5. Tutorial/practical exercises

Exercise 1

Write a Python program that checks if an array is sorted (in ascending order).

Exercise 2

Consider an array of integers. Write a Python program that search for a value in an array:

- Using the function `index`.
- Using your own code.
- Suppose the array is sorted. Give the program to make a smart search on the array.

Exercise 3

The `in` operator checks if an array is contained in another one. For instance, the evaluation of `[1,2,3] in [0,1,2,3,4]` yields `True` whereas the evaluation of `[1,2,3] in [0,2,3,1,4]` yields `False`. Write a Python program that checks if an array is contained in another one without using the `in` operator.

Exercise 4

Consider an array of integers. Write two Python programs that rearrange the table such that all not null elements are shifted to the left. For exemple, the array `[0,1,4,0,2,3,0,5]` becomes `[1,4,2,3,5,0,0,0]`:

- By using another table.
- Without using any other table.

Exercise 5

We represent a polynomial as an array. For example: the polynomial $5x^3 - 0.5x + 8$ is represented with the array `[8,-0.5,5]`. In this example, we say that the degree of the polynomial is 3. Write the following programs:

- Given a polynomial P (defined by its array) and a value x, compute $P(x)$.
- Given a polynomial P, compute its degree.
- Given two polynomial P and Q, compute their addition.
- Given two polynomial P and Q, compute their product.

Exercise 6

Write a Python program that converts a string into an integer (as made by `int` function). You should not use the `int` function.

Exercise 7

Write a Python program that fills a triangular matrix as follows:

1	1	1	1	1	1	1
0	1	1	1	1	1	1
0	0	1	1	1	1	1
0	0	0	1	1	1	1
0	0	0	0	1	1	1
0	0	0	0	0	1	1
0	0	0	0	0	0	1

Exercise 8

Write a program that builds the Pascal triangle (in reality this is the Al-Kashy triangle) like the following:

1	1	0	0	0	0	0	0	0	0
1	2	1	0	0	0	0	0	0	0
1	3	3	1	0	0	0	0	0	0
1	4	6	4	1	0	0	0	0	0
1	5	10	10	5	1	0	0	0	0
1	6	15	20	15	6	1	0	0	0
1	7	21	35	35	21	7	1	0	0
1	8	28	56	70	56	28	8	1	0
1	9	36	84	126	126	84	36	9	1