



## Math Help Sheet: P.E.M.D.A.S. and Order of Operations

When approaching a mathematical expression with a mixture of operations, you must remember to do them in the correct order or you risk coming up with an incorrect answer.

The correct order is **Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction**. (P.E.M.D.A.S. can be remembered with the mnemonic phrase “Please Excuse My Dear Aunt Sally.”)

**Parentheses** (or other grouping symbols, like brackets) must take priority in your operation. Don’t start combining values outside the parentheses until you have evaluated the values inside first.

Example:  $1 + 2(4 - 3)$

Here,  $(4 - 3)$  is the first thing to calculate since it is in the parentheses.

**Exponents** are evaluated before other arithmetic operations can take place.

Example:  $8 - 2^2$

Here,  $2^2$  must be evaluated before subtracting.

**Multiplication and Division** are evaluated from left to right as they appear. They must be done before addition or subtraction.

Example:  $5 + 6 \div 3 \div 2$

Here,  $6 \div 3 \div 2$  is evaluated first, from left to right.

**Addition and Subtraction** are the last to be evaluated.

Example:  $1 + 2 + 2 + 1$

Here, it is recommended that you can work left to right  $(1 + 2)$ .

You can mix the order of your work as long as it is only addition and subtraction  $(2 + 2 + 1 + 1)$ .

Let’s try P.E.M.D.A.S in a longer example.

$8(4 - 3) - 2^3 + 5 \times 4$	Are there parentheses to evaluate first? Yes: $(4 - 3) = 1$
$= 8(1) - 2^3 + 5 \times 4$	Are there exponents to evaluate? Yes: $2^3 = 8$
$= 8(1) - 8 + 5 \times 4$	Are there multiplications and/ or divisions to calculate? Yes: $8(1) = 8$ and $5 \times 4 = 20$
$= 8 - 8 + 20$	Are there additions and/ or subtractions to calculate? Yes: $8 - 8 = 0$
$= 0 + 20$	Complete the final operation.
$= 20$	Your final answer!

In Pre-Algebra and Algebra, you'll see expressions as fractions. A fraction bar is considered a grouping symbol that separates the numerator and denominator. Imagine parentheses around the numerator and parentheses around the denominator. Evaluate PEMDAS of the numerator and the denominator separately before you complete the fraction division operation.

$\frac{3 \times 4 + 2}{2(10 - 3)}$	Evaluate PEMDAS of the numerator first.
$\frac{3 \times 4 + 2}{2(10 - 3)}$	Evaluate PEMDAS of the denominator second.
$\frac{3 \times 4 + 2}{2(10 - 3)}$	Multiply $3 \times 4$ ; then add 2
$\frac{3 \times 4 + 2}{2(10 - 3)}$	Subtract inside the parentheses first ( $10 - 3$ ); then multiply by 2
$= \frac{12 + 2}{2 \times 7}$	Add $12 + 2$
$= \frac{12 + 2}{2 \times 7}$	Multiply by $2 \times 7$
$= \frac{14}{14}$	Complete the fraction division operation
$= 1$	Your final answer!

Practice:

1.  $5(3 + 4) - 5$

2.  $2 + 6 \times (4 + 5) \div 3 - 5$

3.  $4 + (5 \times 3^2 + 2)$

4.  $(5 - 2)^2 - (16 - 10)$

5.  $\frac{1 - (2 - 3)}{9 + (-2)^3}$

6.  $\frac{5 + (-4) \times [3 \div (2)^2]}{7 - (3)^{(6 \div 3)}}$

1. 30    2. 15    3. 51  
4. 3    5. 2    6. -1