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AIM :- Implement a Stack and perform the stack operations: Infix to Postfix, Infix to Prefix, Evaluation of Postfix Expression, Print using Menu Driver Program such as 1. Infix to Postfix, 2. Infix to Prefix, and 3. Evaluation of Postfix Expression and 4. Exit.

PROGRAM :-

```
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>

#define MAX 100
struct Stack
{
   int top;
   char items[MAX];
};

int isEmpty(struct Stack *stack)
{
   return stack->top == -1;
}

char peek(struct Stack *stack)
{
   return stack->items[stack->top];
}
```

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```
char pop(struct Stack *stack)
{
  if (!isEmpty(stack))
    return stack->items[stack->top--];



  return '\0';
}

void push(struct Stack *stack, char ch)
{
  stack->items[++stack->top] = ch;
}

int precedence(char ch)
{
  switch (ch)
  {
  case '+':
  case '-':
    return 1;
  case '*':
  case '/':
    return 2;
  case '^':
    return 3;
  }
```

```
   return -1;
}
 // Convert infix to postfix
void infixToPostfix(char *exp)
{
   struct Stack stack;
   stack.top = -1;
   int i, k;
   char output[MAX];

    for (i = 0, k = 0; exp[i]; i++)
   {
      if (isalnum(exp[i]))
      {
         output[k++] = exp[i];
      }
      else if (exp[i] == '(')
      {
         push(&stack, exp[i]);
      }
      else if (exp[i] == ')')
      {
         while (!isEmpty(&stack) && peek(&stack) != '(')
            output[k++] = pop(&stack);
         pop(&stack); // Remove '('
      }
      else
      {
        while (!isEmpty(&stack) && precedence(exp[i]) <= precedence(peek(&stack)))
          output[k++] = pop(&stack);
        push(&stack, exp[i]);
      }
    }
    while (!isEmpty(&stack))
      output[k++] = pop(&stack);

    output[k] = '\0';
    printf("Postfix Expression: %s\n", output);
  }
  void reverse(char *exp)
  {
    int n = strlen(exp);
    for (int i = 0; i < n / 2; i++)
    {
      char temp = exp[i];
      exp[i] = exp[n - i - 1];
      exp[n - i - 1] = temp;
    }
  }
  // Convert infix to prefix
  void infixToPrefix(char *exp)
  {
    reverse(exp);
    struct Stack stack;
    stack.top = -1;
    int i, k;
```

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```
char output[MAX];


for (i = 0, k = 0; exp[i]; i++)
{
   if (isalnum(exp[i]))
   {
      output[k++] = exp[i];
   }
   else if (exp[i] == ')')
   {
      push(&stack, exp[i]);
   }
   else if (exp[i] == '(')
    {
      while (!isEmpty(&stack) && peek(&stack) != ')')
         output[k++] = pop(&stack);
      pop(&stack);
   }
   else
   {
      while (!isEmpty(&stack) && precedence(exp[i]) < precedence(peek(&stack)))
         output[k++] = pop(&stack);
      push(&stack, exp[i]);
   }
}
while (!isEmpty(&stack))
   output[k++] = pop(&stack);
   output[k] = '\0';

   reverse(output);

   printf("Prefix Expression: %s\n", output);

}

 struct IntStack

{

   int top;

   int items[MAX];

};


int isIntStackEmpty(struct IntStack *stack)

{

   return stack->top == -1;

}


 int popInt(struct IntStack *stack)

{

   return stack->items[stack->top--];

}

 void pushInt(struct IntStack *stack, int value)

{

   stack->items[++stack->top] = value;

}

 //  Evaluate postfix expression

int evaluatePostfix(char *exp)

{

   struct IntStack stack;

   stack.top = -1;
```

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```
int i;
 for (i = 0; exp[i]; i++)
{
    if (isdigit(exp[i]))
    {
        pushInt(&stack, exp[i] - '0');
    }
    else
    {
        int val1 = popInt(&stack);
        int val2 = popInt(&stack);
        switch (exp[i])
        {
        case '+':
            pushInt(&stack, val2 + val1);

             break;
        case '-':
            pushInt(&stack, val2 - val1);
            break;
        case '*':
            pushInt(&stack, val2 * val1);
            break;
        case '/':
            pushInt(&stack, val2 / val1);
            break;
        }
    }
```

```
  }
  return popInt(&stack);
}
 int main()
{
  int choice;
  char exp[MAX];

   do
  {
    printf("\nMenu:\n");
    printf("1. Infix to Postfix\n");
    printf("2. Infix to Prefix\n");
    printf("3. Evaluate Postfix\n");
    printf("4. Exit\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);
    getchar();

     switch (choice)
    {
    case 1:
      printf("Enter infix expression: ");
      fgets(exp, MAX, stdin);
      exp[strcspn(exp, "\n")] = 0;
      infixToPostfix(exp);
      break;
```

```
        case 2:
          printf("Enter infix expression: ");
          fgets(exp, MAX, stdin);
          exp[strcspn(exp, "\n")] = 0;
          infixToPrefix(exp);
          break;

        case 3:
          printf("Enter postfix expression: ");
          fgets(exp, MAX, stdin);
          exp[strcspn(exp, "\n")] = 0;
          printf("Result of Postfix Evaluation: %d\n", evaluatePostfix(exp));
          break;

        case 4:
          printf("Exit the Program.\n");
          exit(0);
          break;

        default:
          printf("Invalid choice!\n");
        }

    } while (1);
    return 0;
    }
```

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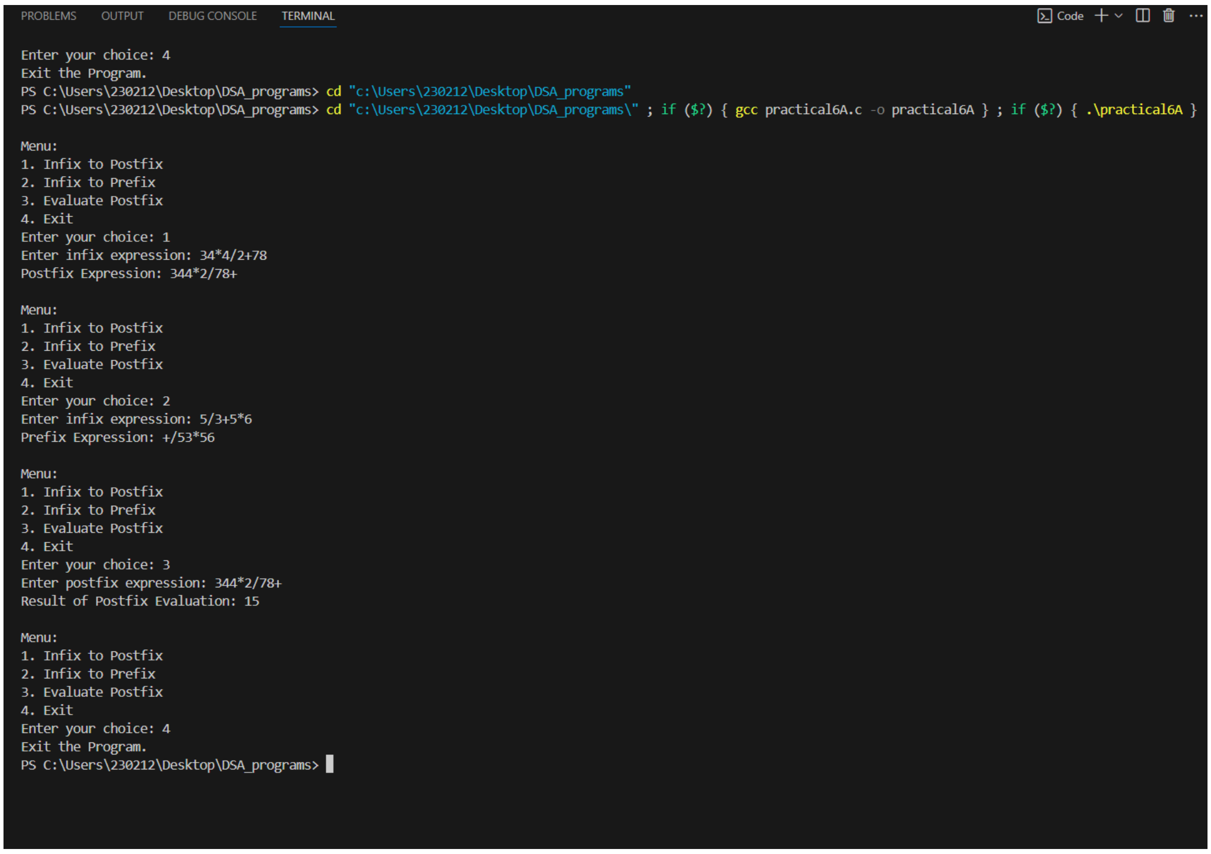
OUTPUT



```
Enter your choice: 4
Exit the Program.
PS C:\Users\230212\Desktop\DSA_programs> cd "c:\Users\230212\Desktop\DSA_programs"
PS C:\Users\230212\Desktop\DSA_programs> cd "c:\Users\230212\Desktop\DSA_programs\" ; if ($?) { gcc practical6A.c -o practical6A } ; if ($?) { .\practical6A }

Menu:
1. Infix to Postfix
2. Infix to Prefix
3. Evaluate Postfix
4. Exit
Enter your choice: 1
Enter infix expression: 34*4/2+78
Postfix Expression: 344*2/78+

Menu:
1. Infix to Postfix
2. Infix to Prefix
3. Evaluate Postfix
4. Exit
Enter your choice: 2
Enter infix expression: 5/3+5*6
Prefix Expression: +/53*56

Menu:
1. Infix to Postfix
2. Infix to Prefix
3. Evaluate Postfix
4. Exit
Enter your choice: 3
Enter postfix expression: 344*2/78+
Result of Postfix Evaluation: 15

Menu:
1. Infix to Postfix
2. Infix to Prefix
3. Evaluate Postfix
4. Exit
Enter your choice: 4
Exit the Program.
PS C:\Users\230212\Desktop\DSA_programs>
```

GITHUB LINK : https://github.com/AmolNagargoje04/Data-Structure-practical