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Section: 2023 Fall Term (1) Algorithms I CSCI 700 231[25504] (Queens College)

Project#: 7

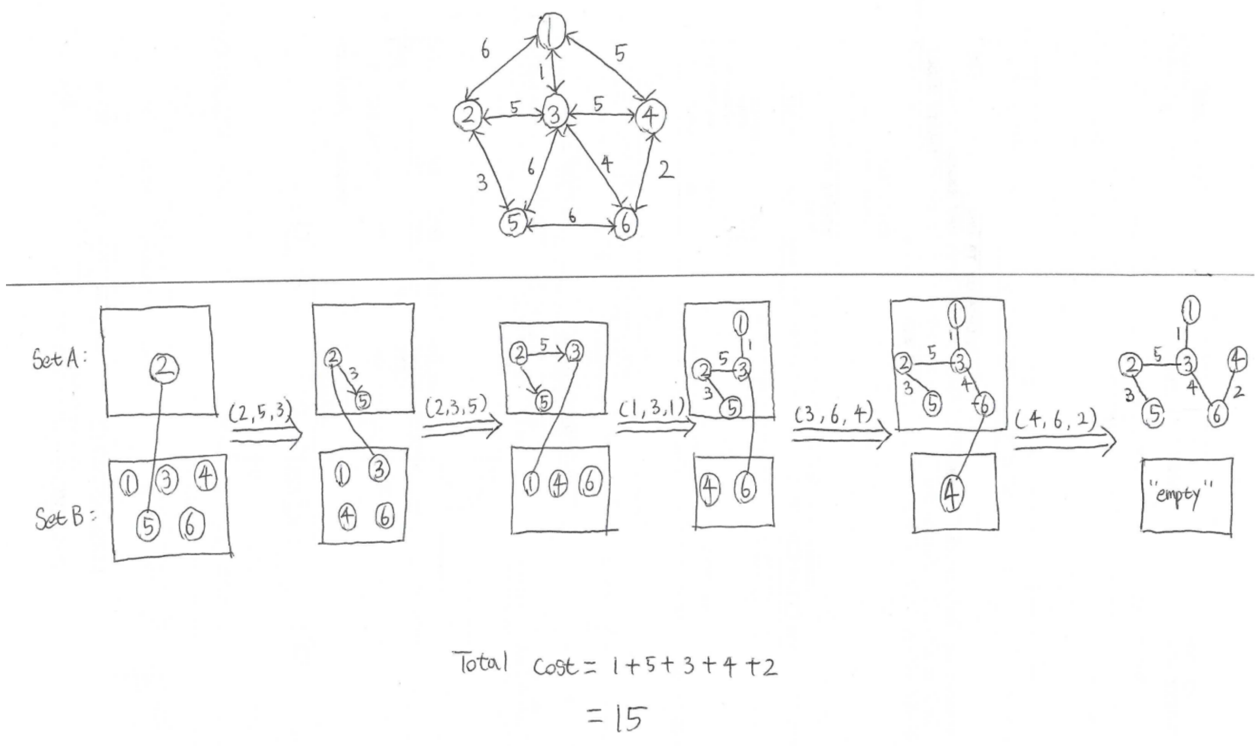
Project Name: Minimum Spanning Tree of a given graph via Prim's algorithm

Due Date: 11/22/2023 Wednesday before midnight

Algorithm Steps:

```
Step 0: inFile, outFile1, MSTfile  open via args[]
numNodes  get from inFile
nodeInSetA  get from args [1]
whichSet []  dynamically allocated, size of numNodes+1, and initialize all to set 'B'
whichSet [0]  'A' // although we do not use index 0.
whichSet[nodeInSetA]  'A' // now, setA has only one node, nodeInSetA.
printSet (whichSet, outFile1) // with caption.
edgelistHead  get an uEdge as the dummy node <0, 0, 0, null> for it to point to.
MSTlistHead  get an uEdge as the dummy node <0, 0, 0, null> for it to point to.
totalMSTCost  0
// Step 1 to Step 3 are constructing the linked list of edges in ascending order.
Step 1: Ni  read from inFile.
Nj  read from inFile.
edgeCost  read from inFile.
newEdge  create a new uEdge node with (Ni, Nj, edgeCost, null)
Spot findSpot (edgelistHead, newEdge)
insertOneNode (Spot, newEdge)
Step 2: outFile1  "In main () print the list of edges"
printEdgeList (edgelistHead, outFile1)
Step 3: repeat step 1 to step 2 until the inFile is empty.
// Step 4 to Step 9 are constructing MST, need not sorted.
Step 4: e  removeEdge (edgelistHead)
Step 5: printEdge (e, outFile1) // with caption
Step 6: updateMST (MSTlistHead, e)
Step 7: printSet (whichSet, outFile1) // with caption
Step 8: printEdgeList (edgeListHead, outFile1) // with caption
printMSTList (MSTlistHead, outFile1) // with caption
Step 9: repeat step 4 – step 8 until isDone (whichSet) // whichSet are all 'A', i.e., all edges are in SetA.
Step 10: MSTfile  print "*** Prim's MST of the input graph, G is: ***"
MSTfile  print numNodes
printMST (MSTlistHead, MSTfile)
MSTfile  print " *** MST total cost = " totalMSTCost
Step 11: close all files.
```

Illustration



Source Code

```
import java.io.FileNotFoundException;
import java.io.FileReader;
import java.io.FileWriter;
import java.io.IOException;
import java.util.Scanner;

public class ChenSalasD_Project7_Main {

    static class uEdge{
        int Ni;
        int Nj;
        int cost;
        uEdge next;

        uEdge(int Ni, int Nj, int cost, uEdge next){
            this.Ni = Ni;
            this.Nj = Nj;
            this.cost = cost;
            this.next = next;
        }
    }
```

```
static Scanner inFile;
static FileWriter outFile1;
static FileWriter MSTfile;

static int numNodes;
static int nodeInSetA;
static char[] whichSet;
static uEdge edgeListHead;
static uEdge MSTlistHead;
static int totalMSTCost;

public static void main(String[] args) throws IOException {
    inFile = new Scanner(new FileReader(args[0]));
    nodeInSetA = Integer.parseInt(args[1]);
    outFile1 = new FileWriter(args[2]);
    MSTfile= new FileWriter(args[3]);

    numNodes = inFile.nextInt();;
    whichSet = new char[numNodes + 1];
    for(int i = 1; i < numNodes + 1 ; i++){
        whichSet[i] = 'B';
    }
    whichSet[0] = 'A';
    whichSet[nodeInSetA] = 'A';
    outFile1.write("***Initial set print***\n");
    printSet(whichSet, outFile1);
    outFile1.write("\n");
    edgeListHead = new uEdge(0, 0, 0, null);
    MSTlistHead = new uEdge(0, 0, 0, null);
    totalMSTCost = 0;

    uEdge newEdge, Spot;
    while(inFile.hasNext()){
        newEdge = new uEdge(inFile.nextInt(), inFile.nextInt(), inFile.nextInt(), null);
        Spot = findSpot(edgeListHead, newEdge);
        insertOneNode(Spot, newEdge);
        outFile1.write("In main() print the list of edges");
        printEdgeList(edgeListHead, outFile1);
    }

    uEdge e;
    uEdge minEdge;
    while(!isDone(whichSet)){
        e = edgeListHead;
        minEdge = new uEdge(0, 0, 99, null);
        while(e.next != null){
            e = e.next;
            if( (whichSet[e.Ni] != whichSet[e.Nj]) && e.cost < minEdge.cost){
                    minEdge = e;
                    break;
            }
        }
        //e = removeEdge(edgeListHead);
        rmEdge(minEdge);

        outFile1.write("\n\n--------------------------------------------------------------------\n");
        outFile1.write("***Pick edge***\n");
        printEdge(e, outFile1);
        updateMST(MSTlistHead, e);
        outFile1.write("\n**Updated set**\n");
        printSet(whichSet, outFile1);
        outFile1.write("\n**Updated edgeListHead**\n");
        printEdgeList(edgeListHead, outFile1);
        outFile1.write("\n**Updated MSTList**\n");
        printMSTList(MSTlistHead, outFile1);
        outFile1.write("--------------------------------------------------------------------\n");
    }

    MSTfile.write("*** Prim's MST of the input graph, G is: ***");
    MSTfile.write("\n" + numNodes + "\n");
    printMST(MSTlistHead, MSTfile);
    MSTfile.write("*** MST total cost = " + totalMSTCost +  " ***");

    inFile.close();
    outFile1.close();
    MSTfile.close();
}

public static void printSet(char[] whichSet, FileWriter outFile1) throws IOException {
    for(int i = 1; i < numNodes + 1; i++){
        outFile1.write(i + " ");
    }
    outFile1.write("\n");
    for(int i = 1; i < numNodes + 1; i++){
        outFile1.write(whichSet[i] + " ");
    }
    outFile1.write("\n");
}

public static void printEdgeList(uEdge edgeListHead, FileWriter outFile1) throws IOException {
    outFile1.write("edgelistHead");
    uEdge tmp = edgeListHead;
    while(tmp.next != null){
        tmp = tmp.next;
        outFile1.write(" --> <" + tmp.Ni + ", " + tmp.Nj + ", " + tmp.cost + ">");
    }
    outFile1.write("\n");
}

public static void printMSTList(uEdge MSTlistHead, FileWriter outFile1) throws IOException {
    outFile1.write("MSTlistHead");
    uEdge tmp = MSTlistHead;
    while(tmp.next != null){
        tmp = tmp.next;
        if(tmp.next == null) {
            outFile1.write(" --> <" + tmp.Ni + ", " + tmp.Nj + ", " + tmp.cost + ", null" + ">");
        }
        else {
            outFile1.write(" --> <" + tmp.Ni + ", " + tmp.Nj + ", " + tmp.cost + ", " + tmp.next.Ni + ">");
        }
    }
    outFile1.write("\n");
}

public static void printMST(uEdge MSTlistHead, FileWriter MSTfile) throws IOException {
    uEdge tmp = MSTlistHead;
    while(tmp.next != null){
        tmp = tmp.next;
        MSTfile.write(tmp.Ni + " " + tmp.Nj + " " + tmp.cost + "\n");
    }
}

public static uEdge findSpot(uEdge edgeListHead, uEdge newEdge) {
    uEdge spot = edgeListHead;
    while(spot.next != null && spot.next.cost < newEdge.cost){
        spot = spot.next;
    }
    return spot;
}

public static void insertOneNode(uEdge spot, uEdge newEdge) {
    newEdge.next = spot.next;
    spot.next = newEdge;
}

public static boolean isDone(char[] whichSet) {
    for(int i = 1; i < numNodes + 1; i++){
        if(whichSet[i] == 'B'){
            return false;
        }
    }
    return true;
}

public static uEdge removeEdge(uEdge head){
    uEdge tmp = head.next;
    head.next = tmp.next;
    tmp.next = null;
    return tmp;
}

public static void printEdge(uEdge edge, FileWriter outFile1) throws IOException {
        outFile1.write("<" + edge.Ni + ", " + edge.Nj + ", " + edge.cost + ">\n");
    }

    public static void updateMST(uEdge MSTlistHead, uEdge edge) {
        pushEdgeToMST(MSTlistHead, edge);
        totalMSTCost += edge.cost;
        if(whichSet[edge.Ni] == 'A'){
            whichSet[edge.Nj] = 'A';
        }
        else{
            whichSet[edge.Ni] = 'A';
        }
    }

    public static void pushEdgeToMST(uEdge MSTlistHead, uEdge edge) {
        edge.next = MSTlistHead.next;
        MSTlistHead.next = edge;
    }

    public static void rmEdge(uEdge rmEdge){
        uEdge tmp = edgeListHead;
        while(tmp.next != rmEdge){
            tmp = tmp.next;
        }
        tmp.next = rmEdge.next;
        rmEdge.next = null;
    }
}
```

Program Output

Output with Data1.txt, 2 as initial node

outFile1.txt

```
***Initial set print***
1 2 3 4 5 6
B A B B B B

In main() print the list of edgesedgelistHead --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <1, 4, 5> --> <1, 2,
6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <2, 3, 5> --> <1, 4,
5> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <2, 5, 3> --> <2, 3,
5> --> <1, 4, 5> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <2, 5, 3> --> <3, 4,
5> --> <2, 3, 5> --> <1, 4, 5> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <2, 5, 3> --> <3, 4,
5> --> <2, 3, 5> --> <1, 4, 5> --> <3, 5, 6> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <2, 5, 3> --> <3, 6,
4> --> <3, 4, 5> --> <2, 3, 5> --> <1, 4, 5> --> <3, 5, 6> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <4, 6, 2> --> <2, 5,
3> --> <3, 6, 4> --> <3, 4, 5> --> <2, 3, 5> --> <1, 4, 5> --> <3, 5, 6> --> <1, 2, 6>
In main() print the list of edgesedgelistHead --> <1, 3, 1> --> <4, 6, 2> --> <2, 5,
3> --> <3, 6, 4> --> <3, 4, 5> --> <2, 3, 5> --> <1, 4, 5> --> <5, 6, 6> --> <3, 5, 6>
--> <1, 2, 6>


----------------------------------------------------------------------
***Pick edge***
<2, 5, 3>

**Updated set**
1 2 3 4 5 6
B A B B A B

**Updated edgeListHead**
edgelistHead --> <1, 3, 1> --> <4, 6, 2> --> <3, 6, 4> --> <3, 4, 5> --> <2, 3, 5> -->
<1, 4, 5> --> <5, 6, 6> --> <3, 5, 6> --> <1, 2, 6>

**Updated MSTList**
MSTlistHead --> <2, 5, 3, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<2, 3, 5>

**Updated set**
1 2 3 4 5 6
B A A B A B

**Updated edgeListHead**
edgelistHead --> <1, 3, 1> --> <4, 6, 2> --> <3, 6, 4> --> <3, 4, 5> --> <1, 4, 5> -->
<5, 6, 6> --> <3, 5, 6> --> <1, 2, 6>

**Updated MSTList**
MSTlistHead --> <2, 3, 5, 2> --> <2, 5, 3, null>
----------------------------------------------------------------------
```

```
----------------------------------------------------------------------
***Pick edge***
<1, 3, 1>

**Updated set**
1 2 3 4 5 6
A A A B A B

**Updated edgeListHead**
edgelistHead --> <4, 6, 2> --> <3, 6, 4> --> <3, 4, 5> --> <1, 4, 5> --> <5, 6, 6> -->
<3, 5, 6> --> <1, 2, 6>

**Updated MSTList**
MSTlistHead --> <1, 3, 1, 2> --> <2, 3, 5, 2> --> <2, 5, 3, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<3, 6, 4>

**Updated set**
1 2 3 4 5 6
A A A B A A

**Updated edgeListHead**
edgelistHead --> <4, 6, 2> --> <3, 4, 5> --> <1, 4, 5> --> <5, 6, 6> --> <3, 5, 6> -->
<1, 2, 6>

**Updated MSTList**
MSTlistHead --> <3, 6, 4, 1> --> <1, 3, 1, 2> --> <2, 3, 5, 2> --> <2, 5, 3, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<4, 6, 2>

**Updated set**
1 2 3 4 5 6
A A A A A A

**Updated edgeListHead**
edgelistHead --> <3, 4, 5> --> <1, 4, 5> --> <5, 6, 6> --> <3, 5, 6> --> <1, 2, 6>

**Updated MSTList**
MSTlistHead --> <4, 6, 2, 3> --> <3, 6, 4, 1> --> <1, 3, 1, 2> --> <2, 3, 5, 2> -->
<2, 5, 3, null>
----------------------------------------------------------------------
```

****MSTfile.txt****

```
*** Prim’s MST of the input graph, G is: ***
6
4 6 2
3 6 4
1 3 1
2 3 5
2 5 3
*** MST total cost = 15 ***
```

Output with Data2.txt, 3 as initial node

outFile1.txt

```
***Initial set print***
1 2 3 4 5 6 7 8 9 10 11 12
B B A B B B B B B B B B

In main() print the list of edgesedgelistHead --> <6, 4, 3>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14> --> <6,
12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <12,
7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> -->
<2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> -->
<3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4,
31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2,
25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8,
21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5,
4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18>
--> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9,
10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15>
```

```
--> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1,
11, 36>
In main() print the list of edgesedgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7,
5> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1,
6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14>
--> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2,
4, 31> --> <1, 11, 36>


----------------------------------------------------------------------
***Pick edge***
<3, 5, 14>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A B A B B B B B B B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7>
--> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4,
12> --> <8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> -->
<4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<12, 5, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A B A B B B B B B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8>
--> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8,
6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23>
--> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <12, 5, 3, 3> --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<5, 7, 5>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A B A B A B B B B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9>
--> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <12,
7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25>
--> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <5, 7, 5, 12> --> <12, 5, 3, 3> --> <3, 5, 14, null>
```

```
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<10, 12, 7>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A B A B A B B A B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10>
--> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <12, 7, 14> --> <8,
10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31>
--> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <10, 12, 7, 5> --> <5, 7, 5, 12> --> <12, 5, 3, 3> --> <3, 5, 14,
null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 7, 8>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A B A A A B B A B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10>
--> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6,
12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <6, 7, 8, 10> --> <10, 12, 7, 5> --> <5, 7, 5, 12> --> <12, 5, 3, 3>
--> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 4, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A A A A A B B A B A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10,
11> --> <5, 4, 12> --> <8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> -->
<9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 5> --> <5, 7, 5, 12>
--> <12, 5, 3, 3> --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
```

```
<11, 4, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A A A A A B B A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4,
12> --> <8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> -->
<4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 5>
--> <5, 7, 5, 12> --> <12, 5, 3, 3> --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<9, 11, 9>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B A A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6,
12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> -->
<3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <9, 11, 9, 11> --> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10>
--> <10, 12, 7, 5> --> <5, 7, 5, 12> --> <12, 5, 3, 3> --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 6, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A B A A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <12, 7,
14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> -->
<2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 6, 10, 9> --> <9, 11, 9, 11> --> <11, 4, 10, 6> --> <6, 4, 3, 6>
--> <6, 7, 8, 10> --> <10, 12, 7, 5> --> <5, 7, 5, 12> --> <12, 5, 3, 3> --> <3, 5,
14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 2, 6>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A A A A A A B A A A A
```

```
**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <12, 7, 14> --> <8, 10,
15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> -->
<1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 2, 6, 1> --> <1, 6, 10, 9> --> <9, 11, 9, 11> --> <11, 4, 10, 6>
--> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 5> --> <5, 7, 5, 12> --> <12, 5, 3,
3> --> <3, 5, 14, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<8, 6, 12>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A A A A A A A A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6,
12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <8, 6, 12, 1> --> <1, 2, 6, 1> --> <1, 6, 10, 9> --> <9, 11, 9, 11>
--> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 5> --> <5, 7, 5,
12> --> <12, 5, 3, 3> --> <3, 5, 14, null>
----------------------------------------------------------------------
```

MSTfile.txt

```
*** Prim’s MST of the input graph, G is: ***
12
8 6 12
1 2 6
1 6 10
9 11 9
11 4 10
6 4 3
6 7 8
10 12 7
5 7 5
12 5 3
3 5 14
*** MST total cost = 87 ***
```

Output with Data2.txt, 7 as initial node

outFile1.txt

```
***Initial set print***
1 2 3 4 5 6 7 8 9 10 11 12
B B B B B B A B B B B B

In main() print the list of edgesedgelistHead --> <6, 4, 3>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14> --> <6,
12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <12,
7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> -->
<2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> -->
<3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4,
31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2,
25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8,
21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5,
4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18>
--> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9,
10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15>
```

```
--> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1,
11, 36>
In main() print the list of edgesedgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7,
5> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1,
6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14>
--> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2,
4, 31> --> <1, 11, 36>


----------------------------------------------------------------------
***Pick edge***
<5, 7, 5>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B B A B A B B B B B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8>
--> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8,
6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21>
--> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<12, 5, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B B A B A B B B B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9>
--> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3,
5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23>
--> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <12, 5, 3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<10, 12, 7>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B B A B A B B A B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10>
--> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12,
7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25>
--> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, null>
```

```
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 7, 8>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B B A A A B B A B A

**Updated edgeListHead**
edgelistHead --> <6, 4, 3> --> <1, 2, 6> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10>
--> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8,
10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31>
--> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <6, 7, 8, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5,
null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 4, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B B A B A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10,
11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> -->
<6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11,
36>

**Updated MSTList**
MSTlistHead --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5>
--> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<11, 4, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B B A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4,
12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> -->
<9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 12>
--> <12, 5, 3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
```

```
***Pick edge***
<9, 11, 9>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6,
12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> -->
<4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <9, 11, 9, 11> --> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10>
--> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 6, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A B B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5,
14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> -->
<3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 6, 10, 9> --> <9, 11, 9, 11> --> <11, 4, 10, 6> --> <6, 4, 3, 6>
--> <6, 7, 8, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 2, 6>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7,
14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> -->
<2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 2, 6, 1> --> <1, 6, 10, 9> --> <9, 11, 9, 11> --> <11, 4, 10, 6>
--> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5,
null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<8, 6, 12>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
```

```
A A B A A A A A A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10,
15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> -->
<1, 11, 36>

**Updated MSTList**
MSTlistHead --> <8, 6, 12, 1> --> <1, 2, 6, 1> --> <1, 6, 10, 9> --> <9, 11, 9, 11>
--> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7, 12> --> <12, 5,
3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<3, 5, 14>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A A A A A A A A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6,
12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <3, 5, 14, 8> --> <8, 6, 12, 1> --> <1, 2, 6, 1> --> <1, 6, 10, 9> -->
<9, 11, 9, 11> --> <11, 4, 10, 6> --> <6, 4, 3, 6> --> <6, 7, 8, 10> --> <10, 12, 7,
12> --> <12, 5, 3, 5> --> <5, 7, 5, null>
----------------------------------------------------------------------
```

MSTfile.txt

```
*** Prim’s MST of the input graph, G is: ***
12
3 5 14
8 6 12
1 2 6
1 6 10
9 11 9
11 4 10
6 4 3
6 7 8
10 12 7
12 5 3
5 7 5
*** MST total cost = 87 ***
```

Output with Data2.txt, 11 as initial node

outFile1.txt

```
***Initial set print***
1  2  3  4  5  6  7  8  9  10  11  12
B  B  B  B  B  B  B  B  B  B  A  B

In main() print the list of edgesedgelistHead --> <6, 4, 3>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <12, 7, 14> --> <6,
12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <12,
7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <10, 12, 7> --> <9,
11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> --> <3, 2, 25> -->
<2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <12, 7, 14> --> <6, 12, 18> -->
<3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <8, 6, 12> --> <12, 7, 14> -->
<8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <3, 2, 25> --> <2, 4,
31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <10, 12,
7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> -->
<12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2,
25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3,
23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> -->
<8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8,
21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <1, 6, 10> --> <9, 10, 11> --> <5,
4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18>
--> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>
In main() print the list of edgesedgelistHead --> <6, 4, 3> --> <5, 7, 5> --> <1, 2,
6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1, 6, 10> --> <9,
10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15>
```

```
--> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1,
11, 36>
In main() print the list of edgesedgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7,
5> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8> --> <9, 11, 9> --> <11, 4, 10> --> <1,
6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14>
--> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2,
4, 31> --> <1, 11, 36>


----------------------------------------------------------------------
***Pick edge***
<9, 11, 9>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B B B B B B A B A B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7>
--> <6, 7, 8> --> <11, 4, 10> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6,
12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> -->
<4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<11, 4, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A B B B B A B A B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <6, 4, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7>
--> <6, 7, 8> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5,
14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> -->
<3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 4, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A B A B B A B A B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7> --> <6, 7, 8>
--> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12,
7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25>
--> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <6, 4, 3, 11> --> <11, 4, 10, 9> --> <9, 11, 9, null>
```

```
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<6, 7, 8>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A B A A B A B A B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <5, 7, 5> --> <1, 2, 6> --> <10, 12, 7> --> <1, 6, 10>
--> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8,
10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31>
--> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <6, 7, 8, 6> --> <6, 4, 3, 11> --> <11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<5, 7, 5>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B A B A B

**Updated edgeListHead**
edgelistHead --> <12, 5, 3> --> <1, 2, 6> --> <10, 12, 7> --> <1, 6, 10> --> <9, 10,
11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> -->
<6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11,
36>

**Updated MSTList**
MSTlistHead --> <5, 7, 5, 6> --> <6, 7, 8, 6> --> <6, 4, 3, 11> --> <11, 4, 10, 9> -->
<9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<12, 5, 3>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B A B A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <10, 12, 7> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4,
12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> -->
<9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <12, 5, 3, 5> --> <5, 7, 5, 6> --> <6, 7, 8, 6> --> <6, 4, 3, 11> -->
<11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
```

```
<10, 12, 7>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
B B B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <1, 6, 10> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6,
12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> -->
<4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, 6> --> <6, 7, 8, 6>
--> <6, 4, 3, 11> --> <11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 6, 10>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A B B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <1, 2, 6> --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5,
14> --> <12, 7, 14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> -->
<3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 6, 10, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, 6>
--> <6, 7, 8, 6> --> <6, 4, 3, 11> --> <11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<1, 2, 6>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A B A A A A B A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <8, 6, 12> --> <3, 5, 14> --> <12, 7,
14> --> <8, 10, 15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> -->
<2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <1, 2, 6, 1> --> <1, 6, 10, 10> --> <10, 12, 7, 12> --> <12, 5, 3, 5>
--> <5, 7, 5, 6> --> <6, 7, 8, 6> --> <6, 4, 3, 11> --> <11, 4, 10, 9> --> <9, 11, 9,
null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<8, 6, 12>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A B A A A A A A A A A
```

```
**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <3, 5, 14> --> <12, 7, 14> --> <8, 10,
15> --> <6, 12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> -->
<1, 11, 36>

**Updated MSTList**
MSTlistHead --> <8, 6, 12, 1> --> <1, 2, 6, 1> --> <1, 6, 10, 10> --> <10, 12, 7, 12>
--> <12, 5, 3, 5> --> <5, 7, 5, 6> --> <6, 7, 8, 6> --> <6, 4, 3, 11> --> <11, 4, 10,
9> --> <9, 11, 9, null>
----------------------------------------------------------------------


----------------------------------------------------------------------
***Pick edge***
<3, 5, 14>

**Updated set**
1 2 3 4 5 6 7 8 9 10 11 12
A A A A A A A A A A A A

**Updated edgeListHead**
edgelistHead --> <9, 10, 11> --> <5, 4, 12> --> <12, 7, 14> --> <8, 10, 15> --> <6,
12, 18> --> <9, 8, 21> --> <4, 3, 23> --> <3, 2, 25> --> <2, 4, 31> --> <1, 11, 36>

**Updated MSTList**
MSTlistHead --> <3, 5, 14, 8> --> <8, 6, 12, 1> --> <1, 2, 6, 1> --> <1, 6, 10, 10>
--> <10, 12, 7, 12> --> <12, 5, 3, 5> --> <5, 7, 5, 6> --> <6, 7, 8, 6> --> <6, 4, 3,
11> --> <11, 4, 10, 9> --> <9, 11, 9, null>
----------------------------------------------------------------------
```

MSTfile.txt

```
*** Prim's MST of the input graph, G is: ***
12
3 5 14
8 6 12
1 2 6
1 6 10
10 12 7
12 5 3
5 7 5
6 7 8
6 4 3
11 4 10
9 11 9
*** MST total cost = 87 ***
```