Assignment #1

Data Structures Deadline – 2022/10/14

Input: p1.in

Output: p1.out

Upload your assignment to Moodle before 11:59pm.

Please consult with TA if you have any questions.

Problem:

Given a sparse matrix A, transpose it by the following two methods:
(1) (50%)Using traditional 2-dimensional array representation
(2) (50%)Using the "Transpose" method in the textbook

Input file description:

The first line reads as m*n, where m and n are the number of rows and columns of the matrix, respectively. The following L lines are these non-zero elements, each line corresponding to a data point in the matrix. For example, a line may read be as "4 0 3", indicating A(4,0) = 3 (assuming the row and column indices start with 0).

Output file description:

The output shall consist of L+2 lines where the first L lines should print out the results of the transpose (refer to the sample output below as an example). The (L+i)-th line shall print out the execution time of method i.

Sample Input:

```
5 6
0 0 1
0 2 1
1 1 2
2 0 4
2 2 3
```

Sample Output:

```
(0, 0, 1) becomes (0, 0, 1) in the transpose
(0, 2, 1) becomes (2, 0, 1) in the transpose
(1, 1, 2) becomes (1, 1, 2) in the transpose
(2, 0, 4) becomes (0, 2, 4) in the transpose
(2, 2, 3) becomes (2, 2, 3) in the transpose
0.03
0.02
```

Note:

For this assignment, please use the input to generate a sparse matrix. Your code should be able to read the input file, and quit this reading process once it reaches the EOF (end of file), and then start constructing the matrix. In Assignment 1, you are expected to work on

the following tasks:

(1) Store all the elements using the 2-dimensional array representation. Then transpose the matrix.
(2) Store the non-zero elements using the triple format; then use "Transpose" methods to do the matrix transposition.

You shall follow the codes provided in the textbook to implement these two methods to write your **C++** codes for this homework assignment, and print out the results using the **triple format**, i.e. (row, column, value) suggested in the textbook. Also, you must **write a function to print out exactly how much time each method takes to transpose a matrix** e.g., millisecond or whatever proper time units to show the difference among these two methods.

Besides, you need to explain what each file contains and how to execute it in the **Readme.txt**. Make sure your program can be executed in **Dev c++** and write code comments.

Please compress all the files, and name the compressed file as HW1_yourstudentID.rar (or in .zip file) (e.g. HW1_P76111111.rar). Then uploadthe compressed file to the Moodle in time. Also, you shall print out the output in the p1.out after executing the .exe

The file structure should be like following figure:

```
|-HW1_P76******.rar (.zip)
| |-HW1_P76****** (Folder)
| | |-main.cpp
| | |-xxx.h
| | |-xxx.cpp
| | |-p1.in
| | |-p1.out
| | |-Readme.txt
| | |-(Other files(Don't contain folder)...)
```

Don't cheating, or you will get 0 for this assignment. If you can't finish the assignment before deadline, just hand in your unfinished code and report.