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

DIRECTED WORK SERIES NO. 1

Algorithmic and data structures 2 Academic year: 2023 / 2024

Exercise 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 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

Let be the following functions:
$F(x) = 2x^2 + 1$
$G(x) = 3x / (x-1)$
$H(x) = F(x) + G(x)$
Write an algorithm that reads a real number z and displays: F(z), G(z), and H(z).

Exercise 4

Write algorithms 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

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*