323.36 Project 6 Dijkstra's algorithm for the Single-Source-Shortest Paths   Java

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Algorithm Steps

Step 0:

      open inFile, SSSfile, deBugFile

      numNodes←get from inFile

      Allocate and initialize all members in the DijktraSSS class accordingly

Step 1;

      LoadCostMatrix (inFile) sourceNode ←1

Step 2;

      setBest (sourceNode)

      setFather (sourceNode)

      setToDo (sourceNode)

Step 3:

      minNode←findMinNode (...)

      toDo [minNode]←0

      debugPrint (...)

Step 4:

expanding the minNode

currentNode ←1

Step 5:

if toDo[currentNode] > 0 { // only process those unsolved nodes.

newCost←computeCost (minNode, currentNode)

If newCost < best [currentNode]

best [currentNode] ←   newCost

father [currentNode]←minNode debugPrint (...)

Step 6:

currentNode ++

Step 7:

Repeat step 5 to step 6 while currentNode <= numNodes

Step 8:

repeat step 3 to step 7 until doneToDo() == true

Step 9;

currentNode←1

Step 10:

printShortestPath (currentNode, sourceNode, SSSfile)

Step 11:

currentNode ++

Step 12:

      repeat 10 and step 11 while currentNode <= numNodes

Step 13;

      sourceNode ++

Step 14;

      repeat step 2 to step 13 while sourceNode <= numNodes

Step 15;

      close all files

Source Code:

Main.java

```java
import java.io.*;
import java.util.Arrays;

public class Main {

    public static void main(String[] args) throws IOException {

        File inFile = new File(args[0]);

        int numNodes = getNumNodes(inFile);

        File SSS = new File(args[1]);
        File out = new File(args[2]);

        FileWriter SSSFile = new FileWriter(SSS);
        FileWriter outFile = new FileWriter(out);

        DijktraSSS proj6 = new DijktraSSS(numNodes);
```

```java
        //step 1
        proj6.numNodes = numNodes;
        proj6.loadCostMatrix(inFile);
        proj6.printCostMatrix(outFile);
        proj6.sourceNode = 1;

        while(proj6.sourceNode <= proj6.numNodes) {
//            System.out.print("sourceNode is: "+
proj6.sourceNode);
            outFile.write("\n\n");
            outFile.write("++++++++++SOURCE NODE IS:" +
proj6.sourceNode + "++++++++++\n");
            //step 2

            proj6.currentNode = proj6.sourceNode;
            proj6.setArrays();
            proj6.debugPrint(outFile);

            while (!proj6.doneToDo()) {
                //step 3
                proj6.minNode = proj6.findMinNode();
//                System.out.println("min node is" +
proj6.minNode);
                proj6.todo[proj6.minNode] = 0;
                proj6.debugPrint(outFile);

                //step 4
                proj6.currentNode = 1;


                while (proj6.currentNode <= proj6.numNodes) {

                    //step 5
                    if (proj6.todo[proj6.currentNode] > 0) {
                        proj6.newCost = proj6.computeCost();
//                        System.out.println("new Cost is " +
proj6.newCost);
//                        System.out.println("best[curr]" +
proj6.best[proj6.currentNode]);
//                        System.out.println();
                        if (proj6.newCost <
proj6.best[proj6.currentNode]) {
//                            System.out.println("curr node is"
+ proj6.currentNode);
                            proj6.best[proj6.currentNode] =
proj6.newCost;
                            proj6.father[proj6.currentNode] =
```

```java
proj6.minNode;
                             proj6.debugPrint(outFile);
                    }
                }

//                step 6
                proj6.currentNode++;
            }
        }

//            step 9
        proj6.currentNode = 1;

        SSSFile.write("\n+++++++Source Node " +
proj6.sourceNode + "++++++++++\n");
        while (proj6.currentNode <= proj6.numNodes) {
            //step 10

            proj6.printShortPath(SSSFile, outFile);
            //step 11
            proj6.currentNode++;
        }

        //step 13
        proj6.sourceNode++;
    }
    //end while


    outFile.close();
    SSSFile.close();
}

public static int getNumNodes(File inFile) throws
IOException{

    FileReader fr=new FileReader(inFile);    //reads the file
    BufferedReader br=new BufferedReader(fr);  //creates a
buffering character input stream
    String line = br.readLine();

    if(line!=null){
        return Integer.parseInt(line);
    }
    System.out.println("COULDNT PRINT NUM NODES");
    return 0;
}
```

```
}
```

Dijkstra.java

```java
import java.awt.event.ItemEvent;
import java.io.*;
import java.util.Arrays;

public class DijktraSSS {

    public int numNodes;
    public int sourceNode;
    public int minNode;
    public int currentNode;
    public int newCost;
    public int[][] costMatrix;
    public int[] father;
    public int[] todo;
    public int[] best;


//    public DijktraSSS(int n,int s, int m, int c, int
ncost){
    public DijktraSSS(int n){

        numNodes = n;
//        sourceNode = s;
//        minNode = m;
//        currentNode = c;
//        newCost = ncost;
        costMatrix = new int[n+1][n+1];
        for(int i=0;i<n+1;i++){
            for(int j=0;j<n+1;j++){
                if(i==j){
                    costMatrix[i][j]=0;
                }else{
                    costMatrix[i][j]=9999;
                }
```

```java
            }
        }

        father = new int[n+1];
        todo = new int [n+1];
        best = new int[n+1];
    }

    public void loadCostMatrix(File inFile) throws
IOException {

        FileReader fr=new FileReader(inFile);    //reads the
file
        BufferedReader br=new BufferedReader(fr);
//creates a buffering character input stream
        String line= br.readLine();
//        System.out.println("first print out is:"+ line);


        while((line= br.readLine()) != null){
            String[] splitArray = line.split("\\s+");
//            System.out.println(line);

costMatrix[Integer.parseInt(splitArray[0])][Integer.parseIn
t(splitArray[1])]= Integer.parseInt(splitArray[2]);
        }
    }

    public void printCostMatrix(FileWriter outFile) throws
IOException {

        for (int i = 1; i < costMatrix.length; i++) {
            for (int j = 1; j < costMatrix[0].length; j++)
{
//                System.out.println(costMatrix[i][j]);
                outFile.write(costMatrix[i][j] + "  ");
            }
            outFile.write("\n");
        }
    }

    public void setArrays(){
        setBest();
        setFather();
```

```java
        setTodo();
    }

    public void setBest(){


        for (int i = 1; i <= numNodes; i++) {
            best[i] = costMatrix[sourceNode][i];
        }


    }

    public void setFather(){
        Arrays.fill(father, sourceNode);
    }

    public void setTodo(){

        for(int i=0; i<todo.length; i++){
            if(i==sourceNode){
                todo[i]=0;
            }
            todo[i]=1;
        }
    }

    public int findMinNode(){

        int minCost  = 99999;
        int minNode = 0;
        int i=1;
        while(i<= numNodes) {
            if (todo[i] > 0) {
                if (best[i] < minCost) {
                    minCost = best[i];
                    minNode = i;
                }
            }
            i++;
        }

        return minNode;
```

```java
    }

    public int computeCost(){

        return best[minNode] +
costMatrix[minNode][currentNode];
    }

    public void debugPrint( FileWriter outFile) throws
IOException {


outFile.write("=========================================
========== \n");
        outFile.write("The Source node is:" + sourceNode +
"\n");
        outFile.write("Best Array is: \n");
        printArray(best, outFile);
        outFile.write("father Array is: \n");
        printArray(father, outFile);
        outFile.write("todo Array is: \n");
        printArray(todo, outFile);

outFile.write("=========================================
========== \n");



    }

    public boolean doneToDo(){

        for(int i: todo){
            if(i!=0)
                return false;
        }
        return true;
    }

    public void printShortPath(FileWriter SSS, FileWriter
outFile) throws IOException {

        int curr = currentNode;
        SSS.write("The shortest path from " + sourceNode +
" to " + curr +":\n\t");
```

```
        while(sourceNode != father[curr]){
            SSS.write(curr + "<----");
            curr = father[curr];
        }
        SSS.write(curr + "<----" + sourceNode);
        SSS.write("\n\tcost: " + best[currentNode]);

        SSS.write("\n");

    }

    void printArray(int[] num, FileWriter outFile) throws
IOException {

        for(int i=1; i<num.length;i++)
         outFile.write(num[i] + " ");
        outFile.write("\n");
    }

}
```

OUTPUT

SSS_DATA1.txt

Debug.txt

```
0    10   70  30   9999
9999 0    50  9999 9999
9999 9999 0   9999 10
9999 9999 20  0    60
40   9999 9999 9999 0


++++++++++SOURCE NODE IS:1++++++++++
=========================================================
The Source node is:1
```

Best Array is:
0 10 70 30 9999
father Array is:
1 1 1 1 1
todo Array is:
1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 10 70 30 9999
father Array is:
1 1 1 1 1
todo Array is:
0 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 10 70 30 9999
father Array is:
1 1 1 1 1
todo Array is:
0 0 1 1 1
==
==
The Source node is:1
Best Array is:
0 10 60 30 9999
father Array is:
1 1 2 1 1
todo Array is:
0 0 1 1 1
==
==
The Source node is:1
Best Array is:
0 10 60 30 9999
father Array is:
1 1 2 1 1
todo Array is:
0 0 1 0 1
==
==

The Source node is:1
Best Array is:
0 10 50 30 9999
father Array is:
1 1 4 1 1
todo Array is:
0 0 1 0 1
==
==
The Source node is:1
Best Array is:
0 10 50 30 90
father Array is:
1 1 4 1 4
todo Array is:
0 0 1 0 1
==
==
The Source node is:1
Best Array is:
0 10 50 30 90
father Array is:
1 1 4 1 4
todo Array is:
0 0 0 0 1
==
==
The Source node is:1
Best Array is:
0 10 50 30 60
father Array is:
1 1 4 1 3
todo Array is:
0 0 0 0 1
==
==
The Source node is:1
Best Array is:
0 10 50 30 60
father Array is:
1 1 4 1 3
todo Array is:
0 0 0 0 0
==

```
====================================================
The Source node is:1
Best Array is:
0 10 50 30 60
father Array is:
1 1 4 1 3
todo Array is:
0 0 0 0 0
====================================================


++++++++++SOURCE NODE IS:2++++++++++
====================================================
The Source node is:2
Best Array is:
9999 0 50 9999 9999
father Array is:
2 2 2 2 2
todo Array is:
1 1 1 1 1
====================================================
====================================================
The Source node is:2
Best Array is:
9999 0 50 9999 9999
father Array is:
2 2 2 2 2
todo Array is:
1 0 1 1 1
====================================================
====================================================
The Source node is:2
Best Array is:
9999 0 50 9999 9999
father Array is:
2 2 2 2 2
todo Array is:
1 0 0 1 1
====================================================
====================================================
The Source node is:2
Best Array is:
9999 0 50 9999 60
father Array is:
```

2 2 2 2 3
todo Array is:
1 0 0 1 1
===
===
The Source node is:2
Best Array is:
9999 0 50 9999 60
father Array is:
2 2 2 2 3
todo Array is:
1 0 0 1 0
===
===
The Source node is:2
Best Array is:
100 0 50 9999 60
father Array is:
5 2 2 2 3
todo Array is:
1 0 0 1 0
===
===
The Source node is:2
Best Array is:
100 0 50 9999 60
father Array is:
5 2 2 2 3
todo Array is:
0 0 0 1 0
===
===
The Source node is:2
Best Array is:
100 0 50 130 60
father Array is:
5 2 2 1 3
todo Array is:
0 0 0 1 0
===
===
The Source node is:2
Best Array is:
100 0 50 130 60

father Array is:

5 2 2 1 3

todo Array is:

0 0 0 0 0

==

==

The Source node is:2

Best Array is:

100 0 50 130 60

father Array is:

5 2 2 1 3

todo Array is:

0 0 0 0 0

==

++++++++++SOURCE NODE IS:3++++++++++

==

The Source node is:3

Best Array is:

9999 9999 0 9999 10

father Array is:

3 3 3 3 3

todo Array is:

1 1 1 1 1

==

==

The Source node is:3

Best Array is:

9999 9999 0 9999 10

father Array is:

3 3 3 3 3

todo Array is:

1 1 0 1 1

==

==

The Source node is:3

Best Array is:

9999 9999 0 9999 10

father Array is:

3 3 3 3 3

todo Array is:

1 1 0 1 0

==

```
=====================================================
The Source node is:3
Best Array is:
50 9999 0 9999 10
father Array is:
5 3 3 3 3
todo Array is:
1 1 0 1 0
=====================================================
=====================================================
The Source node is:3
Best Array is:
50 9999 0 9999 10
father Array is:
5 3 3 3 3
todo Array is:
0 1 0 1 0
=====================================================
=====================================================
The Source node is:3
Best Array is:
50 60 0 9999 10
father Array is:
5 1 3 3 3
todo Array is:
0 1 0 1 0
=====================================================
=====================================================
The Source node is:3
Best Array is:
50 60 0 80 10
father Array is:
5 1 3 1 3
todo Array is:
0 1 0 1 0
=====================================================
=====================================================
The Source node is:3
Best Array is:
50 60 0 80 10
father Array is:
5 1 3 1 3
todo Array is:
0 0 0 1 0
```

```
==================================================
==================================================
The Source node is:3
Best Array is:
50 60 0 80 10
father Array is:
5 1 3 1 3
todo Array is:
0 0 0 0 0
==================================================
==================================================
The Source node is:3
Best Array is:
50 60 0 80 10
father Array is:
5 1 3 1 3
todo Array is:
0 0 0 0 0
==================================================


++++++++++SOURCE NODE IS:4++++++++++
==================================================
The Source node is:4
Best Array is:
9999 9999 20 0 60
father Array is:
4 4 4 4 4
todo Array is:
1 1 1 1 1
==================================================
==================================================
The Source node is:4
Best Array is:
9999 9999 20 0 60
father Array is:
4 4 4 4 4
todo Array is:
1 1 1 0 1
==================================================
==================================================
The Source node is:4
Best Array is:
9999 9999 20 0 60
```

father Array is:

4 4 4 4 4

todo Array is:

1 1 0 0 1

===

===

The Source node is:4

Best Array is:

9999 9999 20 0 30

father Array is:

4 4 4 4 3

todo Array is:

1 1 0 0 1

===

===

The Source node is:4

Best Array is:

9999 9999 20 0 30

father Array is:

4 4 4 4 3

todo Array is:

1 1 0 0 0

===

===

The Source node is:4

Best Array is:

70 9999 20 0 30

father Array is:

5 4 4 4 3

todo Array is:

1 1 0 0 0

===

===

The Source node is:4

Best Array is:

70 9999 20 0 30

father Array is:

5 4 4 4 3

todo Array is:

0 1 0 0 0

===

===

The Source node is:4

Best Array is:

70 80 20 0 30
father Array is:
5 1 4 4 3
todo Array is:
0 1 0 0 0
==
==
The Source node is:4
Best Array is:
70 80 20 0 30
father Array is:
5 1 4 4 3
todo Array is:
0 0 0 0 0
==
==
The Source node is:4
Best Array is:
70 80 20 0 30
father Array is:
5 1 4 4 3
todo Array is:
0 0 0 0 0
==

++++++++++SOURCE NODE IS:5++++++++++
==
The Source node is:5
Best Array is:
40 9999 9999 9999 0
father Array is:
5 5 5 5 5
todo Array is:
1 1 1 1 1
==
==
The Source node is:5
Best Array is:
40 9999 9999 9999 0
father Array is:
5 5 5 5 5
todo Array is:
1 1 1 1 0

```
==================================================
==================================================
The Source node is:5
Best Array is:
40 9999 9999 9999 0
father Array is:
5 5 5 5 5
todo Array is:
0 1 1 1 0
==================================================
==================================================
The Source node is:5
Best Array is:
40 50 9999 9999 0
father Array is:
5 1 5 5 5
todo Array is:
0 1 1 1 0
==================================================
==================================================
The Source node is:5
Best Array is:
40 50 110 9999 0
father Array is:
5 1 1 5 5
todo Array is:
0 1 1 1 0
==================================================
==================================================
The Source node is:5
Best Array is:
40 50 110 70 0
father Array is:
5 1 1 1 5
todo Array is:
0 1 1 1 0
==================================================
==================================================
The Source node is:5
Best Array is:
40 50 110 70 0
father Array is:
5 1 1 1 5
todo Array is:
```

0 0 1 1 0
==
==
The Source node is:5
Best Array is:
40 50 100 70 0
father Array is:
5 1 2 1 5
todo Array is:
0 0 1 1 0
==
==
The Source node is:5
Best Array is:
40 50 100 70 0
father Array is:
5 1 2 1 5
todo Array is:
0 0 1 0 0
==
==
The Source node is:5
Best Array is:
40 50 90 70 0
father Array is:
5 1 4 1 5
todo Array is:
0 0 1 0 0
==
==
The Source node is:5
Best Array is:
40 50 90 70 0
father Array is:
5 1 4 1 5
todo Array is:
0 0 0 0 0
==
==
The Source node is:5
Best Array is:
40 50 90 70 0
father Array is:
5 1 4 1 5

todo Array is:
0 0 0 0 0

SSSfile.txt

```
++++++++Source Node 1++++++++++
The shortest path from 1 to 1:
        1<----1
        cost: 0
The shortest path from 1 to 2:
        2<----1
        cost: 10
The shortest path from 1 to 3:
        3<-----4<----1
        cost: 50
The shortest path from 1 to 4:
        4<----1
        cost: 30
The shortest path from 1 to 5:
        5<-----3<-----4<----1
        cost: 60
++++++++Source Node 2++++++++++
The shortest path from 2 to 1:
        1<-----5<-----3<----2
        cost: 100
The shortest path from 2 to 2:
        2<----2
        cost: 0
The shortest path from 2 to 3:
        3<----2
        cost: 50
The shortest path from 2 to 4:
        4<-----1<-----5<-----3<----2
        cost: 130
The shortest path from 2 to 5:
        5<-----3<----2
        cost: 60
++++++++Source Node 3++++++++++
The shortest path from 3 to 1:
        1<-----5<----3
        cost: 50
The shortest path from 3 to 2:
```

```
        2<-----1<-----5<----3
        cost: 60
The shortest path from 3 to 3:
        3<----3
        cost: 0
The shortest path from 3 to 4:
        4<-----1<-----5<----3
        cost: 80
The shortest path from 3 to 5:
        5<----3
        cost: 10
++++++++Source Node 4++++++++++
The shortest path from 4 to 1:
        1<-----5<-----3<----4
        cost: 70
The shortest path from 4 to 2:
        2<-----1<-----5<-----3<----4
        cost: 80
The shortest path from 4 to 3:
        3<----4
        cost: 20
The shortest path from 4 to 4:
        4<----4
        cost: 0
The shortest path from 4 to 5:
        5<-----3<----4
        cost: 30
++++++++Source Node 5++++++++++
The shortest path from 5 to 1:
        1<----5
        cost: 40
The shortest path from 5 to 2:
        2<-----1<----5
        cost: 50
The shortest path from 5 to 3:
        3<-----4<-----1<----5
        cost: 90
The shortest path from 5 to 4:
        4<-----1<----5
        cost: 70
The shortest path from 5 to 5:
        5<----5
        cost: 0
```

SSS_DATA2.txt

Debug.txt

```
0  9  5  19  29  9999  9999  9999
9999  0  9999  9999  9999  9999  9999  2
9999  7  0  5  9999  9999  28  9
9999  9999  9999  0  8  3  9999  9999
9999  9999  9999  9999  0  14  9999  9999
6  9999  9999  9999  9999  0  4  9999
9999  9999  9999  4  9999  3  0  9999
6  9999  9999  9999  9999  7  2  0


++++++++++SOURCE NODE IS:1++++++++++
====================================================
The Source node is:1
Best Array is:
0 9 5 19 29 9999 9999 9999
father Array is:
1 1 1 1 1 1 1 1
todo Array is:
1 1 1 1 1 1 1 1
====================================================
====================================================
The Source node is:1
Best Array is:
0 9 5 19 29 9999 9999 9999
father Array is:
1 1 1 1 1 1 1 1
todo Array is:
0 1 1 1 1 1 1 1
====================================================
====================================================
The Source node is:1
Best Array is:
0 9 5 19 29 9999 9999 9999
father Array is:
1 1 1 1 1 1 1 1
todo Array is:
```

0 1 0 1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 9 5 10 29 9999 9999 9999
father Array is:
1 1 1 3 1 1 1
todo Array is:
0 1 0 1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 9 5 10 29 9999 33 9999
father Array is:
1 1 1 3 1 1 3 1
todo Array is:
0 1 0 1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 9 5 10 29 9999 33 14
father Array is:
1 1 1 3 1 1 3 3
todo Array is:
0 1 0 1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 9 5 10 29 9999 33 14
father Array is:
1 1 1 3 1 1 3 3
todo Array is:
0 0 0 1 1 1 1 1
==
==
The Source node is:1
Best Array is:
0 9 5 10 29 9999 33 11
father Array is:
1 1 1 3 1 1 3 2

todo Array is:

0 0 0 1 1 1 1 1

==

==

The Source node is:1

Best Array is:

0 9 5 10 29 9999 33 11

father Array is:

1 1 1 3 1 1 3 2

todo Array is:

0 0 0 0 1 1 1 1

==

==

The Source node is:1

Best Array is:

0 9 5 10 18 9999 33 11

father Array is:

1 1 1 3 4 1 3 2

todo Array is:

0 0 0 0 1 1 1 1

==

==

The Source node is:1

Best Array is:

0 9 5 10 18 13 33 11

father Array is:

1 1 1 3 4 4 3 2

todo Array is:

0 0 0 0 1 1 1 1

==

==

The Source node is:1

Best Array is:

0 9 5 10 18 13 33 11

father Array is:

1 1 1 3 4 4 3 2

todo Array is:

0 0 0 0 1 1 1 0

==

==

The Source node is:1

Best Array is:

0 9 5 10 18 13 13 11

father Array is:

1 1 1 3 4 4 8 2
todo Array is:
0 0 0 0 1 1 1 0
===
===
The Source node is:1
Best Array is:
0 9 5 10 18 13 13 11
father Array is:
1 1 1 3 4 4 8 2
todo Array is:
0 0 0 0 1 0 1 0
===
===
The Source node is:1
Best Array is:
0 9 5 10 18 13 13 11
father Array is:
1 1 1 3 4 4 8 2
todo Array is:
0 0 0 0 1 0 0 0
===
===
The Source node is:1
Best Array is:
0 9 5 10 18 13 13 11
father Array is:
1 1 1 3 4 4 8 2
todo Array is:
0 0 0 0 0 0 0 0
===
===
The Source node is:1
Best Array is:
0 9 5 10 18 13 13 11
father Array is:
1 1 1 3 4 4 8 2
todo Array is:
0 0 0 0 0 0 0 0
===

++++++++++SOURCE NODE IS:2++++++++++
===

The Source node is:2
Best Array is:
9999 0 9999 9999 9999 9999 9999 2
father Array is:
2 2 2 2 2 2 2 2
todo Array is:
1 1 1 1 1 1 1 1
==
==
The Source node is:2
Best Array is:
9999 0 9999 9999 9999 9999 9999 2
father Array is:
2 2 2 2 2 2 2 2
todo Array is:
1 0 1 1 1 1 1 1
==
==
The Source node is:2
Best Array is:
9999 0 9999 9999 9999 9999 9999 2
father Array is:
2 2 2 2 2 2 2 2
todo Array is:
1 0 1 1 1 1 1 0
==
==
The Source node is:2
Best Array is:
8 0 9999 9999 9999 9999 9999 2
father Array is:
8 2 2 2 2 2 2 2
todo Array is:
1 0 1 1 1 1 1 0
==
==
The Source node is:2
Best Array is:
8 0 9999 9999 9999 9 9999 2
father Array is:
8 2 2 2 2 8 2 2
todo Array is:
1 0 1 1 1 1 1 0
==

```
==================================================
The Source node is:2
Best Array is:
8 0 9999 9999 9999 9 4 2
father Array is:
8 2 2 2 2 8 8 2
todo Array is:
1 0 1 1 1 1 1 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 9999 9999 9999 9 4 2
father Array is:
8 2 2 2 2 8 8 2
todo Array is:
1 0 1 1 1 1 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 9999 8 9999 9 4 2
father Array is:
8 2 2 7 2 8 8 2
todo Array is:
1 0 1 1 1 1 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 9999 8 9999 7 4 2
father Array is:
8 2 2 7 2 7 8 2
todo Array is:
1 0 1 1 1 1 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 9999 8 9999 7 4 2
father Array is:
8 2 2 7 2 7 8 2
todo Array is:
1 0 1 1 1 0 0 0
```

```
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 9999 8 9999 7 4 2
father Array is:
8 2 2 7 2 7 8 2
todo Array is:
0 0 1 1 1 0 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 13 8 9999 7 4 2
father Array is:
8 2 1 7 2 7 8 2
todo Array is:
0 0 1 1 1 0 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 13 8 37 7 4 2
father Array is:
8 2 1 7 1 7 8 2
todo Array is:
0 0 1 1 1 0 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 13 8 37 7 4 2
father Array is:
8 2 1 7 1 7 8 2
todo Array is:
0 0 1 0 1 0 0 0
==================================================
==================================================
The Source node is:2
Best Array is:
8 0 13 8 16 7 4 2
father Array is:
8 2 1 7 4 7 8 2
todo Array is:
```

0 0 1 0 1 0 0 0
==
==
The Source node is:2
Best Array is:
8 0 13 8 16 7 4 2
father Array is:
8 2 1 7 4 7 8 2
todo Array is:
0 0 0 0 1 0 0 0
==
==
The Source node is:2
Best Array is:
8 0 13 8 16 7 4 2
father Array is:
8 2 1 7 4 7 8 2
todo Array is:
0 0 0 0 0 0 0 0
==
==
The Source node is:2
Best Array is:
8 0 13 8 16 7 4 2
father Array is:
8 2 1 7 4 7 8 2
todo Array is:
0 0 0 0 0 0 0 0
==

++++++++++SOURCE NODE IS:3++++++++++
==
The Source node is:3
Best Array is:
9999 7 0 5 9999 9999 28 9
father Array is:
3 3 3 3 3 3 3 3
todo Array is:
1 1 1 1 1 1 1 1
==
==
The Source node is:3
Best Array is:

9999 7 0 5 9999 9999 28 9
father Array is:
3 3 3 3 3 3 3 3
todo Array is:
1 1 0 1 1 1 1 1
==
==
The Source node is:3
Best Array is:
9999 7 0 5 9999 9999 28 9
father Array is:
3 3 3 3 3 3 3 3
todo Array is:
1 1 0 0 1 1 1 1
==
==
The Source node is:3
Best Array is:
9999 7 0 5 13 9999 28 9
father Array is:
3 3 3 3 4 3 3 3
todo Array is:
1 1 0 0 1 1 1 1
==
==
The Source node is:3
Best Array is:
9999 7 0 5 13 8 28 9
father Array is:
3 3 3 3 4 4 3 3
todo Array is:
1 1 0 0 1 1 1 1
==
==
The Source node is:3
Best Array is:
9999 7 0 5 13 8 28 9
father Array is:
3 3 3 3 4 4 3 3
todo Array is:
1 0 0 0 1 1 1 1
==
==
The Source node is:3

Best Array is:

9999 7 0 5 13 8 28 9

father Array is:

3 3 3 3 4 4 3 3

todo Array is:

1 0 0 0 1 0 1 1

==

==

The Source node is:3

Best Array is:

14 7 0 5 13 8 28 9

father Array is:

6 3 3 3 4 4 3 3

todo Array is:

1 0 0 0 1 0 1 1

==

==

The Source node is:3

Best Array is:

14 7 0 5 13 8 12 9

father Array is:

6 3 3 3 4 4 6 3

todo Array is:

1 0 0 0 1 0 1 1

==

==

The Source node is:3

Best Array is:

14 7 0 5 13 8 12 9

father Array is:

6 3 3 3 4 4 6 3

todo Array is:

1 0 0 0 1 0 1 0

==

==

The Source node is:3

Best Array is:

14 7 0 5 13 8 11 9

father Array is:

6 3 3 3 4 4 8 3

todo Array is:

1 0 0 0 1 0 1 0

==

==

The Source node is:3
Best Array is:
14 7 0 5 13 8 11 9
father Array is:
6 3 3 3 4 4 8 3
todo Array is:
1 0 0 0 1 0 0 0
==
==
The Source node is:3
Best Array is:
14 7 0 5 13 8 11 9
father Array is:
6 3 3 3 4 4 8 3
todo Array is:
1 0 0 0 0 0 0 0
==
==
The Source node is:3
Best Array is:
14 7 0 5 13 8 11 9
father Array is:
6 3 3 3 4 4 8 3
todo Array is:
0 0 0 0 0 0 0 0
==
==
The Source node is:3
Best Array is:
14 7 0 5 13 8 11 9
father Array is:
6 3 3 3 4 4 8 3
todo Array is:
0 0 0 0 0 0 0 0
==

++++++++++SOURCE NODE IS:4++++++++++
==
The Source node is:4
Best Array is:
9999 9999 9999 0 8 3 9999 9999
father Array is:
4 4 4 4 4 4 4 4

todo Array is:

1 1 1 1 1 1 1 1

===

===

The Source node is:4

Best Array is:

9999 9999 9999 0 8 3 9999 9999

father Array is:

4 4 4 4 4 4 4 4

todo Array is:

1 1 1 0 1 1 1 1

===

===

The Source node is:4

Best Array is:

9999 9999 9999 0 8 3 9999 9999

father Array is:

4 4 4 4 4 4 4 4

todo Array is:

1 1 1 0 1 0 1 1

===

===

The Source node is:4

Best Array is:

9 9999 9999 0 8 3 9999 9999

father Array is:

6 4 4 4 4 4 4 4

todo Array is:

1 1 1 0 1 0 1 1

===

===

The Source node is:4

Best Array is:

9 9999 9999 0 8 3 7 9999

father Array is:

6 4 4 4 4 4 6 4

todo Array is:

1 1 1 0 1 0 1 1

===

===

The Source node is:4

Best Array is:

9 9999 9999 0 8 3 7 9999

father Array is:

6 4 4 4 4 4 6 4
todo Array is:
1 1 1 0 1 0 0 1
==
==
The Source node is:4
Best Array is:
9 9999 9999 0 8 3 7 9999
father Array is:
6 4 4 4 4 4 6 4
todo Array is:
1 1 1 0 0 0 0 1
==
==
The Source node is:4
Best Array is:
9 9999 9999 0 8 3 7 9999
father Array is:
6 4 4 4 4 4 6 4
todo Array is:
0 1 1 0 0 0 0 1
==
==
The Source node is:4
Best Array is:
9 18 9999 0 8 3 7 9999
father Array is:
6 1 4 4 4 4 6 4
todo Array is:
0 1 1 0 0 0 0 1
==
==
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 9999
father Array is:
6 1 1 4 4 4 6 4
todo Array is:
0 1 1 0 0 0 0 1
==
==
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 9999

father Array is:
6 1 1 4 4 4 6 4
todo Array is:
0 1 0 0 0 0 0 1
===
===
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 23
father Array is:
6 1 1 4 4 4 6 3
todo Array is:
0 1 0 0 0 0 0 1
===
===
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 23
father Array is:
6 1 1 4 4 4 6 3
todo Array is:
0 0 0 0 0 0 0 1
===
===
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 20
father Array is:
6 1 1 4 4 4 6 2
todo Array is:
0 0 0 0 0 0 0 1
===
===
The Source node is:4
Best Array is:
9 18 14 0 8 3 7 20
father Array is:
6 1 1 4 4 4 6 2
todo Array is:
0 0 0 0 0 0 0 0
===
===
The Source node is:4
Best Array is:

9 18 14 0 8 3 7 20
father Array is:
6 1 1 4 4 4 6 2
todo Array is:
0 0 0 0 0 0 0 0
==

++++++++++SOURCE NODE IS:5++++++++++
==
The Source node is:5
Best Array is:
9999 9999 9999 9999 0 14 9999 9999
father Array is:
5 5 5 5 5 5 5 5
todo Array is:
1 1 1 1 1 1 1 1
==
==
The Source node is:5
Best Array is:
9999 9999 9999 9999 0 14 9999 9999
father Array is:
5 5 5 5 5 5 5 5
todo Array is:
1 1 1 1 0 1 1 1
==
==
The Source node is:5
Best Array is:
9999 9999 9999 9999 0 14 9999 9999
father Array is:
5 5 5 5 5 5 5 5
todo Array is:
1 1 1 1 0 0 1 1
==
==
The Source node is:5
Best Array is:
20 9999 9999 9999 0 14 9999 9999
father Array is:
6 5 5 5 5 5 5 5
todo Array is:
1 1 1 1 0 0 1 1

```
==================================================
==================================================
The Source node is:5
Best Array is:
20 9999 9999 9999 0 14 18 9999
father Array is:
6 5 5 5 5 5 6 5
todo Array is:
1 1 1 1 0 0 1 1
==================================================
==================================================
The Source node is:5
Best Array is:
20 9999 9999 9999 0 14 18 9999
father Array is:
6 5 5 5 5 5 6 5
todo Array is:
1 1 1 1 0 0 0 1
==================================================
==================================================
The Source node is:5
Best Array is:
20 9999 9999 22 0 14 18 9999
father Array is:
6 5 5 7 5 5 6 5
todo Array is:
1 1 1 1 0 0 0 1
==================================================
==================================================
The Source node is:5
Best Array is:
20 9999 9999 22 0 14 18 9999
father Array is:
6 5 5 7 5 5 6 5
todo Array is:
0 1 1 1 0 0 0 1
==================================================
==================================================
The Source node is:5
Best Array is:
20 29 9999 22 0 14 18 9999
father Array is:
6 1 5 7 5 5 6 5
todo Array is:
```

0 1 1 1 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 9999
father Array is:
6 1 1 7 5 5 6 5
todo Array is:
0 1 1 1 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 9999
father Array is:
6 1 1 7 5 5 6 5
todo Array is:
0 1 1 0 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 9999
father Array is:
6 1 1 7 5 5 6 5
todo Array is:
0 1 0 0 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 34
father Array is:
6 1 1 7 5 5 6 3
todo Array is:
0 1 0 0 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 34
father Array is:
6 1 1 7 5 5 6 3

todo Array is:
0 0 0 0 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 31
father Array is:
6 1 1 7 5 5 6 2
todo Array is:
0 0 0 0 0 0 0 1
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 31
father Array is:
6 1 1 7 5 5 6 2
todo Array is:
0 0 0 0 0 0 0 0
==
==
The Source node is:5
Best Array is:
20 29 25 22 0 14 18 31
father Array is:
6 1 1 7 5 5 6 2
todo Array is:
0 0 0 0 0 0 0 0
==

++++++++++SOURCE NODE IS:6++++++++++
==
The Source node is:6
Best Array is:
6 9999 9999 9999 9999 0 4 9999
father Array is:
6 6 6 6 6 6 6 6
todo Array is:
1 1 1 1 1 1 1 1
==
==
The Source node is:6

Best Array is:

6 9999 9999 9999 9999 0 4 9999

father Array is:

6 6 6 6 6 6 6

todo Array is:

1 1 1 1 1 0 1 1

===

===

The Source node is:6

Best Array is:

6 9999 9999 9999 9999 0 4 9999

father Array is:

6 6 6 6 6 6 6

todo Array is:

1 1 1 1 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 9999 9999 8 9999 0 4 9999

father Array is:

6 6 6 7 6 6 6

todo Array is:

1 1 1 1 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 9999 9999 8 9999 0 4 9999

father Array is:

6 6 6 7 6 6 6

todo Array is:

0 1 1 1 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 15 9999 8 9999 0 4 9999

father Array is:

6 1 6 7 6 6 6

todo Array is:

0 1 1 1 1 0 0 1

===

===

The Source node is:6
Best Array is:
6 15 11 8 9999 0 4 9999
father Array is:
6 1 1 7 6 6 6 6
todo Array is:
0 1 1 1 1 0 0 1
==
==
The Source node is:6
Best Array is:
6 15 11 8 35 0 4 9999
father Array is:
6 1 1 7 1 6 6 6
todo Array is:
0 1 1 1 1 0 0 1
==
==
The Source node is:6
Best Array is:
6 15 11 8 35 0 4 9999
father Array is:
6 1 1 7 1 6 6 6
todo Array is:
0 1 1 0 1 0 0 1
==
==
The Source node is:6
Best Array is:
6 15 11 8 16 0 4 9999
father Array is:
6 1 1 7 4 6 6 6
todo Array is:
0 1 1 0 1 0 0 1
==
==
The Source node is:6
Best Array is:
6 15 11 8 16 0 4 9999
father Array is:
6 1 1 7 4 6 6 6
todo Array is:
0 1 0 0 1 0 0 1
==

===

The Source node is:6

Best Array is:

6 15 11 8 16 0 4 20

father Array is:

6 1 1 7 4 6 6 3

todo Array is:

0 1 0 0 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 15 11 8 16 0 4 20

father Array is:

6 1 1 7 4 6 6 3

todo Array is:

0 0 0 0 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 15 11 8 16 0 4 17

father Array is:

6 1 1 7 4 6 6 2

todo Array is:

0 0 0 0 1 0 0 1

===

===

The Source node is:6

Best Array is:

6 15 11 8 16 0 4 17

father Array is:

6 1 1 7 4 6 6 2

todo Array is:

0 0 0 0 0 0 0 1

===

===

The Source node is:6

Best Array is:

6 15 11 8 16 0 4 17

father Array is:

6 1 1 7 4 6 6 2

todo Array is:

0 0 0 0 0 0 0 0

```
===================================================
===================================================
The Source node is:6
Best Array is:
6 15 11 8 16 0 4 17
father Array is:
6 1 1 7 4 6 6 2
todo Array is:
0 0 0 0 0 0 0 0
===================================================


++++++++++SOURCE NODE IS:7++++++++++
===================================================
The Source node is:7
Best Array is:
9999 9999 9999 4 9999 3 0 9999
father Array is:
7 7 7 7 7 7 7 7
todo Array is:
1 1 1 1 1 1 1 1
===================================================
===================================================
The Source node is:7
Best Array is:
9999 9999 9999 4 9999 3 0 9999
father Array is:
7 7 7 7 7 7 7 7
todo Array is:
1 1 1 1 1 1 0 1
===================================================
===================================================
The Source node is:7
Best Array is:
9999 9999 9999 4 9999 3 0 9999
father Array is:
7 7 7 7 7 7 7 7
todo Array is:
1 1 1 1 1 0 0 1
===================================================
===================================================
The Source node is:7
Best Array is:
9 9999 9999 4 9999 3 0 9999
```

father Array is:

6 7 7 7 7 7 7 7

todo Array is:

1 1 1 1 1 0 0 1

==

==

The Source node is:7

Best Array is:

9 9999 9999 4 9999 3 0 9999

father Array is:

6 7 7 7 7 7 7 7

todo Array is:

1 1 1 0 1 0 0 1

==

==

The Source node is:7

Best Array is:

9 9999 9999 4 12 3 0 9999

father Array is:

6 7 7 7 4 7 7 7

todo Array is:

1 1 1 0 1 0 0 1

==

==

The Source node is:7

Best Array is:

9 9999 9999 4 12 3 0 9999

father Array is:

6 7 7 7 4 7 7 7

todo Array is:

0 1 1 0 1 0 0 1

==

==

The Source node is:7

Best Array is:

9 18 9999 4 12 3 0 9999

father Array is:

6 1 7 7 4 7 7 7

todo Array is:

0 1 1 0 1 0 0 1

==

==

The Source node is:7

Best Array is:

9 18 14 4 12 3 0 9999
father Array is:
6 1 1 7 4 7 7 7
todo Array is:
0 1 1 0 1 0 0 1
==
==
The Source node is:7
Best Array is:
9 18 14 4 12 3 0 9999
father Array is:
6 1 1 7 4 7 7 7
todo Array is:
0 1 1 0 0 0 0 1
==
==
The Source node is:7
Best Array is:
9 18 14 4 12 3 0 9999
father Array is:
6 1 1 7 4 7 7 7
todo Array is:
0 1 0 0 0 0 0 1
==
==
The Source node is:7
Best Array is:
9 18 14 4 12 3 0 23
father Array is:
6 1 1 7 4 7 7 3
todo Array is:
0 1 0 0 0 0 0 1
==
==
The Source node is:7
Best Array is:
9 18 14 4 12 3 0 23
father Array is:
6 1 1 7 4 7 7 3
todo Array is:
0 0 0 0 0 0 0 1
==
==
The Source node is:7

Best Array is:

9 18 14 4 12 3 0 20

father Array is:

6 1 1 7 4 7 7 2

todo Array is:

0 0 0 0 0 0 0 1

==

==

The Source node is:7

Best Array is:

9 18 14 4 12 3 0 20

father Array is:

6 1 1 7 4 7 7 2

todo Array is:

0 0 0 0 0 0 0 0

==

==

The Source node is:7

Best Array is:

9 18 14 4 12 3 0 20

father Array is:

6 1 1 7 4 7 7 2

todo Array is:

0 0 0 0 0 0 0 0

==

++++++++++SOURCE NODE IS:8++++++++++

==

The Source node is:8

Best Array is:

6 9999 9999 9999 9999 7 2 0

father Array is:

8 8 8 8 8 8 8 8

todo Array is:

1 1 1 1 1 1 1 1

==

==

The Source node is:8

Best Array is:

6 9999 9999 9999 9999 7 2 0

father Array is:

8 8 8 8 8 8 8 8

todo Array is:

1 1 1 1 1 1 0
==
==
The Source node is:8
Best Array is:
6 9999 9999 9999 9999 7 2 0
father Array is:
8 8 8 8 8 8 8
todo Array is:
1 1 1 1 1 1 0 0
==
==
The Source node is:8
Best Array is:
6 9999 9999 6 9999 7 2 0
father Array is:
8 8 8 7 8 8 8
todo Array is:
1 1 1 1 1 1 0 0
==
==
The Source node is:8
Best Array is:
6 9999 9999 6 9999 5 2 0
father Array is:
8 8 8 7 8 7 8 8
todo Array is:
1 1 1 1 1 1 0 0
==
==
The Source node is:8
Best Array is:
6 9999 9999 6 9999 5 2 0
father Array is:
8 8 8 7 8 7 8 8
todo Array is:
1 1 1 1 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 9999 9999 6 9999 5 2 0
father Array is:
8 8 8 7 8 7 8 8

todo Array is:
0 1 1 1 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 15 9999 6 9999 5 2 0
father Array is:
8 1 8 7 8 7 8 8
todo Array is:
0 1 1 1 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 15 11 6 9999 5 2 0
father Array is:
8 1 1 7 8 7 8 8
todo Array is:
0 1 1 1 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 15 11 6 35 5 2 0
father Array is:
8 1 1 7 1 7 8 8
todo Array is:
0 1 1 1 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 15 11 6 35 5 2 0
father Array is:
8 1 1 7 1 7 8 8
todo Array is:
0 1 1 0 1 0 0 0
==
==
The Source node is:8
Best Array is:
6 15 11 6 14 5 2 0
father Array is:

8 1 1 7 4 7 8 8
todo Array is:
0 1 1 0 1 0 0 0
===
===
The Source node is:8
Best Array is:
6 15 11 6 14 5 2 0
father Array is:
8 1 1 7 4 7 8 8
todo Array is:
0 1 0 0 1 0 0 0
===
===
The Source node is:8
Best Array is:
6 15 11 6 14 5 2 0
father Array is:
8 1 1 7 4 7 8 8
todo Array is:
0 1 0 0 0 0 0 0
===
===
The Source node is:8
Best Array is:
6 15 11 6 14 5 2 0
father Array is:
8 1 1 7 4 7 8 8
todo Array is:
0 0 0 0 0 0 0 0
===
===
The Source node is:8
Best Array is:
6 15 11 6 14 5 2 0
father Array is:
8 1 1 7 4 7 8 8
todo Array is:
0 0 0 0 0 0 0 0
===

SSSfile.txt

```
++++++++Source Node 1++++++++++
The shortest path from 1 to 1:
        1<----1
        cost: 0
The shortest path from 1 to 2:
        2<----1
        cost: 9
The shortest path from 1 to 3:
        3<----1
        cost: 5
The shortest path from 1 to 4:
        4<-----3<----1
        cost: 10
The shortest path from 1 to 5:
        5<-----4<-----3<----1
        cost: 18
The shortest path from 1 to 6:
        6<-----4<-----3<----1
        cost: 13
The shortest path from 1 to 7:
        7<-----8<-----2<----1
        cost: 13
The shortest path from 1 to 8:
        8<-----2<----1
        cost: 11

++++++++Source Node 2++++++++++
The shortest path from 2 to 1:
        1<-----8<----2
        cost: 8
The shortest path from 2 to 2:
        2<----2
        cost: 0
The shortest path from 2 to 3:
        3<-----1<-----8<----2
        cost: 13
```

The shortest path from 2 to 4:

    4<-----7<-----8<----2

    cost: 8

The shortest path from 2 to 5:

    5<-----4<-----7<-----8<----2

    cost: 16

The shortest path from 2 to 6:

    6<-----7<-----8<----2

    cost: 7

The shortest path from 2 to 7:

    7<-----8<----2

    cost: 4

The shortest path from 2 to 8:

    8<----2

    cost: 2

++++++++Source Node 3++++++++++

The shortest path from 3 to 1:

    1<-----6<-----4<----3

    cost: 14

The shortest path from 3 to 2:

    2<----3

    cost: 7

The shortest path from 3 to 3:

    3<----3

    cost: 0

The shortest path from 3 to 4:

    4<----3

    cost: 5

The shortest path from 3 to 5:

    5<-----4<----3

    cost: 13

The shortest path from 3 to 6:

    6<-----4<----3

    cost: 8

The shortest path from 3 to 7:

    7<-----8<----3

cost: 11
The shortest path from 3 to 8:
        8<----3
        cost: 9

++++++++Source Node 4++++++++++
The shortest path from 4 to 1:
        1<-----6<----4
        cost: 9
The shortest path from 4 to 2:
        2<-----1<-----6<----4
        cost: 18
The shortest path from 4 to 3:
        3<-----1<-----6<----4
        cost: 14
The shortest path from 4 to 4:
        4<----4
        cost: 0
The shortest path from 4 to 5:
        5<----4
        cost: 8
The shortest path from 4 to 6:
        6<----4
        cost: 3
The shortest path from 4 to 7:
        7<-----6<----4
        cost: 7
The shortest path from 4 to 8:
        8<-----2<-----1<-----6<----4
        cost: 20

++++++++Source Node 5++++++++++
The shortest path from 5 to 1:
        1<-----6<----5
        cost: 20
The shortest path from 5 to 2:
        2<-----1<-----6<----5

cost: 29
The shortest path from 5 to 3:
        3<-----1<-----6<----5
        cost: 25
The shortest path from 5 to 4:
        4<-----7<-----6<----5
        cost: 22
The shortest path from 5 to 5:
        5<----5
        cost: 0
The shortest path from 5 to 6:
        6<----5
        cost: 14
The shortest path from 5 to 7:
        7<-----6<----5
        cost: 18
The shortest path from 5 to 8:
        8<-----2<-----1<-----6<----5
        cost: 31

++++++++Source Node 6++++++++++
The shortest path from 6 to 1:
        1<----6
        cost: 6
The shortest path from 6 to 2:
        2<-----1<----6
        cost: 15
The shortest path from 6 to 3:
        3<-----1<----6
        cost: 11
The shortest path from 6 to 4:
        4<-----7<----6
        cost: 8
The shortest path from 6 to 5:
        5<-----4<-----7<----6
        cost: 16
The shortest path from 6 to 6:

```
        6<----6
        cost: 0
The shortest path from 6 to 7:
        7<----6
        cost: 4
The shortest path from 6 to 8:
        8<-----2<-----1<----6
        cost: 17


++++++++Source Node 7++++++++++
The shortest path from 7 to 1:
        1<-----6<----7
        cost: 9
The shortest path from 7 to 2:
        2<-----1<-----6<----7
        cost: 18
The shortest path from 7 to 3:
        3<-----1<-----6<----7
        cost: 14
The shortest path from 7 to 4:
        4<----7
        cost: 4
The shortest path from 7 to 5:
        5<-----4<----7
        cost: 12
The shortest path from 7 to 6:
        6<----7
        cost: 3
The shortest path from 7 to 7:
        7<----7
        cost: 0
The shortest path from 7 to 8:
        8<-----2<-----1<-----6<----7
        cost: 20


++++++++Source Node 8++++++++++
The shortest path from 8 to 1:
```

```
          1<----8
          cost: 6
The shortest path from 8 to 2:
          2<-----1<----8
          cost: 15
The shortest path from 8 to 3:
          3<-----1<----8
          cost: 11
The shortest path from 8 to 4:
          4<-----7<----8
          cost: 6
The shortest path from 8 to 5:
          5<-----4<-----7<----8
          cost: 14
The shortest path from 8 to 6:
          6<-----7<----8
          cost: 5
The shortest path from 8 to 7:
          7<----8
          cost: 2
The shortest path from 8 to 8:
          8<----8
          cost: 0
```