Lab Exercise 2 (**Bonus**): Revisiting Java Fundamentals – Part 2

SE2205: Data Structures and Algorithms using Java – Fall 2021

Open Day: September 20, 2021; **Cut off time**: Friday September 24, 2021 @11pm

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A. Rationale and Background

In this lab exercise we will review basic programming concepts in the context of Java using one problem.

B. Evaluation and Submission Instructions

You will get **BONUS** credit for this lab exercise when you submit the working code. No part-mark will be awarded if the code does not run. Submit your lab work online by carrying out the following instructions:

1. Create a Project with the following name: *username_Lab2*
2. For this question create a package (Q1L2)
3. Use meaningful names for each class and the associated variables by following the general naming conventions.
4. For this question, use the static header and footer methods yourcreated before.
5. Comments: Writing comment for Lab Exercises is not mandatory but it is recommended.
6. Once the assignment is completed, go to your 'Assignments' folder. Select the project folder (e.g. username_Lab1). Right-click to select 'Send to' 'Compressed zipped folder'. Make sure it has the same naming convention (e.g. username_Lab2.zip). Upload this file on OWL as your submission.

C. Lab Question

1. [10 Marks]

Working with generics and arrays. Here you will create a data structure that will keep a record of key and values. Here the key will be the year of studies of a group of University students, and the values will be their first names. These students are the leaders in the University Student Council. Here your task would be to find out how many student leaders belong to a specific year.

a) Define a generic class called *Pair <Y, N>* with the following specifications (see the class diagram below): [Hint: this code is given in the class handout]

- Two private data fields: key Y and value N.
- Constructor with both Y and N parameters.
- Getter and setter methods for both the data fields.

Pair <Y, N>
- key: Y - value: N
+ Pair(key: Y, value: N) + setKey (key: Y): void

+ setvalue (value: N): void +getKey():Y +getValue(): N

b) Define the driver method and do the following (Check the class handouts):

i) Call the header method

ii) Declare an ArrayList type reference variable with Integer-tag and fill out the list with integer values 2, 3, 4, 3, 2, 2 with the aid of Array.asList(value1, value2..) method as shown below. These numbers will represent the year of studies of the student leaders, Note that both **ArrayList<E>** and **Arrays** classes are available in **java.util.*** package.
ArrayList<Integer> anyValidName = new ArrayList(Arrays.asList(2,3,….));

iii) Declare a second ArrayList type reference variable with String-tag and fill out the list with String values Harry, Lavender, Ron, Hermione, Luna and Vincent with the aid of Array.asList(..) method. These string values represent the names of the student leaders. (FYI: Based on both the Lists, Harry is in 2nd year, Lavender is in 3rd year and so on).

iv) Create an array of size ***anyValidName.***size() of Pair type reference variables.

v) Populate this Pair-array by the **key** and the corresponding **value** pairs using the two ArrayList<E> reference variables with the help of the getter methods (Slide 16, Unit 1-P2) from the ArrayList class.

vi) Now ask the user the following question: "From which academic year would you like to list the names of the leaders: "

vii) Validate that the user enters either 2 or 3 or 4.

viii) Now based on the user's choice print the names of the leader(s) from that specific year.

ix) Keep asking the user till she/he does not want to continue.

Sample output:

//Your header is displayed here.
Let's check out the leaders from different year of program.
From which academic year would you like to list the names of the leaders: 5
Invalid Entry! Enter a valid number between 2 and 4: 1
Invalid Entry! Enter a valid number between 2 and 4: 9
Invalid Entry! Enter a valid number between 2 and 4: 6
Invalid Entry! Enter a valid number between 2 and 4: 2
We found 3 student leader(s) from year 2 and here is the list:
Harry
Luna
Vincent

Do you want to Continue (y/n): y
From which academic year would you like to list the names of the leaders: 3
We found 2 student leader(s) from year 3 and here is the list:
Lavender
Hermione

Do you want to Continue (y/n): n

//Your footer is displayed here.