

The real number system and order of operations

[Science](#), [Mathematics](#)



Order of Operations al Affiliation Order of Operations Operator precedence or what is simply discussed as the order of operations is very important in mathematics. The same order of operations is applied in execution of commands in computer science making it an essential tool in mathematics. In order of operations PEMDAS is the acronym used to illustrate the way the orders are executed (Angel, 2011).

P stands for parentheses or brackets. In any sum, first work on the numbers inside the brackets. For example, in $3 \times (5-2)$, we first operate inside the parenthesis. $5-2=3$, then $3 \times 3 = 9$. This is our final answer.

E stands for exponents. These are the powers or the roots which are in the equation or the sum. For example in $3^3 \times 7$, we square 3 to get 9 then multiply by 7 to get 63.

M stands for Multiplication and it takes the third precedence in the order of operations. Looking at this expression, $4 \times 8 - 6 + 3$, we multiply 8 by 4 to get 32, then add 6 to 3 to get 9. Subtracting 9 from 32 we get 23.

D stands for division and it is the fourth operation to be executed. Looking at this expression, $8 \div 4 \times 3$, we first divide 8 by 4 then we multiply the answer (2) by 3 to get 6.

However multiplication and division are often interchanged without affecting the results as will be seen in section 3.

A stands for addition. In the above expression, after multiplying we added 6 to 3 to get 9. This is the fifth step that should be done in calculations.

S stands for subtraction. Any subtracting command is executed last when doing the sums. In our above expression, our last step was to subtract 9 from 32 where we got 23. The order in which the signs will follow each other is

important and it determines the answer one gets.

2. Application of Order of Operations in Real Life

Following the correct steps and orders in life is very important. For science students, following the correct order of operations and steps would mean the difference between getting the desired results and getting a disaster in case the steps are mixed up. Take an example of the preparation of Potassium Hydroxide;-

These are the steps followed.

- a. Cut a small chip of Potassium and put it in paraffin.
- b. Prepare a cold bath in a clean beaker
- c. Using a pair of forceps, take the potassium from the paraffin and place it gently into the water bath.
- d. Record the observations.

If for example a student interchanged the steps and put the potassium into the water bath then due to the high reactivity of potassium with water, an explosion would ensue. This just helps to illustrate the need to follow correct steps in real life.

3. Solving a Mathematical Expression

Looking at this mathematical expression;-

$$4 + 6 - (2 + 1) \times 22 \div 2$$

A student gave the following solution,

$$4 + 6 - (2 + 1) \times 22 \div 2$$

$$= 10 - (2 + 1) \times 22 \div 2$$

$$= 10 - 1 \times 4 \div 2$$

$$= 9 \times 4 \div 2$$

$$= 36 \div 2$$

$$= 18$$

This is my response to the student,

Dear Student,

When solving this expression,

$$4 + 6 - (2 + 1) \times 2 \div 2$$

Always remember PEMDAS, (Parentheses, Exponents, Multiplication, Division, Addition and Subtraction) However you can interchange division with multiplication and still get the correct answer.

Solving the Parentheses first;-

$$= 4 + 6 - 1 \times 2 \div 2$$

Solve the exponents next;-

$$= 4 + 6 - 1 \times 2 \div 2$$

Solve division next;-

$$= 4 + 6 - 1 \times 2$$

Solve Multiplication next;-

$$= 4 + 6 - 2$$

Solve addition next;-

$$= 10 - 2$$

Lastly solve the subtraction;-

$$= 10 - 2 = 8$$

This is the way to solve such expressions. If one of the components of PEDMAS is absent, just skip and solve the one that follows until you get your final answer.

Reference

Angel, R. A. (2011). Elementary Algebra for College Students. New York (NY) : Addison Wesley. Print.