Instituto Superior de Engenharia do Porto
(ISEP)

Licenciatura em Engenharia de Telecomunicações e Informática (LETI)

Desenvolvimento de Software e Sistemas Móveis (DSSMV)

DSSMV: PL: Week 1

Introduction to Java Programming Language

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1 Java Programming Basics

Create a Java console project and add the following methods as well as the correspondent unit tests.

1.1 Even and odd

Write method that outputs if a given number is even or odd.
Note: the resolution of this exercise is in TP1.pdf file.

1.2 Fahrenheit to Celsius

Write method to convert temperature from Fahrenheit(T_F) to Celsius(T_C) degree:

$$T_C = (T_F - 32) * 5/9$$

1.3 Get number digits

Write method to break an integer into a sequence of individual digits

1.4 Sum

Write a method to perform the following operation:

$$\sum_{i=1}^{n} i * A/B$$

1.5 Series

Write a method to sum of the first n terms of

$$\sum_{i=1}^{n} 1/2^i$$

1.6 Factorial

In mathematics, the factorial of a non-negative integer n, denoted by $n!$, is the product of all positive integers less than or equal to n.

$$n! = \begin{cases} 1 & \text{if } n = 0 \\ (n-1)! * n & \text{if } n > 0 \end{cases}$$

Write a method that computes (and prints) the factorial of a given number.

1.7 Perfect Number

A perfect number is a positive integer that is equal to the sum of its proper positive divisors, that is, the sum of its positive divisors excluding the number itself. Examples, the first perfect number is 6. Its proper divisors are 1, 2, and 3, and $1+2+3=6$. The next perfect number is $28=1+2+4+7+14$. Write a method to check whether a given number is perfect.

1.8 Compute PI

Write a method to compute π using the following series expansion:

$$\pi = 4 * \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + ...\right)$$

Hints: Add, if the denominator modulus 4 is 1, and subtract, if it is 3.
Use different values for the max denominator (100000, 1000000 and ...) and compare the values obtained with the `Math.PI`.

1.9 Greatest Common Divisor

Greatest Common Divisor (GCD), one of the earlier known algorithms is the Euclid algorithm to find the GCD of two integers.
By definition,GCD(a, b) is the greatest factor that divides both a and b. Assume that a and b are positive integers, and $a \geq b$, the Euclid algorithm is based on these two properties:

- GCD$(a, 0) = a$
- GCD(a, b) = GCD$(b, a \bmod b)$, where $(a \bmod b)$ denotes the remainder of a divides by b. Write a method to compute GCD

```
1: procedure GCD(a, b)
2:     while b ≠ 0 do
3:         temp ← b
4:         b ← a mod b
5:         a ← temp
6:     return a                                  ▷ The gcd is a
```

1.10 Hexagon Area

The area of a hexagon (AH) is computed as:

- $AH = (3 * \sqrt{3} * s^2)/2$, where s is the length of a side

Write a method to compute the area of a hexagon.

1.11 Polygon Area

Check the webpage `http://www.mathwords.com/r/regular_polygon.htm` and write a Java program to compute the area of a regular polygon.