

1 The console

Problem 1. Using the Python Interpreter:

- a) Try the math operators and built-in functions: `+`, `-`, `*`, `/`, `//`, `%`, `**`, `max`, `min`. Once you have tried them, use them to find out the highest value among 2^{15} , 3^{12} and 5^{10} .
- b) Use the functions `ord` and `hex`. Try them to find out the binary representation of 'a' and 'A'. Check that they differ only in one bit. If you have doubts with any built-in Python function you can use the also built-in function `help()`.
- c) Use the built-in function `chr` to know what letter represents the number 81.
- d) Obtain the binary representation for the integer 23 using operators and variables.
- e) Now you need to work with the built-in functions `type`, `int`, `str` and `float`. Write a real value, an integer and a string. Then obtain the data type of these constants. Finally, convert each of them to the other basic data types. As a remainder, you can use the function `help` to see the Python documentation of built-in functions.
- f) Use the built-in function `round` to obtain numbers with 0, 2 and 5 decimal digits from the number 3.4. Can you see all the decimals that you want? Try the function `format()`. Which are the types of the values returned by each function?
- g) What will be the output if you execute `type("Hello")`? And what if you execute `type(hex(100))`? Check it.
- h) What is the result of `1/2`? And `1//2`? Try to guess the type of each result and then check it.

Problem 2. In the Python console, create a variable called `a` and use it to store the value 3. Now, create a second variable `b` and assign to it the expression `a + 5`.

- a) What is the value of `b`?
- b) Change the value of the variable `a`. Set it to 7. Then, what is the value of `b`? Why?
- c) What is the type of `a` and `b`?
- d) Now, assign to `a` the value 5.0 and update `b` by setting `b = a + 5` again. What is the value of `b` now? What is the type?
- e) If we write the expression `b = b + 1` in the interpreter, are we checking if the value of `b` is the same than the value of `b + 1`? What do we get?
- f) Set `a` to "Hello" and `b` to "World". What is the type of the variables now? What function can you use to know their type? What could you see if the expression `a + b` is executed?

2 The editor

Problem 3. In the previous exercises you have used the console, which takes a command and executes it. Now you are going to learn how to work with files where you can keep your code for executing it multiple times. Download `problem.py` from the Intranet. Read the comments and the code and try to fix the errors you detect. How many errors can you find? Identify the type of the mistakes and then correct them all (the result should be 65.45 hours)

Problem 4. In a new file in your editor...

- a) Write a code snippet to compute the remainder of 500 divided by 7. If you have done it correctly, the result should be 3.
- b) Write the code for printing a line of 80 stars (*).
- c) Compute the square root and print it with 5 decimal digits.
- d) Set n to 5. Then compute the n -eseme root of 2 (2 to the power of $1/n$): it should be 1.1486983549970351.

Problem 5. This is just the same as before, just a little bit more complex. Write a program to convert Celsius to Fahrenheit, and vice versa. Follow the next instructions.

1. °C to °F: Multiply by 9, divide by 5, then add 32

2. °F a °C: Subtract 32, then multiply by 5, finally divide by 9

Write a program that requests the user for a °F temperature, converses it to Celsius and then computes it back to Fahrenheit. The three temperatures should be printed to the screen.

Problem 6. The basic equation governing a uniformly accelerated motion can be expressed as $S_f = S_i + a \times t$, where S_f is the final speed, S_i the initial speed, a the acceleration and t the time. Write a program to compute S_f given the remaining variables. Test your code with $S_i = 20m/s$, $a = 9.8m/s$, $t = 30sec$ and the solution must be $S_f = 314m/s$.

Problem 7. Make a program that requests the name and height of three friends. Then, print the name of the taller and the name of the smaller.

Problem 8. Write a program that asks the name of 5 friends. Then, for each of them print the UPPERCASE, lowercase and the length of each name.

Problem 9. It is known that “a year is a leap year if it is divisible by 4, except the last of the century (divisible by 100) unless it is divisible by 400”. Write a program that given a year prints whether the year is leap or not.

Examples: leap years (2000, 2012, 2024), not leap years (2011, 2013, 2100)

Problem 10. Write the code that, given two numbers a and b, computes and shows the following conditions:

- “a is between 5 and 30 (inclusive) and b is an **even number**”.
- “a is not between 5 and 30 or b is an **odd number**”.

3 At home...

You need to install Python in your computer in order to study at home. If you are a Windows user, first you need to install a Python interpreter and then a Python IDE (in our case, PyScripter).

- Download Portable Python 3 (the interpreter) from <https://portablepython.com/wiki/Download/>
- Download PyScripter <https://sourceforge.net/projects/pyscripter/>

In case that you are a MacOS user, your computer already has a native Python Interpreter. Unfortunately, PyScripter is not available for MacOS, but you have many other options. We strongly recommend the use of Spyder, which is very similar to PyScripter. To install Spyder on your MacOS:

- Download the Spyder IDE with Anaconda following the instructions in <https://www.spyder-ide.org>