# CS161: Introduction to Computer Science
## Homework Assignment 2
### Due: 1/30 by 11:59pm

## Variables and Arithmetic Operations

The purpose of this homework assignment is to give you practice,

- Creating and using variables of primitive type (mostly `int` and `double`)

- Using the arithmetic operators

- Using the `final` modifier

- Casting between `int` and `double`

Download and unzip the starter code for homework assignment 2 from the course webpage. The starter code consists of a directory named `hw2`. Inside the directory is a BlueJ project that has already been started for you. There is a single class called `ArithmeticOperations`. All of the code you write will be inside of this class.

## Programming Problems

This homework asks you to fill-in 3 different methods. The methods have already been created for you. Your job is to write the code inside each method.

**1**. Complete the method named `volume`. This method should compute the volume of a sphere using the formula:

$$V = \frac{4}{3}\,\pi\,r^3$$

where $r$ is the radius and pi is 3.14159. Notice that there is a variable named `radius` that is being passed into the method between the parentheses. You should use this variable in your calculations – this is the variable that holds the radius of the sphere. You should *print* the computed volume to the screen.

**2**. Complete the method named `yardsConversion`. This method should convert some amount from yards to meters and centimeters. For example, 3.7 yards is equal to 3 meters and 38.328 centimeters. Again, notice that there is a variable named `yards` that is being passed into the method between the parentheses. You should use this variable in your calculations – this is the variable that holds the amount in yards.

Here are some conversion factors you might need:

```
1 yard = 3 feet = 0.9144 meters
1 meter = 100 centimeters
```

Again, you should *print* the answer to the screen.

**3**. Your *heart rate* is the number of beats of your heart per minute. Your *resting heart rate* is your heart rate when you have been sitting or lying for at least 20 minutes. Your *maximum heart rate* is the highest heart rate you can achieve without hurting yourself. You can estimate your maximum heart rate using the formula,

$$\max_{HR} = 208 - 0.7 * \text{age} \quad \text{(beats per minute)}$$

When you work out, your heart rate falls within different training zones. You can think of these training zones as a percentage of your maximum heart rate – thus, 100% means you're exercising as hard as you can. Below are a description of the different zones:

**Zone 1** $(50 - 60\%)$ : This zone should feel super easy – almost like you didn't work out at all.

**Zone 2** $(60 - 70\%)$ : This is the "average effort" level where it is still possible to hold a conversation.

**Zone 3** $(70 - 80\%)$ : This is the "above average effort" level where you can only talk in one- or two-word answers.

**Zone 4** $(80 - 93\%)$ : This is the "hard effort" level. Your breathing is labored, your arms and legs feel heavy, and you can't sustain the pace for much more than an hour (at best).

**Zone 5** $(93 - 100\%)$ : This is the "all out" level. You can sustain this pace for a few seconds to maybe five minutes.

You can use the training zones to help you plan your work out. Let's say your goal is to maintain good heart health. Then, ideally, you want to spend most of your workout within zone 2. So the question is, *what range of heart rates would correspond to zone 2?*

This question asks you to complete the method named `trainingZones` which takes a user's age and resting heart rate and computes the range of heart rates for each training zone. Notice that this time, there are 2 variables being passed into the method: `age` and `restHR`. The variable `age` holds the user's age. The variable `restHR` holds the user's resting heart rate. There are three steps in order to compute the range of heart rates for each zone:

(a) Compute the maximum heart rate using the equation given above

(b) Subtract the resting heart rate from the maximum heart rate. This is called your heart rate *reserve*

(c) Multiply your reserve by the corresponding percentage and then add this to your resting heart rate,

$$\text{rest}_{HR} + \text{reserve} * X\%$$

For example, suppose you are 20 years old and your resting heart rate is 70 beats per minute. Then your maximum heart rate is $208 - 0.7 * 20 = 194$ beats per minute (bpm). Your reserve is $194 - 70 = 124$ bpm. At 60%, your heart rate should be $70 + 124 * 0.6 = 144$ bpm and at 70% your heart rate should be $70 + 124 * .07 = 156$ bpm. Thus, if you want to work out at zone 2, your heart rate should be between 144 and 156 bpm.

Your method should print out the range of heart rates for each of the training zones.

## Style Guide

Make sure your code adheres to the following "style guides" before submitting:

1. All variables use `lowerCamelCase` and are appropriately named.

2. Use `final` variables to hold any constants, e.g. `final double PI = 3.14159;`.

3. Use inline comments (using `//`) to explain any code inside a method that is not obvious – i.e., anywhere you think someone would appreciate an explanation of what you're doing.

**4**. Make sure to add the Javadoc comment before the `class` declaration. This should contain a brief description of the class (written in full English sentences), your name, and the date

```
/**
 * Brief description of what the class does
 * @author Your Name
 * @version The date
 */
```

Note: you do **not** need to write a Javadoc comment for each of the methods.

## Submitting your assignment

Please make sure to rename your folder <u>before</u> zipping. You should rename your folder as `hw2_firstName_lastName`.

Submit your zipped folder via Moodle. (Refer to lab 1 or the lab syllabus for more details on how to submit your assignment.)