Java Development Homework 2

Due before 2024 April 3 9:00am

注意事項

1. OJ會在截止日期之後，評測同學的所交到 Moodle的程式碼，寫完程式後，請務必繳交到 Moodle。
2. OJ帶有程式相似度比對系統，抄襲程式者將會依校規處理。
3. 在繳交的作業中請不要有中文註解，避免造成編碼錯誤
4. 對於題目有任何問題，請聯繫助教。

Homework 3

Problem Description

Problem: Class Point in Plane
Description:
Please implement a class named Point to store and manipulate the position of the point on the screen.

- Class Point has two private integer variables: vertical and horizontal, where vertical is the x coordinate and horizontal is the y coordinate of a point.
- The default coordinate of Point when constructing is (0,0).
- Please implement the following member functions:
  - **void Set(int vertical, int horizontal)**
    Reset the coordinate position of the point by the given the x and y.
  - **void Move(int x, int y)**
    Move the current point x pixels on the x-axis and y pixels on the y-axis.
  - **void Rotate()**
    Rotate 90 degrees clockwise from the origin.
  - **int RetrieveVertical()**
    Get the value x of the point.
  - **int RetrieveHorizontal()**
    Get the value y of the point.

Problem Description (cont.)

- Please implement the following member functions:
  - **int calculateManhattanDistance(Point other)**
    calculate the distance between other point class using the Manhattan distance
  - **double ChebyshevDistance(Point other)**
    calculate the distance between other point class using the Chebyshev distance

Input:

Given 2 points in plane (x,y), a move value (x,y) and output the result, example as follows:

0 5 0 5 1 2

Red: Main Point (x,y)
Blue: Other Point (x,y)
Black: Move value (x,y)

Note:

- All (x,y) are guaranteed to be integer number and separated by a single space.
- Rotation is based on the main point, other point is only for distance calculation.
- You should design the class Point, if the TA inspect there exist no such class, 50% points will deducted from your score.

Sample Input and Output

Keyboard Input	0 5 0 5 1 2
Output	0 5 // Original Main Point (x,y) 1 7 // Move 7 -1 // Rotate -1 -7 // Rotate -7 1 // Rotate 1 7 // Rotate 3 // Manhattan Distance 2.0 // Chebyshev Distance

Notes:

- Rotate 4 times to get back to original point

Sample Input and Output（中文）

Keyboard Input	0 5 0 5 1 2
Output	0 5 // 印出Main Point (x,y) 1 7 // 移動後 (x,y) 7 -1 // 第一次旋轉 -1 -7 // 第二次旋轉 -7 1 // 第三次旋轉 1 7 // 第四次旋轉 3 // 與Other Point 的曼哈頓距離 2.0 // 與Other Point 的切比雪夫距離

Notes:

- 旋轉四次應轉回原本的點

Homework 4

Problem Description

For linear equations with n unknowns, they are represented in the following form:

$$a_1x_1 + a_2x_2 + \cdots + a_nx_n = b$$

Where $a_1, a_2, \ldots, a_n$, and b are real-valued coefficients, and $x_1, x_2, \ldots, x_n$ are variables.

The linear system consists of m equations and n unknowns, forming an m × n system:

$$\begin{cases} a_{1,1}x_1 + a_{1,2}x_2 + \cdots + a_{1,n}x_n = b_1 \\ a_{2,1}x_1 + a_{2,2}x_2 + \cdots + a_{2,n}x_n = b_2 \\ \cdots \\ a_{m,1}x_1 + a_{m,2}x_2 + \cdots + a_{m,n}x_n = b_n \end{cases}$$

Please design a program that, based on the input linear equation system, determines the types of solutions, including the only solution, no solution, and infinite solutions. You can refer to the Gaussian elimination method to solve the problem. (The input and output formats will be explained on the next page.)

Problem Description (Cont.)

Input Format (Please use java.util.Scanner to read the input.)

The first line of input is an integer, n, where 0 < n < 10, representing the number of variables. Following that, there will be m lines of equations, where 1 ≤ m ≤ n. If there are n variables, each line will contain n+1 values separated by spaces. For example, 1 2 2 8 represents the equation $x_1 + 2x_2 + 2x_3 = 8$ .The real values range from $|a_{i,j}|$ ≤100 and $|b_i|$ ≤250. Finally, inputting -999 indicates the end of equation inputs.

Output Format

If there is a unique solution, output "The only solution". If there is no solution, output "No solution". If there are infinitely many solutions, output "Infinite solutions".

Problem Description (中文)

對於具有 n 個未知數的線性方程式而言，其形式如以下所示：

$$a_1x_1 + a_2x_2 + \cdots + a_nx_n = b$$

其中 $a_1, a_2, \ldots, a_n, b$ 為實數值(real-valued)， $x_1, x_2, \ldots, x_n$為變數(variable)
而線性方程組具有 n 個未知數，m 個方程式，為m × n 的系統：

$$\begin{cases} a_{1,1}x_1 + a_{1,2}x_2 + \cdots + a_{1,n}x_n = b_1 \\ a_{2,1}x_1 + a_{2,2}x_2 + \cdots + a_{2,n}x_n = b_2 \\ \cdots \\ a_{m,1}x_1 + a_{m,2}x_2 + \cdots + a_{m,n}x_n = b_n \end{cases}$$

現在請你設計一程式，根據輸入的線性方程組，判斷解的情況，包括唯一解、無解及無限多解，可以參考高斯消去法來解題。(輸入格式與輸出格式在下一頁說明)

Problem Description (中文)

輸入格式 (請使用java.util.Scanner讀取輸入)

第一行輸入為整數n，其範圍0<n<10，代表有n個變數，接下來輸入m行方程式，其範圍1≤m≤n。若有n個變數，則每一行中有n+1個值，實數值(real-valued)之間以空白隔開。舉例來說若輸入1 2 2 8，代表$x_1 + 2x_2 + 2x_3 = 8$，若輸入0 0 1 2，代表$x_3 = 2$。實數值(real-valued)的範圍為$|a_{i,j}|$≤100，$|b_i|$≤250，最後輸入-999代表方程式輸入結束。

輸出格式

若唯一解則輸出The only solution，無解則輸出No solution，無限多組解則輸出Infinite solutions。

Sample Input and Output (1/2)

Keyboard Input	3 1 2 2 8 1 2 4 10 1 3 5 5 -999
Output	The only solution

輸入說明:
第一行輸入代表有3個變數x_1、x_2、x_3
第二行至第四行為方程式，分別為

$$x_1 + 2x_2 + 2x_3 = 8$$
$$x_1 + 2x_2 + 4x_3 = 10$$
$$x_1 + 3x_2 + 5x_3 = 5$$

最後一行為輸入終止的條件-999

輸出說明:
依據方程式的解，印出The only solution

Sample Input and Output (2/2)

Keyboard Input	3 1 2 3 4 1 2 3 5 1 2 5 6 -999
Output	No solution

Keyboard Input	3 1 2 3 4 0 0 1 2 0 0 1 2 -999
Output	Infinite solutions

Submission

Please archive your source code to STUDENT_ID.zip (download the example zip file from Moodle) and **upload to Moodle Homework 4** before deadline.

Your zip file should follow the following format.

STUDENT_ID.zip

|- src

|- META-INF

| |- MANIFEST.MF

All the source files (*.java) are put in the src directory.

The entry point (i.e. main class) of the program is specified in the MANIFEST.MF file.

No late submission is accepted.