 - 10)^2[24 \div (6 - 2)] + 5$$

$$(-2)^2[24 \div (-4)] + 5$$

$$(-2)^2[-6] + 5$$

$$4[-6] + 5$$

$$-24 + 5$$

$$-19$$

1.

2.

3.

4.

5.

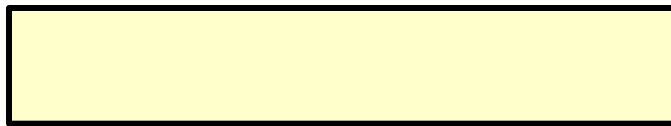
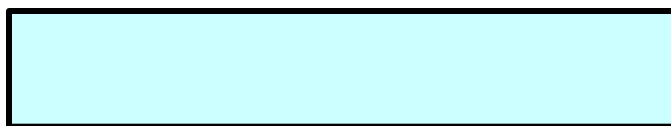
Was the expression simplified correctly? _____

Justify your answer: _____

Make it Simple!

Simplify the expression below:

$$-5[(6 \div 3)^2 + 9 - 3]$$



Task Cards

1.

In the expression below,
what operation must be
done first?

$$(-5) + 9 \div 3 - 6(2)$$

2.

In PEMDAS, after simplifying
operations inside the parentheses
and then working on exponents,
multiplication must always follow.

TRUE or **FALSE**

3.

In simplifying numerical
expressions, whichever operation
comes first must be calculated
first.

TRUE or **FALSE**

4.

In simplifying numerical expressions, we
start by working on operations from the
innermost part of the expression that
are enclosed in parentheses, then
brackets and finally braces.

TRUE or **FALSE**

5.

Simplify:

$$12 \div (-3)(2) + 10 - 15$$

6.

Simplify:

$$8(8 - 10) \div 2 + 9 - (-7)$$

7.

Simplify:

$$-12 + (-2)^3 \div 2^2 - 10(-2)$$

8.

Simplify:

$$-1[16 \div (-8) + 2]^2 + (6 - 9)^2$$

Answers:

The Order is Right!

1. Subtract numbers inside the parentheses
2. Divide the numbers inside the brackets
3. Simplify the number with exponent
4. Multiply
5. Add

Yes, because it follows the correct order of operations.

Make It Simple!

$$-5[(6 \div 3)^2 + 9 - 3]$$

$$-5[(2)^2 + 9 - 3]$$

$$-5[4 + 9 - 3]$$

$$-5[13 - 3]$$

$$-5[10]$$

$$-50$$

Task Cards

1. DIVIDE

2. FALSE

3. FALSE

4. TRUE

5. $12 \div (-3)(2) + 10 - 15$

$$(-4)(2) + 10 - 15$$

$$-8 + 10 - 15$$

$$2 - 15$$

$$\mathbf{-13}$$

6. $8(8 - 10) \div 2 + 9 - (-7)$

$$8(-2) \div 2 + 9 - (-7)$$

$$-16 \div 2 + 9 - (-7)$$

$$-8 + 9 - (-7)$$

$$1 - (-7)$$

$$\mathbf{8}$$

7. $-12 + (-2)^3 \div 2^2 - 10(-2)$

$$-12 + (-8) \div 4 - 10(-2)$$

$$-12 + (-2) - 10(-2)$$

$$-12 + (-2) - (-20)$$

$$-14 - (-20)$$

$$\mathbf{6}$$

8. $-1[16 \div (-8) + 2]^2 + (6 - 9)^2$

$$-1[-2 + 2]^2 + (-3)^2$$

$$-1[0]^2 + (-3)^2$$

$$-1[0] + 9$$

$$0 + 9$$

$$\mathbf{9}$$