MASSEY UNIVERSITY
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UNIVERSITY OF NEW ZEALAND

159.201 Algorithms & Data Structures
S1 2022

Assignment 2

Write a C++ program to evaluate a single Reverse Polish Notation expression using a *stack*.

Notes:

- the stack ***must*** be implemented using a linked-list (*not* a static array).
- handle both the situations of too many numbers (e.g. 12 5 23 *) and too many operators (e.g. 68 49 - * +).
- the operators ***must*** be one of: +, *, -, / (integer division). Ensure that the operands are popped off the stack in the correct order. Any other operator is not valid, and an error message should be printed in this case.
- The expression ***must*** be read from a *.txt file. A sample code and sample *.txt files are provided to you in Stream. You are allowed to modify and adapt the sample code in any way you want, and modify the text files. However, the assignment code ***input*** has to accept the text file in the same *format* as the example txt files provided (one number or operator per line).
- You ***must*** use command line arguments in the main function to get the file names.
- The ***output*** has to show what the program is reading and the final result of S (use printf or cout). E.g.,

```
reading number 24
reading number 15
reading number 3
reading operator *
reading operator +
The result is 69
```

The algorithm, in pseudo-code, is as follows:

```
Stack S; // a stack of integers
string expr;
int op1, op2, result;
read the expression into the string expr;
while (there is still something in the expression) {
   if (a space) do nothing;
   if (a number) push the number onto S;
   if (an operator) {
     op2 = top of S;
     pop S;// carefull about the order!
     op1 = top of S;
     pop S;
     result = apply the operator to op1 and op2;
     push result onto S;
   }
}
display top of S;  // top of S will be the final result
```

Use our virtual machine to test your submissions (host name **vm000296**). The input/output requirements are essential, please follow them carefully to avoid losing marks. Spaces matter and text is case sensitive.

After you are satisfied with the performance of your code as tested in the virtual machine, submit a **one source file** code on Stream by **Friday 25 of March 2022.** Your **name** and **ID number** must appear **on top of the file as comments.** If you are working in a group, then ***all*** names and IDs must appear on top of the file as comments, but you still need to **submit individually** in both the virtual machine and Stream.