MASSEY UNIVERSITY
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159.201 Algorithms & Data Structures
S1 2022

Assignment 1

Write code *to complete a program (download it from Stream)* that reads in two ***sparse matrices*** *from *.txt files* and stores them as linked lists (dynamic memory). Use either the c or cpp start-up code available on Stream. The prototype reads text files in a specific format, with the first lines indicating the number of rows and columns (see example on Stream).

Write the function that adds the two matrices together and produce a result matrix. The result matrix **must** also be stored as a linked list. We are assuming that the matrices are too large to fit into memory as arrays, thus all calculations must be carried out with the matrices stored in their linked list format.
Write a display function that shows all three **matrices** in the usual matrix format.
Write a display function that shows all three **linked lists** in order of elements.

Note 1: The programs should read the matrices from the *.txt files, NOT from keyboard. Use the sample codes provided on Stream. Use either the C or the C++ style (both files provided on Stream).

Note 2: Make sure that values of zero are ***not*** nodes in the linked list (after all, that's the point in implementing the sparse matrix code!).

Note 3: The output ***must be*** in this format. This example has 4x4 matrices:

```
Matrix 1: 1 2 3 4 5
0 1 0 0
0 0 2 0
0 3 0 4
0 0 0 5
Matrix 2: 1 1 2 3 4 10 3 3
1 1 2 0
0 0 3 0
0 4 0 10
0 0 3 3
Matrix Result: 1 2 2 5 7 14 3 8
1 2 2 0
0 0 5 0
0 7 0 14
0 0 3 8
```

If the matrix is all zeros, it should be printed like this, indicating that the corresponding linked-list is **empty**:

```
Matrix 2:
0 0 0 0
0 0 0 0
0 0 0 0
0 0 0 0
```

Use our virtual machine to mark your submissions. The host name of the server is **vm000296**. You should have received information about your password in the first tutorial. If not, please contact the lecturer. The input/output requirements are essential, please follow them carefully to avoid losing marks. Spaces matter and text is case sensitive.

After you are satisfied with the performance of your code as tested in the virtual machine, submit a **one source file** code on Stream by **Friday 18 of March 2022.** Your **name** and **ID number** must appear **on top of the file as comments.** If you are working in a group, then ***all*** names and IDs must appear on top of the file as comments, but you still need to **submit the assignment individually** on Stream.