PWr Week 11
Data Structures and Algorithms
Laboratory – **List 10**

In above tasks vertices a numbered from 0. Any graph is without loops (a loop is an edge form a vertex to this same vertex).

1. Implement graph representation as an adjacency matrix. Do following functions:
    a. **void** `loadGraph(Graph &g, int n, double m)` – which loads from a console a graph with `n` vertices and `m` edges. The format is presented below.
    b. **void** `insertEdge(Graph &g, int u, int v, double weight)` – insert vertex from `u` to `v` of the weight equal `weight`. If the edge already exists, change the weight to the new value.
    c. **bool** `findEdge(Graph &g, int u, int v, double &weight)` – find an edge from `u` to `v` and under variable `weight` return its weight. Return information if the edge exists.
    d. **void** `showAsMatrix(Graph &g)` – print on console the graph as an matrix. The format of output take from an example.
    e. **void** `showAsArrayOfLists(Graph &g)` – print on console the graph as an array of lists. The format of output take from an example.
2. Implement graph representation as an array of adjacency lists, vertices in every lists have to be sorted depending on vertices number. Do the same functions like for task 1 for the second representation.

Format of input lines: m lines of the format:
`<startingVertex> <endingVertex> <weightOfEdge>`
e.a:
`2 4 3.5`
Means an edge form 2 to 4 of the weight 3.5. Vertices are numbered from 0.

For **10 points** present solutions for this list till **Week 12**.
For 8 **points** present solutions for this list till **Week 13**.
For 5 **points** present solutions for this list till **Week 14**.
After Week 14 the list is closed.

Appendix 1

The solution will be automated tested with tests from console of presented below format. The test assumes, that there are up to X different graphs, which there are created as the first operation in the test. Each graph will be loaded from input stream.

If a line starts from '`#`' sign, the line have to be ignored.
In any other case, your program should print an exclamation mark and write (copy) introduced a line and then, depending on the command follow the correct procedure / function.

If a line has a format:
`GO` *X*
your program has to create *n* graphs (without initialization). The graphs are numbered from 0 like an array of lists. Default current graph is a graph with number 0. This operation will be called once as the first command.

If a line has a format:
`CH` *n*
your program has to choose a graph of a number `n`, and all next functions will operate on this graph. There is *n>=0* and *n<X*.

If a line has a format:
`LG n m`
your program has to call `loadGraph(g, n, m)` for current graph g. For any graph this operation will be called once, before using the graph. **The next `m` lines will present the information about edges.**

If a line has a format:
`IE` *u v w*
your program has to call `insertEdge(g,u,v,w )` for current graph `g`.

If a line has a format:
`FE u v`
your program has to call `findEdge(g,u,v,w)` for current graph `g`, and if the function return **`true`**, write on the output returned value `w`. Otherwise write "false" with new line character.

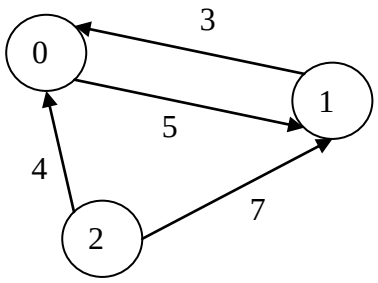
If a line has a format:
`SM`
your program has to call `showAsMatrix(g)` for current graph `g`.

If a line has a format:
`SA`
your program has to call `showAsArrayOfLists(g)` for current graph `g`.

If a line has a format:
`HA`

your program has to end the execution, writing as the last line “END OF EXECUTION”. Every test ends with this line.

A graph from example test:



For example for input test:

```
GO 2
LG 3 4
0 1 5
2 0 4
1 0 3
2 1 7
FE 0 2
FE 2 0
SM
FE 1 2
SA
HA
```

The output have to be:

```
START
!GO 2
!LG 3 4
!FE 0 2
false
!FE 2 0
4
!SM
0,5,-,
3,0,-,
4,7,0,
!FE 1 2
false
!SA
0:1(5),
1:0(3),
```

```
2:0(4),1(7),
!HA
END OF EXECUTION
```