Mathematics Reviewer

PEMDAS

All of us prioritize one thing over another. You most likely prioritize education over leisure, food over video games, or family over friends.

Similarly, each mathematical operation has a corresponding level or priority.

You have learned how to add, subtract, multiply, and divide integers. *But what if there are multiple mathematical operations involved such as in 9 + (3 x 2) - 4? What do you think is the operation that must be performed first, second, third, and so on?*

In this reviewer, we will discuss the standard way of prioritizing mathematical operations, commonly known as the order of operations or PEMDAS.

What is PEMDAS?

PEMDAS is an acronym for **P**arenthesis, **E**xponents, **M**ultiplication, **D**ivision, **A**ddition, and **S**ubtraction. This is a standard method of determining which operations you must prioritize first, second, third, and so on. In other words, PEMDAS tells you what operation must be performed first given a set of multiple operations.

In other math textbooks, PEMDAS is referred to as MDAS or GEMDAS.

PEMDAS implies that the operation inside the parenthesis has the **highest priority** or must be performed first. Then, you simplify the number with an exponent. Afterward, you multiply or divide the numbers from left to right. Finally, you add and subtract numbers from left to right.

A fun way to remember PEMDAS is this sentence "**P***lease* **E***xcuse* **M***y* **D***ear* **A***unt* **S***ally*"

How to Solve PEMDAS Problems: 4 Steps.

If there is more than one mathematical operation involved in your calculation, you must follow PEMDAS. The steps to perform PEMDAS are:

1. First, perform the operation inside the **parenthesis** or grouping symbol.
2. Simplify any number with **exponents**.
3. Perform **multiplication** or **division** from left to right.
4. Perform **addition** or **subtraction** from left to right.

***Note**: Make sure that you are already capable of **performing mathematical operations on integers** because they will be applied in our succeeding examples.*

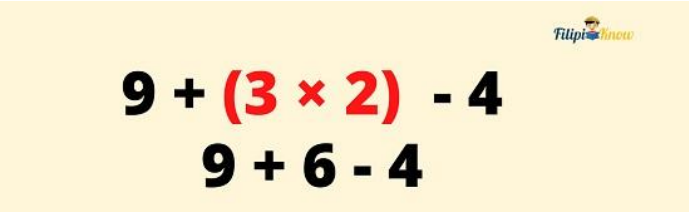
Example 1: 9 + (3 x 2) - 4

The given problem has more than one operation involved. There is an addition, a multiplication, and a subtraction sign. There is also an operation inside the parenthesis. This means that we need to use PEMDAS.

Solution:

P - *Perform the operation inside the parenthesis or grouping symbol*.

The first thing we need to perform is the operation inside the parenthesis. In particular, we are going to solve 3 x 2 first.



The operation inside the parenthesis is 3 x 2 which is equal to 6.

E - *Simplify any number with exponents*.

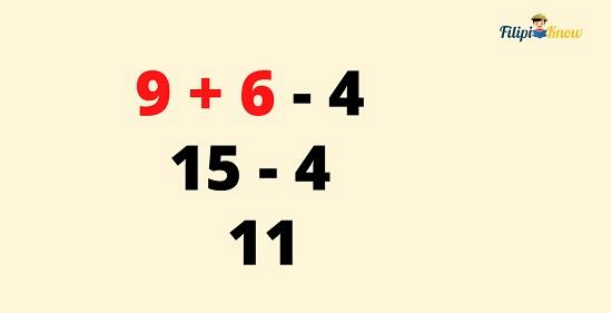
There are no exponents involved in the given problem. Thus, we will skip this step.

MD - *Perform multiplication or division from left to right*.

There is no more multiplication or division involved in 9 + 6 - 4. Therefore, we will skip this step.

AS - *Perform addition or subtraction from left to right*.

We perform addition first since it is the first one that appeared from the left. 9 + 6 = 15. Lastly, we perform subtraction: 15 - 4 = 11



Let's review what we have done:

9 + (3 x 2) - 4

9 + 6 - 4

15 - 4

11

Hence, using PEMDAS, **9 + (3 x 2) - 4 = 11**

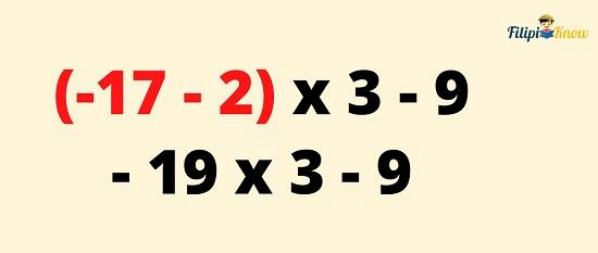
I hope you still remember the rules on operations on integers because we will use them for the next example.

Example 2: (-17 - 2) x 3 - 9

Let us use PEMDAS to answer the above problem.

P - *Perform the operation inside the parenthesis*.

The operation inside the parenthesis is - 17 - 2. By subtracting the given integers, we will obtain - 17 - 2 = - 19.



E - *Simplify any number with exponents*.

The given problem doesn't have any exponent. Thus, we will skip this step.

MD - *Perform multiplication or division from left to right*.

AS - ***Perform addition or subtraction from left to right.***

Here's a quick review of what we have done:

(-17 - 2) x 3 - 9

(-19) x 3 - 9

-57 - 9

- 66

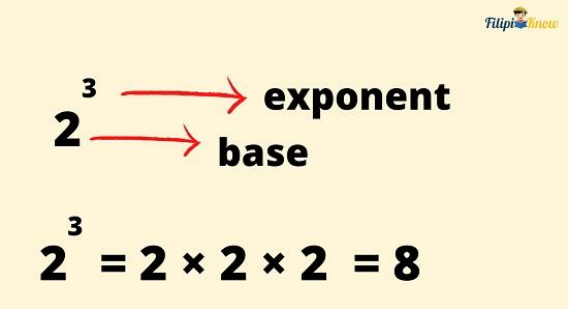
Hence, using PEMDAS, **(- 17 - 2) x 3 - 9 = -66**

Before we proceed to our third example, let's first discuss how to compute numbers with exponents.

What is an Exponent?

An exponent is a number written on the upper right of another number which is called the base. This means that the base is raised to a certain power.

For example, in 2^3, the exponent is 3 (the small letter above or the superscript) while the base is 2.



How to Compute Numbers with an Exponent.

Although an exponent is written as a tiny number above the base, its impact is actually powerful!

The exponent corresponds to the number of times the base must be multiplied by itself. For example, in 2^3, we have 2 as the base while 3 as the exponent. This means that you need to use the base (which is 2) three times in a multiplication process.

$2^3 = 2 \times 2 \times 2 = 8$

Therefore, $2^3 = 8$.

Now, can you compute for 9^2?

Our exponent is 2 which means we need to use 9 two times in a multiplication Process:

$9^2 = 9 \times 9 = 81$

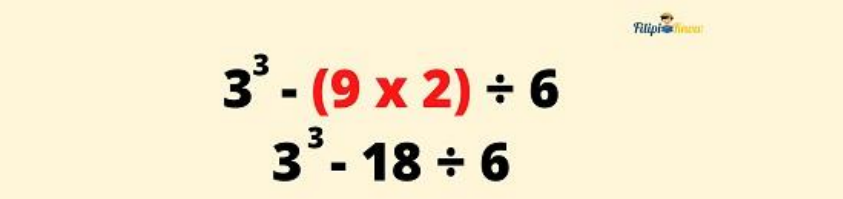
Therefore, $9^2 = 81$

Keep in mind how to compute exponents since we will use this method for our third example.

Example 3: What is the value of 3^3 - (9 x 2) ÷ 6?

Let us apply PEMDAS to solve the question.

P - *Perform the operation inside the parenthesis or grouping symbol*.



E - *Simplify any number with exponents*.

3^3 is a number with an exponent. Hence, we need to simplify it. Note that 3^3 = 3 x 3 x 3 = 27

MD - *Perform multiplication or division from left to right*.

There is only division involved and there is no more multiplication sign left. Hence, we solve 18 ÷ 6

AS - *Perform addition or subtraction from left to right*.

27 - 3
24

A quick review of what we have done:

3^3 - (9 x 2) ÷ 6

3^3 - 18 ÷ 6

27 - 18 ÷ 6

27 - 3

24

Hence, using PEMDAS, 3^3 - (9 x 2) ÷ 6 = 24

Example 4: Compute for 81 ÷ (4^2 - 7) x 3

We can determine the answer to the given problem above using PEMDAS.

As usual, we start our computation with the operation inside the parenthesis. However, there are two things involved inside the parenthesis: An exponent and a subtraction sign. Note that it is easier to perform the exponent first before performing subtraction.

81 ÷ (4^2 - 7) x 3

81 ÷ (16 - 7) x 3

Now, we can perform subtraction which is inside the parenthesis:

81 ÷ (16 - 7) x 3

81 ÷ 9 x 3

We have already performed P of PEMDAS. Since there are no more exponents involved, we move to the next operations which are multiplication and division (MD). Let's go back to the same problem:

81 ÷ 9 x 3

Since division appeared first from the left, we will perform it first.

81 ÷ 9 x 3

9 x 3

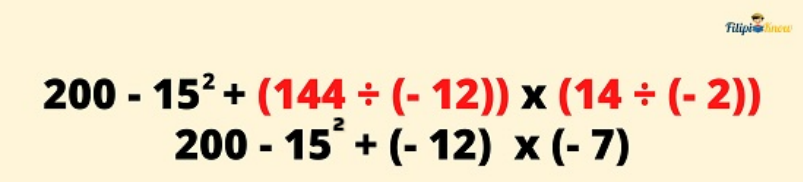
Lastly, we will perform multiplication

9 x 3 = 27

Let's try to answer something more challenging in our fifth example.

Example 5: Compute for 200 - 15^2 + (144 ÷ (-12)) x (14 ÷ (-2))

Let us begin by performing the operations inside the parenthesis. There are two parentheses. Thus, we will perform the operations inside them simultaneously.



We already did the P of PEMDAS so we are now on E which is exponents. We simplify the number with an exponent.

$$200 - 15^2 + (-12) \times (-7)$$
$$200 - 225 + (-12) \times (-7)$$

We are now on the MD part of PEMDAS. There is only multiplication involved and there is no division sign left. Hence,

$$200 - 225 + (-12) \times (-7)$$
$$200 - 225 + 84$$

Next is the AS part of PEMDAS. Since subtraction appeared first from the left, it is one that must be performed first.

$$200 - 225 + 84$$
$$-25 + 84$$

Finally, let us add the remaining numbers

$$-25 + 84$$
$$59$$

Here is a quick review of what we have done above:

$200 - 15^2 + (144 \div (-12)) \times (14 \div (-2))$

$200 - 15^2 + (-12) \times (-7)$

$200 - 225 + 84$

$-25 + 84$

59

Hence, using PEMDAS, $200 - 15^2 + (144 \div (-12)) \times (14 \div (-2)) = 59$