Lab Two: Expressions & Calculations

Objective

The objective of this lab is to

- gain some skill and knowledge in using the Netbeans IDE;
- learn to read and use java libraries;
- become familiar with creating classes and Objects; and
- become more familiar with the use of operators and operands, plus an overview of the different types of errors you see while programming in Java.

What to hand in:

Submit your source code no later than Sunday Jan 24, 2016 @ 11:59pm in the dropbox.

- Sphere.java
- CashRegister.java

Note: Late submissions will be penalized at a rate of 20% per weekday.

Marking Scheme:

Your solution be assessed based on the following:

- Code formatting
  - correct indentation
  - appropriately named variables
- Code commenting
  - author and date created
  - brief description of all methods
- Correct implementation of Java classes, including:
  - followed specifications
  - correctly calculating values
  - handling user input
  - outputting values

Note:

- Make a directory called lab02 in your home directory. Inside this folder complete the following exercises.
- Functionality that may be useful to you can be found in the Math class - in particular, Math.PI, Math.pow(), Math.Random(). As well, the Text class for formatting numbers.
- Review the document on Expressions (in Lab 2 content)
- Read up on User Inputs (in Lab 2 content)

Exercises

1. Design and implement a class named Sphere.

   - We want to calculate the surface area and volume of a sphere.
   - To calculate the surface area use the formula: S = 4 * PI * r^2 . To verify that the formula is correct you can compare using PI * d^2. Where r is the radius and d is the diameter.
   - To calculate the volumes use the formula: V = (4 * PI / 3) * r^3. To verify that the formula is correct you can compare using PI / 6 * d^3 where r is the radius and d is the diameter.
   - You must also calculate the surface area and volume ratio between two spheres as integers. You calculate the area ratio by areaRatio = surfaceAreaOne / surfaceAreaTwo and so forth.
   - Display the results to the screen.
   - The radius and diameter are integers.
   - The surface area and volume are floats;
   - The ratio is a double

   Note: the values of your spheres are completely up to you.

   For example, you could set the radius of sphere one to 5 and the radius of sphere two to 7. Your results would look like:

```
Sphere1:

    radius: 5
    surface area: 314.15927
    volume: 523.59875

Sphere2:

    radius: 7
    surface area: 615.75214
    volume: 1436.755

 Surface Area ratio: Sphere 1 to Sphere 2: 0.5102041363716125

Volume ratio: Sphere 1 to Sphere 2: 0.3644314706325531
```

2. Create a class named CashRegister - this will simulate a purchase at a register that only takes cash but the smallest value is 25cents.

   Hard code in the values. To challenge yourself create random dollar values for the purchase and amount of cash provided but remember, the smallest value is a quarter.

   Basically, the goal of this program is to return the correct change back to the user based on how much cash they provide to the machine and the cost of the purchase. Of course, you want to make sure you provide the customer with the

largest bills possible when giving back their change rather than providing their change back in all quarters.

The machine accepts Canadian dollar bills ($5, $10, $20, $50, $100, $1000) and change twoonies, loonies, and quarters. The machine will not give back $1000.

Here is a sample output. You do not need to round your numbers to two digits, but once again, if you want to challenge yourself, look under the Text package in the Java API's on how to do this and which methods to use.

```
Amount due: $375.25
Amount received: $1,000.00
Change due: $624.75

    $100: 6
    $50: 0
    $20: 1
    $10: 0
    $5: 0
    $2: 2
    $1: 0
    0.25: 3
```

3. Finally, modify the last question to allow the user to input the purchase price and the cash value. Your code will basically do everything exactly as you have done it above except allow for changing values.
   You are looking to use the Scanner class.