|  |
| --- |
| **Order of Operations** |

When a numerical expression involves two or more operations, there is a specific order in which these operations must be performed.

|  |
| --- |
| When evaluating an expression, proceed in this order:1.  parentheses are done first2.  exponents are done next3.  multiplication and division are done as they are encountered from left to right.4.  addition and subtraction are done as they are encountered from left to right. |

The proper application of "order of operations" is needed when working with such mathematical topics as evaluating formulas, solving equations, evaluating algebraic expressions, and simplifying monomials and polynomials.

There is a phrase that may help you to remember this order:  **PEMDAS
Parenthesis**, **Exponents**, (**Multiplication/Division**), (**Add/Subtract**)

|  |  |  |
| --- | --- | --- |
|

|  |
| --- |
|  **Please Excuse (My Dear) (Aunt Sally).**  |

 | http://www.regentsprep.org/regents/math/algebra/aop2/AuntSally.gif |

The reason (multiplication & division - MD) and (add & subtract - AS) are "grouped" in sets of parentheses is that when those operations are next to each other you do the math from **left to right**.  You do not always do multiplication or addition first.  It may be the case where division will be done BEFORE multiplication or subtraction will be done BEFORE addition.

|  |  |
| --- | --- |
| http://www.regentsprep.org/regents/math/algebra/aop2/arrow.gif | **Be very careful when listening to Aunt Sally!!!** |

|  |  |
| --- | --- |
| If you forget to take MD and AS in order as you come to them from left to right, Aunt Sally's advice is toast! | http://www.regentsprep.org/regents/math/algebra/aop2/AuntSallyNO.gif |

|  |  |
| --- | --- |
| **Example:** | 8 - 6 + 2 |
|  |   2 + 2  | **Subtraction is done first !** |
|  |      4 |

|  |  |  |
| --- | --- | --- |
| **Example:** |  | When there are two or more parenthesis, or grouping symbols, perform the*inner most*grouping symbol first. |
|   |   | 2 + 3[ 5 + (4 - 1)2] 2 + 3[ 5 + (3)2]    inner most parentheses are done first2 + 3[ 5 + 9]   then work your way out2 + 3[ 14]2 + 42 44 |

|  |  |  |
| --- | --- | --- |
| **Example:** |   Simplify:  2 + 6 (3+1)2 |   |
| It may be helpful to build a PEMDAS table. Check off the operation after it has been performed.  For operations that are not part of the problem, place a hyphen.   |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **P** | **E** | **M** | **D** | **A** | **S** |
|   |   |   |   |   |   |

 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **P** | **E** | **M** | **D** | **A** | **S** |
|   |   |   |   |   |   |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **P** | **E** | **M** | **D** | **A** | **S** |
| **x** |   |   |   |   |   |
| **P** | **E** | **M** | **D** | **A** | **S** |
| **x** | **x** |   |   |   |   |
| **P** | **E** | **M** | **D** | **A** | **S** |
| **x** | **x** | **x** |   |   |   |
| **P** | **E** | **M** | **D** | **A** | **S** |
| **x** | **x** | **x** | - |   |   |
| **P** | **E** | **M** | **D** | **A** | **S** |
| **x** | **x** | **x** | **-** | **x** | - |

 |   Draw a PEMDAS table.  |
| 2 + 6 (3+1)2 | Simplify any parenthesis first, starting with the inner most group, and check off the "P" box.  |
| 2 + 6 (4)2 | Simplify any powers ( exponents) and check off the "E" box.  |
| 2 + 6 (16) | Perform the multiplication and division in order from left to right and check off the "M" & "D" boxes.  |
| 2 + 96 | Do the addition and subtraction last. Remember, if the operations are written next to each other work from left to right and check off the last two boxes. |
| 98 |

|  |  |
| --- | --- |
| http://www.regentsprep.org/regents/math/algebra/aop2/arrow.gif | **It is very important to understand that it DOES make a difference if the order is not performed correctly!!!!** |

|  |  |
| --- | --- |
| 70 - 2(5+3)70 - 2(8)68(8)544 **incorrect http://www.regentsprep.org/regents/math/algebra/aop2/button3.gif** | 70 - 2(5+3)70 - 2( 8)70 - 1654 **correct http://www.regentsprep.org/regents/math/algebra/aop2/button4.gif** |
| (subtraction was done before multiplication) |  |