DATA STRUCTURES AND ALGORITHMS

ASSIGNMENT # 3

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\* C++ Program to Evaluate an Expression using Stacks

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#include <iostream>

#include <string.h>

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#include <math.h>

using namespace std;

struct node // defining structure of node

{

int data; // node include data field

node \*next; // and an address field

};

class stack // class stack use the structure to create

{ // node and contain alter methods

private:

node \*head;

public:

stack() // default constructor that sets head to NULL

{

head = NULL;

}

void push(int x)// push method to push a new node containing a given data in the stack

{

if (head == NULL) {

node \*newnode = new node;

newnode->next = NULL;

newnode->data = x;

head = newnode;

}

else {

node \*newnode = new node;

newnode->next = head;

head = newnode;

newnode->data = x;

}

}

int pop() // pop method is used to delete the

{ //first elememt of stack and return the value in it

node \*ptr;

int x;

if (head == NULL) {

cout << "stack is empty" << endl;

}

else {

x = head->data;

ptr = head;

head = head->next;

delete ptr;

ptr = NULL;

}

return x;

}

};

int main() // main method starts here

{

string str; // declaring data types

int a = 0, b = 0;

stack st = stack(); // creating stack object

// prompt the user

cout << "Enter the postfix expression with comas after each operand:" << endl;

cin >> str; // reading the postfix into string

for (int i = 0; i < str.length(); i++) // for loop to traverse the string

{

switch (str[i]) // switch and case used to check for particular operator

{ // or operand in the default case and perform the push and

case '+': // pop instructions

b = st.pop();

a = st.pop();

st.push(a + b);

break;

case '-':

b = st.pop();

a = st.pop();

st.push(a - b);

break;

case '\*':

b = st.pop();

a = st.pop();

st.push(a\*b);

break;

case '/':

b = st.pop();

a = st.pop();

st.push(a / b);

break;

case '^':

b = st.pop();

a = st.pop();

st.push(pow(a, b));

break;

default:

int p = i+1, q = 1;// algorithm to check the multi digit numbers

int num = 0; // and pushing them in the stack

while (str[p] != ',') {//',' is used here to check the number of //digits

q \*= 10;

p++;

}

p = i;

while (str[p] != ',') {

num += (str[p] - '0')\*q;

if (q > 1)

q = q / 10;

p++;

}

st.push(num);

i = p;

}

}

// poping out the last value in the stack which is also the answer of the postfix

cout << "RESULT OF POSTFIX EVALUATION = " << st.pop() << endl;

}

RESULT:

