ITI 1120 Fall 2012 - Assignment 1

Available: Sept. 17, 2012
Due: Midnight (11:59 pm), Sept 30, 2012

Instructions

This assignment is to be done INDIVIDUALLY. Follow the instructions in the lab manual for submitting assignments through the Virtual campus. The following are specific instructions for this assignment:

- Question 1 should be answered in a Word file A1Q1.doc.
- Question 2 requires you to implement a Java program in a file A1Q2.java. The .java file should be compiled to the file A1Q2.class. Paste the content of the A1Q2.java file into the Word file A1Q2.doc.
- Question 3 should be answered in a Word file A1Q3.doc.
- Question 4 requires you to implement a Java program in a file A1Q4.java. The .java file should be compiled to the file A1Q4.class. Paste the content of the A1Q4.java file into the Word file A1Q4.doc.
- Inserting the Java source code into Word files will allow the marker to make comments on the source code in the Word file.
- Your algorithms should be developed using the format used in class, and it is NOT permitted to use structures such as branches and loops that have not yet been covered in the lectures.
- To help you with this first assignment, template files have been provided for A1Q1.doc, A1Q3.doc, A1Q2.java and A1Q4.java.
- Zip all the .doc files and the .java files and .class files in A1_xxxxxx.zip, where xxxxxx is your student number, and submit it to Virtual Campus.

Marking Scheme (total 100 marks)

- **Regulations and Standards: 10 marks**
- Question 1: 20 marks
- Question 2: 20 marks
- Question 3: 25 marks
- Question 4: 25 marks

Question 1 (20 marks)

Andy is working in a car dealership. As part of his duties, Andy should assess and give price estimations for used cars. For this purpose he uses the following formula:

$$currentPrice = fAge * fMileage * originalPrice$$

where

$fAge = \sqrt{\frac{1}{age+1}}$ where age is the age of the car in years and

$fMileage$ is a factor which represents the car's mileage and is defined as follows:

$fMileage$ = 1.2, if mileage is low
$fMileage$ = 1.0, if mileage is average
$fMileage$ = 0.7, if mileage is high

a) Write an algorithm (givens, results, assumptions, intermediates, header, and body) that will calculate the current price of a used car as described above. Make use of at least one intermediate variable (e.g. for storing *fAge*). Assume that the user will enter the appropriate value for the $fMileage$

b) Write a main algorithm that interacts with the user to get the car's original price(originalPrice), the age of the car in years (*fAge*), and the factor of car's mileage (fMileage) and calls the algorithm developed in (a), and displays the results using the following format (the characters typed in by the user are in bold and italics):

```
Please enter the original price of the car: 20000
Please enter the age of the car in years: 6
Please enter the mileage factor (1.2, 1.0, 0.7): 1.2

The estimated price of this car is $9071.147352221453
```

c) Develop three test cases, that is 3 sets of given values and expected results.

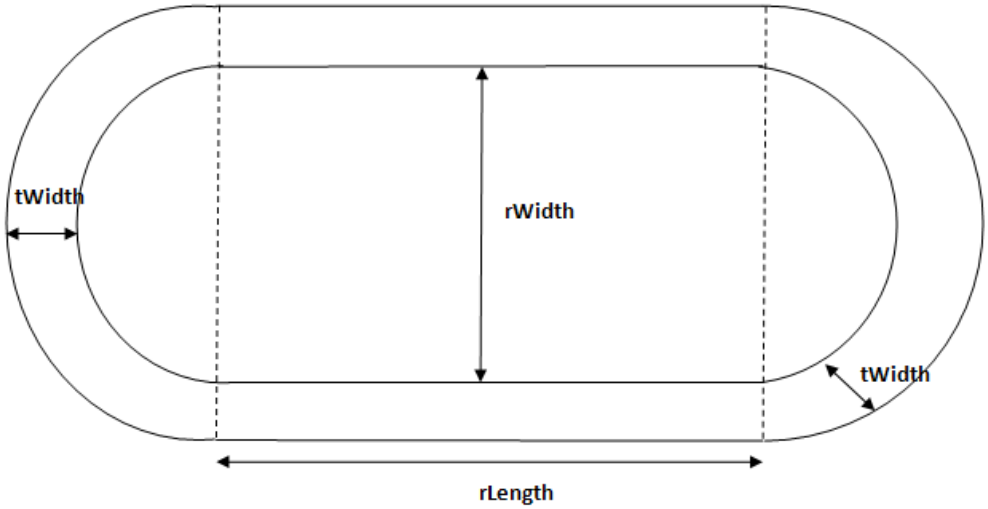
Question 2 (20 marks)

Develop a Java program to implement the algorithms you developed in question 1. Test your program using the test cases.

Question 3 (25 marks)

Dirt Track Racing (Wikipedia) is a type of auto racing performed on oval tracks and is reported as the most common form of auto racing in the United States. The surface of a race track for dirt track racing may be composed of any soil, but most are covered by clay.

Assume there is a race track as shown in the following picture and we wish to calculate using software the volume of clay needed to cover this track to a given depth. The calculation of the volume of clay uses the following givens: the length of the rectangle part of the field (rLength), the width of the inner rectangle (rWidth), the width of track (tWidth) and the depth of clay (depth).



a) Write an algorithm (givens, results, assumptions, intermediates, header, and body) that will calculate the volume of clay (in meters cubed, i.e. m^3) needed to cover the track to a given depth in centimeters. Other track dimensions are given in meters. (Hint: Both inner field itself and the track and inner field together have the same shape; they can be seen as a rectangle attached to two semi-circles on two sides)

b) Write a main algorithm that reads from the user the input and prints out results using output with the following format (the characters typed in by the user are in bold and italics):

```
Please enter the width of the rectangle part of the inner field in meters: 300
Please enter the length of the rectangle part of the inner field in meters: 400
Please enter the width of the track in meters: 20
Please enter the desired depth of clay in centimeters: 70

Width of the rectangle part of the inner field is 300.0 meters
Length of the rectangle part of the inner field is 400.0 meters
Width of the track is 20.0 meters
The desired depth of clay is 70.0 centimeters
The volume of clay needed to cover the track is 25274.335088082244 cubic meters
```

c) Develop three test cases, that is 3 sets of given values and expected results.

Question 4 (25 marks)

Develop a Java program to implement the algorithms you developed in question 3. Test your program using the test cases.