CS3353: Data Structures and Algorithm Analysis I
Spring 2024

Homework #4

- Full name only: _____
- Release date: 4:00 PM, March 4, 2024 (Monday)
- Due date: **2:30 PM, March 25, 2024 (Monday)**
- It should be done INDIVIDUALLY; Show ALL your work; Submit your source code and results through Canvas.
- Please refer to the course syllabus (Course Requirements and Grading Policy - Assignment, page 3) for the policy of submission, late submission, missing submission, and wrong submission.
- Total: 20 pts
- **Grading Policy**
    - Compilation error / run-time error: -5 pts
        - Deduct 5 pts first. Then TA needs to evaluate the program and apply the following grading policy.
    - No homework submission: 0 pts
    - Use recursion to discover all routes: 10 pts
        - Recursion implementation correct: 10 pts
        - Recursion implementation wrong: TA needs to evaluate the program. Partial points (e.g., 1 pt or 1.5 pts) are deducted depending on the degrees of wrongness.
            - Base case: 4 pts
            - Inductive clause: 6 pts
        - No recursion implementation: -9 pts
    - Program menu as required: 1 pt
    - Horizontal Axis input: 1 pt
    - Vertical Axis input: 1 pt
    - Flexibility of changing Horizontal Axis and Vertical Axis before "Start Discovery": 1 pt
    - Program output: 4 pts
        - Correct output: 4 pts
        - Wrong output:
            - Partial points (e.g., 1 pt or 2 pts) are deducted depending on the degrees of wrongness.
    - Self-testing results: 2 pts
        - No testing conducted / No WORD document: -2
    - Students will not receive 0 pts if students spent time and effort on program and make the submission.
        - If the program has issues/problems, TA needs to evaluate student's program and gives partial points depending on the quality/completion of program.
    - The instructor will decide the grade policy of any scenario which is not covered by the above list. Meanwhile, please kindly contact the instructor if you have any questions regarding the grading policy.

1. Given an M x N rectangular grid, write a program to discover all routes in the grid starting at the source (0, 0) and ending at the destination (M-1, N-1). During the discovery, you can move down or right or diagonally (down-right), but not up or left. Here is a set of requirements to follow:
    - Type the homework number and your full name at the top in your all source codes.

    ```
    /* Homework #4, James Bond */
    ```

    - Your program should be menu-driven and execute the chosen command. If you type 3, then exit the program.

                    M E N U

```
                Horizontal Axis (0), Vertical Axis (1), Start
                Discovery (2), Exit Program (3)

                        Choose?
```

- Show ALL your work. For example,

```
                        M E N U

                Horizontal Axis (0), Vertical Axis (1), Start
                Discovery (2), Exit Program (3)

                        Choose?  0   3


                        M E N U

                Horizontal Axis (0), Vertical Axis (1), Start
                Discovery (2), Exit Program (3)

                        Choose?  1   2


                        M E N U

                Horizontal Axis (0), Vertical Axis (1), Start
                Discovery (2), Exit Program (3)

                        Choose?  1   3
```
(Note: The user changed the size of Vertical Axis via entering a new
value. The program should be flexible with change before discovery.)

```
                        M E N U

                Horizontal Axis (0), Vertical Axis (1), Start
                Discovery (2), Exit Program (3)

                        Choose?  2

                    [ 1, 4, 7, 8, 9 ]
                    [ 1, 4, 5, 8, 9 ]
                    [ 1, 4, 5, 6, 9 ]
                    [ 1, 4, 5, 9 ]
                    [ 1, 4, 8, 9 ]
                    [ 1, 2, 5, 8, 9 ]
                    [ 1, 2, 5, 6, 9 ]
                    [ 1, 2, 5, 9 ]
                    [ 1, 2, 3, 6, 9 ]
                    [ 1, 2, 6, 9 ]
                    [ 1, 5, 8, 9 ]
                    [ 1, 5, 6, 9 ]
                    [ 1, 5, 9 ]
```

```
                M E N U

Horizontal Axis (0), Vertical Axis (1), Start
Discovery (2), Exit Program (3)

              Choose?


                .
                .
                .
```

- Use recursion to discover all routes.

- Submit your source code and self-testing results (e.g., readable and clear screenshots) through Canvas before the due date, **2:30 PM, March 25, 2024 (Monday)**. The TA will build and run your source code and test with random input.
  - **Source code (one file only)** – The file name should be "your name + homework number", e.g., james_bond_4.cpp or james_bond_4.java.
  - **Self-testing Results** (e.g., readable and clear screenshots) **in WORD** document