

```
package Searching;
public class LineraSerachRecur
{
    static boolean search(int[] arr,int start,int value)
    {
        if(start==arr.length)
        {
            return false;
        }
        else if(arr[start]==value)
        {
            return true;
        }
        else
        {
            return search(arr,start+1,value);
        }
    }
    public static void main(String[] args)
    {
        int[] arr={123,2,34,2,67,8,1};
        boolean flag = search(arr,0,1);
        if(flag)
        {
            System.out.print("Value found");
        }
        else
        {
            System.out.print("Value not found");
        }
    }
}
```

```
package AdjacencyList;
public class MyList
{
    Node head;
    Node end;
    MyList()
    {
        //System.out.println("Constructor invoked");
        head = new Node(0);
        end = head;
    }
}
```

```
}
void insert(int value)
{
    head.value++;
    end.next = new Node(value);
    end = end.next;
}
void print()
{
    Node run = this.head;
    while(run!=null)
    {
        System.out.print(" "+run.value);
        run=run.next;
    }
}
static void bfs(MyList[] arr)
{
    MyQueue Q = new MyQueue();
    MyQueue result = new MyQueue();
    Q.enqueue(0);
    while(!Q.isEmpty())
    {
        int u = Q.dequeue();
        result.enqueue(u);
        // Visit all the adjacent vertices of u
        for(Node v = arr[u].head.next;v!=null;v = v.next)
        {
            if(v.color==Node.WHITE)
            {
                v.setColor(Node.BLACK);
                Q.enqueue(v.value);
                // Mark 'v' as visited in all the adjacency lists
                for(int i=0;i<arr.length;i++)
                {
                    for(Node n = arr[i].head.next;n!=null;n=n.next)
                    {
                        if (n.value == v.value)
                        {
                            n.setColor(Node.BLACK);
                        }
                    }
                }
            }
        }
    }
}
```

```
    }
    // Mark 'u' visited in all the adjacency lists
    for(int i = 0;i<arr.length;i++)
    {
        for(Node run = arr[i].head.next;run!=null;run=run.next)
        {
            if(run.value==u)
            {
                run.color=Node.BLACK;
            }
        }
    }
}
result.printQ();
}
static void dfs(MyList[] arr,int i,MyQueue result)
{
    result.enqueue(i);
    for(Node j = arr[i].head.next;j!=null;j = j.next)
    {
        if(j.color==Node.WHITE)
        {
            j.setColor(Node.BLACK);
            dfs(arr,j.value,result);
        }
    }
}
static void dfs_dir(MyList[] arr,int i,MyQueue result)
{
    result.enqueue(i);
    for(int k = 0;k<arr.length;k++)
    {
        for (Node run = arr[k].head.next; run != null; run = run.next)
        {
            if (run.value == i)
            {
                run.setColor(Node.BLACK);
            }
        }
    }
    for(Node j = arr[i].head.next;j!=null;j = j.next)
    {
        if(j.color==Node.WHITE)
        {
```

```
        dfs_dir(arr,j.value,result);
    }
}
}

package windows;
import java.awt.*;
import java.awt.event.*;
public class Lists extends Frame implements ItemListener
{
    String msg1 = "Selected item : ";
    String msg2 = "";
    Choice mylist;
    Lists()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        mylist = new Choice();
        mylist.add("Windows");
        mylist.add("Mac");
        mylist.add("Linux");
        mylist.add("BSD");
        mylist.addItemListener(this);
        add(mylist);
        setSize(300,300);
        setVisible(true);
        addWindowListener(new WindowAdapter()
        {
            public void windowClosing(WindowEvent w)
            {
                setVisible(false);
            }
        });
    }
    public void itemStateChanged(ItemEvent e)
    {
        msg2 = mylist.getSelectedItem();
        repaint();
    }
    public void paint(Graphics g)
    {
        g.drawString(msg1+msg2,100,100);
    }
    public static void main(String[] args)
```

```
{  
    Lists l = new Lists();  
}  
}
```

```
package Sorting;  
public class QuickSort  
{
```

```
    static int part(int[] arr,int start,int end)  
    {  
        int i = start+1;  
        int j = end;  
        int pivot = arr[start];  
        while(i<=j)  
        {  
            while((i<=end)&&(arr[i]<pivot))  
            {  
                i++;  
            }  
            while((j>start)&&(arr[j]>pivot))  
            {  
                j--;  
            }  
            if(i<j)  
            {  
                int temp = arr[j];  
                arr[j] = arr[i];  
                arr[i] = temp;  
            }  
        }  
        arr[start] = arr[j];  
        arr[j] = pivot;  
        return j;  
    }  
    static void sort(int[] arr,int start,int end)  
    {  
        if(start<end)  
        {  
            int pivot = part(arr,start,end);  
            sort(arr,start,pivot-1);  
            sort(arr,pivot+1,end);  
        }  
    }  
}
```

```
public static void main(String[] args)
{
    int[] arr = {6,5,4,3,2,1};
    sort(arr,0,arr.length-1);
    for(int i = 0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}

package Thread;
public class MyThread extends Thread
{
    Thread t;
    int value;
    MyThread(int x)
    {
        value = x;
        t = new Thread(this);
        t.start();
    }
    public void run()
    {
        print(value);
    }
    synchronized void print(int x)
    {
        System.out.print("\nTable of :"+x);
        for(int i=1;i<=10;i++)
        {
            System.out.print("\n"+(x*i));
        }
    }
}
public static void main(String[] args)
{
    MyThread t1 = new MyThread(5);
    MyThread t2 = new MyThread(10);
    try
    {
        t1.t.join();
        t2.t.join();
        System.out.print("\nThis is main thread");
        for(int i =0;i<=10;i++)
```

```
        {
            System.out.print("\n"+i*1);
        }
    }
    catch(InterruptedExcepiton e)
    {
    }
}
}
```

```
package Sorting;
public class MergeSort
{
    static void merge(int[] arr,int start,int mid,int end)
    {
        int n = mid-start+1;
        int m = end-mid;
        int index = start;
        int[] arr1 = new int[n];
        int[] arr2 = new int[m];
        for(int i=0;i<n;i++)
        {
            arr1[i] = arr[index++];
        }
        for(int i=0;i<m;i++)
        {
            arr2[i] = arr[index++];
        }
        int i = 0;
        int j = 0;
        index = start;
        while((i<n)&&(j<m))
        {
            if(arr1[i]<arr2[j])
            {
                arr[index++] = arr1[i++];
            }
            else
            {
                arr[index++] = arr2[j++];
            }
        }
        while(i<n)
        {

```

```
        arr[index++] = arr1[i++];
    }
    while(j<m)
    {
        arr[index++] = arr2[j++];
    }
}
static void sort(int[] arr,int start,int end)
{
    if(start<end)
    {
        int mid =(start+end)/2;
        sort(arr,start,mid);
        sort(arr,mid+1,end);
        merge(arr,start,mid,end);
    }
}
public static void main(String[] args)
{
    int[] arr = {123,2,-123,-65,334,1,2,1};
    sort(arr,0,arr.length-1);
    for(int i =0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}
```

```
package Sorting;
public class InsertionSort
{
    static void sort(int[] arr)
    {
        for(int i =1;i<arr.length;i++)
        {
            int value = arr[i];
            int j = i-1;
            while((j>=0)&&(arr[j]>value))
            {
                arr[j+1] = arr[j];
                j--;
            }
            arr[j+1] = value;
        }
    }
}
```



```

    }
    public static void main(String[] args)
    {
        int[] arr = {123,98,32,-12,76,-9998,0};
        sort(arr);
        for(int i=0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}

```

```

package DynamicProgramming;
public class LargestSubsequence
{
    public static void main(String[] args)
    {
    }
}

```

```

package ua.com.pahaoks.hillel.async;
import java.util.ArrayList;
import java.util.concurrent.Phaser;
public class Bus {
    private static final Phaser PHASER = new Phaser(1); //Сразу регистрируем главный
поток
    //Фазы 0 и 6 - это автобусный парк, 1 - 5 остановки
    public static void main(String[] args) throws InterruptedException {
        ArrayList<Passenger> passengers = new ArrayList<>();
        for (int i = 1; i < 5; i++) { //Сгенерируем пассажиров на
остановках
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, i + 1)); //Этот пассажир выходит на
следующей
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, 5)); //Этот пассажир выходит
на конечной
        }
        for (int i = 0; i < 7; i++) {
            switch (i) {
                case 0:
                    System.out.println("Автобус выехал из парка.");
                    PHASER.arrive(); //В фазе 0 всего 1 участник - автобус
                    break;

```

```

        case 6:
            System.out.println("Автобус уехал в парк.");
            PHASER.arriveAndDeregister();//Снимаем главный поток,
ломаем барьер
            break;
        default:
            int currentBusStop = PHASER.getPhase();
            System.out.println("Остановка № " + currentBusStop);
            for (Passenger p : passengers)          //Проверяем, есть ли
пассажиры на остановке
                if (p.departure == currentBusStop) {
                    PHASER.register();//Регистрируем поток, который
будет участвовать в фазах
                    p.start();          // и запускаем
                }
            PHASER.arriveAndAwaitAdvance();//Сообщаем о своей
готовности
        }
    }
}

public static class Passenger extends Thread {
    private int departure;
    private int destination;
    public Passenger(int departure, int destination) {
        this.departure = departure;
        this.destination = destination;
        System.out.println(this + " ждёт на остановке № " + this.departure);
    }
    @Override
    public void run() {
        try {
            System.out.println(this + " сел в автобус.");
            while (PHASER.getPhase() < destination) //Пока автобус не приедет
на нужную остановку(фазу)
                PHASER.arriveAndAwaitAdvance();      //заявляем в каждой
фазе о готовности и ждем
            Thread.sleep(1);
            System.out.println(this + " покинул автобус.");
            PHASER.arriveAndDeregister();    //Отменяем регистрацию на
нужной фазе
        } catch (InterruptedException e) {
        }
    }
}
@Override

```

```
        public String toString() {
            return "Пассажиp{" + departure + " -> " + destination + "}";
        }
    }
}
```

```
package windows.TextInput;
import java.awt.*;
import java.awt.event.*;
public class TextInput extends Frame implements ActionListener
{
    private Label l1,l2;
    private TextField t1,t2;
    Button b1;
    public void actionPerformed(ActionEvent e)
    {
        StringBuffer str = new StringBuffer(t1.getText());
        str = str.reverse();
        String temp = str.toString();
        temp = temp.toUpperCase();
        t2.setText(temp);
    }
    TextInput()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        l1 = new Label("String : ");
        l2 = new Label("Reverse : ");
        t1 = new TextField(35);
        t2 = new TextField(35);
        b1 = new Button("Show");
        b1.addActionListener(this);
        add(l1);
        add(t1);
        add(l2);
        add(t2);
        add(b1);
        setSize(400,200);
        setVisible(true);
    }
    public static void main(String[] args)
    {
        TextInput a = new TextInput();
    }
}
```

```
}
```

```
package Searching;
public class LinearSearch
{
    static boolean search(int[] arr,int value)
    {
        boolean flag = false;
        for(int i = 0;i<arr.length;i++)
        {
            if(arr[i]==value)
            {
                flag = true;
                break;
            }
        }
        return flag;
    }
    public static void main(String[] args)
    {
        int[] arr = {123,2,34,12,5,6,9};
        boolean var = search(arr,2);
        if(var)
        {
            System.out.print("Value found");
        }
        else
        {
            System.out.print("Value not found");
        }
    }
}
```

```
package Thread;
public class ThreadSync extends Thread
{
    public static final int ODD = 1;
    public static final int EVEN = 2;
    int type = 0;
    Temp obj = new Temp();
    ThreadSync(int TYPE)
    {
        this.type = TYPE;
        new Thread(this).start();
    }
}
```

```
    }
    public void run()
    {
        synchronized (obj)
        {
            obj.print(type);
        }
    }
    public static void main(String[] args)
    {
        ThreadSync t1 = new ThreadSync(ThreadSync.ODD);
        ThreadSync t2 = new ThreadSync(ThreadSync.EVEN);
    }
}
class Temp
{
    void print(int TYPE)
    {
        int i = 0;
        if(TYPE==ThreadSync.ODD)
        {
            i = 1;
        }
        for(;i<20;i+=2)
        {
            System.out.println(i);
        }
    }
}
```

```
package Searching;
public class LinearSearch
{
    static boolean search(int[] arr,int value)
    {
        boolean flag = false;
        for(int i = 0;i<arr.length;i++)
        {
            if(arr[i]==value)
            {
                flag = true;
                break;
            }
        }
    }
}
```

```
        return flag;
    }
    public static void main(String[] args)
    {
        int[] arr = {123,2,34,12,5,6,9};
        boolean var = search(arr,2);
        if(var)
        {
            System.out.print("Value found");
        }
        else
        {
            System.out.print("Value not found");
        }
    }
}

package applet;
import java.applet.*;
import java.awt.*;
import java.awt.event.MouseEvent;
import java.awt.event.MouseListener;
import java.awt.event.MouseMotionListener;
public class MyApplet extends Applet implements MouseListener, MouseMotionListener
{
    String msg = "";
    public void init()
    {
        addMouseListener(this);
        addMouseMotionListener(this);
    }
    public void mouseExited(MouseEvent m)
    {
        msg = "Mouse Exited";
        repaint();
    }
    public void mouseReleased(MouseEvent m)
    {
        msg = "Mouse Released";
        repaint();
    }
    public void mouseEntered(MouseEvent m)
    {
    }
}
```

```
    public void mouseDragged(MouseEvent m)
    {
    }
    public void mousePressed(MouseEvent m)
    {
    }
    public void mouseMoved(MouseEvent m)
    {
        msg = "Mouse Moved";
        repaint();
    }
    public void mouseClicked(MouseEvent m)
    {
        msg = "Mouse Clicked";
        repaint();
    }
    public void paint(Graphics g)
    {
        Font myfont = new Font("sans-serif",Font.BOLD,18);
        g.setFont(myfont);
        g.setColor(Color.GREEN);
        g.drawString(msg,100,100);
    }
}
```

```
package Sorting;
public class SelectionSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            int index = i;
            for(int j=i+1;j<arr.length;j++)
            {
                if(arr[j]<arr[index])
                {
                    index = j;
                }
            }
            int temp = arr[i];
            arr[i] = arr[index];
            arr[index] = temp;
        }
    }
}
```

```
    }  
    public static void main(String[] args)  
    {  
        int[] arr = {123,-1,987,-23423,123,3,4,6,34};  
        sort(arr);  
        for(int i = 0;i<arr.length;i++)  
        {  
            System.out.print(" "+arr[i]);  
        }  
    }  
}
```

```
package AdjacencyList;  
public class Node  
{  
    static final int WHITE = 0;  
    static final int BLACK = 1;  
    int value;  
    int color;  
    Node next;  
    Node(int value)  
    {  
        this.value = value;  
        this.color = WHITE;  
        this.next = null;  
    }  
    void setColor(int x)  
    {  
        this.color = x;  
    }  
}
```

```
package AdjacencyList;  
import java.util.Scanner;  
public class MyClass  
{  
    public static void main(String[] args)  
    {  
        int n;  
        Scanner in = new Scanner(System.in);  
        System.out.print("How many vertices : ");  
        n = in.nextInt();  
        MyList[] list = new MyList[n];  
        for(int i=0;i<n;i++)
```



```
{
    list[i] = new MyList();
}
for(int i=0;i<n;i++)
{
    int TotalVertices;
    System.out.print("\nEnter no of adjacent vertices to "+i+" : ");
    TotalVertices = in.nextInt();
    for(int j=0;j<TotalVertices;j++)
    {
        int value;
        System.out.print("\nEnter adjacent vertex : ");
        value = in.nextInt();
        list[i].insert(value);
    }
}
MyQueue result = new MyQueue();
MyList.dfs_dir(list,0,result);
result.printQ();
// System.out.print("\n\nBFS IS : ");
// MyList.bfs(list);
}
}
```

```
package Thread;
public class MyThread extends Thread
{
    Thread t;
    int value;
    MyThread(int x)
    {
        value = x;
        t = new Thread(this);
        t.start();
    }
    public void run()
    {
        print(value);
    }
    synchronized void print(int x)
    {
        System.out.print("\nTable of :"+x);
        for(int i=1;i<=10;i++)
        {
```

```
        System.out.print("\n" + (x * i));
    }
}
public static void main(String[] args)
{
    MyThread t1 = new MyThread(5);
    MyThread t2 = new MyThread(10);
    try
    {
        t1.t.join();
        t2.t.join();
        System.out.print("\nThis is main thread");
        for(int i = 0; i <= 10; i++)
        {
            System.out.print("\n" + i * 1);
        }
    }
    catch (InterruptedException e)
    {
    }
}
}
```

```
package Sorting;
public class RadixSort
{
    static int[] sort(int[] arr)
    {
        int m = 0;
        int e = 1;
        for (int i = 0; i < arr.length; i++)
        {
            if (arr[i] > 0)
            {
                m = arr[i];
            }
        }
        while (m / e > 0)
        {
            arr = rsort(arr, e);
            e *= 10;
        }
        return arr;
    }
}
```

```
static int[] rsort(int[] arr,int e)
{
    int[] temp = new int[10];
    int[] c = new int[arr.length];
    for(int i = 0;i<arr.length;i++)
    {
        temp[(arr[i]/e)%10]++;
    }
    for(int i = 1;i<10;i++)
    {
        temp[i] = temp[i-1]+temp[i];
    }
    for(int i = arr.length-1;i>=0;i--)
    {
        c[temp[(arr[i]/e)%10]-1] = arr[i];
        temp[(arr[i]/e)%10]--;
    }
    return c;
}
public static void main(String[] args)
{
    int[] arr = {123,34,1,2,2,98,765};
    arr = sort(arr);
    for(int i = 0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
```

```
package Searching;
public class InsertionSort
{
    static void sort(int[] arr)
    {
        for(int i = 1;i<arr.length;i++)
        {
            int value = arr[i];
            int j = i-1;
            while((j>=0)&&(arr[j]>value))
            {
                arr[j+1] = arr[j];
                j--;
            }
        }
    }
}
```

```
        arr[j+1]=value;
    }
}
public static void main(String[] args)
{
    int[] arr={123,2,2,456,7,-123,987123,10,0};
    sort(arr);
    System.out.print("After sorting : ");
    for(int i=0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}
```

```
package Sorting;
public class HeapSort
{
    static void heapify(int[] arr,int i,int heapsize)
    {
        int left = i*2+1;
        int right = i*2+2;
        int max = i;
        if((left<heapsize)&&(arr[left]>arr[max]))
        {
            max = left;
        }
        if((right<heapsize)&&(arr[right]>arr[max]))
        {
            max = right;
        }
        if(max!=i)
        {
            int temp = arr[i];
            arr[i] = arr[max];
            arr[max] = temp;
            heapify(arr,max,heapsize);
        }
    }
    static void buildHeap(int[] arr)
    {
        int top = arr.length/2-1;
        for(int i = top;i>=0;i--)
        {
```

```
        heapify(arr,i,arr.length);
    }
}
static void sort(int[] arr)
{
    buildHeap(arr);
    System.out.print("\nAfter building heap : ");
    for(int i =0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
    System.out.print("\n\n");
    int heapsize = arr.length;
    for(int i=arr.length-1;i>0;i--)
    {
        int temp = arr[i];
        arr[i] = arr[0];
        arr[0] = temp;
        heapsize--;
        heapify(arr,0,heapsize);
    }
}
public static void main(String[] args)
{
    int[] arr = {12,3,44,-1,3,123,333,123123,-12312};
    sort(arr);
    for(int i = 0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}

package windows.TextInput;
import java.awt.*;
import java.awt.event.*;
public class TextInput extends Frame implements ActionListener
{
    private Label l1,l2;
    private TextField t1,t2;
    Button b1;
    public void actionPerformed(ActionEvent e)
    {
        StringBuffer str = new StringBuffer(t1.getText());
```

```
        str = str.reverse();
        String temp = str.toString();
        temp = temp.toUpperCase();
        t2.setText(temp);
    }
    TextInput()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        l1 = new Label("String : ");
        l2 = new Label("Reverse : ");
        t1 = new TextField(35);
        t2 = new TextField(35);
        b1 = new Button("Show");
        b1.addActionListener(this);
        add(l1);
        add(t1);
        add(l2);
        add(t2);
        add(b1);
        setSize(400,200);
        setVisible(true);
    }
    public static void main(String[] args)
    {
        TextInput a = new TextInput();
    }
}

package windows.Adapter;
import java.awt.event.WindowAdapter;
import java.awt.event.WindowEvent;
public class MyWindowAdapter extends WindowAdapter
{
    MyFrame myframe;
    MyWindowAdapter(MyFrame myframe)
    {
        this.myframe = myframe;
    }
    public void windowClosing(WindowEvent e)
    {
        myframe.setVisible(false);
    }
}
```

```
package Searching;
public class SelectionSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            int index = i;
            for(int j = i+1;j<arr.length;j++)
            {
                if(arr[j]<arr[index])
                {
                    index = j;
                }
            }
            int temp = arr[i];
            arr[i] = arr[index];
            arr[index] = temp;
        }
    }
    public static void main(String[] args)
    {
        int[] arr={13,2,1,-1,234,1231231,987};
        sort(arr);
        System.out.print("After sorting : ");
        for(int i =0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package windows.Adapter;
import java.awt.event.MouseAdapter;
import java.awt.event.MouseEvent;
public class MyMouseListener extends MouseAdapter
{
    MyFrame myframe;
    public MyMouseListener(MyFrame myframe)
    {
        this.myframe = myframe;
    }
    public void mouseClicked(MouseEvent e)
    {

```

```

        myframe.setMsg("Mouse Clicked");
        myframe.repaint();
    }
    public void mouseEntered(MouseEvent e)
    {
        myframe.setMsg("Mouse Entered");
        myframe.repaint();
    }
    public void mouseExited(MouseEvent e)
    {
        myframe.setMsg("Mouse Exited");
        myframe.repaint();
    }
}

package ua.com.pahaoks.hillel.async;
import java.util.ArrayList;
import java.util.concurrent.Phaser;
public class Bus {
    private static final Phaser PHASER = new Phaser(1); //Сразу регистрируем главный
поток
    //Фазы 0 и 6 - это автобусный парк, 1 - 5 остановки
    public static void main(String[] args) throws InterruptedException {
        ArrayList<Passenger> passengers = new ArrayList<>();
        for (int i = 1; i < 5; i++) { //Сгенерируем пассажиров на
остановках
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, i + 1)); //Этот пассажир выходит на
следующей
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, 5)); //Этот пассажир выходит
на конечной
        }
        for (int i = 0; i < 7; i++) {
            switch (i) {
                case 0:
                    System.out.println("Автобус выехал из парка.");
                    PHASER.arrive(); //В фазе 0 всего 1 участник - автобус
                    break;
                case 6:
                    System.out.println("Автобус уехал в парк.");
                    PHASER.arriveAndDeregister(); //Снимаем главный поток,
ломаем барьер
                    break;
            }
        }
    }
}

```



```

        default:
            int currentBusStop = PHASER.getPhase();
            System.out.println("Остановка № " + currentBusStop);
            for (Passenger p : passengers)          //Проверяем, есть ли
пассажиры на остановке
                if (p.departure == currentBusStop) {
                    PHASER.register();//Регистрируем поток, который
будет участвовать в фазах
                        p.start();          // и запускаем
                }
                PHASER.arriveAndAwaitAdvance();//Сообщаем о своей
ГОТОВНОСТИ
            }
        }
    }

    public static class Passenger extends Thread {
        private int departure;
        private int destination;
        public Passenger(int departure, int destination) {
            this.departure = departure;
            this.destination = destination;
            System.out.println(this + " ждёт на остановке № " + this.departure);
        }
        @Override
        public void run() {
            try {
                System.out.println(this + " сел в автобус.");
                while (PHASER.getPhase() < destination) //Пока автобус не приедет
на нужную остановку(фазу)
                    PHASER.arriveAndAwaitAdvance();      //заявляем в каждой
фазе о готовности и ждем
                    Thread.sleep(1);
                    System.out.println(this + " покинул автобус.");
                    PHASER.arriveAndDeregister();    //Отменяем регистрацию на
нужной фазе
            } catch (InterruptedException e) {
            }
        }
        @Override
        public String toString() {
            return "Пассажир{" + departure + " -> " + destination + "}";
        }
    }
}

```

```
}
```

```
package windows.Adapter;
import java.awt.event.MouseEvent;
import java.awt.event.MouseMotionAdapter;
public class MyMouseMotionAdapter extends MouseMotionAdapter
{
    MyFrame myframe;
    MyMouseMotionAdapter(MyFrame myframe)
    {
        this.myframe = myframe;
    }
    public void mouseMoved(MouseEvent e)
    {
        myframe.setX(e.getX());
        myframe.setY(e.getY());
        myframe.repaint();
    }
    public void mouseDragged(MouseEvent e)
    {
        myframe.setX(e.getX());
        myframe.setY(e.getY());
        myframe.repaint();
    }
}
```

```
package AdjacencyList;
import java.util.Scanner;
public class MyClass
{
    public static void main(String[] args)
    {
        int n;
        Scanner in = new Scanner(System.in);
        System.out.print("How many vertices : ");
        n = in.nextInt();
        MyList[] list = new MyList[n];
        for(int i=0;i<n;i++)
        {
            list[i] = new MyList();
        }
        for(int i=0;i<n;i++)
        {
            int TotalVertices;
```

```
        System.out.print("\nEnter no of adjacent vertices to "+i+" : ");
        TotalVertices = in.nextInt();
        for(int j=0;j<TotalVertices;j++)
        {
            int value;
            System.out.print("\nEnter adjacent vertex : ");
            value = in.nextInt();
            list[i].insert(value);
        }
    }
    MyQueue result = new MyQueue();
    MyList.dfs_dir(list,0,result);
    result.printQ();
    // System.out.print("\n\nBFS IS : ");
    // MyList.bfs(list);
}
}
```

```
package AdjacencyList;
public class MyList
{
    Node head;
    Node end;
    MyList()
    {
        //System.out.println("Constructor invoked");
        head = new Node(0);
        end = head;
    }
    void insert(int value)
    {
        head.value++;
        end.next = new Node(value);
        end = end.next;
    }
    void print()
    {
        Node run = this.head;
        while(run!=null)
        {
            System.out.print(" "+run.value);
            run=run.next;
        }
    }
}
```

```
static void bfs(MyList[] arr)
{
    MyQueue Q = new MyQueue();
    MyQueue result = new MyQueue();
    Q.enqueue(0);
    while(!Q.isEmpty())
    {
        int u = Q.dequeue();
        result.enqueue(u);
        // Visit all the adjacent vertices of u
        for(Node v = arr[u].head.next;v!=null;v = v.next)
        {
            if(v.color==Node.WHITE)
            {
                v.setColor(Node.BLACK);
                Q.enqueue(v.value);
                // Mark 'v' as visited in all the adjacency lists
                for(int i=0;i<arr.length;i++)
                {
                    for(Node n = arr[i].head.next;n!=null;n=n.next)
                    {
                        if (n.value == v.value)
                        {
                            n.setColor(Node.BLACK);
                        }
                    }
                }
            }
        }
        // Mark 'u' visited in all the adjacency lists
        for(int i = 0;i<arr.length;i++)
        {
            for(Node run = arr[i].head.next;run!=null;run=run.next)
            {
                if(run.value==u)
                {
                    run.color=Node.BLACK;
                }
            }
        }
        result.printQ();
    }
}

static void dfs(MyList[] arr,int i,MyQueue result)
```

```
{
    result.enqueue(i);
    for(Node j = arr[i].head.next;j!=null;j = j.next)
    {
        if(j.color==Node.WHITE)
        {
            j.setColor(Node.BLACK);
            dfs(arr,j.value,result);
        }
    }
}
static void dfs_dir(MyList[] arr,int i,MyQueue result)
{
    result.enqueue(i);
    for(int k = 0;k<arr.length;k++)
    {
        for (Node run = arr[k].head.next; run != null; run = run.next)
        {
            if (run.value == i)
            {
                run.setColor(Node.BLACK);
            }
        }
    }
    for(Node j = arr[i].head.next;j!=null;j = j.next)
    {
        if(j.color==Node.WHITE)
        {
            dfs_dir(arr,j.value,result);
        }
    }
}
}
```

```
package AdjacencyList;
import java.util.Scanner;
public class MyClass
{
    public static void main(String[] args)
    {
        int n;
        Scanner in = new Scanner(System.in);
        System.out.print("How many vertices : ");
        n = in.nextInt();
```

```

        MyList[] list = new MyList[n];
        for(int i=0;i<n;i++)
        {
            list[i] = new MyList();
        }
        for(int i=0;i<n;i++)
        {
            int TotalVertices;
            System.out.print("\nEnter no of adjacent vertices to "+i+" : ");
            TotalVertices = in.nextInt();
            for(int j=0;j<TotalVertices;j++)
            {
                int value;
                System.out.print("\nEnter adjacent vertex : ");
                value = in.nextInt();
                list[i].insert(value);
            }
        }
        MyQueue result = new MyQueue();
        MyList.dfs_dir(list,0,result);
        result.printQ();
        // System.out.print("\n\nBFS IS : ");
        // MyList.bfs(list);
    }
}

```

```

package windows;
import java.awt.*;
import java.awt.event.*;
public class Lists extends Frame implements ItemListener
{
    String msg1 = "Selected item : ";
    String msg2 = "";
    Choice mylist;
    Lists()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        mylist = new Choice();
        mylist.add("Windows");
        mylist.add("Mac");
        mylist.add("Linux");
        mylist.add("BSD");
        mylist.addItemListener(this);
        add(mylist);
    }
}

```

```
        setSize(300,300);
        setVisible(true);
        addWindowListener(new WindowAdapter()
        {
            public void windowClosing(WindowEvent w)
            {
                setVisible(false);
            }
        });
    }
    public void itemStateChanged(ItemEvent e)
    {
        msg2 = mylist.getSelectedItem();
        repaint();
    }
    public void paint(Graphics g)
    {
        g.drawString(msg1+msg2,100,100);
    }
    public static void main(String[] args)
    {
        Lists l = new Lists();
    }
}
```

```
package Sorting;
public class CountSort
{
    static int[] countSort(int[] arr)
    {
        int n = 0;
        for(int i =0;i<arr.length;i++)
        {
            if(arr[i]>n)
            {
                n = arr[i];
            }
        }
        int[] temp = new int[n+1];
        for(int i=0;i<arr.length;i++)
        {
            temp[arr[i]] ++;
        }
        for(int i =1;i<n+1;i++)
```

```
        {
            temp[i] = temp[i]+temp[i-1];
        }
        int[] c = new int[arr.length];
        for(int i = arr.length-1;i>=0;i--)
        {
            c[temp[arr[i]]-1] = arr[i];
            temp[arr[i]]--;
        }
        return c;
    }
    public static void main(String[] args)
    {
        int[] arr = {100,3,2,1,34,23,1,98};
        arr = countSort(arr);
        for(int i =0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package Sorting;
public class SelectionSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            int index = i;
            for(int j=i+1;j<arr.length;j++)
            {
                if(arr[j]<arr[index])
                {
                    index = j;
                }
            }
            int temp = arr[i];
            arr[i] = arr[index];
            arr[index] = temp;
        }
    }
    public static void main(String[] args)
    {
```



```
        int[] arr = {123,-1,987,-23423,123,3,4,6,34};
        sort(arr);
        for(int i = 0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package Sorting;
public class BubbleSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            for(int j=0;j<arr.length-1-i;j++)
            {
                if(arr[j]>arr[j+1])
                {
                    int temp = arr[j];
                    arr[j] = arr[j+1];
                    arr[j+1] = temp;
                }
            }
        }
    }
    public static void main(String[] args)
    {
        int[] arr = {1,98,765,234,-987,2};
        sort(arr);
        for(int i=0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package windows.Adapter;
import java.awt.event.MouseAdapter;
import java.awt.event.MouseEvent;
public class MyMouseListener extends MouseAdapter
{
    MyFrame myframe;
```

```
public MyMouseAdapter(MyFrame myframe)
{
    this.myframe = myframe;
}
public void mouseClicked(MouseEvent e)
{
    myframe.setMsg("Mouse Clicked");
    myframe.repaint();
}
public void mouseEntered(MouseEvent e)
{
    myframe.setMsg("Mouse Entered");
    myframe.repaint();
}
public void mouseExited(MouseEvent e)
{
    myframe.setMsg("Mouse Exited");
    myframe.repaint();
}
}
```

```
package Searching;
public class BubbleSort
{
    static void sort(int[] arr)
    {
        for(int i =0;i<arr.length-1;i++)
        {
            for(int j = 0;j<arr.length-1-i;j++)
            {
                if(arr[j]>arr[j+1])
                {
                    int temp = arr[j];
                    arr[j] = arr[j+1];
                    arr[j+1] = temp;
                }
            }
        }
    }
    public static void main(String[] args)
    {
        int[] arr={123,2,-12,234,1,56464,0,5};
        sort(arr);
        System.out.print("After sorting : ");
    }
}
```

```

        for(int i = 0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}

package ua.com.pahaoks.hillel.async;
import java.util.ArrayList;
import java.util.concurrent.Phaser;
public class Bus {
    private static final Phaser PHASER = new Phaser(1);//Сразу регистрируем главный
поток
    //Фазы 0 и 6 - это автобусный парк, 1 - 5 остановки
    public static void main(String[] args) throws InterruptedException {
        ArrayList<Passenger> passengers = new ArrayList<>();
        for (int i = 1; i < 5; i++) {           //Сгенерируем пассажиров на
остановках
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, i + 1));//Этот пассажир выходит на
следующей
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, 5));    //Этот пассажир выходит
на конечной
        }
        for (int i = 0; i < 7; i++) {
            switch (i) {
                case 0:
                    System.out.println("Автобус выехал из парка.");
                    PHASER.arrive();//В фазе 0 всего 1 участник - автобус
                    break;
                case 6:
                    System.out.println("Автобус уехал в парк.");
                    PHASER.arriveAndDeregister();//Снимаем главный поток,
ломаем барьер
                    break;
                default:
                    int currentBusStop = PHASER.getPhase();
                    System.out.println("Остановка № " + currentBusStop);
                    for (Passenger p : passengers)           //Проверяем, есть ли
пассажиры на остановке
                        if (p.departure == currentBusStop) {
                            PHASER.register();//Регистрируем поток, который
будет участвовать в фазах

```

```

        p.start();          // и запускаем
    }
    PHASER.arriveAndAwaitAdvance();//Сообщаем о своей
ГОТОВНОСТИ
    }
}

public static class Passenger extends Thread {
    private int departure;
    private int destination;
    public Passenger(int departure, int destination) {
        this.departure = departure;
        this.destination = destination;
        System.out.println(this + " ждёт на остановке № " + this.departure);
    }
    @Override
    public void run() {
        try {
            System.out.println(this + " сел в автобус.");
            while (PHASER.getPhase() < destination) //Пока автобус не приедет
на нужную остановку(фазу)
                PHASER.arriveAndAwaitAdvance();    //заявляем в каждой
фазе о готовности и ждем
                Thread.sleep(1);
                System.out.println(this + " покинул автобус.");
                PHASER.arriveAndDeregister();    //Отменяем регистрацию на
нужной фазе
        } catch (InterruptedException e) {
        }
    }
    @Override
    public String toString() {
        return "Пассажир{" + departure + " -> " + destination + "}";
    }
}

}

package Searching;
public class LineraSerachRecur
{
    static boolean search(int[] arr,int start,int value)
    {
        if(start==arr.length)
        {

```

```
        return false;
    }
    else if(arr[start]==value)
    {
        return true;
    }
    else
    {
        return search(arr,start+1,value);
    }
}
public static void main(String[] args)
{
    int[] arr={123,2,34,2,67,8,1};
    boolean flag = search(arr,0,1);
    if(flag)
    {
        System.out.print("Value found");
    }
    else
    {
        System.out.print("Value not found");
    }
}
}
```

```
package DynamicProgramming;
public class LargestSubsequence
{
    public static void main(String[] args)
    {
    }
}
```

```
package applet;
import java.applet.*;
import java.awt.*;
import java.awt.event.MouseEvent;
import java.awt.event.MouseListener;
import java.awt.event.MouseMotionListener;
public class MyApplet extends Applet implements MouseListener, MouseMotionListener
{
    String msg = "";
    public void init()
```

```
{
    addMouseListener(this);
    addMouseMotionListener(this);
}
public void mouseExited(MouseEvent m)
{
    msg = "Mouse Exited";
    repaint();
}
public void mouseReleased(MouseEvent m)
{
    msg = "Mouse Released";
    repaint();
}
public void mouseEntered(MouseEvent m)
{
}
public void mouseDragged(MouseEvent m)
{
}
public void mousePressed(MouseEvent m)
{
}
public void mouseMoved(MouseEvent m)
{
    msg = "Mouse Moved";
    repaint();
}
public void mouseClicked(MouseEvent m)
{
    msg = "Mouse Clicked";
    repaint();
}
}
public void paint(Graphics g)
{
    Font myfont = new Font("sans-serif",Font.BOLD,18);
    g.setFont(myfont);
    g.setColor(Color.GREEN);
    g.drawString(msg,100,100);
}
}
```

```
package windows;
import javafx.scene.control.CheckBox;
```

```
import java.awt.*;
import java.awt.event.*;
public class MyClass extends Frame implements ItemListener
{
    String msg1 = "Windows : ";
    String msg2 = "False";
    String msg3 = "Linux : ";
    String msg4 = "False";
    Checkbox c1,c2;
    MyClass()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        c1 = new Checkbox("Windows");
        c2 = new Checkbox("Linux");
        add(c1);
        add(c2);
        addWindowListener(new WindowAdapter()
        {
            public void windowClosing(WindowEvent e)
            {
                setVisible(false);
            }
        });
        c1.addItemListener(this);
        c2.addItemListener(this);
        setSize(300,300);
        setVisible(true);
    }
    public void paint(Graphics g)
    {
        g.drawString(msg1,100,100);
        g.drawString(msg2,180,100);
        g.drawString(msg3,100,140);
        g.drawString(msg4,180,140);
    }
    public void itemStateChanged(ItemEvent e)
    {
        if(c1.getState())
        {
            msg2 = "True";
        }
        else
        {
            msg2 = "False";
        }
    }
}
```

```
    }
    if(c2.getState())
    {
        msg4 = "True";
    }
    else
    {
        msg4 = "False";
    }
    repaint();
}
public static void main(String[] args)
{
    MyClass m = new MyClass();
}
}
```

```
package AdjacencyList;
public class MyQueue
{
    int start = 0;
    int end = 0;
    int[] arr = new int[100];
    void enqueue(int x)
    {
        arr[end++] = x;
    }
    int dequeue()
    {
        return arr[start++];
    }
    boolean isEmpty()
    {
        return (start==end);
    }
    boolean InQueue(int value)
    {
        boolean flag = false;
        for(int i=start;i<end;i++)
        {
            if(arr[i]==value)
            {
                flag = true;
            }
        }
    }
}
```



```
    }
    return flag;
}
void printQ()
{
    for(int i=start;i<end;i++)
    {
        System.out.print(" "+this.arr[i]);
    }
}
}
```

```
package windows.Adapter;
import java.awt.event.WindowAdapter;
import java.awt.event.WindowEvent;
public class MyWindowAdapter extends WindowAdapter
{
    MyFrame myframe;
    MyWindowAdapter(MyFrame myframe)
    {
        this.myframe = myframe;
    }
    public void windowClosing(WindowEvent e)
    {
        myframe.setVisible(false);
    }
}
```

```
package AdjacencyList;
public class Node
{
    static final int WHITE = 0;
    static final int BLACK = 1;
    int value;
    int color;
    Node next;
    Node(int value)
    {
        this.value = value;
        this.color = WHITE;
        this.next = null;
    }
    void setColor(int x)
    {

```

```

        this.color = x;
    }
}

package ua.com.pahaoks.hillel.async;
import java.util.ArrayList;
import java.util.concurrent.Phaser;
public class Bus {
    private static final Phaser PHASER = new Phaser(1); //Сразу регистрируем главный
поток
    //Фазы 0 и 6 - это автобусный парк, 1 - 5 остановки
    public static void main(String[] args) throws InterruptedException {
        ArrayList<Passenger> passengers = new ArrayList<>();
        for (int i = 1; i < 5; i++) { //Сгенерируем пассажиров на
остановках
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, i + 1)); //Этот пассажир выходит на
следующей
            if ((int) (Math.random() * 2) > 0)
                passengers.add(new Passenger(i, 5)); //Этот пассажир выходит
на конечной
        }
        for (int i = 0; i < 7; i++) {
            switch (i) {
                case 0:
                    System.out.println("Автобус выехал из парка.");
                    PHASER.arrive(); //В фазе 0 всего 1 участник - автобус
                    break;
                case 6:
                    System.out.println("Автобус уехал в парк.");
                    PHASER.arriveAndDeregister(); //Снимаем главный поток,
ломаем барьер
                    break;
                default:
                    int currentBusStop = PHASER.getPhase();
                    System.out.println("Остановка № " + currentBusStop);
                    for (Passenger p : passengers) //Проверяем, есть ли
пассажиры на остановке
                        if (p.departure == currentBusStop) {
                            PHASER.register(); //Регистрируем поток, который
будет участвовать в фазах
                            p.start(); // и запускаем
                        }
                    PHASER.arriveAndAwaitAdvance(); //Сообщаем о своей

```

ГОТОВНОСТИ

```

    }
    }
}
public static class Passenger extends Thread {
    private int departure;
    private int destination;
    public Passenger(int departure, int destination) {
        this.departure = departure;
        this.destination = destination;
        System.out.println(this + " ждёт на остановке № " + this.departure);
    }
    @Override
    public void run() {
        try {
            System.out.println(this + " сел в автобус.");
            while (PHASER.getPhase() < destination) //Пока автобус не приедет
на нужную остановку(фазу)
                PHASER.arriveAndAwaitAdvance();    //заявляем в каждой
фазе о готовности и ждем
                Thread.sleep(1);
                System.out.println(this + " покинул автобус.");
                PHASER.arriveAndDeregister();    //Отменяем регистрацию на
нужной фазе
        } catch (InterruptedException e) {
        }
    }
    @Override
    public String toString() {
        return "Пассажир{" + departure + " -> " + destination + "}";
    }
}
}

```

```

package Sorting;
public class BubbleSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            for(int j=0;j<arr.length-1-i;j++)
            {
                if(arr[j]>arr[j+1])

```

```
        {
            int temp = arr[j];
            arr[j] = arr[j+1];
            arr[j+1] = temp;
        }
    }
}

public static void main(String[] args)
{
    int[] arr = {1,98,765,234,-987,2};
    sort(arr);
    for(int i=0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}
```

```
package Searching;
public class SelectionSort
{
    static void sort(int[] arr)
    {
        for(int i=0;i<arr.length-1;i++)
        {
            int index = i;
            for(int j = i+1;j<arr.length;j++)
            {
                if(arr[j]<arr[index])
                {
                    index = j;
                }
            }
            int temp = arr[i];
            arr[i] = arr[index];
            arr[index] = temp;
        }
    }

    public static void main(String[] args)
    {
        int[] arr={13,2,1,-1,234,1231231,987};
        sort(arr);
        System.out.print("After sorting : ");
    }
}
```

```
        for(int i =0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}

package Linux;
import java.lang.Runnable;
class MyClass implements Runnable
{
    public MyClass(String name)
    {
        Thread T = new Thread(this,name);
        T.start();
        System.out.println("New Thread is starting");
    }
    public void run()
    {
        try
        {
            for(int i=0;i<10;i++)
            {
                System.out.println("New Thread : "+i);
                Thread.sleep(10000);
            }
        }
        catch (InterruptedException E)
        {
            System.out.println("Exception found");
        }
    }
}

public class MyThread {
    public static void main(String[] args) {
        Thread T = Thread.currentThread();
        MyClass obj=new MyClass("Balraj");
        try {
            for (int i = 0; i < 10; i++) {
                System.out.println("Main Thread : " + i);
                T.sleep(2000);
            }
        }
        catch (InterruptedException E)
```

```
        {  
            System.out.println("Exception found");  
        }  
    }  
}
```

```
package Sorting;  
public class RadixSort  
{  
    static int[] sort(int[] arr)  
    {  
        int m = 0;  
        int e = 1;  
        for (int i = 0; i < arr.length; i++)  
        {  
            if (arr[i] > 0)  
            {  
                m = arr[i];  
            }  
        }  
        while (m / e > 0)  
        {  
            arr = rsort(arr,e);  
            e*=10;  
        }  
        return arr;  
    }  
    static int[] rsort(int[] arr,int e)  
    {  
        int[] temp = new int[10];  
        int[] c = new int[arr.length];  
        for(int i = 0;i<arr.length;i++)  
        {  
            temp[(arr[i]/e)%10]++;  
        }  
        for(int i = 1;i<10;i++)  
        {  
            temp[i] = temp[i-1]+temp[i];  
        }  
        for(int i = arr.length-1;i>=0;i--)  
        {  
            c[temp[(arr[i]/e)%10]-1] = arr[i];  
            temp[(arr[i]/e)%10]--;  
        }  
    }  
}
```

```
        return c;
    }
    public static void main(String[] args)
    {
        int[] arr = {123,34,1,2,2,98,765};
        arr = sort(arr);
        for(int i = 0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package Sorting;
public class InsertionSort
{
    static void sort(int[] arr)
    {
        for(int i =1;i<arr.length;i++)
        {
            int value = arr[i];
            int j = i-1;
            while((j>=0)&&(arr[j]>value))
            {
                arr[j+1] = arr[j];
                j--;
            }
            arr[j+1] = value;
        }
    }
    public static void main(String[] args)
    {
        int[] arr = {123,98,32,-12,76,-9998,0};
        sort(arr);
        for(int i=0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package Sorting;
public class HeapSort
{
```

```
static void heapify(int[] arr,int i,int heapsize)
{
    int left = i*2+1;
    int right = i*2+2;
    int max = i;
    if((left<heapsize)&&(arr[left]>arr[max]))
    {
        max = left;
    }
    if((right<heapsize)&&(arr[right]>arr[max]))
    {
        max = right;
    }
    if(max!=i)
    {
        int temp = arr[i];
        arr[i] = arr[max];
        arr[max] = temp;
        heapify(arr,max,heapsize);
    }
}

static void buildHeap(int[] arr)
{
    int top = arr.length/2-1;
    for(int i = top;i>=0;i--)
    {
        heapify(arr,i,arr.length);
    }
}

static void sort(int[] arr)
{
    buildHeap(arr);
    System.out.print("\nAfter building heap : ");
    for(int i =0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
    System.out.print("\n\n");
    int heapsize = arr.length;
    for(int i=arr.length-1;i>0;i--)
    {
        int temp = arr[i];
        arr[i] = arr[0];
        arr[0] = temp;
```



```
        heapsize--;  
        heapify(arr,0,heapsize);  
    }  
}  
public static void main(String[] args)  
{  
    int[] arr = {12,3,44,-1,3,123,333,123123,-12312};  
    sort(arr);  
    for(int i = 0;i<arr.length;i++)  
    {  
        System.out.print(" "+arr[i]);  
    }  
}  
}
```

```
package Sorting;  
public class QuickSort  
{  
  
    static int part(int[] arr,int start,int end)  
    {  
        int i = start+1;  
        int j = end;  
        int pivot = arr[start];  
        while(i<=j)  
        {  
            while((i<=end)&&(arr[i]<pivot))  
            {  
                i++;  
            }  
            while((j>start)&&(arr[j]>pivot))  
            {  
                j--;  
            }  
            if(i<j)  
            {  
                int temp = arr[j];  
                arr[j] = arr[i];  
                arr[i] = temp;  
            }  
        }  
        arr[start] = arr[j];  
        arr[j] = pivot;  
        return j;  
    }  
}
```

```
}
static void sort(int[] arr,int start,int end)
{
    if(start<end)
    {
        int pivot = part(arr,start,end);
        sort(arr,start,pivot-1);
        sort(arr,pivot+1,end);
    }
}
public static void main(String[] args)
{
    int[] arr = {6,5,4,3,2,1};
    sort(arr,0,arr.length-1);
    for(int i = 0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}

package windows.Adapter;
import java.awt.*;
public class MyFrame extends Frame
{
    private String msg = "Welcome";
    private String msg1 = "Mouse Location : ";
    private int x = 0;
    private int y = 0;
    MyFrame()
    {
        addMouseListener(new MyMouseAdapter(this));
        addWindowListener(new MyWindowAdapter(this));
        addMouseMotionListener(new MyMouseMotionAdapter(this));
        setVisible(true);
        setSize(300,300);
    }
    public void setX(int x)
    {
        this.x = x;
    }
    public void setY(int y)
    {
        this.y = y;
    }
}
```

```
}
public void setMsg(String msg)
{
    this.msg = msg;
}
public void paint(Graphics g)
{
    g.drawString(msg,100,100);
    g.drawString(msg1+x+"",y,100,130);
}
public static void main(String[] args)
{
    MyFrame ob = new MyFrame();
}
}

package Thread;
public class ThreadSync extends Thread
{
    public static final int ODD = 1;
    public static final int EVEN = 2;
    int type = 0;
    Temp obj = new Temp();
    ThreadSync(int TYPE)
    {
        this.type = TYPE;
        new Thread(this).start();
    }
    public void run()
    {
        synchronized (obj)
        {
            obj.print(type);
        }
    }
    public static void main(String[] args)
    {
        ThreadSync t1 = new ThreadSync(ThreadSync.ODD);
        ThreadSync t2 = new ThreadSync(ThreadSync.EVEN);
    }
}

class Temp
{
    void print(int TYPE)
```

```
{
    int i = 0;
    if(TYPE==ThreadSync.ODD)
    {
        i = 1;
    }
    for(;i<20;i+=2)
    {
        System.out.println(i);
    }
}
```

```
package DynamicProgramming;
public class MatrixChainMultiplication
{
    static int[][] multiply(int[] arr)
    {
        int n = arr.length-1;
        int[][] temp = new int[n][n];
        for(int i=0;i<n;i++)
        {
            temp[i][i] = 0;
        }
        for(int l = 2;l<n+1;l++)
        {
            for(int i=0;i<n-l+1;i++)
            {
                int j = i+l-1;
                temp[i][j] = 9999999;
                for(int k = i;k<j;k++)
                {
                    int q = temp[i][k]+temp[k+1][j]+arr[i]*arr[k+1]*arr[j+1];
                    if(q<temp[i][j])
                    {
                        temp[i][j] = q;
                    }
                }
            }
        }
        return temp;
    }
    public static void main(String[] args)
    {
```

```
        int[] arr ={30,35,15,5,10,20,25};
        int[][] temp = multiply(arr);
        System.out.print("Total : "+temp[0][5]);
    }
}

package FileHandling;
import java.io.*;
import java.util.Scanner;
public class WriteFile
{
    public static void main(String[] args) throws IOException
    {
        FileWriter fw = new FileWriter("myfile.txt");
        Scanner in = new Scanner(System.in);
        System.out.print("Enter text : ");
        String str = in.nextLine();
        while(!str.equals("stop"))
        {
            try
            {
                fw.write(str);
                fw.write("\n");
                str = in.nextLine();
            }
            catch(IOException e)
            {
            }
        }
        in.close();
        fw.close();
    }
}
```

```
package FileHandling;
import java.io.*;
public class ReadFile
{
    public static void main(String[] args) throws IOException
    {
        FileReader fr = new FileReader("myfile.txt");
        BufferedReader br = new BufferedReader(fr);
        FileWriter fw = new FileWriter("myfile1.txt");
        BufferedWriter bw = new BufferedWriter(fw);
```

```
        String str = br.readLine();
        while(str!=null)
        {
            bw.write(str);
            bw.write("\n");
            str = br.readLine();
        }
        bw.close();
        br.close();
    }
}

package Searching;
public class BubbleSort
{
    static void sort(int[] arr)
    {
        for(int i =0;i<arr.length-1;i++)
        {
            for(int j = 0;j<arr.length-1-i;j++)
            {
                if(arr[j]>arr[j+1])
                {
                    int temp = arr[j];
                    arr[j] = arr[j+1];
                    arr[j+1] = temp;
                }
            }
        }
    }

    public static void main(String[] args)
    {
        int[] arr={123,2,-12,234,1,56464,0,5};
        sort(arr);
        System.out.print("After sorting : ");
        for(int i = 0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}
```

```
package Linux;
import java.lang.Runnable;
```

```
class MyClass implements Runnable
{
    public MyClass(String name)
    {
        Thread T = new Thread(this,name);
        T.start();
        System.out.println("New Thread is starting");
    }
    public void run()
    {
        try
        {
            for(int i=0;i<10;i++)
            {
                System.out.println("New Thread : "+i);
                Thread.sleep(10000);
            }
        }
        catch (InterruptedException E)
        {
            System.out.println("Exception found");
        }
    }
}

public class MyThread {
    public static void main(String[] args) {
        Thread T = Thread.currentThread();
        MyClass obj=new MyClass("Balraj");
        try {
            for (int i = 0; i < 10; i++) {
                System.out.println("Main Thread : " + i);
                T.sleep(2000);
            }
        }
        catch (InterruptedException E)
        {
            System.out.println("Exception found");
        }
    }
}

public class Hello
{
    public static void main (String args[])
}
```

```
{
System.out.println("hello");
}
}

package AdjacencyList;
public class MyQueue
{
    int start = 0;
    int end = 0;
    int[] arr = new int[100];
    void enqueue(int x)
    {
        arr[end++] = x;
    }
    int dequeue()
    {
        return arr[start++];
    }
    boolean isEmpty()
    {
        return (start==end);
    }
    boolean InQueue(int value)
    {
        boolean flag = false;
        for(int i=start;i<end;i++)
        {
            if(arr[i]==value)
            {
                flag = true;
            }
        }
        return flag;
    }
    void printQ()
    {
        for(int i=start;i<end;i++)
        {
            System.out.print(" "+this.arr[i]);
        }
    }
}
```



```
package Sorting;
public class MergeSort
{
    static void merge(int[] arr,int start,int mid,int end)
    {
        int n = mid-start+1;
        int m = end-mid;
        int index = start;
        int[] arr1 = new int[n];
        int[] arr2 = new int[m];
        for(int i=0;i<n;i++)
        {
            arr1[i] = arr[index++];
        }
        for(int i=0;i<m;i++)
        {
            arr2[i] = arr[index++];
        }
        int i = 0;
        int j = 0;
        index = start;
        while((i<n)&&(j<m))
        {
            if(arr1[i]<arr2[j])
            {
                arr[index++] = arr1[i++];
            }
            else
            {
                arr[index++] = arr2[j++];
            }
        }
        while(i<n)
        {
            arr[index++] = arr1[i++];
        }
        while(j<m)
        {
            arr[index++] = arr2[j++];
        }
    }
    static void sort(int[] arr,int start,int end)
    {
        if(start<end)
```

```
        {
            int mid =(start+end)/2;
            sort(arr,start,mid);
            sort(arr,mid+1,end);
            merge(arr,start,mid,end);
        }
    }
    public static void main(String[] args)
    {
        int[] arr = {123,2,-123,-65,334,1,2,1};
        sort(arr,0,arr.length-1);
        for(int i =0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}

package windows.Adapter;
import java.awt.event.MouseEvent;
import java.awt.event.MouseMotionAdapter;
public class MyMouseMotionAdapter extends MouseMotionAdapter
{
    MyFrame myframe;
    MyMouseMotionAdapter(MyFrame myframe)
    {
        this.myframe = myframe;
    }
    public void mouseMoved(MouseEvent e)
    {
        myframe.setX(e.getX());
        myframe.setY(e.getY());
        myframe.repaint();
    }
    public void mouseDragged(MouseEvent e)
    {
        myframe.setX(e.getX());
        myframe.setY(e.getY());
        myframe.repaint();
    }
}

package FileHandling;
import java.io.*;
```

```
public class ReadFile
{
    public static void main(String[] args) throws IOException
    {
        FileReader fr = new FileReader("myfile.txt");
        BufferedReader br = new BufferedReader(fr);
        FileWriter fw = new FileWriter("myfile1.txt");
        BufferedWriter bw = new BufferedWriter(fw);
        String str = br.readLine();
        while(str!=null)
        {
            bw.write(str);
            bw.write("\n");
            str = br.readLine();
        }
        bw.close();
        br.close();
    }
}
```

```
package FileHandling;
import java.io.*;
import java.util.Scanner;
public class WriteFile
{
    public static void main(String[] args) throws IOException
    {
        FileWriter fw = new FileWriter("myfile.txt");
        Scanner in = new Scanner(System.in);
        System.out.print("Enter text : ");
        String str = in.nextLine();
        while(!str.equals("stop"))
        {
            try
            {
                fw.write(str);
                fw.write("\n");
                str = in.nextLine();
            }
            catch(IOException e)
            {
            }
        }
        in.close();
    }
}
```

```
        fw.close();
    }
}

package Searching;
public class InsertionSort
{
    static void sort(int[] arr)
    {
        for(int i = 1;i<arr.length;i++)
        {
            int value = arr[i];
            int j = i-1;
            while((j>=0)&&(arr[j]>value))
            {
                arr[j+1] = arr[j];
                j--;
            }
            arr[j+1]=value;
        }
    }
    public static void main(String[] args)
    {
        int[] arr={123,2,2,456,7,-123,987123,10,0};
        sort(arr);
        System.out.print("After sorting : ");
        for(int i=0;i<arr.length;i++)
        {
            System.out.print(" "+arr[i]);
        }
    }
}

package windows.Adapter;
import java.awt.*;
public class MyFrame extends Frame
{
    private String msg = "Welcome";
    private String msg1 = "Mouse Location : ";
    private int x = 0;
    private int y = 0;
    MyFrame()
    {
        addMouseListener(new MyMouseAdapter(this));
    }
}
```

```
        addWindowListener(new MyWindowAdapter(this));
        addMouseMotionListener(new MyMouseMotionAdapter(this));
        setVisible(true);
        setSize(300,300);
    }
    public void setX(int x)
    {
        this.x = x;
    }
    public void setY(int y)
    {
        this.y = y;
    }
    public void setMsg(String msg)
    {
        this.msg = msg;
    }
    public void paint(Graphics g)
    {
        g.drawString(msg,100,100);
        g.drawString(msg1+x+"",y,100,130);
    }
    public static void main(String[] args)
    {
        MyFrame ob = new MyFrame();
    }
}
```

```
package Sorting;
public class CountSort
{
    static int[] countSort(int[] arr)
    {
        int n = 0;
        for(int i =0;i<arr.length;i++)
        {
            if(arr[i]>n)
            {
                n = arr[i];
            }
        }
        int[] temp = new int[n+1];
        for(int i=0;i<arr.length;i++)
        {
```

```
        temp[arr[i]] ++;
    }
    for(int i =1;i<n+1;i++)
    {
        temp[i] = temp[i]+temp[i-1];
    }
    int[] c = new int[arr.length];
    for(int i = arr.length-1;i>=0;i--)
    {
        c[temp[arr[i]]-1] = arr[i];
        temp[arr[i]]--;
    }
    return c;
}
public static void main(String[] args)
{
    int[] arr = {100,3,2,1,34,23,1,98};
    arr = countSort(arr);
    for(int i =0;i<arr.length;i++)
    {
        System.out.print(" "+arr[i]);
    }
}
}

package windows;
import javafx.scene.control.CheckBox;
import java.awt.*;
import java.awt.event.*;
public class MyClass extends Frame implements ItemListener
{
    String msg1 = "Windows : ";
    String msg2 = "False";
    String msg3 = "Linux : ";
    String msg4 = "False";
    Checkbox c1,c2;
    MyClass()
    {
        setLayout(new FlowLayout(FlowLayout.CENTER,10,10));
        c1 = new CheckBox("Windows");
        c2 = new CheckBox("Linux");
        add(c1);
        add(c2);
        addWindowListener(new WindowAdapter())
```

```
{
    public void windowClosing(WindowEvent e)
    {
        setVisible(false);
    }
});
c1.addItemListener(this);
c2.addItemListener(this);
setSize(300,300);
setVisible(true);
}
public void paint(Graphics g)
{
    g.drawString(msg1,100,100);
    g.drawString(msg2,180,100);
    g.drawString(msg3,100,140);
    g.drawString(msg4,180,140);
}
public void itemStateChanged(ItemEvent e)
{
    if(c1.getState())
    {
        msg2 = "True";
    }
    else
    {
        msg2 = "False";
    }
    if(c2.getState())
    {
        msg4 = "True";
    }
    else
    {
        msg4 = "False";
    }
    repaint();
}
public static void main(String[] args)
{
    MyClass m = new MyClass();
}
}
```

```
package DynamicProgramming;
public class MatrixChainMultiplication
{
    static int[][] multiply(int[] arr)
    {
        int n = arr.length-1;
        int[][] temp = new int[n][n];
        for(int i=0;i<n;i++)
        {
            temp[i][i] = 0;
        }
        for(int l =2;l<n+1;l++)
        {
            for(int i=0;i<n-l+1;i++)
            {
                int j = i+l-1;
                temp[i][j] = 9999999;
                for(int k = i;k<j;k++)
                {
                    int q = temp[i][k]+temp[k+1][j]+arr[i]*arr[k+1]*arr[j+1];
                    if(q<temp[i][j])
                    {
                        temp[i][j] = q;
                    }
                }
            }
        }
        return temp;
    }
    public static void main(String[] args)
    {
        int[] arr ={30,35,15,5,10,20,25};
        int[][] temp = multiply(arr);
        System.out.print("Total : "+temp[0][5]);
    }
}
```