

# BIOINFORMATICS. AN INTRODUCTION TO MATLAB PROGRAMMING

The course will take place in five classes. Every day a sheet of exercises will be given to be solved in the class. In each sheet there will be some mandatory exercises that must be sent to [jklett@cbm.uam.es](mailto:jklett@cbm.uam.es) and [acortes@cbm.uam.es](mailto:acortes@cbm.uam.es). These problems will be explained during the classes, and there will be enough time to complete them. Students are strongly encouraged to do all problems.

Please, before sending the exercises, note:

- Programs should be sent by e-mail in separate .m files with the original exercise name.
- Student name should be the first line of the program as a comment. Comments in the programs and text messages may be in English or Spanish.

Once the exercises are corrected, a second deadline will be available for fixes. These exercises will be evaluated as passed/non-passed. All exercises must be passed in order to continue with the bioinformatics course.

At the end of the classes period, all student must perform a project related with the theoretical part of the bioinformatics course. Details on project evaluation will be discussed with the project list.

## Day 1 problems

### 1. Calculotes.

- Compute  $\sqrt{\frac{3^4 - 45}{9}}$
  - The time needed to travel between Madrid and Soria at constant speed can be computed as  $t=d/v$ , where  $t$  is the time,  $d$  is the distance and  $v$  is the speed. Define a variable with the distance (234 Km) and another variable with the maximum speed allowed in the highway (120 Km/h). Use them to compute the time of travel. Modify the variable speed to find the time needed for the trip at the following speeds: 6, 12, 50 and 110 Km/h.
- HelloWorld.** Write a script that prints "Hello World" on the screen.
  - Pitagoras.** Write a script that defines two variables with the lengths of the catheti of a right triangle and stores the hypotenuse in another variable, using the well known formula  $h = \sqrt{c_1^2 + c_2^2}$ , where  $c_1, c_2$  are the catheti and  $h$  the hypotenuse. **Pitagoras\_limpio.** Create a script identical to the previous one ("Pitagoras"), but in this case make sure that all variables except the hypotenuse variable are erased at the end of the program. Also, the script should not display the assignment of values to the variables on the screen, only the result.

4. **Moneda.** Write a script that generates a random number between 0 and 1, using command rand. Then the program must display "Cara" if the number is lower than 0.5, and "Cruz" if the number is equal or higher than 0.5.
5. **Pesadito.** Write a script that prints 10 times the sentence "Soy un pesao".
6. **MuestraContador.** Write a script that shows the natural numbers from 1 to 10.
7. **Tetraktys.** Write a script that finds the sum of the n first natural numbers (define n in the beginning of the script). For example,  $1+2+3+4=10$ . Use self-referent variable operations.
8. **CuentaCaras (mandatory).** Write a script that simulates flipping a coin several times. Define the number of times we want to flip the coin at the beginning of the script. In the end the program must show the number of heads (caras) obtained.
9. **Factorialaco (mandatory).** Problem that gathers a long and boring tradition in the Programming classrooms. Write a script that and calculates the factorial of an integer number, using the maybe-not-so-well-known formula  $n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot (n-1) \cdot n$ , where  $n!$  is the factorial of  $n$ . For convention,  $0!=1$ . You will need a "for" loop. No vectors are necessary. The result must be stored in a variable and the rest should be erased.
10. **Fibonacci.** The Fibonacci sequence is 0, 1, 1, 2, 3, 5, 8, 13... (each number is the sum of the two previous ones. By definition, the two first numbers are 0, 1). Write a script that shows the first numbers of the progression. All variables must be erased at the end. Note: You may use vectors for this program, but it is not necessary (we recommend to try this exercise without vectors).