Order of Operations - *PEMDAS*

Operations

***"Operations"*** means things like add, subtract, multiply, divide, squaring, etc. If it isn't a number it is probably an operation.

But, when you see something like ...

7 + (6 × 52 + 3)

... what part should you calculate first?

Start at the left and go to the right?
Or go from right to left?

*Warning: Calculate them in the wrong order, and you will get a wrong answer !*

So, long ago people agreed to follow rules when doing calculations, and they are:

Order of Operations

**Do things in Parentheses First.** Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| yes |   | 6 × (5 + 3) | = | 6 × 8 | = | **48** |   |
| no |   | 6 × (5 + 3) | = | 30 + 3 | = | 33 | (wrong) |

[**Exponents**](http://www.mathsisfun.com/exponent.html)**(Powers, Roots) before Multiply, Divide, Add or Subtract**. Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| yes |   | 5 × 22 | = | 5 × 4 | = | **20** |   |
| no |   | 5 × 22 | = | 102 | = | 100 | (wrong) |

**Multiply or Divide before you Add or Subtract**. Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| yes |   | 2 + 5 × 3 | = | 2 + 15 | = | **17** |   |
| no |   | 2 + 5 × 3 | = | 7 × 3 | = | 21 | (wrong) |

**Otherwise just go left to right**. Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| yes |   | 30 ÷ 5 × 3 | = | 6 × 3 | = | **18** |   |
| no |   | 30 ÷ 5 × 3 | = | 30 ÷ 15 | = | 2 | (wrong) |

How Do I Remember It All ... ? PEMDAS !

|  |  |
| --- | --- |
|  |   |
| **P** | **P**arentheses first |
| **E** | **E**xponents (ie Powers and Square Roots, etc.) |
| **MD** | **M**ultiplication and **D**ivision (left-to-right) |
| **AS** | **A**ddition and **S**ubtraction (left-to-right) |

Divide and Multiply rank equally (and go left to right).

Add and Subtract rank equally (and go left to right)

|  |  |  |
| --- | --- | --- |
| http://www.mathsisfun.com/images/pemdas.gif |   | After you have done "P" and "E", just go from left to right doing any "M" ***or*** "D" as you find them.Then go from left to right doing any "A" ***or*** "S" as you find them. |

|  |  |
| --- | --- |
| http://www.mathsisfun.com/images/style/thought-sm.gif | You can remember by saying "**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally". |

*Or ...*
Pudgy Elves May Demand A Snack
Popcorn Every Monday Donuts Always Sunday
Please Eat Mom`s Delicious Apple Strudels
People Everywhere Made Decisions About Sums

*Note: in the UK they say*[*BODMAS*](http://www.mathsisfun.com/operation-order-bodmas.html)*(Brackets,Orders,Divide,Multiply,Add,Subtract), and in Canada they say BEDMAS (Brackets,Exponents,Divide,Multiply,Add,Subtract). It all means the same thing! It doesn't really matter how you remember it, just so long as you get it right.*

Examples

Example: How do you work out **3 + 6 × 2** ?

**M**ultiplication before **A**ddition:

First **6 × 2 = 12**, then **3 + 12 = 15**

Example: How do you work out **(3 + 6) × 2** ?

**P**arentheses first:

First **(3 + 6) = 9**, then **9 × 2 = 18**

Example: How do you work out **12 / 6 × 3 / 2** ?

**M**ultiplication and **D**ivision rank equally, so just go left to right:

First **12 / 6 = 2**, then **2 × 3 = 6**, then **6 / 2 = 3**

Oh, yes, and what about **7 + (6 × 52 + 3)** ?

|  |  |
| --- | --- |
| 7 + (6 × 52 + 3) |   |
| 7 + (6 × 25 + 3) | Start inside *Parentheses*, and then use *Exponents* First |
| 7 + (150 + 3) | Then *Multiply* |
| 7 + (153) | Then *Add* |
| 7 + 153 | *Parentheses* completed, last operation is an *Add* |
| **160** | DONE ! |

**YOUR TURN!!**

What is the value of 6 ÷ 3 + 4 × 2 ?

What is the value of 6 × 4 - 12 ÷ 3 – 8

What is the value of 4 × 4 - 3 × 3 - 16 ÷ 4
(You may use your calculator.)

What is the value of 20 - (3 × 23 - 5)?

What is the value of (5 + 2)2 - 9 × 3 + 23 ?

What is the value of (12 ÷ 3 + 4) - (42 - 6 × 2)?

What is the value of (52 - 5) / (42 + 8 - 7 × 2) ?

What is the value of (33 - 9 / 3) + (4 × 3 - 32) ?