PEMDAS

Often times in Algebra I and beyond, you will encounter an equation that looks like this:
3 * 5 + 6 – 3 / 3
And you will be told to evaluate what number this is. Naturally, you will evaluate it going from left to right, so your work will look like:
3 * 5 + 6 – 3 / 3 =
15 + 6 - 3 / 3 =
21 – 3 / 3 =
18 / 3 =
6

Although it is natural for you to proceed with solving the equation this way, you are shocked to find out that your answer is wrong. Why?

In order to solve the issue of how to proceed with complex math equations, an order of operations was established, telling people exactly what operation they should do first when faced with an equation containing numerous different operations. The most common one that is used (and the one we will be using) is **PEMDAS.**

PEMDAS is an abbreviated form of the order of operations of **P**arenthesis **E**xponents **M**ultiplication **A**ddition **S**ubtraction. What this tells us to do is:
(NOTE: these steps must be done in the sequence given. If there is nothing that we can do on a step, we can then skip to the next step)
-Apply PEMDAS to items in parenthesis first
-Then simplify any number with exponents next if there are no more quantities in parenthesis to solve for
- Once we are done with exponents, then we multiply
-When there is nothing left to multiply, then we divide:
-After we have done the above four things, we add whatever numbers need to be added:
-Finally, we do our subtraction

NOTES:
-If you have troubling remembering PEMDAS, you can try memorizing it as an acronym for **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally
-For repeats of the same operation (including separate quantities in parenthesis that are side by side but not incased in one another), we go from left to right. PEMDAS gives the order to do different operations, not the order to do several of the exact same ones.
Example: **2 + 7** + 3 + 4 **= 9 + 3** + 4 => **12 + 4** => **16**

-If we are unable to do something at any given step, we skip to the next one. If we are already at the end, then we are done!
-If you are faced with an equation with multiple quantities in parenthesis and don't know where to start, find the rightmost "(". Then apply PEMDAS to the quantity encased inside of it, and repeat this procedure until there are no more quantities in parenthesis left.

Example:
What is (6 + 3) * 2 / 3 – 5 + 8?
(6 + 3) * 2 / 3 – 5 + 8 =
9 * 2 / 3 – 5 + 8 =
18 / 3 – 5 + 8 =
6 **- 5 + 8** =
6 + 3 =
9
Because there are no usages of exponents in this expression, we skip **E** and go directly to **M**

Another example:
What is $(6 * 3 + 5^2 – 6) + 4^2 – 8 + 6$
-The first thing to notice is that there are numerous operations in the parenthesis, so we apply PEMDAS to simplify $6 * 3 + 5^2 – 6$ first.
$6 * 3 + \mathbf{5^2} – 6 =$
6 * 3 + 25 – 6 =
18 + 25 – 6 =
43 – 6 =
37
-We skipped **P** and **D** above since there were no parentheses or division in this equation.
-Now we replace $(6 * 3 + 5^2 – 6)$ with 37, giving us: $37 + 4^2 – 8 + 6$
$37 + \mathbf{4^2} – 8 + 6 =$
37 + 16 – 8 + 6 **=**
53 **- 8 + 6** =
53 – 2 =
51 (Final Answer)
-We skipped **P**, **D**, and **M** above since there were no more parentheses, no division symbols, and no multiplication symbols in the equation.

Chained-Parenthesis Example:
What is (63 – 43 + (18 * 4 + 12) – 15) + 16 * 2 + 14?
-Start by finding the rightmost "(". As we can see, the rightmost "(" is right before 18.
-The part of the equation encased by this rightmost "(" is 18 * 4 + 12, so we apply to PEMDAS to that, and replace (18 * 4 + 12) with our result.

18 * 4 + 12 **= 72 + 12** = **84**

-So now we have: (63 – 43 + 84 – 15) + 16 * 2 + 14

-We still have part of the equation encased in parenthesis, but there are no more parentheses encased in it, so we only need to simply the quantity inside of it and replace that part of our equation with our result.

63 **– 43 + 84** – 15 =

63 + 41 + 15 =

104 + 15 =

119

-Now we replace (63 – 43 + 84 – 15) with 119 and simplify the remaining part of the equation.

109 + **16 * 2** + 14 **=**

119 + 32 + 14 =

151 + 14 =

165 (Final Answer)