Homework Assignment #1

CS5004 – Object-Oriented Design
Northeastern University – Silicon Valley
Spring 2022

Due Sunday 1/30 at 11:00pm PST

Instructions: Please submit on Canvas.

Problem 1 [6pts]. Determine the answer to the following expressions. You must provide a short explanation (a sentence of two) for each one.

- 2 % 3
- 0 % 3
- 3 % 3
- -2 % 3
- 2 % -3
- -2 % -3

Submission format: A text file problem1.txt.

Problem 2 [5pts]. We all know about bits and bytes. In particular we know that 1 byte equals $2^3 = 8$ bits. Now, you might have noticed that a hard disk drive which is advertised as having a capacity equal to 500 Gigabytes, shows up in your operating system with a smaller number, approximately 465. Why is that? It is because, in marketing, the SI[1] units are used where 1Kilo = $10^3 = 1000$. On the other hand, in computer science we use the IEC[2] standard where 1Kilo = $2^{10} = 1024$. To avoid confusion, when working with powers of 2, we are supposed to write KiB instead of KB (i.e. kibi instead of kilo) and so on.[3] For example

$$1MB = 1000KB = 1000 \times 1000B = 10^6B$$
$$1MiB = 1024KiB = 1024 \times 1024B = 2^{20}B$$

[1] System Internationale
[2] International Electrotechnical Commission
[3] Read https://en.wikipedia.org/wiki/biary_prefix

In this problem, you write a simple program that coverts giga to gibi. For example, given 500GB as input you must calculate its equivalence in GiB. Below is a skeleton for the code:

```
1. public class Converter {
2.     public static void main(String[] args) {
3.         long giga = 500;
4.         long gibi = 0;
5.
6.         // your code for computing gibi from giga
7.
8.         System.out.println(giga + "GB = " + gibi + "GiB");
9.
10.       }
11.   }
```

Submission format: A java source file Converter.java.

Problem 3 Temperature Conversion [5 points] (Author: Yuyan Zhao)
Write a program to convert Fahrenheit to Celsius.

The formula for the conversion is: ˚F = (9/5)* ˚C + 32, where C is Celsius and F is Fahrenheit.

The input to the program is an **integer** representing the temperature in Fahrenheit. Output the corresponding temperature in Celsius, also an **integer**.

For example, given 100˚F as input, you must calculate its equivalence in Celsius. Below is a skeleton for the code:

```
1. public class TemperatureConverter {
2.   public static void main(String[] args) {
3.       int fah = 100;
4.      int celsius = 0;
5.
6.       // your code for computing Celsius from Fahrenheit
7.
8.      System.out.println(Fahrenheit + " °F= " + celsius + "°C");
9.
10.  }
11. }
```

Submission format: A java source file TemperatureConverter.java.

Problem 4 Check Leap Year [8 pts] (Author: Qiyang Xie)
Write a java program to check if the given year is a leap year. A leap year could be divided by 4, if it can be divided by 100, it must be divided by 400 as well.

Input: A year number greater than 1 (inclusive).
Output example: “1900 is not a leap year.” “2000 is a leap year.”

```
1.   public class CheckLeapYear{
2.     public static void main(String[] args) {
3.         int year = 1900;
5.
6.         // Put your code below:
7.
9.
10.     }
11. }
```

Submission format: A java source file CheckLeapYear.java.