

PROBLEM 1

You must be familiar with matrices from your JEE preparation. So let's play a bit with them. This time the play is simple as you just have to take the transpose of the given matrix. But we have added a twist in the tale, i.e. It is a matrix of strings instead of just matrix of numbers.

So here is the task.

Write a function **void transpose(string infilename, string outfilename)** to compute the following task.

The function reads data from a file, whose name is in the variable infilename. The contents of the file are as described below:

1. Each line is a sequence of strings separated by a single space
2. There are many lines in the file
3. The number of strings in each line is the same.

So, essentially each file is a matrix of strings. The number of rows and columns of the matrix are not specified.

The function takes a transpose of the matrix and prints the matrix in the same format as the original input file.

NOTE:-

You should **ONLY** write this function

Do not write a **MAIN FUNCTION**. If you do so, your code will not compile and will be awarded a zero.

Also, **do not change the name of the function** and fill in your code, only write in the function body provided.

Also, you do not need to take any input from the user. So, do not use any cin or cout statements.

There should not be any trailing or preceding white spaces in any of the line.

Each line is separated by a newline character.

INPUT FORMAT

- Read directly from the file.
- The file description is same as described above.

CONSTRAINTS

- The length of the matrix varies from **2 x 2** to **200 x 100**.

- **Total Execution Time = 6s.**

OUTPUT FORMAT

- Output the transposed matrix in a file named by the variable outfilename.

SAMPLE EXAMPLE:

If the contents of the input file are:

```
hello world col100
is good i
am enjoying it
graded lab four
```

You should write to the output file:

```
hello is am graded
world good enjoying lab
col100 i it four
```

PROBLEM 2

Write a function `void prettyPrint(string infilename, string outfilename)` to compute the following task.

The function reads data from a file, whose name is in the variable `infilename`. The contents of the file are as described below:
Each line is a sequence of integers separated by a single space
There are many lines in the file
The number of integers in each line is the same.
So, essentially each file is a matrix of integers. The number of rows and columns of the matrix are unknown.

The function prints the matrix in a good looking table-like format as described below.

1. Each element of the matrix is in a cell.
2. Each cell has a fixed width which is equal to the two more than the maximum number of digits of any element in the matrix
3. Each cell has its corner specified with the character '+' (without quotes)
4. The horizontal boundaries of each cell are specified with the character '-' (without quotes)
5. The vertical boundaries of each cell are specified with the character '|' (without quotes)
6. Each element in a cell is left justified and prefixed with space. So, let's say that the cell width computed in step 2 is 5 and the present number to be filled in the cell is 23 then this cell, would like like

```
+-----+  
| 23  |  
+-----+
```

So there is a space followed by the left '|' character and a space preceding the right '|' character. In the remaining places, the number is left justified, with the blank places being replaced by space. This explains the reason why the cell width is the maximum number of digits + 2.

7. You need to do this for the complete matrix and write the pretty looking tabular format to the file name stored in the variable `outfilename`

NOTE:-

You should ONLY write this function

Do not write a MAIN FUNCTION. If you do so, your code will not compile and will be awarded a zero.

Also, do not change the name of the function and fill in your code, only write in the function body provided.

Also, you do not need to take any input from the user. So, do not use any `cin` or `cout` statements.

There should not be any trailing or preceding white spaces in any of the line. Your output will be matched exactly and even if there is one extra space or

newline, you FAIL the test case.
Each line is separated by a newline character.

INPUT FORMAT

Read directly from the file.
File description is same as provided above.

CONSTRAINTS

The size of the matrix varies from 1x1 to 200x100.
Each element of the matrix will be less than 10^9 .
Total Execution Time = 6s.

OUTPUT FORMAT

Output the pretty printed matrix in a file named by the variable outfilename
SAMPLE EXAMPLE:

If the contents of the input file are:

```
7682675 915 9 22 1
384 52619 69045 35 931
3880247 43328340 537 736291 14
97 25052386 34 2601484 7592
```

You should write to the output file:

```
+-----+-----+-----+-----+-----+
| 7682675 | 915      | 9        | 22       | 1        |
+-----+-----+-----+-----+-----+
| 384      | 52619    | 69045    | 35       | 931     |
+-----+-----+-----+-----+-----+
| 3880247  | 43328340 | 537      | 736291   | 14      |
+-----+-----+-----+-----+-----+
| 97       | 25052386 | 34       | 2601484  | 7592    |
+-----+-----+-----+-----+-----+
```

PROBLEM 3

The Instructors of COL100 are finding it really hard to manage the time-table of the course as many students are enrolled in different courses with different timings. So this time you have got a chance to impress the instructors by writing code to solve this problem. You never know, You might get extra credits if you can impress the instructors !!!.

So here is the task. You would be given just 2 databases, A and B. Database A and B will have just 2 attributes (RollNo Name) and (RollNo CourseID) respectively. In simple terms, a Database is just a table containing valuable information of students.

Database A will look something like this:-

RollNo Name

1	Ram
2	Hari

Database B will look something like this:-

RollNo CourseID

1	COL100
1	COL114
1	COL356
2	CSL656

The above table indicates that Ram is enrolled in 3 courses, i.e. COL100, COL114 and COL356, whereas Hari is enrolled in just 1 course, i.e. CSL656.

You would be given these 2 databases inside your input file. You have to read them appropriately and then answer few queries that we would be asking on it. All the queries would also be present inside your input file. The databases will be followed by queries inside the input file.

Queries are of 3 types, i.e. X, Y and Z.

Query X:-

Syntax:- X CourseID

Meaning:- Output all the names of the students who are enrolled in the CourseID.

Example:-

Query:- X COL100

Meaning:- Output all the names of students who are enrolled in COL100.

Query Y:-

Syntax:- Y String

Meaning:- Output all the names of the students who are enrolled in the CourseID whose start matches with the given string.

Example:-

Query:- Y COL

Meaning:- Output all the names of students who are enrolled in CourseID starting with COL, i.e. COL100, COL114.

Query Z:-

Syntax:- Z none

Meaning:- Output all the names of the students who are not enrolled in any of the courses offered.

or

Syntax:- Z all

Meaning:- Output all the names of the students who are enrolled in all of the courses offered.

or

Syntax:- Z one

Meaning:- Output all the names of the students who are enrolled in at least one of the courses offered.

In any of the above queries(X,Y or Z) if no student exists then output/write 'N' (without quotes).

Write a function **void queryFile(string infilename, string outfilename)** to compute the following task.

The function reads data from a file, whose name is in the variable infilename. The contents of the file are as described below:

1. The first line contains 2 integers separated by a space denoting total_number_of_students and total_no_of_courses_offered.
2. The next line contains a single character 'A'(without quotes) denoting Database A.
3. The next line contains 2 strings "RollNo" and "Name" (Both without quotes) separated by a space.
4. The next few lines contain student information as described above, each line entry separated by a space and line terminated by '\n'.
5. After this, a line appears containing a single character 'B'(without quotes) denoting Database B.
6. The next line contains 2 strings "RollNo" and "CourseID" (Both without quotes) separated by a space.
7. The next few lines contain student information as described above, each line entry separated by a space and line terminated by '\n'.
8. After this, a line appears containing a single character 'Q'(without quotes) denoting Queries.
9. The next few lines contain queries as described above, each line entry separated by a space and line terminated by '\n'.

Finally your function should process all the queries and write/output the answers to the outfilename.

NOTE:-

- You should **ONLY** write this function
- Do not write a **MAIN FUNCTION**.If you do so, your code will not compile and will be awarded a zero.
- Also,**do not change the name of the function** and fill in your code, only write in the function body provided.
- Also, you do not need to take any input from the user. So, do not use any cin or cout statements.
- There should not be any trailing or preceding white spaces in any of the line.
- Each line is separated by a newline character.

INPUT FORMAT

- Read directly from the file.
- File description is same as provided above.

CONSTRAINTS

- The RollNo is between the range 0 to 100 (Both inclusive).
- $0 < \text{total_no_of_courses_offered} \leq 100$
- Each CourseID contains 3 alphabets (Both capital and small letters) followed by 3 numbers.
- $0 < \text{Total number of queries} \leq 50$.
- Number of entries in each table ≤ 500 .
- Total number of test-cases = 30
- The names of students consists of alphabets (a-z A-Z) only.
- There will be at least 1 entry in database A.
- There will not be any false entries in database B, i.e. there will not be any RollNo entry in database B that is not present in database A.
- There will not be any duplicate entries in any of the databases.
- Total Execution Time = 6s

OUTPUT FORMAT

- Directly write the answer to each query in the outfile name.
- Avoid writing extra spaces at line endings, i.e. line should terminate with '\n'.

SAMPLE EXAMPLE:

If the contents of the input file are:

2 4

A

RollNo Name

1 Ram

2 Hari

B

RollNo CourseID

1 COL100

1 COL114

1 COL356

2 CSL656

Q

X COL100

Y COL

Z none

Z all

Z one

Your Output File should contain:-

Ram

Ram

N

N

Ram

Hari

Important Note:-

For the query "Z one" above you should output/write Ram followed by Hari. Maintain the same order of names as contained in the database A.

SAMPLE INPUT FILES:-

Test Case 1 -<https://iitd-plos.github.io/col100/labs/1.txt>

Test Case 2 -<https://iitd-plos.github.io/col100/labs/2.txt>