

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, \dots, a_n , and b are real-valued coefficients, and x_1, x_2, \dots, x_n are variables.

The linear system consists of m equations and n unknowns, forming an $m \times n$ system:

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

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 $1 \leq m \leq n$. 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 $|a_{i,j}| \leq 100$ and $|b_i| \leq 250$. 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, \dots, a_n, b 為實數值(real-valued)， x_1, x_2, \dots, 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 $m \times n$ 的系統：

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

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 $1 \leq m \leq n$ 。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 $|a_{i,j}| \leq 100$ ， $|b_i| \leq 250$ ，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.