

Directed Work (TD) n°=1

Exercise 1

We consider the following algorithm :

Algorithm exo1

a, b: integers;

Begin

a ← 5; # Initialize 'a' to 5

b ← 9; # Initialize 'b' to 9

a ← a + b; //'a' now holds the sum of a and b (5 + 9 = 14)

b ← a - b; //'b' now holds the original value of 'a' (14 - 9 = 5)

a ← a - b; //'a' now holds the original value of 'b' (14 - 5 = 9)

End.

Questions :

- 1) Describe the declaration part?
- 2) Describe the body part?
- 3) What will be the values of variables a, b, and c after the execution of each instruction (Perform the execution trace)?
- 4) What is the purpose of this algorithm?
- 5) Rewrite the algorithm without using arithmetic operations, then perform the execution trace for the same values of a and b?

Exercise 2

The creation of a computer-executable program requires following a process consisting of 4 phases: problem analysis, algorithm writing, programming, compilation, and execution.

- 1) Perform the analysis of the following problems by identifying the data, results, methods, and calculation formulas:
 - a) The sum of two integers.
 - b) The sum and average of three real numbers.
 - c) The perimeter of a circle.
 - d) The total price including taxes (TTC) of a product.
 - e) The solution of a quadratic equation.
 - f) Checking whether an integer is prime or not.
- 2) Write the corresponding algorithm for each of the aforementioned problems (additional question).

Exercise 3

Let's consider the declaration part of an algorithm:

```
N1, N2, N3 : integer ;
```

```
X1, X2 : real ;
```

```
C : character ;
```

1) Evaluate and provide the type of the following expressions:

- a) $N1+N2$;
- b) $N1+X2$;
- c) $N1+N2 \text{ div } 4$;
- d) $X1 \text{ mod } N1$
- e) $N1 \text{ mod } X2 + N2$;
- f) $N1 > N2$;
- g) $N2 < N1 \text{ and Bool1 or Bool2}$;
- h) $N1+N3 < N1 \text{ and not Bool2}$;

2) Are the following assignment statements valid? Explain.

- a) $N1 \leftarrow X1 + 2$;
- b) $X1 \leftarrow N1 * 20$;
- c) $\text{Chaine1} \leftarrow \text{'lundi'}$;
- d) $N1 + N2 \leftarrow 3$;
- e) $\text{Chaine1} \leftarrow \text{'lundi'} + 11.0$;
- f) $N1 + 2 \leftarrow 5$;
- g) $5 \leftarrow N1 + 45$;

3) Add parentheses to clarify the order of calculation for the following expressions:

- a) $N1 + N2 * N3$
- b) $N1 / N2 \text{ div } N3 * N1$
- c) $-a / -(b + c)$
- d) $\text{not not } b \text{ or } a \text{ and } N1 \text{ div } 2 * -N1 = N1 - N2 / 2 * 7 \text{ and } -N2 \neq 0$

Exercise 4

Write algorithms to achieve the following:

- 1) Read an integer N composed of two digits and reverse it.
- 2) Read an integer N composed of three digits and reverse it.

Example:

If $N = 123$, after executing the algorithm, N becomes 321.

Exercise 5 (Additional)

A cashier has coins in denominations of 10 DA, 5 DA, and 1 DA.

Write an algorithm that exchanges an amount in DA by using the maximum number of 10 DA coins and the remaining in 5 DA coins and 1 DA coins.

Example:

If the amount is 328 DA, the cashier will give you 32 coins of 10 DA, 1 coin of 5 DA, and 3 coins of 1 DA.

Note: Use the modulo (mod) and integer division (div) operators.

Keep up the good work