Northeastern University
CSYE 6200 – Concepts of Object-Oriented Design
Fall 2022, Prof. Jones Yu

Lab 4

No submission is required

1. Problem 1

Write a program that reads grades from a file named csye6200.txt. Read up to the first 15 grades in the file, compute the average of those grades, and then print out how far away each grade is from the average (the difference of the grade and the average). The csye6200.txt file is already provided in the project and it has 25 numbers as the following.

```
70
80.2
95
67.5
50
88
87.3
92.5
98
96
87
89
76
30.75
69
93
90
75
76.2
54
84
89
69.4
85
88
```

csye6200.txt file

Expected results:

```
Grade differences from the average 78.42:
Grade 1: -8.42
Grade 2: 1.78
Grade 3: 16.58
Grade 4: -10.92
Grade 5: -28.42
Grade 6: 9.58
Grade 7: 8.88
Grade 8: 14.08
Grade 9: 19.58
Grade 10: 17.58
Grade 11: 8.58
Grade 12: 10.58
Grade 13: -2.42
Grade 14: -47.67
Grade 15: -9.42
```

2. Problem 2

Design a class named `LinearEquation` for a 2 * 2 system of linear equations:

$$\begin{aligned} ax + by &= e \\ cx + dy &= f \end{aligned} \quad x = \frac{ed - bf}{ad - bc} \quad y = \frac{af - ec}{ad - bc}$$

The class contains:

- Private data fields **a**, **b**, **c**, **d**, **e**, and **f**.
- A constructor with the arguments for **a**, **b**, **c**, **d**, **e**, and **f**.
- Six getter methods for **a**, **b**, **c**, **d**, **e**, and **f**.
- A method named `isSolvable()` that returns true if ad - bc is not 0.
- Methods `getX()` and `getY()` that return the solution for the equation.

Write a test program that prompts the user to enter **a**, **b**, **c**, **d**, **e**, and **f** and displays the result. If ad - bc is 0, report that "The equation has no solution."

Expected results:

```
Enter a, b, c, d, e, f: 9.0 4.0 3.0 -5.0 -6.0 -21.0
x is -2.0 and y is 3.0

Enter a, b, c, d, e, f: 1.0 2.0 2.0 4.0 4.0 5.0
The equation has no solution
```

3. Problem 3

Design a class named `MyDataPoint` to represent a point with x- and y-coordinates. The class contains:

- The data fields `x` and `y` that represent the coordinates with getter methods.
- A no-arg constructor that creates a point (0, 0).
- A constructor that constructs a point with specified coordinates.
- A method named `distance` that returns the distance from this point to a specified point of the `MyDataPoint` type.
- A method named `distance` that returns the distance from this point to another point with specified x- and y-coordinates.

Write a test program that creates the two data points (0, 0) and (10, 30.5) and displays the distance between them. Please print out the distance by using two different approaches, i.e. from one point's `distance` method and from `MyDataPoint` class's `distance` method respectively.

Expected results:

```
The distance is (using one point's distance method): 32.09750769140807
The distance is (using MyDataPoint class's distance method): 32.09750769140807
```