American University of Beirut
Department of Computer Science
CMPS 200 – Introduction to Programming
A03 – Deadline: Monday March 7 @11:00 PM

Exercise 1. Perfect Number

A **perfect** number is a positive integer that is **equal to the sum of its positive divisors**, *excluding the number itself*. For instance, 6 has divisors 1, 2 and 3 (excluding itself), and 1 + 2 + 3 = 6, so 6 is a perfect number.

Write a method that takes an integer n and returns true if n is a perfect number and false otherwise. Implement the main to test your method on different user input.

Two sample runs are shown below:

```
Enter a positive integer: 6
6 is a perfect number!
```

```
Enter a positive integer: 12
12 is not a perfect number.
```

Exercise 2. Triangle – Special Diagonal

Write a program that takes an integer n from the user, and draws a triangle of n lines as shown below (for n = 5):

```
x . . . .
. x . . .
. . x . .
. . . x .
. . . . x
```

Exercise 3. Strings Combination

Having the following two strings, "abcde" and "12345", write the needed code to display the output as shown below:

```
a1 a2 a3 a4 a5
b1 b2 b3 b4 b5
c1 c2 c3 c4 c5
d1 d2 d3 d4 d5
e1 e2 e3 e4 e5
```

Exercise 4. Triangle of Stars

Create a program that takes a positive integer n from the user and displays a triangle of stars with n lines. For example, the following triangle is produced when the user enters 4 as value for n:

```
   *
  ***
 *****
*******
```

Exercise 5. Contains Vowel

Write a method that takes a string and returns **true** if the **string contains at least one vowel** letter, and **false otherwise**. Test your method on different strings.

Exercise 6. Pattern

Write a program **`Pattern.java`** that assigns a random integer value to the variable n ($1 \le n \le 100$) and displays the following pattern (depending on the value of n) as shown below

n = 3	n = 5	n = 7
1 1 3 1 1 3 9 3 1	1 1 3 1 1 3 9 3 1 1 3 9 27 9 3 1 1 3 9 27 81 27 9 3 1	1 1 3 1 1 3 9 3 1 1 3 9 27 9 3 1 1 3 9 27 81 27 9 3 1 1 3 9 27 81 243 81 27 9 3 1 1 3 9 27 81 243 729 243 81 27 9 3 1

Exercise 7. Binary Numbers

Write a Java method, `ConversionBtoD`, which converts a binary number (stored as a long number) to decimal and returns the result on the console. *Hint*. The decimal value of a number with a binary representation of the form $d_n d_{n-1} \dots d_i \dots d_1 d_0$ may be computed as $\sum_{i=0}^{n} d_i \times 2^i$.

Sample Run (the binary number to convert is 1001011101):

```
(1001011101) in binary = (605) in decimal.
```

Sample Run (the binary number to convert is 11011):

```
(11011) in binary = (27) in decimal.
```

Exercise 8. Strings Comparison

Implement a class that asks the user to enter two strings. It will then compare them based on the summation of their ASCII code, and display which one is bigger.

Sample runs:

```
Enter the first string: add
Enter the second string: bcd
"add and "bcd " are equal
```

```
Enter the first string: object
Enter the second string: data
"object" is greater than "data"
```

```
Enter the first string: BACK
Enter the second string: zoo
"BACK" is less than "zoo"
```