1 Variables and Arithmetic Operations

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

- Using variables of primitive type and arithmetic operators
- Using the final modifier
- Casting between int and double

2 Programming Problems

Create a Java class named ArithmeticOperations with a main() method. All of your code should be inside of the main() method. Use comments to organize your code and make it clear where each exercise begins.

1. Given the radius of a sphere, compute the volume using the formula:

\[ V = \frac{4}{3} \pi r^3 \]

where \( r \) is the radius and \( \pi \) is 3.1415. Choose a value for the radius of the sphere and then print the radius and the volume to the screen.

2. 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,

\[ \text{max}_{HR} = 208 - 0.7 \times \text{age} \quad \text{(beats per minute)} \]

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 1. So the question is, what range of heart rates would correspond to zone 1? Another question is what range of heart rates would correspond to zone 2?

Given a user’s age and resting heart rate, compute the range of heart rates for each training zone. 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,

\[ \text{rest}HR + \text{reserve} \times X\% \]

For example, suppose you are 20 years old and your resting heart rate is 70 beats per minute. Then your maximum heart rate is \(208 - 0.7 \times 20 = 194\) beats per minute (bpm). Your reserve is \(194 - 70 = 124\) bpm. At 50%, your heart rate should be \(70 + 124 \times 0.5 = 132\) bpm. At 60%, your heart rate should be \(70 + 124 \times 0.6 = 144\) bpm and at 70% your heart rate should be \(70 + 124 \times .07 = 156\) bpm. Thus, if you want to work out at zone 1, your heart rate should be between 132 and 144 bpm. If you want to work out at zone 2, your heart rate should be between 144 and 156 bpm.

Be sure to print out the range of heart rates for each of the training zones. Please print the heart rates as integers.

The next page shows an example of what my code prints when run.
3 Before Submitting...

Before you submit your assignment, double check the following:

- You have a Javadoc comment at the top of the class with a brief description (written in full English sentences), Your name, and the date.
- All variable names are lower cased (remember, only classes are capitalized in Java)
- Use `final` when appropriate
- Use inline comments (`//`) to explain any complicated code

4 Submitting your assignment

Please make sure to rename your folder before zipping. You should rename your folder using both of your first and last names. For example, `hw2_John_Doe` Submit your zipped folder via Canvas. (Refer to lab 1 or the lab syllabus for more details on how to submit your assignment.)