CS161: Introduction to Computer Science
Homework Assignment 2
due 9/18 by 11:59pm

▬▬▬ Variables and Arithmetic Operations ▬▬▬

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

- Using variables of primitive type and arithmetic operators

- Casting between `int` and `double`

▬▬▬ 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 and whitespace to organize your code and make it clear where each exercise begins.

1. Create a variable to hold the radius of a sphere. Given the radius, compute the volume of the sphere and then print the volume to the screen. You can compute the volume using the formula:

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

where r is the radius and pi is 3.1415.

2. Create a variable to hold some amount of US money. Then compute the fewest number of each bill and coin needed to represent that amount. (Assume that the highest bill is a \$10 dollar bill.) For example, if we have \$47.63, then you would need

- 4 ten dollar bills
- 1 five dollar bill
- 2 one dollar bills
- 2 quarters
- 1 dime
- 0 nickles
- 3 pennies

Your code should print the starting amount of money and the breakdown of coins and bills.
Hint: You will need to use both division and the mod operator as well as casting.

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?*

Create variables to hold the user's age and resting heart rate. Then compute the range of heart rates for <u>each</u> training zone as <u>integers</u>. 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.

Print out the range of heart rates for <u>each</u> of the training zones as <u>integers</u>.

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

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 inline comments (//) to explain any complicated code

Submitting your assignment

Please make sure to rename your folder <u>before</u> zipping. You should rename your folder using both your first and last name. 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.)

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● ● ●              BlueJ: Terminal Window - hw2_solution

A sphere with radius 10.0 has volume 4188.786666666666 cm^3


Total amount: $47.63
Here is a breakdown:
        4 ten dollar bill(s)
        1 five dollar bill(s)
        2 one dollar bill(s)
        2 quarter(s)
        1 dime(s)
        0 nickle(s)
        3 pennie(s)




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Age: 20
Resting heart rate: 65
Your max heart rate is: 194 bpm
Your heart rate reserve is: 129 bpm

Here is a breakdown of your training zones:
Zone 1: 129 to 142 bpm
Zone 2: 143 to 155 bpm
Zone 3: 156 to 168 bpm
Zone 4: 169 to 184 bpm
Zone 5: 185 to 194 bpm
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