

//Stack

```
import java.util.*;
class StackClass {
    int s[],tos,MaxSize;

    StackClass(int n)
    {
        MaxSize=n;
        tos=-1;
        s=new int[MaxSize];
    }

    void push(int element)
    {
        tos++;
        s[tos]=element;
    }

    int pop()
    {
        int t=s[tos];
        tos--;
        return(t);
    }

    int elementattos()
    {
        return(s[tos]);
    }

    void printall()
    {
        for(int i =tos;i>=0;i--)
            System.out.println(s[i]);
    }

    boolean is_empty()
    {
        if(tos== -1)
            return(true);
        else
            return(false);
    }
    boolean is_full()
    {
        if(tos==MaxSize-1)
```



```

        return(true);
    else
        return(false);
    }
}

class Stack
{

    public static void main(String args[])
    {
        StackClass s=null;
        int size,choice,e;
        Scanner in=new Scanner(System.in);
        System.out.println("enter size of stack");
        size=in.nextInt();
        s=new StackClass(size);
        do
        {
            System.out.println("1. Push\n2. Pop\n3. Element at top\n4. Print Stack
Data\n0. Exit\n: ");
            choice=in.nextInt();
            switch(choice)
            {
                case 1:
                    if(!s.is_full())
                    {
                        System.out.println("enter element:");
                        e=in.nextInt();
                        s.push(e);
                    }
                    else
                    {
                        System.out.println("Sorry Stack Full");
                    }
                    break;

                case 2:
                    if(!s.is_empty())
                    {
                        System.out.println("Element popped is:"+s.pop());
                    }
                    else
                    {
                        System.out.println("Sorry Stack Empty");
                    }
                    break;

                case 3:

```



```

        if(!s.is_empty())
        {
            System.out.println("Element At Top is:"+s.elementatpos());

        }
        else
        {
            System.out.println("Sorry Stack Empty");
        }
        break;

    case 4:
        if(!s.is_empty())
        {
            System.out.println("Element OnStack Are:\n");
            s.printall();

        }
        else
        {
            System.out.println("Sorry Stack Empty");
        }
        break;

    case 0:
        System.out.println("Exiting program");
        break;

    default:
        System.out.println("Wrong input");
        break;

    }

    }while(choice!=0);
}

```



//TOWER OF HANOI

```
public class TowerOfHanoi {
    public static void main(String args[])
    {
        sol(3,'a','b','c');
    }

    static void sol(int disk,char Source,char Aux,char Dest)
    {
        if(disk==0)
            return;
        else
        {
            sol(disk-1,Source,Dest,Aux);
            System.out.println(" Move disk "+disk+" from "+Source+" to "+Dest);
            sol(disk-1,Aux,Source,Dest);
        }
    }
}
```



//INFIX TO POSTFIX

```
import java .util.*;
class Stackchar
{
    int MaxSize, tos;
    char s[];
    Stackchar(int size)
    {
        MaxSize = size;
        tos = -1;
        s= new char[MaxSize];
    }

    void push(char x)
    {
        tos++;
        s[tos]= x;
    }

    char pop()
    {
        char t = s[tos];
        tos--;
        return t;
    }

    boolean is_full()
    {
        if(tos==MaxSize-1)
            return true;
        else
            return false;
    }

    boolean is_empty()
    {
        if(tos== -1)
            return true;
        else
            return false;
    }

    char at_tos()
    {
        if (tos== -1)
            return(' ');
        else
            return(s[tos]);
    }
}
```



```

void print()
{
    for(int i= tos;i>=0;i--)
        System.out.println(s[i]);
}

}

class InfixtoPostfix
{
    public static void main(String args[])
    {

        Scanner in = new Scanner(System.in);

        Stackchar s= null;

        String post="", infix;

        System.out.println("Enter Infix:");
        infix= in.nextLine();

        int size = infix.length();

        s = new Stackchar(size);

        for(int i=0; i<size ; i++)
        {
            char c = infix.charAt(i);

            switch(c)
            {
                case '(': s.push(c); break;

                case ')': while(s.at_tos()!='(')
                    {
                        post = post + s.pop();
                    }
                    char g = s.pop();
                    break;

                case '+': case '-': case '*': case '/':

                    while(precedence(c)<=precedence(s.at_tos()) && !s.is_empty())
                    {
                        post = post+s.pop();
                    }
                    s.push(c);
                    break;
            }
        }
    }
}

```



```

        default: post= post+c;
    }
}

while(!s.is_empty())
{
    post = post + s.pop();
}

System.out.println("Postfix= "+post);
}

public static int precedence(char ch)
{
    if(ch=='*' || ch=='/')
        return(2);

    else if(ch=='+' || ch=='-')
        return(1);

    else
        return(0);
}
}

```



//INFIX TO PREFIX

```
import java .util.*;
class Stackchar
{
    int MaxSize, tos;
    char s[];
    Stackchar(int size)
    {
        MaxSize = size;
        tos = -1;
        s= new char[MaxSize];
    }

    void push(char x)
    {
        tos++;
        s[tos]= x;
    }

    char pop()
    {
        char t = s[tos];
        tos--;
        return t;
    }

    boolean is_full()
    {
        if(tos==MaxSize-1)
            return true;
        else
            return false;
    }

    boolean is_empty()
    {
        if(tos== -1)
            return true;
        else
            return false;
    }

    char at_tos()
    {
        if (tos== -1)
            return(' ');
        else
            return(s[tos]);
    }
}
```




```

void print()
{
    for(int i= tos;i>=0;i--)
        System.out.println(s[i]);
}

}

class InfixtoPrefix
{
    public static void main(String args[])
    {

        Scanner in = new Scanner(System.in);

        Stackchar s= null;

        String pre="", infix;

        System.out.println("Enter Infix:");
        infix= in.nextLine();

        int size = infix.length();

        s = new Stackchar(size);

        for(int i=size-1; i>=0 ; i--)
        {
            char c = infix.charAt(i);

            switch(c)
            {
                case')': s.push(c); break;

                case'(': while(s.at_tos()!='')
                {
                    pre = pre + s.pop();
                }
                char g = s.pop();
                break;

                case'+': case'-': case'*': case'/':

                    while(precedence(c)<precedence(s.at_tos()) && !s.is_empty())
                    {
                        pre = pre+s.pop();
                    }
                    s.push(c);
                    break;
            }
        }
    }
}

```



```
        default: pre= pre+c;
    }
}

while(!s.is_empty())
{
    pre = pre + s.pop();
}

System.out.println("Prefix= \n");
for(int i=pre.length()-1;i>=0;i--)
    System.out.print(pre.charAt(i));

}

public static int precedence(char ch)
{
    if(ch=='*' || ch=='/')
        return(2);

    else if(ch=='+' || ch=='-')
        return(1);

    else
        return(0);
}
}
```



//Queue

```
import java.util.*;
class QueueClass {
    int q[],front,rear,MaxSize;

    QueueClass(int n)
    {
        MaxSize=n;
        front=0;
        rear=-1;
        q=new int[MaxSize];
    }

    void enqueue(int element)
    {
        rear++;
        q[rear]=element;
    }

    int dequeue()
    {
        int t=q[front];
        front++;
        return(t);
    }

    int elementatfront()
    {
        return(q[front]);
    }
    int elementatrear()
    {
        return(q[rear]);
    }

    void printall()
    {
        for(int i =front;i<=rear;i++)
            System.out.print(q[i]+"-");
    }

    boolean is_empty()
    {
        if(front>rear)
            return(true);
        else
            return(false);
    }
}
```



```

    }
    boolean is_full()
    {
        if(rear==MaxSize-1)
            return(true);
        else
            return(false);
    }
}

class queue
{

    public static void main(String args[])
    {
        QueueClass q=null;
        int size,choice,e;
        Scanner in=new Scanner(System.in);
        System.out.println("enter size of queue");
        size=in.nextInt();
        q=new QueueClass(size);
        do
        {
            System.out.println("\n1. Enqueue\n2. Dequeue\n3. Element at Front\n4.
Element at Rear\n5. Print Queue Data\n0. Exit\n: ");
            choice=in.nextInt();
            switch(choice)
            {
                case 1:
                    if(!q.is_full())
                    {
                        System.out.println("enter element:");
                        e=in.nextInt();
                        q.enqueue(e);
                    }
                    else
                    {
                        System.out.println("Sorry Queue Is Full");
                    }
                    break;

                case 2:
                    if(!q.is_empty())
                    {
                        System.out.println("Element popped is:"+q.dequeue());
                    }
                    else
                    {

```



```

        System.out.println("Sorry Queue Empty");
    }
    break;

case 3:
    if(!q.is_empty())
    {
        System.out.println("Element At Front is:"+q.elementatfront());

    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 4:
    if(!q.is_empty())
    {
        System.out.println("Element At Rear is:"+q.elementatrear());

    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 5:
    if(!q.is_empty())
    {
        System.out.println("Element OnQueue Are:\n");
        q.printall();

    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 0:
    System.out.println("Exiting program");
    break;

default:
    System.out.println("Wrong input");
    break;
}
}while(choice!=0);

```



```
}  
}
```

//Circular queue

```
import java.util.*;  
class QueueClass {  
    int q[],front,rear,MaxSize,count;  
  
    QueueClass(int n)  
    {  
        MaxSize=n;  
        front=0;  
        rear=-1;  
        count=0;  
        q=new int[MaxSize];  
    }  
  
    void enqueue(int element)  
    {  
        rear=(rear+1)%MaxSize;  
        q[rear]=element;  
        count++;  
    }  
  
    int dequeue()  
    {  
        int t=q[front];  
        rear=(rear+1)%MaxSize;  
        count--;  
        return(t);  
    }  
  
    int elementatfront()  
    {  
        return(q[front]);  
    }  
    int elementatrear()  
    {  
        return(q[rear]);  
    }  
  
    void printall()  
    {  
        int i=front;  
        int c=0;  
        for(; c<=count ;c++,i=(i+1)%MaxSize)  
            System.out.print(q[i]+"-");  
    }  
}
```



```

    }

    boolean is_empty()
    {
        if(count==0)
            return(true);
        else
            return(false);
    }
    boolean is_full()
    {
        if(count==MaxSize-1)
            return(true);
        else
            return(false);
    }
}

public class Circularqueue
{

    public static void main(String args[])
    {
        QueueClass q=null;
        int size,choice,e;
        Scanner in=new Scanner(System.in);
        System.out.println("enter size of queue");
        size=in.nextInt();
        q=new QueueClass(size);
        do
        {
            System.out.println("\n1. Enqueue\n2. Dequeue\n3. Element at Front\n4.
            Element at Rear\n5. Print Queue Data\n0. Exit\n: ");
            choice=in.nextInt();
            switch(choice)
            {
                case 1:
                    if(!q.is_full())
                    {
                        System.out.println("enter element:");
                        e=in.nextInt();
                        q.enqueue(e);
                    }
                    else
                    {
                        System.out.println("Sorry Queue Is Full");
                    }
                    break;

```



```
case 2:
    if(!q.is_empty())
    {
        System.out.println("Element popped is:"+q.dequeue());
    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 3:
    if(!q.is_empty())
    {
        System.out.println("Element At Front is:"+q.elementatfront());
    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 4:
    if(!q.is_empty())
    {
        System.out.println("Element At Rear is:"+q.elementatrear());
    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 5:
    if(!q.is_empty())
    {
        System.out.println("Element OnQueue Are:\n");
        q.printall();
    }
    else
    {
        System.out.println("Sorry Queue Empty");
    }
    break;

case 0:
    System.out.println("Exiting program");
    break;

default:
```




```
        System.out.println("Wrong input");  
        break;  
    }  
}while(choice!=0);  
}  
}
```



//LinkedList

```

import java.util.*;
class node
{
    int data;
    node next;
    node(int e)
    {
        data=e;
        next=null;
    }
}
class LinkedListClass
{
    node root,newnode,t,t2;
    LinkedListClass()
    {
        root=null;
    }
    void insert_left(node n)
    {
        if(root==null)
        {
            root=n;
        }
        else
        {
            n.next=root;
            root=n;
        }
    }
    node delete_left()
    {
        t=null;
        if(root!=null)
        {
            t=root;
            root=root.next;
        }
        return(t);
    }
    void insert_right(node n)
    {
        if(root==null)
        {
            root=n;
        }
        else
        {

```



```

        t=root;
        while(t.next!=null)
            t=t.next;
        t.next=n;
    }
}
node delete_right()
{
    t=null;
    if(root!=null)
    {
        t=root;
        while(t.next!=null)
        {
            t2=t;
            t=t.next;
        }
        t2.next=null;
    }
    return(t);
}

void printall()
{
    if(root!=null)
    {
        t=root;
        while(t!=null)
        {
            System.out.print("|" + t.data + "|->|");
            t=t.next;
        }
    }
}

boolean is_empty()
{
    if(root==null)
        return true;
    else
        return false;
}

}

public class LinkedList {
    public static void main(String args[])
    {
        int choice,e;node n;

```



```

Scanner in=new Scanner(System.in);
LinkedListClass l=new LinkedListClass();
do
{
    System.out.println("1. Insert to Left\n2. Insert to right\n3. Delete Left\n4.
Delete Right\n5. Print Data\n0. Exit\n: ");
    choice=in.nextInt();
    switch(choice)
    {
        case 1:
            System.out.println("enter element:");
            e=in.nextInt();
            n=new node(e);
            l.insert_left(n);
            break;

        case 2:
            System.out.println("enter element:");
            e=in.nextInt();
            n=new node(e);
            l.insert_right(n);
            break;

        case 3:
            if(!l.is_empty())
                System.out.println("element removed is "+(l.delete_left()).data);
            else
                System.out.println("Sorry Linkelist is empty");
            break;

        case 4:
            if(!l.is_empty())
                System.out.println("element removed is "+(l.delete_right()).data);
            else
                System.out.println("Sorry Linkelist is empty");
            break;

        case 5:
            if(!l.is_empty())
                l.printall();
            else
                System.out.println("Sorry Linkelist is empty");
            break;

        case 0:
            System.out.println("Exiting program");
            break;

        default:
            System.out.println("Wrong input");
    }
}

```



```
        break;

    }

    }while(choice!=0);
}
```



//Circular LinkedList

```
import java.util.*;
class node
{
    int data;
    node next;
    node(int e)
    {
        data=e;
        next=null;
    }
}
class LinkedListClass
{
    node root,newnode,t,t2,last;
    LinkedListClass()
    {
        root=null;
        last=null;
    }
    void insert_left(node n)
    {
        if(root==null)
        {
            root=n;
            last=n;
            last.next=root;
        }
        else
        {
            n.next=root;
            root=n;
            last.next=root;
        }
    }
    node delete_left()
    {
        t=null;
        if(root!=null)
        {
            t=root;
            root=root.next;
            last.next=root;
        }
        return(t);
    }
    void insert_right(node n)
    {
```



```

    if(root==null)
    {
        root=n;
        last=n;
        last.next=root;
    }
    else
    {
        t=root;
        while(t!=last)
            t=t.next;
        t.next=n;
        last=n;
        last.next=root;
    }
}
node delete_right()
{
    t=null;
    if(root!=null)
    {
        t=root;
        while(t!=last)
        {
            t2=t;
            t=t.next;
        }
        last=t2;
        last.next=root;
        return(t);
    }
    return(t);
}

void printall()
{
    if(root!=null)
    {
        t=root;
        while(t.next!=last)
        {
            System.out.print("|" + t.data + "|->|");
            t=t.next;
        }
        System.out.print("|" + t.data + "|->|");
    }
}

boolean is_empty()
{

```



```

        if(root==null)
            return true;
        else
            return false;

    }
}

public class CircularLinkedList {
    public static void main(String args[])
    {
        int choice,e;node n;
        Scanner in=new Scanner(System.in);
        LinkedListClass l=new LinkedListClass();
        do
        {
            System.out.println("\n1. Insert to Left\n2. Insert to right\n3. Delete Left\n4.
Delete Right\n5. Print Data\n0. Exit\n: ");
            choice=in.nextInt();
            switch(choice)
            {
                case 1:
                    System.out.println("enter element:");
                    e=in.nextInt();
                    n=new node(e);
                    l.insert_left(n);
                    break;

                case 2:
                    System.out.println("enter element:");
                    e=in.nextInt();
                    n=new node(e);
                    l.insert_right(n);
                    break;

                case 3:
                    if(!l.is_empty())
                        System.out.println("element removed is "+(l.delete_left()).data);
                    else
                        System.out.println("Sorry Linkelist is empty");
                    break;

                case 4:
                    if(!l.is_empty())
                        System.out.println("element removed is "+(l.delete_right()).data);
                    else
                        System.out.println("Sorry Linkelist is empty");
                    break;

                case 5:

```




```
        if(!l.is_empty())
            l.printall();
        else
            System.out.println("Sorry Linkelist is empty");
            break;

    case 0:
        System.out.println("Exiting program");
        break;

    default:
        System.out.println("Wrong input");
        break;

    }

}while(choice!=0);
}
```



//Doubly LinkeList

```
import java.util.*;
```

```
class node
```

```
{  
    int data;
```

```
    node left , right;
```

```
    node(int e)
```

```
{  
    data =e;  
    left = right =null;  
}  
}
```

```
class DLL
```

```
{  
    node root,t,t2;
```

```
    DLL()
```

```
{  
    root = null;  
}
```

```
public void insert_left(node n)  
{
```

```
    if(root == null)  
        root = n;  
    else  
    {  
        n.right= root;  
        root.left= n;  
        root = n;  
    }
```

```
}
```

```
public void insert_right(node n)
```

```
{  
    node t;  
    if(root == null)  
        root = n;  
    else  
    {  
        t= root;  
        while(t.right!=null)  
            t=t.right;
```



```

        t.right= n;
        n.left= t;
    }
}

```

```

public node delete_left()
{
    t =null;
    if(root != null)
    {
        t = root;
        root = root.right;
        root.left = null;
    }
    return t;
}

```

```

public node delete_right()
{
    t= null;

    if(root!= null)
    {
        t = root;
        while(t.right!=null)
            t= t.right;

        t2 = t.left;
        t2.right = null;
    }
    return t;
}

```

```

public void printall()
{
    t = root;
    while(t!=null)
    {
        System.out.print("<-|" +t.data+"|->");
        t = t.right;
    }
}
boolean is_empty()
{
    if(root==null)

```



```

        return true;
    else
        return false;
}
}

```

```

public class DoublyLinkedList
{
    public static void main(String args[])
    {
        Scanner in = new Scanner(System.in);

        DLL l = new DLL();

        int e, choice;

        node n;

        do
        {
            System.out.println("\n1. Insert to Left\n2. Insert to right\n3. Delete Left\n4.
Delete Right\n5. Print Data\n0. Exit\n: ");
            choice=in.nextInt();
            switch(choice)
            {
                case 1:
                    System.out.println("enter element:");
                    e=in.nextInt();
                    n=new node(e);
                    l.insert_left(n);
                    break;

                case 2:
                    System.out.println("enter element:");
                    e=in.nextInt();
                    n=new node(e);
                    l.insert_right(n);
                    break;

                case 3:
                    if(!l.is_empty())
                        System.out.println("element removed is "+(l.delete_left()).data);
                    else
                        System.out.println("Sorry Linkelist is empty");
                    break;

                case 4:
                    if(!l.is_empty())

```



```

        System.out.println("element removed is "+(l.delete_right()).data);
    else
        System.out.println("Sorry Linkelist is empty");
        break;

    case 5:
        if(!l.is_empty())
            l.printall();
        else
            System.out.println("Sorry Linkelist is empty");
            break;

    case 0:
        System.out.println("Exiting program");
        break;

    default:
        System.out.println("Wrong input");
        break;

    }

    }while(choice!=0);
}
}

```

//Binary Search Tree

```

import java.util.*;

class node
{
    int data;

    node left , right;

    node(int e)
    {
        data = e;

        left = right = null;
    }
}

class tree
{
    node root;

    tree()

```



```

{
    root = null;
}

node get_root()
{
    return root;
}

void insert( node r, node n)
{
    if(r == null)
        root=n;

    else
    {
        if(n.data<r.data)
        {
            if(r.left == null)
                r.left = n;
            else
                insert(r.left , n);
        }
        else
        {
            if(r.right == null)
                r.right = n;
            else
                insert(r.right , n);
        }
    }
}

void inorder(node r)
{
    if(r!= null)
    {
        inorder(r.left); // L

        System.out.println(r.data+"\t"); // V

        inorder(r.right); // R
    }
}

void preorder(node r)
{
    if(r!= null)
    {
        System.out.println(r.data+"\t"); // V
    }
}

```



```

        preorder(r.left); // L
        preorder(r.right); // R
    }
}

void postorder(node r)
{
    if(r!= null)
    {
        postorder(r.left); // L

        postorder(r.right); // R

        System.out.println(r.data+"\t"); // V
    }
}

// count no. of elements in a tree

int count(node r , int counter)
{
    if(r!= null)
    {
        count(r.left, counter);

        counter++;

        count(r.right , counter);

    }
    return counter;
}

// function to count no. of leaf nodes

int Lcount(node r , int counter)
{
    if(r!= null)
    {
        Lcount(r.left , counter);

        if(r.left == null && r.right == null)
            counter++;

        Lcount(r.right , counter);

    }
}

```



```

    return counter;
}

void search(int key)
{
    if(root == null)
        System.out.println("Empty Tree");
    else
    {
        node t = root;

        while(t.data!= key && t!= null)
        {
            if(key< t. data)
                t= t.left;
            else
                t = t.right;
        }

        if(t!= null)
            System.out.println("Found");
        else
            System.out.println("Not Found");
    }
}

node deletion(int key)
{
    node p , r , t , c=null;

    if(root == null)
    {
        System.out.println("Empty Tree");
        return null;
    }
    else
    {
        r = root;
        p = r;

        while(r!= null && r.data!= key)
        {
            p = r;

            if(key< r.data)
                r = r.left;
            else
                r = r.right;
        }
    }
}

```




```
if(r == null)
{
    System.out.println("Not Found");
    return null;
}
else
{
    // found
    // case 1

    if(r.left == null && r.right == null)
    {
        if(root == r)
        {
            root = null;
            return r;
        }
        else
        {
            if( p.left == r)
                p.left =null;
            else
                p.right = null;

            return r;
        }
    }

    // case 2

    if(r.left == null && r.right!= null)
    {
        if(r == root)
        {
            root = root.right;
            return r;
        }
        else
        {
            if(p.right == r)
                p.right = r.right;
            else
                p.left = r.right;

            return r;
        }
    }

    if(r.left!= null && r.right == null)
    {
```



```

if(r == root)
{
    root = root.left;
    return r;
}
else
{
    if(p.left == r)
        p.left = r.left;
    else
        p.right = r.left;

    return r;
}
}

// case 3

if( r.left!= null && r.right!= null)
{
    if(r == root)
    {
        c = root;
        r = r.right;
        t = r;

        while(r.left!= null)
        {
            t = r;
            r = r.left;
        }

        t.left = r.right;

        r.left = root.left;
        r.right = root.right;
        root = r;

    }
    else
    {
        c = r;
        r = r.right;
        t = r;

        while(r.left!= null)
        {
            t = r;
            r = r.right;

```



```

    }
    t.left = r.right;

    r.left = c.left;
    r.right = c.right;

    if(p.left == c)
        p.left = r;
    else
        p.right = r;

    } // else
    } // if (case 3 finished)
    } // else (found finished)
    } // else (function else finished)

return c;

} // function
} // class

class BST
{
    public static void main(String args[])
    {
        Scanner in = new Scanner(System.in);

        tree t = new tree();

        node x , r, n;

        int ch , e;

        do
        {
            System.out.println("\n1.INSERT \n2.INORDER \n3.PREORDER
\n4.POSTORDER \n5.SEARCH \n6.DELETE \n0.EXIT:");
            ch = in.nextInt();
            r = t.get_root();

            switch(ch)
            {

                case 1: System.out.println("Enter number:");
                    e = in.nextInt();
                    n = new node(e);
                    t.insert(r,n);
                    break;

                case 2: t.inorder(r);

```



```
        break;

    case 3: t.preorder(r);
        break;

    case 4: t.postorder(r);
        break;

    case 5: System.out.println("Enter Element To Search:");
        e = in.nextInt();
        t.search(e);
        break;

    case 6: System.out.println("Enter Element To Delete:");
        e = in.nextInt();
        x = t.deletion(e);

        if(x!= null)
            System.out.println("Deleted:"+x.data);
        break;

    case 0: System.out.println("Exiting");
        break;

    default: System.out.println("Wrong Input");
        break;
} // switch
}while(ch!= 0);
}
```



//Postfix Based Expression Tree

```
import java.util.*;
```

```
class node
```

```
{  
    char data;  
    node left , right;
```

```
    node(char e)  
    {  
        data = e;  
        left = right = null;  
    }  
}
```

```
class Stack
```

```
{  
    int MaxSize , tos;  
    node s[];
```

```
    Stack(int size)  
    {  
        MaxSize = size;  
        tos = -1;  
        s = new node[MaxSize];  
    }
```

```
    void push(node e)  
    {  
        tos++;  
        s[tos] = e;  
    }
```

```
    node pop()  
    {  
        if(tos == -1)  
        {  
            System.out.println("Error in input\n");  
            return null;  
        }  
        else  
        {  
            node t = s[tos];  
            tos--;  
            return t;  
        }  
    }  
} // stack
```



```

public class Postfixtree
{
    public static void main(String args[])
    {
        node n , r , l , root=null;

        Scanner in = new Scanner(System.in);

        String postfix;

        Stack s = new Stack(50);

        System.out.println("Enter Postfix:");

        postfix = in.nextLine();

        for(int i = 0; i < postfix.length(); i++)
        {
            char c = postfix.charAt(i);
            n = new node(c);

            if( (n.data>='a' && n.data<='z') || (n.data>='A' && n.data<='Z') )
                s.push(n);
            else
            {
                r = s.pop();
                l = s.pop();
                n.left = l;
                n.right = r;
                s.push(n);
            }
        }

        if(s.tos!= 0)
            System.out.println("Error in Input");
        else
            root = s.pop();

        System.out.println("Postfix:"+ postfix);

        System.out.println("Prefix:");

        preorder(root);

    } // main

    public static void preorder(node r)
    {

```



```
if( r!= null)
{
    System.out.print(r.data+"\t"); // V
    preorder(r.left); // L
    preorder(r.right); // R
}
}
} // class postfix tree
```



//Prefix Based Expression Tree

```
import java.util.*;
```

```
class node
```

```
{  
    char data;  
    node left , right;
```

```
    node(char e)  
    {  
        data = e;  
        left = right = null;  
    }  
}
```

```
class Stack
```

```
{  
    int MaxSize , tos;  
    node s[];
```

```
    Stack(int size)  
    {  
        MaxSize = size;  
        tos = -1;  
        s = new node[MaxSize];  
    }
```

```
    void push(node e)  
    {  
        tos++;  
        s[tos] = e;  
    }
```

```
    node pop()  
    {  
        if(tos == -1)  
        {  
            System.out.println("Error in input\n");  
            return null;  
        }  
        else  
        {  
            node t = s[tos];  
            tos--;  
            return t;  
        }  
    }  
} // stack
```




```

public class Prefixtree
{
    public static void main(String args[])
    {
        node n=null , r=null , l=null , root=null;

        Scanner in = new Scanner(System.in);

        String prefix;

        Stack s = new Stack(50);

        System.out.println("Enter Prefix:");

        prefix = in.nextLine();

        for(int i = prefix.length()-1; i >=0 ; i--)
        {
            char c = prefix.charAt(i);
            n = new node(c);

            if( (n.data>='a' && n.data<='z') || (n.data>='A' && n.data<='Z') )
                s.push(n);
            else
            {
                l = s.pop();
                r = s.pop();
                n.left = l;
                n.right = r;
                s.push(n);
            }
        }

        if(s.tos!= 0)
            System.out.println("Error in Input");
        else
            root = s.pop();

        System.out.println("Prefix:"+ prefix);

        System.out.println("Postfix:");

        postorder(root);

    } // main

    public static void postorder(node r)

```



```
{
  if(r!= null)
  {
    postorder(r.left); // L

    postorder(r.right); // R

    System.out.print(r.data+" "); // V
  }
}
// class prefix tree
```



//bubble sort

```

import java.util.*;
public class bubble_sort
{
    public static void main(String args[])
    {
        int a[],size;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        bubble(a,size);
    }

    static void bubble(int x[],int n)
    {
        for(int i=0;i<n;i++)
        {
            for(int j=0;j<n-1;j++)
            {
                if(x[j]>x[j+1])
                {
                    int t=x[j];
                    x[j]=x[j+1];
                    x[j+1]=t;
                }
            }
        }
        display(x,n);
    }

    static void display(int x[],int n)
    {
        System.out.println("Sorted array is\n");
        for(int i=0;i<n;i++)
        {
            System.out.println(x[i]);
        }
    }
}

```

//heap sort

```

import java.util.*;
public class heap_sort
{

```



```

    public static void main(String args[])
    {
        int a[],size;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        heap(a,size);

    }

    static void heap(int x[],int n)
    {
        int pc,done;
        for(int i=n-1;i>=0;i--)
        {
            for(int j=0;j<=i;j++)
            {
                pc=j;
                done=0;
                while(pc>=0 && pc/2>=0 && done!=1)
                {
                    if(x[pc] > x[pc/2])
                    {
                        int t=x[pc];
                        x[pc]=x[pc/2];
                        x[pc/2]=t;
                        pc=pc/2;
                    }
                    else
                        done=1;
                }
            }
            int t=x[0];
            x[0]=x[i];
            x[i]=t;
        }

        display(x,n);
    }

    static void display(int x[],int n)
    {

```



```
System.out.println("Sorted array is\n");  
for(int i=0;i<n;i++)  
{  
    System.out.println(x[i]);  
}  
}  
}
```



//insertion sort

```
import java.util.*;
public class insertion_sort {
    public static void main(String args[])
    {
        int a[],size;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        insertion(a,size);
    }
}
```

```
static void insertion(int x[],int n)
{
    int newno,i,j;
    for(i=0;i<n-1;i++)
    {
        newno=x[i+1];
        for(j=i+1;j>0 && x[j-1]>newno;j--)
        {
            x[j]=x[j-1];
        }
        x[j]=newno;
    }
    display(x,n);
}

static void display(int x[],int n)
{
    System.out.println("Sorted array is\n");
    for(int i=0;i<n;i++)
    {
        System.out.println(x[i]);
    }
}
}
```

//quick sort

```
import java.util.*;
```



```

class quick_sort {
    public static void main(String args[])
    {
        int a[],size;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        quick(a,0,size-1);
    }
}

```

```

static void quick(int x[],int low,int high)
{
    int i,j,pivot;
    pivot=(low+high)/2;
    i=low;
    j=high;
    while(i<j)
    {
        while(x[i]<x[pivot])
            i++;
        while(x[j]>x[pivot])
            j--;
        if(i<=j)
        {
            int t=x[i];
            x[i]=x[j];
            x[j]=t;
        }
    }
    if(low<j)
        quick(x,low,j-1);
    if(i<high)
        quick(x,i+1,high);

    display(x);
}

static void display(int x[])
{
    System.out.println("Sorted array is\n");
    for(int i=0;i<x.length;i++)

```



```
    {  
        System.out.println(x[i]);  
    }  
}
```



//radix sort

```
import java.util.*;
public class radix_sort {
    public static void main(String args[])
    {
        int a[],size,nod;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        System.out.println("enter number of digits :");
        nod=in.nextInt();
        radix(a,size,nod);
    }
}
```

```
static void radix(int x[],int n,int nod)
{
    int b[][]=new int [10][10];
    int count[]=new int[10];
    int i,j,k,e=1,r,c,xindex;
    while(nod>0)
    {
        for(i=0;i<10;i++)
            count[i]=-1;
        for(i=0;i<n;i++)
        {
            r=(x[i]/e)%10;
            count[r]++;
            c=count[r];
            b[r][c]=x[i];
        }
        xindex=0;
        for(i=0;i<10;i++)
        {
            if(count[i]>-1)
            {
                for(k=0;k<=count[i];k++)
                    x[xindex++]=b[i][k];
            }
        }
        nod--;
    }
}
```



```

        e=e*10;
    }
    display(x,n);
}
static void display(int x[],int n)
{
    System.out.println("Sorted array is\n");
    for(int i=0;i<n;i++)
    {
        System.out.println(x[i]);
    }
}
}

```

//selection sort

```

import java.util.*;
public class selection_sort
{
    public static void main(String args[])
    {
        int a[],size;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        selection(a,size);

    }

    static void selection(int x[],int n)
    {
        int min,pos;
        for(int i=0;i<n;i++)
        {
            min=x[i];
            pos=i;
            for(int j=i+1;j<n;j++)
            {
                if(x[j]<min)
                {
                    min=x[j];
                    pos=j;
                }
            }
        }
    }
}

```



```
        }
        x[pos]=x[i];
        x[i]=min;
    }
    display(x,n);
}

static void display(int x[],int n)
{
    System.out.println("Sorted array is\n");
    for(int i=0;i<n;i++)
    {
        System.out.println(x[i]);
    }
}
}
```



//sequential search

```
import java.util.*;
public class sequential_search
{
    public static void main(String args[])
    {
        int a[],size,key;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+" :");
            a[i]=in.nextInt();
        }
        System.out.println("enter element to search :");
        key=in.nextInt();

        int ans=sequential(a,size,key);
        if(ans!=-1)
            System.out.println("Element found at:"+ans);
        else
            System.out.println("Element not found");
    }

    static int sequential(int x[],int n,int key)
    {
        for(int i=0;i<n;i++)
        {
            if(key==x[i])
                return(i);
        }

        return(-1);
    }
}
```



//binary search

```
import java.util.*;
public class binary_search
{
    public static void main(String args[])
    {
        int a[],size,key;
        Scanner in=new Scanner(System.in);
        System.out.println("enter number of elements :");
        size=in.nextInt();
        a=new int[size];
        for(int i=0;i<size;i++)
        {
            System.out.println("Enter element "+(i+1)+":");
            a[i]=in.nextInt();
        }
        System.out.println("enter element to search :");
        key=in.nextInt();

        int ans=bin(a,0,size-1,key);
        if(ans!=-1)
            System.out.println("Element found at:"+ans);
        else
            System.out.println("Element not found");
    }

    static int bin(int x[],int low,int high,int key)
    {
        int mid;
        if(low<=high)
        {
            mid=(low+high)/2;
            if(key==x[mid])
                return(mid);
            else
            {
                if(key<x[mid])
                    bin(x,low,mid-1,key);
                else
                    bin(x,mid+1,high,key);
            }
        }
        return(-1);
    }
}
```

