Mila University Center
Institute of Mathematics and Computer Science
Department of Computer Science
1st Year LMD

DIRECTED WORK SERIES NO. 1

Algorithmic and data structures 2 Academic year: 2024 / 2025

Exercise 1

1) Consider the following algorithm:

```
Algorithm Exo1
N, S: integer;
function Sum ( Nbr : integer): integer;
R, i: integer;
Begin
R ← 0;
For i = 1 to Nbr DO
R ← R + i;
End for ;
Return (R);
END ;
Begin // main program
Read (N);
S ← Sum(N);
Write ("The sum of the first", N, "integers is:", S);
END.
```

a) Describe the declaration part.
b) Describe the body part (instructions).
c) ***input*** and ***output*** variables
d) Determine the ***formal*** and ***effective parameters***.
e) ***global*** variables and ***local*** variables.

Exercise 2

Write algorithms (**after having done the modular division**) that allow you to:

1) Display double of an integer N.
2) Display double and triple of an integer N.
3) Read a positive integer N then display whether it is prime or not.

Exercise 3

Two integers X and Y are said to be friendly if the sum of the divisors of one is equal to the sum of the divisors of the other and if these two sums are equal to the sum of the two numbers.

Write an algorithm allowing you to read any two numbers X, Y and say whether these two numbers are friendly or not.

***Example* :**

220 and 284 are friendly because:

- ✓ The sum of the divisors of 220 = 1 + 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110 + 220 = **504**
- ✓ The sum of the divisors of 284 = 1 + 2 + 4 + 71 + 142 + 284 = **504**
- ✓ And **504** = *220 + 284*

Exercise 4

Write algorithms (**after having done the modular division**) that allow you to:

1) read three non-zero positive numbers A, B, and C then calculate and display the following sum: $((A! + (B)^{C})!)^{B}$
2) read two positive numbers **n** (integer) and **x** (real) then calculate and display the following sum: $x - x^{2}/2! + x^{3}/3! - \ldots x^{n}/n!$

Exercise 5

We consider the Student type defined in the previous series. The administration of the MI department wants to automate the management of its students and entrusts you with this task.
Write an algorithm (**after having done the modular division**) which allows you to:

a) Read an array of **N** students.
b) Write the average of a student searched by their number.
c) Display the information of admitted students.
d) Display the student with the best average.

Exercise 6

Write an algorithm (**after having done the modular division**) which allows you to:

a) Read a matrix of N x M integer elements.
b) Construct the vector V1 witch contain the elements of the line with the maximum value from the matrix M.
c) read a value Val and verify if it exists in the vector V1 or not?
d) Construct a vector V2 so that for each element of V1 we keep only its first occurrence and replace the others with 0.

***Example* :**

M

0	-1	2	-8	0	2	2	5	4	2
2	5	5	3	2	3	0	-7	4	3
10	7	9	7	10	6	7	4	8	8
1	2	4	0	0	4	1	2	3	0

>>>

V1

10	7	9	7	10	6	7	4	8	8

V2

10	7	9	0	0	6	0	4	8	0