

Tutorial No. 1: Basic elements of algorithmics

Exercise 1: Steps to Solving a Problem

Perform the analysis step for each of the following problems:

1. The calculation of the area of a rectangle knowing its length and width.
2. The calculation of a vehicle's travel time based on the distance traveled and its speed.

Exercise 2: Variables and Constants

Write the following declarations in pseudocode:

- A constant i^2 with the value -1.
- An integer variable β .
- A real variable unit price.
- A constant initial with the value G.

Exercise 3: Understanding Identifiers and Types

a. Indicate whether the following identifiers are valid or invalid, and justify your answer:

NAME, 2value, total_sum, while, INT, counter-1

b. Assign the appropriate simple type to each data:

The population of a city: ...

The price of a medicine: ...

The words in a dictionary: ...

The result of a comparison: ...

Exercise 4: Execution Trace

Provide the execution trace of the following algorithm for $z = 4$:

Algorithm Example;

Constants rate = 2;

Variables x, y, z: integer;

Begin

x $\leftarrow$ 5;

Read(z);

y $\leftarrow$ x * rate;

y $\leftarrow$ y - 1;

x $\leftarrow$ x + 3 - sqrt(z);

Write("The result is", y);

Write(z * 5, x * x);

End.

Exercise 5:

Write an algorithm that converts a given speed in km/h to a speed in m/s.

Exercise 6:

Write an algorithm that calculates the average of three integer numbers.

Exercise 7:

Write an algorithm that reads an integer between 10 and 99, then calculates and displays its digits. For example, 25 consists of 2 and 5.

Exercise 8:

Write an algorithm that swaps two integer variables:

- Using an intermediate variable.
- Without using an intermediate variable.

Exercise 9:

Write an algorithm that reads a time in seconds and converts it to hours, minutes, and seconds. For example, 76710 s represents 21h 18m 30s.