Assignments

Exercise 1

Algorithm 1.

Instructions of the algorithm:
1 Ask for a number x
2 Add 1
3 Multiply by 2
4 Remove 3
5 Square this number (multiply it by itself)
6 Add 7
7 Print the result

1. What does this algorithm print when we give it a value of x equal to...
   (a) 1
   (b) 2
   (c) -2
2. Give an expression $f(x)$ of what it prints with respect to x.
3. The algorithm, as written, makes 5 operations (line 2: $+$, line 3: $\times$, line 4: $-$, line 5: $\times$, line 6: $+$) before it prints the result. Write another algorithm that outputs the same numbers but that uses only 4 operations.

Exercise 2

What do the variables a and b contain after the following sequence of instructions?

Algorithm 2.

Variables:
a and b are two integers.

Instructions of the algorithm:
1 $a \leftarrow 3$
2 $b \leftarrow 5$
3 $a \leftarrow b$
4 $b \leftarrow a$

Exercise 3

What do the variables a and b contain after the following sequence of instructions?

Algorithm 3.

Variables:
a and b are two integers.

Instructions of the algorithm:
1 $a \leftarrow 1$
2 $b \leftarrow a + 1$
3 $a \leftarrow b + 2$
4 $b \leftarrow a + 2$
5 $a \leftarrow b + 3$
6 $b \leftarrow a + 3$

Exercise 4

What do the variables n and s contain after the following sequence of instructions?

Algorithm 4.

Variables:
n and s are two integers.

Instructions of the algorithm:

1	$n \leftarrow 1$
2	$s \leftarrow n$
3	$n \leftarrow n + 1$
4	$s \leftarrow s + n$
5	$n \leftarrow n + 1$
6	$s \leftarrow s + n$
7	$n \leftarrow n + 1$
8	$s \leftarrow s + n$
9	$n \leftarrow n + 1$
10	$s \leftarrow s + n$

Exercise 5

We are given an extract from a bigger algorithm:

Algorithm 5.

Variables:
a and b are two integers.

Instructions of the algorithm:

...	...
42	$a \leftarrow a + b$
43	$b \leftarrow a - b$
44	$a \leftarrow a - b$
...	...

1. We suppose that, at the end of line 41, the values of a and b were $a = 13$ and $b = 5$. What are the values of a and b at the end of line 44?
2. Same question than 1) if the values at the end of line 41 were $a = 0$ and $b = -3$.
3. Now, we would like a general result to understand the effect of this sequence of instructions on the content of variables a and b, whatever the initial values were. Same question than 1) if we note x and y the values of a and b at the end of line 41, which means that the values were $a = x$ and $b = y$. Can you explain with simple words the meaning of those 3 lines of instructions?

Exercise 6

Rewrite the algorithm of exercise 1 more properly: make use of a variable, and write each instruction as a proper assignment with the symbol $\leftarrow$. For instance, if you choose to use the variable a, line 2 will look like $a \leftarrow a + 1$.