

ITEC 120: Principles of Computer Science I

Homework 6

>>>>> **Due Date: Friday, February 25th at 10:00 PM via Desire 2 Learn** <<<<<<<

In doing this homework, remember to abide by the RU Honor Code.

Problem 1 - Testing modifications for increased value using arrays 15 points

Gaming scenario

You are the weapons master for a warrior guild and have been tasked with approving or disapproving the purchase of one or two sets of damage augmentations for your weapons. For the survival of your guild members, it is imperative that the new items do not drastically decrease the damage dealt with your current gear. To gauge the impact of the damage augmentations, you must calculate the average and standard deviation of the damage dealing capabilities for your current set of weapons.

Next, you need to use the formula for applying the augmentations to determine if the damage dealt is increased or decreased. The formula is to add the value of the modification to the odd numbered weapons and subtract the modification for the even numbered weapons (magic augmentations don't work under normal rules). The second modification is applied consecutively after the first modification is finished. If there is no increase in the number of weapons that are less than one standard deviation off the current average damage dealt, then the modifications will not cause harm to your guild. However, they must provide the most benefit as well. To determine if there are benefits, check to see if there is an increase in the number of weapons that deal more than one standard deviation worth of damage for each augmentation. Next, recommend whether or not to buy the augmentations (i.e. no change, apply first augmentation, apply both augmentations).

Non-gaming scenario

You are working for Don't Breathe Inc., a respected chemical development and testing company. The head alchemist has come up with two possible additions to your current set of acids and needs to know whether or not the recipe for creating the acids should be changed. The effectiveness of the acids is represented using a numeric value. The higher the value, the better the acid. To apply the additions, you add the modification to the odd numbered acids and subtract it from the even numbered acids. The second modification is made after the first modification has been applied. The subtraction is necessary due to the changes in the process for creating the acids.

The company does not want the effectiveness of any acids in the current product line to significantly decrease. A significant decrease would be an increase in the number of acids that are rated less than one standard deviation away from the average effectiveness for the entire product line. If there isn't an increase in the number of low performing

acids and if there is an increase in high performing acids (those with a rating more than one standard deviation above the average value), you are to recommend the best set of additions for the product mix (i.e. no change, apply first change, apply both changes).

Input

Your program will receive several integers, one on each line. For testing purposes, your program must run using file redirection (java program < file.txt). As long as you only create one Scanner object (pass it around as a function parameter instead of creating one in each function), your code will work properly when tested.

The first number tells you how many data points each of the three sets of numbers used will hold. You will need to store each set of numbers in an array of doubles. The rest of the input is three sets of numbers, with each set holding the identical amount of numbers as the first number entered into the program.

Computation

Your program must calculate the average and standard deviation for the first set of numbers given to your program. Next, it will modify the first set of numbers with the modification technique listed in the first section (add the odd values in the 2nd / 3rd sets and subtract the even values in the 2nd and 3rd sets). Next, determine if there is no significant change (an increase in the number of values that are more than one standard deviation lower than the original set) for each modification. Next, determine how many high value additions the modifications make (an increase in the number of values that are more than one standard deviation above the average). Finally, print out the recommendation for no change, apply the first change, or apply both changes.

Output

Your program must print out the number of values that it used, the average and standard deviation of the first set of information, then the number of low values for each set of numbers (more than one standard deviation lower than the average value), the number of high values for each set of numbers (more than one standard deviation higher than the average value), and lastly, which set of modifications to recommend.

Sample input:

```
5
2
12
2
8
12
5
5
5
5
5
5
5
2
22
```

11
5

Sample output:

```
Welcome to the testing program
There are 5 values to be tested
The standard deviation for your data is 5.019960159204453
The average for your data is 7.2
The total number of low values for the original is 2
The total number of low values for the first set of changes
is 2
The total number of low values for the second set of
changes is 3
The total number of high values for the original is 0
The total number of high values for the first set of
changes is 2
The total number of high values for the second set of
changes is 2
The first set of modifications should be bought
```

Hint: Use functions for your calculations, it will save you quite a bit of effort! **Also, come up with your own test cases, when I test your program I will use test cases other than the ones listed in the assignment.**

Constraints:

You must submit at least one usage scenario that is not included in this specification when you submit your program and ensure that it is non-trivial. Use the Desire2Learn comment functionality when submitting the assignment.

No fields, instance, or class variables may be used in this program. If you don't know what they are, don't worry about it. The purpose for this rule is to make sure you must pass information through the program with parameters.

The reference solution for this project is 110 lines of code without comments. Feel free to use more or less code in your solution. This number is provided to help you gauge the difficulty of the assignment.

Submission requirements:

You must submit the .java file containing your program to Desire 2 Learn under the Homework #6 assignment. If your submitted file does not compile, it will receive a 0. You can demo the homework the next school day after it is due, or it will be graded automatically. If you choose not to demo your homework you cannot contest the grade you receive.

Grading Rubric

- 3 Points - Is the average and standard deviation correct?
- 3 Points - Is the right recommendation printed?
- 3 Points - Are the high and low values properly calculated?
- 3 Points - Is the program properly commented?
- 3 Points - Did you include a reasonable test case with your program?