ST1/ST1(G) 4483/8995

Java Programming Assignment/Project

Object Oriented Programming with Java

Due Date: Week 11 Friday 11.55 pm

This assignment is worth 40% of final mark for this unit

Submission and Assessment requirements:

This assignment has three parts {part 1, part 2 and part 3) and will be marked out of 40 marks (worth 40% mark of the overall mark) for the unit. Please check the unit outline for late penalties and resubmissions.

For details of marking/grading for this assignment, please refer the marking guide available separately.

The final submissions need to be electronic submissions through Moodle before the due date. Submission should be one single zip file (A1StudentIDLastName.zip) with Java source files for all parts, and a short report (word/pdf document). The report should include for each problem, the details of:

1. **INPUT**
2. **OUTPUT**
3. **PROBLEM ANALYSIS AND ALGORITHM DESIGN**
4. **VARIABLES**
5. **FORMATTING THE OUTPUT**
6. **MAIN ALGORITHM**
7. **JAVA SOURCE CODE LISTING**
8. **TESTING (3 TEST CASES)**

Important Notes:

1. The requirements for some programming problems are specified clearly, and for some, they are not specified clearly, and the requirements are somewhat vague. This has been done intentionally to make it more challenging, and it is expected that you come up with appropriate design strategy for solving these problems. You may want to refer to the lab activities in the tutorial classes for guidance on how to attempt each question.

2. Include UML class design wherever needed using ObjectAid a free UML class diagram creation tool available at http://www.objectaid.com/home

3. A mid term progress report in week 6 in terms of reflective summary (1 page) on Assignment 2 part 2/part 3 is needed in week 6 tutorial class to the tutor, for getting feedback (5 marks)

4. General requirements for each program or class submitted are to have a header or block of comments at the top. The comments should contain your name, question number, part and the date. Here is an example:

```
/***********************************
    Authors
    John Smith (u123456)& Mary Joe (u543217)
    Assignment 1_Q1_(a)
    22/4/15
*/******************************************************************
```

Part 1: Lab Work Book (Completed weekly lab activities from week 2, week 3, week 4, week 5, week 6, week 7, week 9 week 10, week 11, and week 6 progress report on Assignment) [9 marks]

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Part 2: Problem Solving With Java Language Constructs [16 marks]

Q.1: (2.5 marks) Java Language Basics

Employee Pay Cheque Calculator: You have to design and implement a Java console or GUI based software program for Employee pay cheque calculations, that can calculate and prints the monthly pay cheque for an employee.

The net pay of an employee is calculated after taking the following deductions:

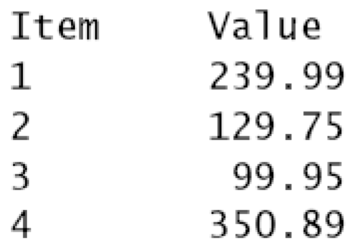
Federal Income Tax:	15%
State Tax:	3.5%
Social Security Tax:	5.75%
Medicare/Medicaid Tax:	2.75%
Pension Plan:	5%
Health Insurance:	$75.00

Your java software program should prompt the user to input the gross amount and the employee name. The output need to be displayed on a dialog box with output formatted to have two decimal places. A sample output test case is as follows:

```
Bill Robinson
Gross Amount: $ 3575.00
Federal Tax:   $ 536.25
State Tax:     $ 125.13
Social Security Tax: $ 205.56
Medicare/Medicaid Tax: $ 98.31
Pension Plan: $ 178.75
Health Insurance:     $ 75.00
Net Pay:       $ 2356.00
```

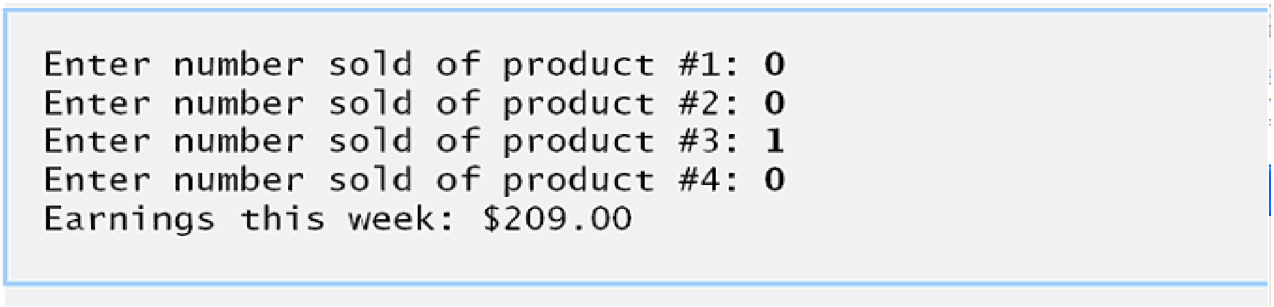
Q.2: (2.5 marks): Arithmetic and Logic with Java

Sales Commission Calculator: A large company pays its salespeople on a commission basis. The salespeople receive $200 per week plus 9% of their gross sales for that week. For example, a salesperson who sells $5,000 worth of merchandise in a week receives $200 plus 9% of $5,000, or a total of $650. You've been supplied with a list of items sold by each salesperson. The values of these items are as follows:

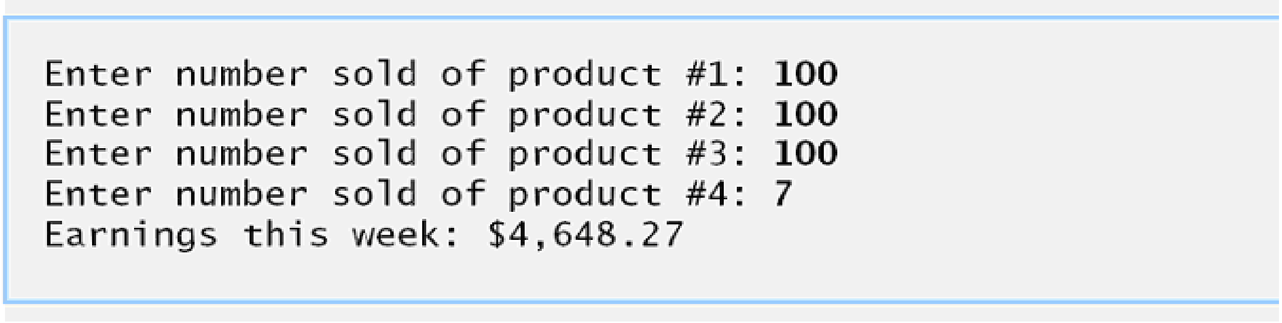


Item	Value
1	239.99
2	129.75
3	99.95
4	350.89

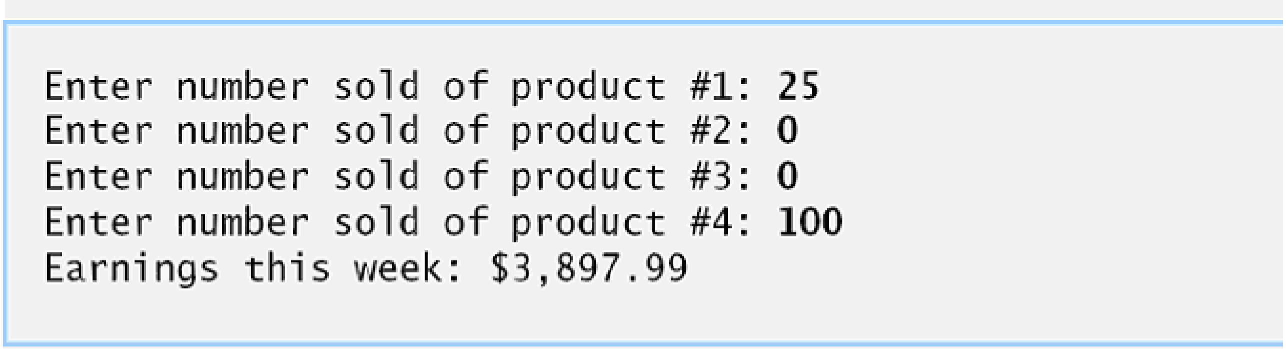
Develop a Java console application, that inputs one salesperson’s items sold for last week and calculates and displays that salesperson's earnings. There is no limit to the number of items that can be sold by a salesperson. The test run of this application should produce the output shown below:



```
Enter number sold of product #1: 0
Enter number sold of product #2: 0
Enter number sold of product #3: 1
Enter number sold of product #4: 0
Earnings this week: $209.00
```



```
Enter number sold of product #1: 100
Enter number sold of product #2: 100
Enter number sold of product #3: 100
Enter number sold of product #4: 7
Earnings this week: $4,648.27
```



```
Enter number sold of product #1: 25
Enter number sold of product #2: 0
Enter number sold of product #3: 0
Enter number sold of product #4: 100
Earnings this week: $3,897.99
```

Q.3 (2.5 marks): Decision Making with Java

Award Points Calculator: Serendipity Booksellers has a book club that awards points to the customers based on the number of books purchased each month. The points are awarded as follows:

- If a customer purchases 0 books, he or she earns 0 points.
- If a customer purchases 1 book, he or she earns 5 points.
- If a customer purchases 2 books, he or she earns 15 points.
- If a customer purchases 3 books, he or she earns 30 points
- If a customer purchases 4 or more books, he or she earns 60 points

Create a Java or GUI application that lets the user enter the number of books that he or she has purchased this month and displays the number of points awarded.

Q.4: (2.5 marks): Writing User Defined Methods in Java

Hospital Charges Calculator:

Create a Java Console or GUI application that calculates the total cost of the hospital stay. The daily base charge is $350. The hospital also charges for medication, surgical fees, lab fees, and physical rehab. The application should accept the following input:

- The number of days spent in the hospital
- The amount of medication charges
- The amount of surgical charges
- The amount of lab fees
- The amount of physical rehabilitation charges

Create and use the following value returning methods in the application

- `CalcStayCharges` – Calculates and returns the base charges for the hospital stay This is computed as $350 times the number of days in the hospital.

- `CalcMiscCharges` – Calculates and returns the total of the medication, surgical, lab, and physical rehabilitation charges.

- `CalcTotalCharges` – Calculates and returns the total charges.

Q.5: (3 marks): File I/O in Java

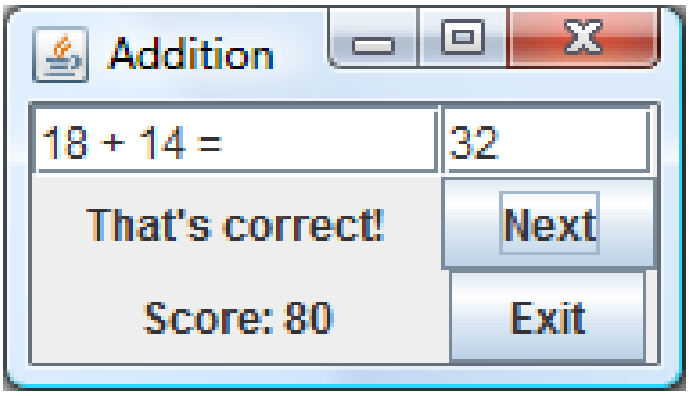
The UC Irvine Machine Learning repository contains many datasets for conducting computer science research. One such dataset is the Haberman's Survival dataset, available at http://archive.ics.uci.edu/ml/datasets/Haberman's+Survival . The file "haberman.data" contains survival data for breast cancer patients in comma-separated value format. The first field is the patient's age at the time of surgery, the second field is the year of the surgery, the third field is the number of positive axillary nodes detected, and the fourth field is the survival status. The survival status is 1 if the patient survived 5 years or longer and 2 if the patient died within 5 years.

Write a Java Console or GUI based application program that reads the CSV file and calculates the average number of positive axillary nodes detected for patients that survived 5 years or longer, and the average number of positive axillary nodes detected for patients that died within 5 years. A significant difference between the two averages suggests whether or not the number of positive axillary nodes detected can be used to predict survival time. Your program should ignore the age and year fields for each record.

Q. 6: (3 marks): GUI and event handling in Java

Math Quiz Game for kids:

Develop a Java GUI application for a Math Quiz Game for school kids. You quiz game generates random addition problems. Provide some kind of feedback and scoring system as the problems are answered. The GUI should be somewhat similar to the following screenshot.



Addition

18 + 14 =

32

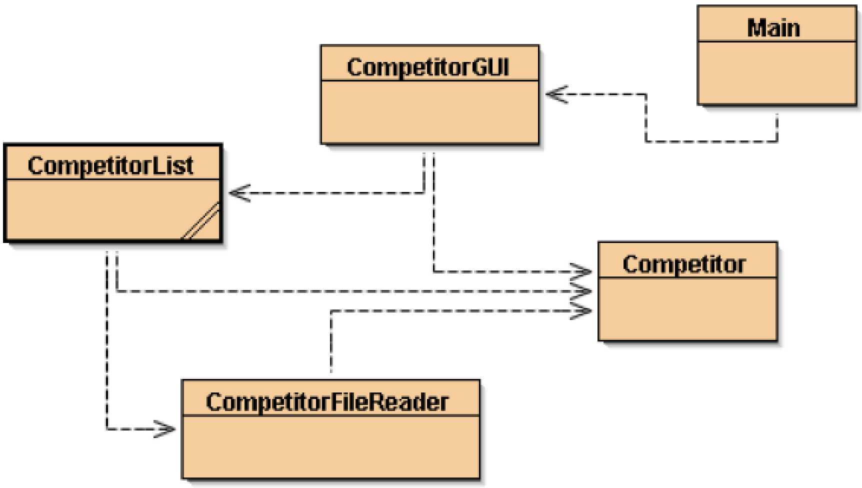
That's correct!

Score: 80

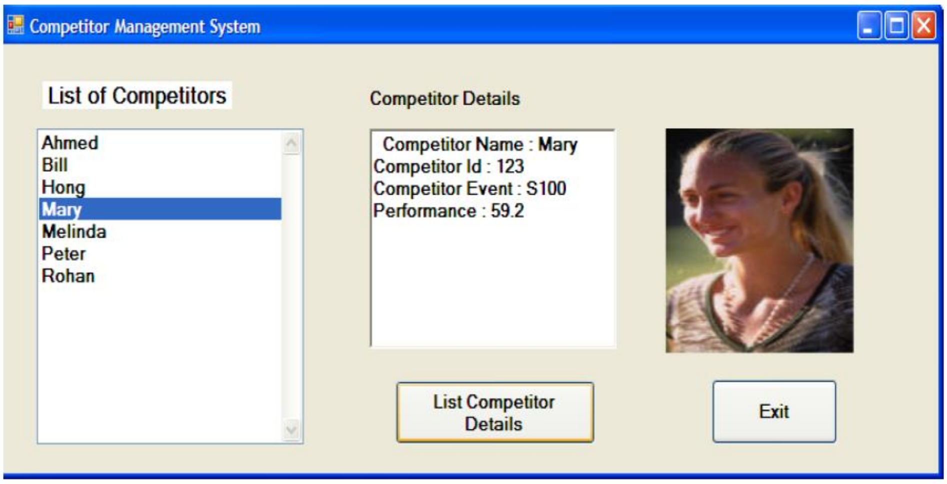
Part 3: Object Oriented Application Development with Java [15 marks]

Community Sport Information Software Development

The context for this problem is managing Community Sport data, called Competitor Management System. The class design for this system is based on Model-View-Control Design approach for object oriented software development, and can include classes as shown in the following Class diagram :
In this application, each competitor has an event and a best performance (time / distance / etc) in



that event. (In the event field, S = "Swimming", "A" = "Athletics"). All parts of the question use the following graphical user interface:



Ahmed
Bill
Hong
Mary
Melinda
Peter
Rohan

Competitor Name : Mary
Competitor Id : 123
Competitor Event : S100
Performance : 59.2

The file "**competitors.txt**" contains competitor name, id, event and best performance (time/distance/etc), as shown here (The jpeg images you can use from free images website http://www.shutterstock.com/):

```
Mary,123,S100,59.2
Melinda,345,A100,10.1
Hong,234,S200,118.2
Ahmed,678,S100,60.1
Bill,456,S100,58.5
Rohan,432,S200,115.5
Peter,654,S100,59.5
```

1. **(1 mark):** Write the code for **Competitor** class with declarations for appropriate instance variables to store the individual competitor data. Include appropriate input validation, error and exception handling code in this class.

2. **(2 marks):** Write the code for **CompetitorList** Class which contains an Array of Objects or an ArrayList of Competitor objects in them. . Include appropriate input validation, error and exception handling code in this class.

3. **(1 mark):** Write the code for **CompetitorFileReader** class to read the file "competitors.txt" and store the data in the array of objects or ArrayList. . Include appropriate input validation, error and exception handling code in this class.

4. **(1 mark):** Write the code for **CompetitorGUI** class, When a competitor is selected in the list box, and "**List Competitor Details**" button is pressed, the competitor details including the photo, the event and the performance are displayed. Write the code to put the competitor's details into the text area shown in GUI. . Include appropriate input validation, error and exception handling code in this class

5. **(2 marks):** Improve this Object Oriented Java Application in terms of **test driven development** approach with **Junit testing**

6. **(2 marks):** Improve this Object Oriented Java Application in terms of better design features such as **inheritance, polymorphism, and interfaces**.

7. **(2 marks):** Improve this Object Oriented Java Application in terms of robustness by including **input validation** and **exception handling** in the application.

8. **(2 marks):** Improve this Object Oriented Java Application in terms of real world interoperability by including **database connectivity** instead of text file you have been given.

9. **(1 mark):** Evidence of complete application testing **and updated** UML class diagram

10. **(1 mark):** Demonstration to Tutor in week 11