# DATA STRUCTURES

25. IMPLEMENTATION OF LINKED LIST

```
#include <stdio.h>

#include<stdlib.h>

struct node

        {

                int data;

                struct node *next;

        };

        struct node *h,*nn,*t,*p;


        void ibegin()

        {

        nn=(struct node*)malloc(sizeof(struct node));

                printf("enter data ");

                scanf("%d",&nn->data);

                nn->next=h;

                h=nn;

        }

        void imid()

        {

                nn=(struct node*)malloc(sizeof(struct node));

                printf("enter data ");

                scanf("%d",&nn->data);

                int i=1,pos;

                printf("\nenter insert position ");

                scanf("%d",&pos);
                t=h;

                while(i<pos && t!=0)

                {

                t=t->next;

                i++;

        }

                nn->next=t->next;

                t->next=nn;

        }


        void iend()

        {

                nn=(struct node*)malloc(sizeof(struct node));

                printf("enter data ");

                scanf("%d",&nn->data);

                nn->next=0;

                t=h;

                while(t->next!=0)

                {

                        t=t->next;

                }

                t->next=nn;

        }



        void ins()

{
```

```
            int a;

            do

            {


            printf("\nenter insersion type: 1-b 2-m 3-e\n");

            scanf("%d",&a);

            switch(a)

            {


                    case 1: ibegin();

                    break;

                    case 2: imid();

                    break;

                    case 3: iend();

                    break;

                    default: printf("invalid choice");

            }

    }

    while(a!=0);

  }


            void dbegin()

   {

            t=h;

            h=t->next;

            t->next=0;

            free(t);
```

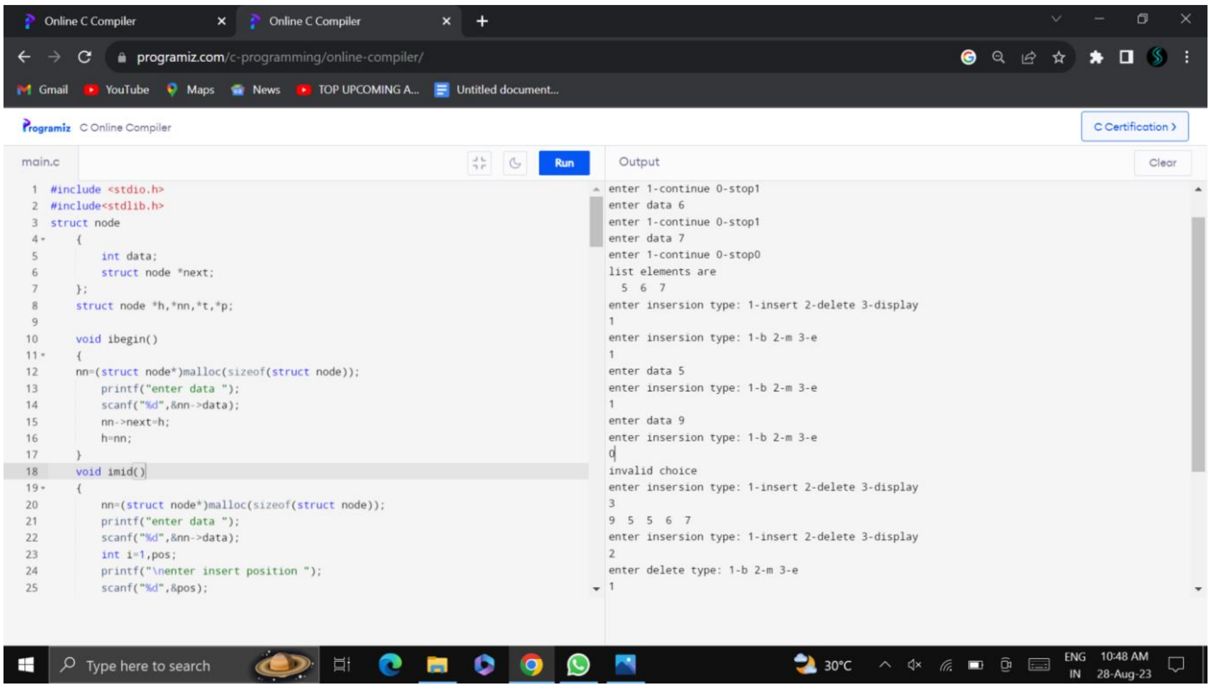
```
}
void dmid()
{
        int pos,i=1;
printf("\nenter insert position ");
                scanf("%d",&pos);
                t=h;
                while(i<pos && t!=0)
                {
                t=t->next;
                i++;
          }
                while(p->next!=t)
                p=p->next;
                p->next=t->next;
                t->next=0;
                free(t);
}
void dend()
{
        while(t->next!=0)
                {
                        t=t->next;
                }
                while(p->next!=t)
                p=p->next;
                p->next=0;
```

```
                        free(t);
}
void del()
{
            int b;
            do
            {

            printf("\nenter delete type: 1-b 2-m 3-e\n");
            scanf("%d",&b);
            switch(b)
            {

                        case 1: dbegin();
                        break;
                        case 2: dmid();
                        break;
                        case 3: dend();
                        break;
                        default: printf("invalid choice");
            }
 }
 while(b!=0);
}



            void display()
```

```
        {
                t=h;
                while(t!=0)
                {
                        printf("%3d",t->data);
                        t=t->next;
                }
        }
int main()
{
        h=0;
        int c=1;
        while(c==1)
        {
                nn=(struct node*)malloc(sizeof(struct node));
                printf("enter data ");
                scanf("%d",&nn->data);
                nn->next=0;
                if(h==0)
                {
                        h=t=nn;
                }
                else
                {
                        t->next=nn;
                        t=nn;
                }
```

```
    printf("enter 1-continue 0-stop");

    scanf("%d",&c);

}

t=h;

printf("list elements are\n");

while(t!=0)

{

            printf("%3d",t->data);

            t=t->next;


}

int x;

do

{


printf("\nenter  type: 1-insert 2-delete 3-display\n");

scanf("%d",&x);

switch(x)

{


            case 1: ins();

            break;

            case 2: del();

            break;

            case 3: display();

            break;

            default: printf("invalid choice");
```

```
          }
  }
  while(x!=0);
          return 0;
}
```



```
#include <stdio.h>
#include<stdlib.h>
struct node
    {
        int data;
        struct node *next;
    };
    struct node *h,*nn,*t,*p;

    void ibegin()
    {
    nn=(struct node*)malloc(sizeof(struct node));
        printf("enter data ");
        scanf("%d",&nn->data);
        nn->next=h;
        h=nn;
    }
    void imid()
    {
        nn=(struct node*)malloc(sizeof(struct node));
        printf("enter data ");
        scanf("%d",&nn->data);
        int i=1,pos;
        printf("\nenter insert position ");
        scanf("%d",&pos);
```

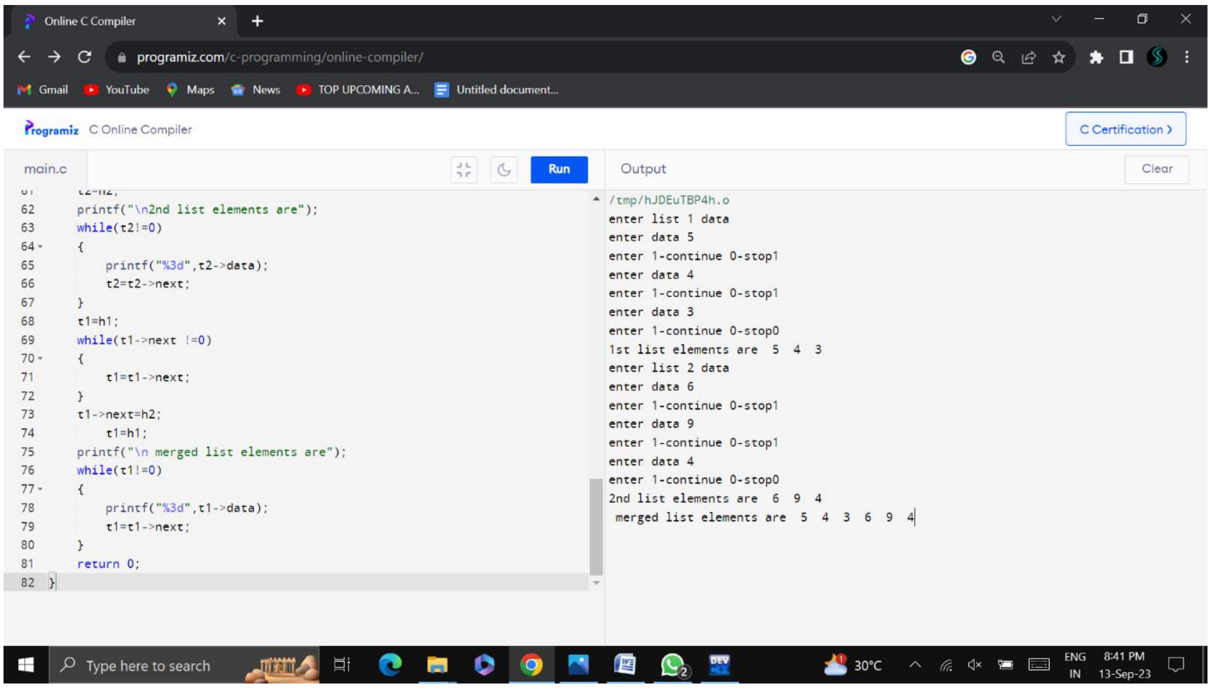
```
enter 1-continue 0-stop1
enter data 6
enter 1-continue 0-stop1
enter data 7
enter 1-continue 0-stop0
list elements are
  5  6  7
enter insersion type: 1-insert 2-delete 3-display
1
enter insersion type: 1-b 2-m 3-e
1
enter data 5
enter insersion type: 1-b 2-m 3-e
1
enter data 9
enter insersion type: 1-b 2-m 3-e
0
invalid choice
enter insersion type: 1-insert 2-delete 3-display
3
9  5  5  6  7
enter insersion type: 1-insert 2-delete 3-display
2
enter delete type: 1-b 2-m 3-e
1
```

26. MERGE TWO LISTS

```
#include <stdio.h>
#include<stdlib.h>
int main()
{
          struct node
          {
                    int data;
                    struct node *next;
          };
          struct node *h1,*nn1,*t1;
          h1=0;
```

```
int c1=1;

printf("enter list 1 data\n");

while(c1==1)

{

        nn1=(struct node*)malloc(sizeof(struct node));

        printf("enter data ");

        scanf("%d",&nn1->data);

        nn1->next=0;

        if(h1==0)

        {

                h1=t1=nn1;

        }

        else

        {

                t1->next=nn1;

                t1=nn1;

        }

   printf("enter 1-continue 0-stop");

   scanf("%d",&c1);

}

t1=h1;

printf("1st list elements are");

while(t1!=0)

{

        printf("%3d",t1->data);

        t1=t1->next;

}
```

```
            struct node *h2,*nn2,*t2;
h2=0;
int c2=1;
printf("\nenter list 2 data\n");
while(c2==1)
{
            nn2=(struct node*)malloc(sizeof(struct node));
            printf("enter data ");
            scanf("%d",&nn2->data);
            nn2->next=0;
            if(h2==0)
            {
                        h2=t2=nn2;
            }
            else
            {
                        t2->next=nn2;
                        t2=nn2;
            }
    printf("enter 1-continue 0-stop");
    scanf("%d",&c2);
}
t2=h2;
printf("\n2nd list elements are");
while(t2!=0)
{
            printf("%3d",t2->data);
            t2=t2->next;
        }
        t1=h1;
        while(t1->next !=0)
        {
            t1=t1->next;
        }
        t1->next=h2;
            t1=h1;
        printf("\n merged list elements are");
        while(t1!=0)
        {
            printf("%3d",t1->data);
            t1=t1->next;
        }
        return 0;
}
```



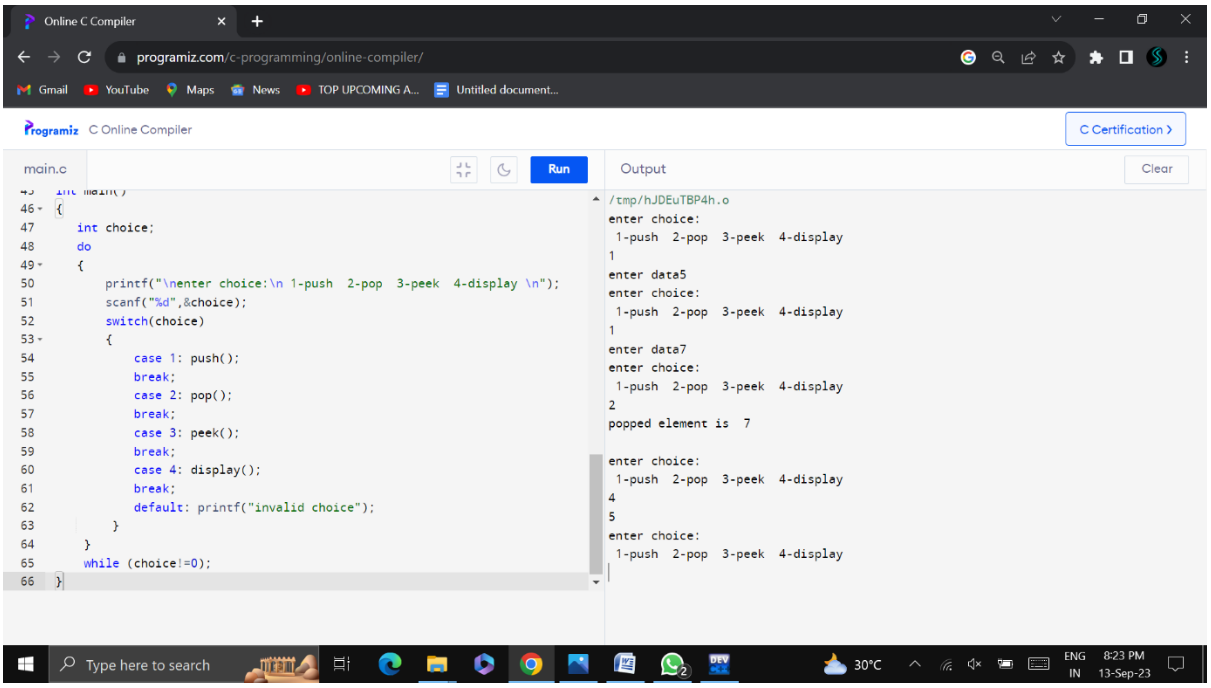
```
printf("\n2nd list elements are");
while(t2!=0)
{
    printf("%3d",t2->data);
    t2=t2->next;
}
t1=h1;
while(t1->next !=0)
{
    t1=t1->next;
}
t1->next=h2;
    t1=h1;
printf("\n merged list elements are");
while(t1!=0)
{
    printf("%3d",t1->data);
    t1=t1->next;
}
return 0;
}
```

```
/tmp/hJDEuTBP4h.o
enter list 1 data
enter data 5
enter 1-continue 0-stop1
enter data 4
enter 1-continue 0-stop1
enter data 3
enter 1-continue 0-stop0
1st list elements are  5  4  3
enter list 2 data
enter data 6
enter 1-continue 0-stop1
enter data 9
enter 1-continue 0-stop1
enter data 4
enter 1-continue 0-stop0
2nd list elements are  6  9  4
 merged list elements are  5  4  3  6  9  4
```

27. TO IMPLEMENT STACK OPERATIONS

```
#include<stdio.h>
#include<stdlib.h>
int s[10];
int t=-1,n=10;
void push()
{
        int x;
        printf("enter data");
        scanf("%d",&x);
        if(t>=n-1)
        {
                printf("stack is full\n");
        }
        else
        {
                t++;
                s[t]=x;
        }
}
void pop()
{
        int item;
        if(t==-1)
        printf("stack is empty to pop\n");
        else
```

```
            {
                        item=s[t];
                        t--;
            }
            printf("popped element is %2d\n",item);
}
void peek()
{
            if(t==-1)
            printf("stack is empty\n");
            else
                        printf("peek element is %2d\n",s[t]);
}
 void display()
 {
            int i;
            for(i=t;i>=0;i--)
            printf("%3d",s[i]);
 }
 int main()
 {
            int choice;
            do
            {
                        printf("\nenter choice:\n 1-push  2-pop  3-peek  4-display \n");
                        scanf("%d",&choice);
                        switch(choice)
            {
                    case 1: push();
                    break;
                    case 2: pop();
                    break;
                    case 3: peek();
                    break;
                    case 4: display();
                    break;
                    default: printf("invalid choice");
            }
        }
        while (choice!=0);
}
```



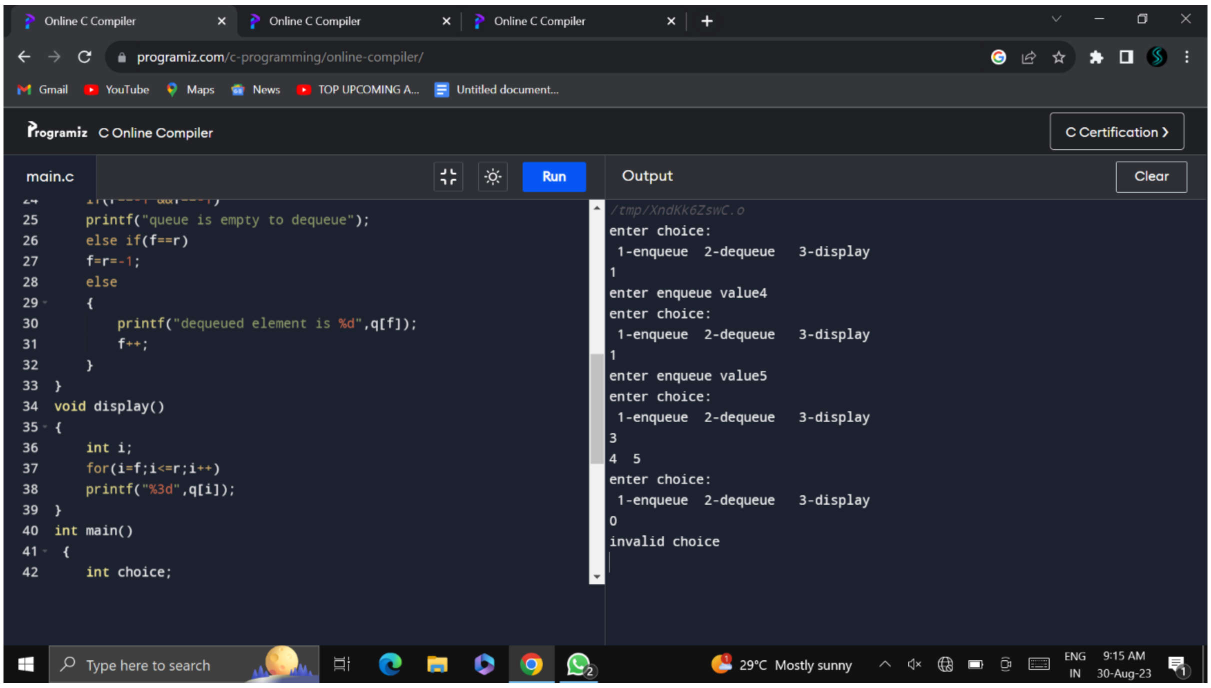
```
int main()
{
    int choice;
    do
    {
        printf("\nenter choice:\n 1-push  2-pop  3-peek  4-display \n");
        scanf("%d",&choice);
        switch(choice)
        {
            case 1: push();
            break;
            case 2: pop();
            break;
            case 3: peek();
            break;
            case 4: display();
            break;
            default: printf("invalid choice");
         }
     }
     while (choice!=0);
}
```

```
/tmp/hJDEuTBP4h.o
enter choice:
 1-push  2-pop  3-peek  4-display
1
enter data5
enter choice:
 1-push  2-pop  3-peek  4-display
1
enter data7
enter choice:
 1-push  2-pop  3-peek  4-display
2
popped element is  7

enter choice:
 1-push  2-pop  3-peek  4-display
4
5
enter choice:
 1-push  2-pop  3-peek  4-display
```

28. TO IMPLEMENT QUEUE OPERATIONS

```
#include<stdio.h>

int q[5],f=-1,r=-1,n=5;
```

```
void enqueue()
{
        int x;
        printf("enter enqueue value");
        scanf("%d",&x);
        if(r>=n-1)
        printf("queue is full");
        else if(f==-1 &&r==-1)
        {
                f++;
                r++;
                q[r]=x;
        }
        else
        {
                r++;
                q[r]=x;
        }
}
void dequeue()
{
        if(r==-1 &&f==-1)
        printf("queue is empty to dequeue");
        else if(f==r)
        f=r=-1;
        else
        {
                printf("dequeued element is %d",q[f]);
                f++;
        }
}
void display()
{
        int i;
        for(i=f;i<=r;i++)
        printf("%3d",q[i]);
}
int main()
 {
        int choice;
        do
        {
                printf("\nenter choice:\n 1-enque  2-deque   3-display \n");
                scanf("%d",&choice);
                switch(choice)
                {
                        case 1: enqueue();
                        break;
                        case 2: dequeue();
                        break;
                        case 3: display();
                        break;
                        default: printf("invalid choice");
                 }
        }
        while (choice!=0);
}
```



```
    printf("queue is empty to dequeue");
    else if(f==r)
    f=r=-1;
    else
    {
        printf("dequeued element is %d",q[f]);
        f++;
    }
}
void display()
{
    int i;
    for(i=f;i<=r;i++)
    printf("%3d",q[i]);
}
int main()
 {
    int choice;
```

```
/tmp/XndKk6ZswC.o
enter choice:
 1-enqueue  2-dequeue   3-display
1
enter enqueue value4
enter choice:
 1-enqueue  2-dequeue   3-display
1
enter enqueue value5
enter choice:
 1-enqueue  2-dequeue   3-display
3
4  5
enter choice:
 1-enqueue  2-dequeue   3-display
0
invalid choice
```

29. TO CONVERT INFIX TO POSTFIX USING STACK

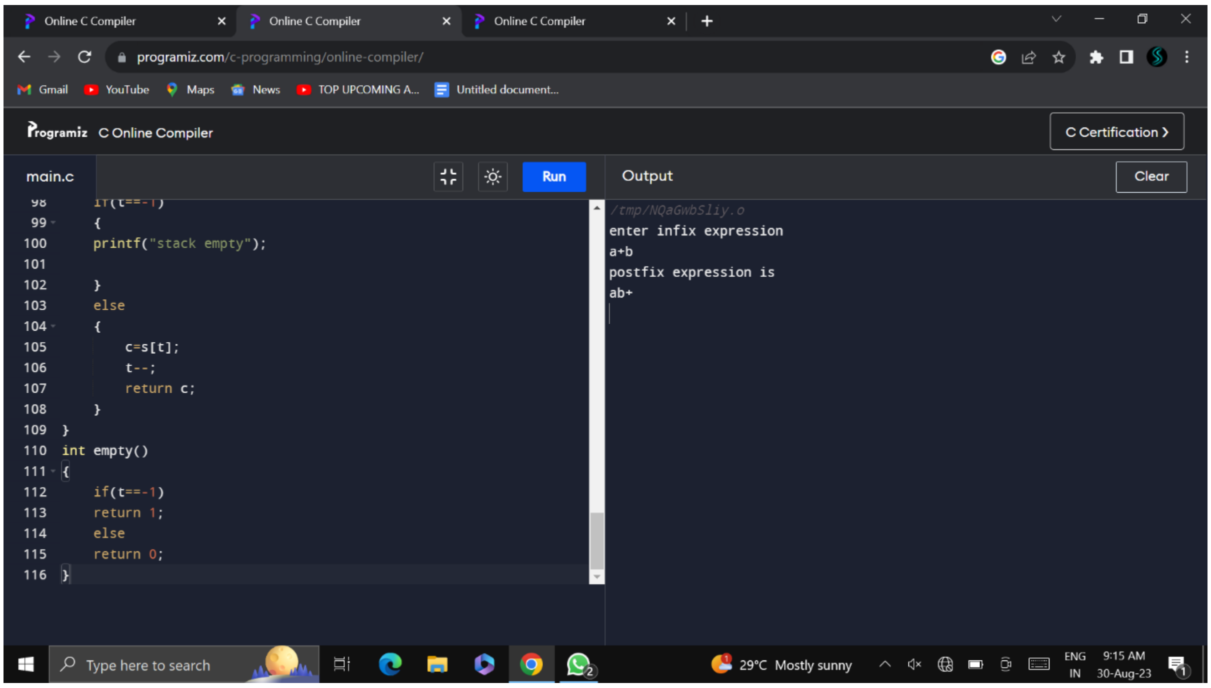
```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
char s[50],in[50],post[50];
int t=-1;
void push(char);
char pop();
int empty();
void topost();
void print();
int pre(char);

int main()
```

```
{
        printf("enter infix expression\n");
        gets(in);
        topost();
        print();
        return 0;
}
void topost()
{

        int i,j=0;
        char sym,nxt;
        for(i=0;i<strlen(in);i++)
        {
                sym=in[i];
                switch(sym)
                {
                        case '(':
                                push(sym);
                                break;
                        case ')':
                        while((nxt=pop())!='(')
                        post[j++]=nxt;
                        break;
                        case '+':
                        case '-':
                        case '*':
```

```
                    case '/':
                    case '^':
                    while(!empty() && pre(s[t])>=pre(sym))
                    post[j++]=pop();
                    push(sym);
                    break;
                    default:
                    post[j++]=sym;
                }
        }
        while(!empty())
        post[j++]=pop();
        post[j++]='\0';
}

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

```
                        case '%':
                                return 4;

                        default:
                        return 0;
        }
}
void print()
{
        int i=0;
        printf("postfix expression is\n");
        while(post[i])
        {
                printf("%c",post[i++]);
        }
        printf("\n");
}
void push(char c)
{
        if(t>=50-1)
        printf("stack is full\n");
        else
        {
                t++;
                s[t]=c;
        }
}
```

```
char pop()

{

            int c;

            if(t==-1)

            {

            printf("stack empty");


    }

            else

            {

                        c=s[t];

                        t--;

                        return c;

            }

}

int empty()

{

            if(t==-1)

            return 1;

            else

            return 0;

}
```

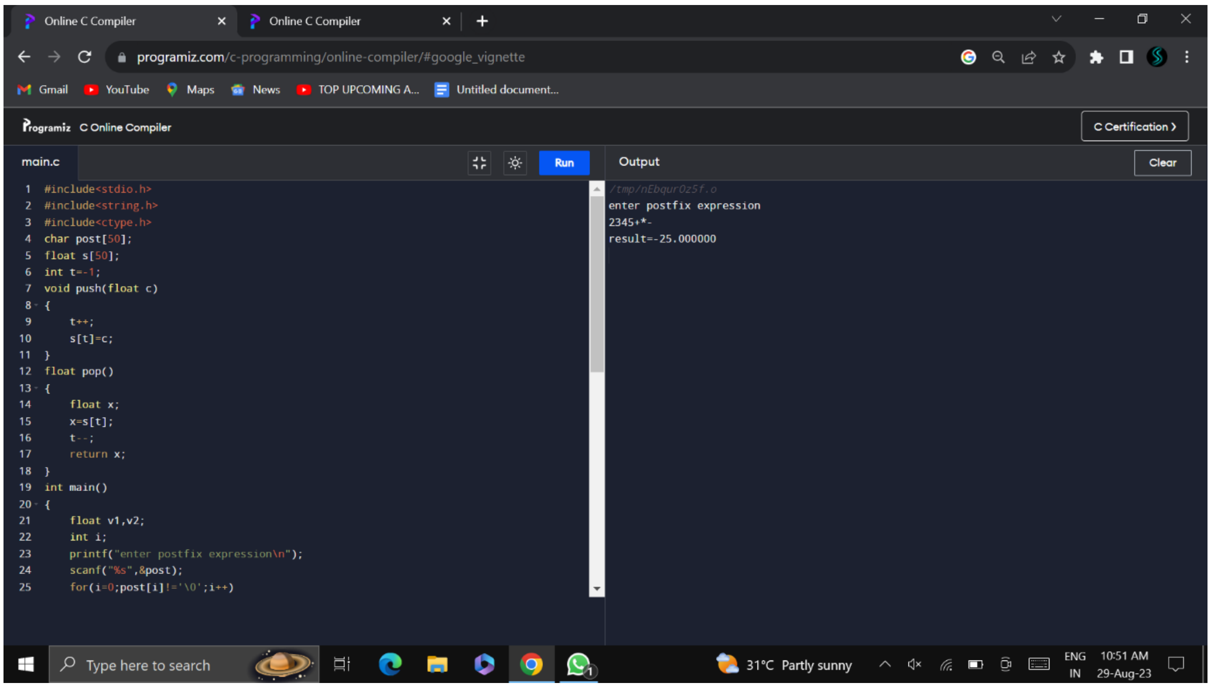


```
    if(t==-1)
    {
    printf("stack empty");

    }
    else
    {
        c=s[t];
        t--;
        return c;
    }
}
int empty()
{
    if(t==-1)
    return 1;
    else
    return 0;
}
```

```
/tmp/NQaGwbSliy.o
enter infix expression
a+b
postfix expression is
ab+
```

## 30. TO EVALUTE THE POSTFIX EXPRESSION

```
#include<stdio.h>

#include<string.h>

#include<ctype.h>

char post[50];

float s[50];

int t=-1;

void push(float c)

{

        t++;

        s[t]=c;

}

float pop()

{

        float x;

        x=s[t];

        t--;
        return x;
}
int main()
{
        float v1,v2;
        int i;
        printf("enter postfix expression\n");
        scanf("%s",&post);
        for(i=0;post[i]!='\0';i++)
        {
                if(isdigit(post[i]))
                {
                        push(post[i]-'0');
                }
                else
                {
                        v1=pop();
                        v2=pop();
                        switch(post[i])
                        {
                                case '+':
                                        push(v2+v1);
                                        break;
                                case '-':
                                        push(v2-v1);
                                        break;
                                case '*':
                                        push(v2*v1);
                                        break;
                                case '/':
                                        push((float)v2/v1);
                                        break;


                        }
                }
        }
        printf("result=%f\n",s[t]);
        return 0;
}
```



```
#include<stdio.h>
#include<string.h>
#include<ctype.h>
char post[50];
float s[50];
int t=-1;
void push(float c)
{
    t++;
    s[t]=c;
}
float pop()
{
    float x;
    x=s[t];
    t--;
    return x;
}
int main()
{
    float v1,v2;
    int i;
    printf("enter postfix expression\n");
    scanf("%s",&post);
    for(i=0;post[i]!='\0';i++)
```

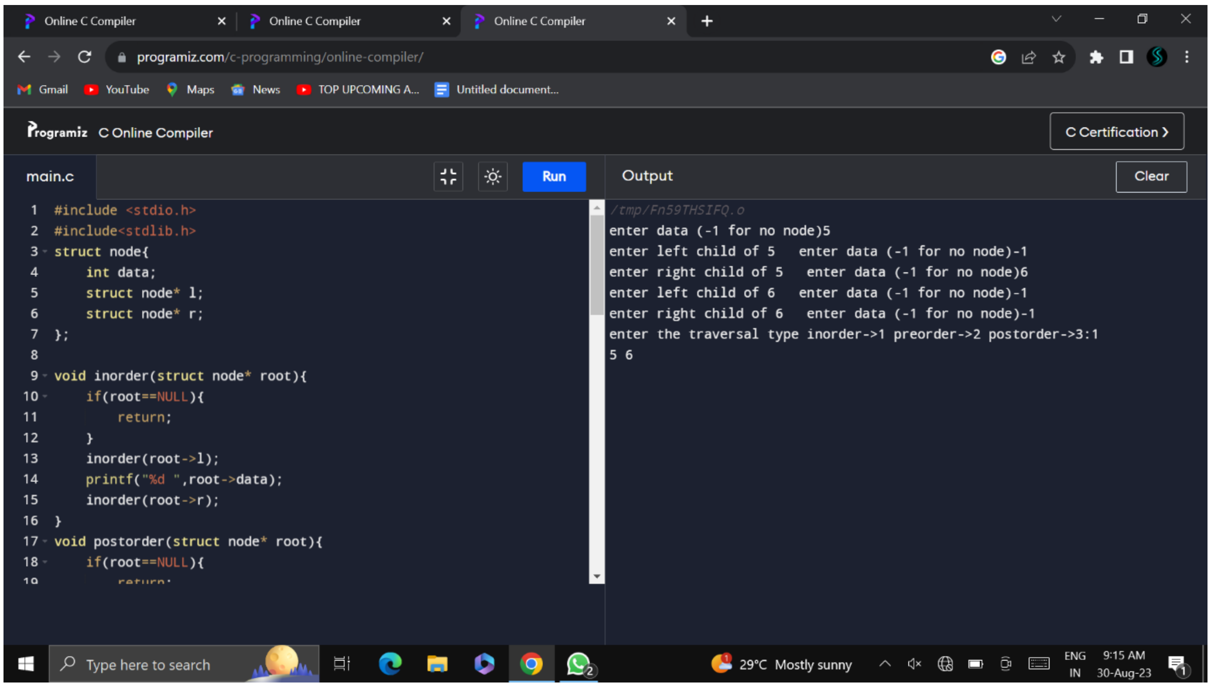
```
/tmp/nEbqurOz5f.o
enter postfix expression
2345+*-
result=-25.000000
```

31. TO IMPLEMENT TREE TRAVERSALS

```
#include <stdio.h>
#include<stdlib.h>
struct node{
    int data;
    struct node* l;

    struct node* r;

};


void inorder(struct node* root){

    if(root==NULL){

        return;

    }

    inorder(root->l);

    printf("%d ",root->data);

    inorder(root->r);

}

void postorder(struct node* root){

    if(root==NULL){

        return;

    }

    postorder(root->l);

    postorder(root->r);

    printf("%d ",root->data);

}

void preorder(struct node* root){

    if(root==NULL){

        return;

    }

    printf("%d ",root->data);

    preorder(root->l);

    preorder(root->r);
```

```
}

struct node *create()

{

            int x;

            struct node *nn;

            nn=(struct node*)malloc(sizeof(struct node));

            printf("enter data (-1 for no node)");

            scanf("%d",&x);

            if(x==-1)

            return 0;

            nn->data=x;

            printf("enter left child of %d   ",x);

            nn->l=create();

            printf("enter right child of %d   ",x);

            nn->r=create();

            return nn;

}


int main(){

   int a;

   struct node* root;

            root=create();

   printf("enter the traversal type inorder->1 preorder->2 postorder->3:");

   scanf("%d",&a);

   switch(a){

      case 1:inorder(root);

      break;
```

```
        case 2:preorder(root);
        break;
        case 3:postorder(root);
        break;
    }
    return 0;
}
```



```
#include <stdio.h>
#include<stdlib.h>
struct node{
    int data;
    struct node* l;
    struct node* r;
};

void inorder(struct node* root){
    if(root==NULL){
        return;
    }
    inorder(root->l);
    printf("%d ",root->data);
    inorder(root->r);
}
void postorder(struct node* root){
    if(root==NULL){
        return;
```

```
/tmp/Fn59THSIFQ.o
enter data (-1 for no node)5
enter left child of 5   enter data (-1 for no node)-1
enter right child of 5   enter data (-1 for no node)6
enter left child of 6   enter data (-1 for no node)-1
enter right child of 6   enter data (-1 for no node)-1
enter the traversal type inorder->1 preorder->2 postorder->3:1
5 6
```