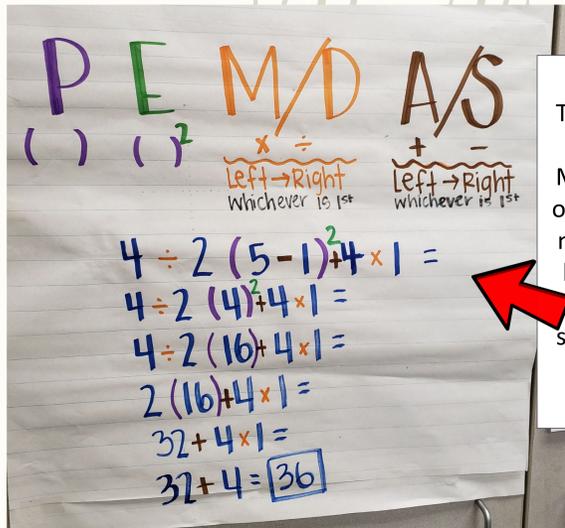




# PEMDAS - How can it go wrong?



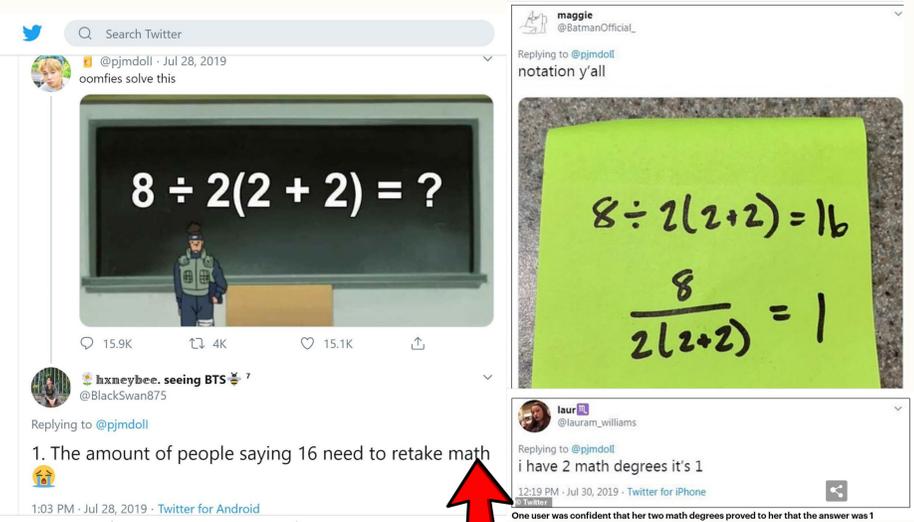
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This is a poster I made for my mentor teacher's class. Making sure to address some of the misconceptions such as multiplication always coming before division and addition always coming before subtraction. In the example, I showed how to work with parentheses as well.

## Abstract

Within the order of operations in elementary school, there are many misconceptions with the proper order because of the mnemonic that we have learned, Please Excuse My Dear Aunt Sally (PEMDAS). This mnemonic has many pros, but there is also a lot of confusion that comes with it. The letters represent a mathematical concept and the order that it should come in. Parentheses, Exponent, Multiply, Divide, Addition, Subtraction. Misconceptions that come from this are that students always do parentheses first, even if it is just around a number representing multiplication (i.e.  $2(4)$ ). Another misconception is that students think multiplication comes before division. The third is that addition always come before subtraction. The last is that everything you would solve the pieces of an equation from left to right, not always following the PEMDAS order. Not only does this problem occur in middle school, but it is apparent in adults as well.



This problem went around social media and it is evident here the misconceptions of PEMDAS

## Introduction

Alternatives to PEMDAS I have come across are BEDMAS, B standing for brackets, or BODMAS (bracket opening, division, multiplication, addition, subtraction). Both of which still stress the order of moving left to right. The mnemonic is very popular and memorable, most adults will remember that mnemonic from primary school, which is beneficial in some ways. Students don't know the reasoning behind using this mnemonic, it is just easy enough for them to remember. If the students were taught the meaning behind the order and why parentheses would come before exponents and so on, they would understand the mnemonic isn't concrete and is just a general rule, as they would know how the different loopholes. Is teaching PEMDAS the best method to teach order of operations to elementary students? Regardless of the misconceptions, would there be an easier route to teaching the basics of order of operations that using this mnemonic? If students were to understand what kinds of parentheses are applicable, that multiplication and division are equivalent in importance as well as addition and subtraction, they would be able to better understand how to correctly apply PEMDAS. In other words, if teachers rule out the misconceptions at the very beginning of introducing PEMDAS, there won't be as much confusion to the mnemonic.

## Discussion

How to introduce PEMDAS:

- Go over the correct mathematical terms
- Address the order of M/D and A/S
- Discuss the types of parenthesis that are included in "P"

<https://www.youtube.com/watch?v=ZzeDWFhYv3E>

This is a link for a song on YouTube that would be helpful when introducing the order of operations, *Order of Operations Song | PEMDAS Rap for 5th Grade and Up*. Similar to the poster above, it addresses the main misconceptions. It also has examples that are worked out in the song. This is a screen shot of part of the video.



## Results

After asking some co-workers, fellow Part-time Teachers. To solve the same problem  $8/2(2+2)$ , and three of them answered 16, one of them answered 1. The Elementary Education cohort were asked the same problem, again there was one of the four who answered 1, the rest answered 16. Both people who answered 1, were asked to explain why that was their answer. One said that it was because multiplication came before division. The other said it was because 4 was still in parentheses. The results have showed that of the two who got them wrong, they both got it wrong because of different misconceptions. A science teacher at a private school and an auditor for the federal government both answered 1. It doesn't matter how much education a person has, it is how the mnemonic stuck with them. After showing the auditor the correct way to solve it, she was sure that she was correct and tried to explain to how she learned it, which is anything with parentheses being done first. This misconception stuck with her through her whole life.

## Conclusions

PEMDAS is a helpful mnemonic when teaching math when it is taught properly. Saying PEMDAS or teaching, *Please Excuse My Dear Aunt Sally* works in helping students remember the basic order of operations. That showed in the auditor who is over 50 years old, she still remembered it and was explaining it as if she just learned it. However, the misconceptions needs to be addressed in the beginning or it will be really hard to break. Using this mnemonic is still the best method to teach the order of operations when done correctly.



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## References

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