CPS125
Digital Computation and Programming
Winter 2017

Project #2:

This project is proposed to get a better understanding of 2-D arrays and their relation to functions.

A data file contains real numbers that are to be read into a 2-D array. The first two numbers in the file are not part of the data but are actually the number of rows and the number of columns in that order. The last two numbers are also not part of the data and are used to specify which row and which column will be used in calling the **rows** and **column** functions (see below). A typical file will look like this:

```
3 6
2.3 6.77 6.5 3.4 2.19 2.123
4.4 6.77 8.9 3.9 3.24 4.567
3.6 4.55 1.5 3.4 8.44 9.542
2
4
```

The file will never be larger than 200 rows and 200 columns and never be smaller than 2 rows and 2 columns.

Write a C program that reads the file and fills the 2-D array in row-major order (like reading a text in English).
See https://en.wikipedia.org/wiki/Row-_and_column-major_order for more details.

Your program must have functions, each one performing a specific task:
1) The **average** function calculates the average (mean) of all the numbers in the array.
2) The **corners** function calculates the sum of the four corners of the array.
3) The **row** function takes the array and a row number and returns the sum of all the numbers in that row.
4) The **column** function takes the array and a column number and returns the average of all the numbers in that column.
5) The **diagonals** function "returns" the sum of all the numbers in the main diagonal and the sum of all the numbers in the anti-diagonal but only if the array is square (number of rows is the same as the number of columns).
6) The **borders** function calculates the sum of all four borders (top row, bottom row, left column, right column). Be careful not to add the corners twice!

The main program will fill the array from the file, and call each function in turn and then print out the results obtained from them.
In the cases of the **row** and **column** functions you will need the file's last two numbers that specify which row (or which column) to sum before calling the function.
In the case of the **diagonals** function, it only gets meaningful results if the array is square. If it is not, display a sentence to that effect.

Try your program with the above file and these examples (you can create more if you want):

```
4 4
5.5 7.8 7.8 3.3
2.2 1.1 4.4 7.7
9.9 7.6 4.4 6.6
9.0 4.0 5.0 2.0
2
3
```

```
2 3
234.56 122.97 4.657
536.43 263.87 5.937
1
2
```

Submission is optional but one question on the final exam will be loosely related to the project. Once your project is completed you might ask your lab TA or your professor to check if your answer is correct.

For maximum benefits, this project is to be done individually.