American University of Armenia
CS 120 Intro to OOP
Spring 2019

Homework Assignment 2

1. (10 points) Convert the following statements to the specified targets.

(a) Express the following multiway `if-else` statement by using a `switch` statement.

```
if (grade == 10 || grade == 9)
{
    a = 1;
    b = 2;
}
else if (grade == 8)
{
    a = 3;
    b = 4;
}
else
{
    a = 5;
}
```

(b) Express the following `for` loop by using a `while` loop.

```
int sum = 0;
int power = 1;
for (int i = 0; i < 25; i++)
{
    sum += power;
    power = power << 1;
}
```

What value is computed in `sum`? Explain the calculations.

2. (10 points) Write two variants of a Java program that reads a power of 10 (6, 9, etc.) and displays the name of that number (Million, Billion, etc.). The first variant should rely on a multiway `if-else` statement. The second variant should use a `switch` statement. Display an appropriate message for the input value that has no corresponding name. The names are given in the table below:

Power of 10	Number Name
6	Million
9	Billion
12	Trillion
15	Quadrillion
18	Quintillion
21	Sextillion
30	Nonillion
100	Googol

3. (10 points) Write two variants of a Java program that reads a natural number n and prints its factorial $n!$. The first variant should rely on loops for the calculations. The second should use recursion. What is the maximum value for n that allows its factorial to be represented with type `long`?

4. **(10 points)** Write a Java program that inputs the daily temperatures for one month (30 days) and outputs the following information:

   - the hottest and the coldest days of the month (both days and the corresponding temperatures);
   - the average temperature of the month;
   - the temperature difference between the hottest and coldest days of the month.

5. **(10 points)** Write a Java program that first reads an integer n, then reads a sequence of n words and prints that sequence swapping pairs of neighbouring words. For example, after reading:

   ```
   5 abra cadabra hocus pocus magic
   ```

   it should print:

   ```
   cadabra abra pocus hocus magic
   ```

   How many iterations does each of the loops in your program do?

6. **(15 points)** Write a Java program that inputs a 6-digit integer, checks if it is a lucky ticket number and outputs a corresponding message. We call a ticket with a 6-digit number lucky, if the sum of its first 3 digits is equal to the sum of its last 3 digits. For example, 346094 is a lucky ticket number since $3+4+6 = 0+9+4$. Your program should use a separate method for checking if a number is lucky.

7. **(15 points)** Write a Java program that inputs an integer n ($1 \leq n \leq 30$) and outputs an $n \times n$ matrix with the numbers from 1 to n^2 arranged in an antispiral order. For example, the matrices for $n = 3$ and $n = 4$ would be:

1	2	3
8	9	4
7	6	5

1	2	3	4
12	13	14	5
11	16	15	6
10	9	8	7

   Make sure that the output is nicely formatted.

8. **(20 points)** Using recursion, write a Java program that reads a natural number n ($1 \leq n \leq 12$) and generates all binary strings of length n (one string per output line) without consecutive 0's. For example, if $n = 3$, the output should look like:

   ```
   010
   011
   101
   110
   111
   ```

   How many recursive calls does your program make for $n = 4$? What is the number of resulting strings of length n? Explain your answer.