Bialystok University of Technology
Faculty of Electrical Engineering
Department of Electrotechnics, Power Electronics
and Electrical Power Engineering

Instruction
for a specialist workshop on

Python Programming 1

Subject code: **CP1S02005E**

(Full-Time Studies)

PYTHON - CONDITIONAL STATEMENT

Instruction Number

PP_02_EN

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Teaching Materials for Students of the Faculty of Electrical Engineering at BUT.

1. Workstation Description

1.1. Equipment used

A PC-class computer with the Microsoft Windows 10 operating system is used during classes.

1.2. Software

The computers are equipped with the Visual Studio Code 1.86 (or newer) source code editor along with the appropriate extension (Python extension for Visual Studio Code).

2. Exercises Procedure

In the specialist workshop, selected tasks assigned by the instructor must be completed. Different groups may perform different tasks.

1. The minimum dangerous value of alternating current flowing through the body for an extended period for a person is **0.03 A** (**30 mA**). Write a program where the user inputs the current in amperes from the keyboard. The program should print information on whether the entered current value is safe or dangerous.

2. Write a program that reads **height** (in **cm**) and prints information about assigning a person to one of three groups:
   - below 150 cm - short height;
   - from 150 cm to below 180 cm - medium height;
   - 180 cm and above - tall height.

   Examples of program execution:

```
Height: 171
-------------
Medium height
```

```
Height: 145
-------------
Short height
```

```
Height: 180
-------------
Tall height
```

3. Write a program that reads three integers and prints the value of the **maximum** number and the value of the **minimum** number.

   Examples of program execution:

```
Number 1: 2
Number 2: 3
Number 3: 1
------------
Max:      3
Min:      1
```

```
Number 1: 2
Number 2: 3
Number 3: 3
------------
Max:      3
Min:      2
```

```
Number 1: 2
Number 2: 2
Number 3: 2
------------
Max:      2
Min:      2
```

4. Write a program in which the user enters three numbers from the keyboard, and the program displays them from the largest to the smallest, and then from the smallest to the largest.

5. Write a program in which the user enters an integer from the keyboard. The program should check and display information about the number's parity (**even**/**odd**) and sign (**positive**/**negative**). If the user enters zero, the program should display only the message: **zero**.

6. Write a program that reads three numbers: the **lower** limit of a range, the **upper** limit of a range, any number **x**. If the lower limit is greater than the upper one, the program should print an error message and exit. Otherwise, the program should print information on the location of **x** in the range:

   - x is in the range (but isn't a limit of the range);
   - x is the upper limit of the range;
   - x is the lower limit of the range;
   - x is located below the range;
   - x is located above the range.

   Examples of program execution:

```
Lower limit:  5
Upper limit:  8
Number x:     6
------------------
x is in the range
```

```
Lower limit:  9
Upper limit:  4
Number x:     3
------------------
Wrong limits!
```

7. Write a program that reads three numbers from the keyboard and then calculates the arithmetic mean of only those numbers that are greater than zero. Ensure the program is protected against division by zero.

8. Figure 1 shows the waveform of a trapezoidal pulse. Write a program that, based on the time **t** entered from the keyboard, calculates and displays the corresponding voltage **u**.

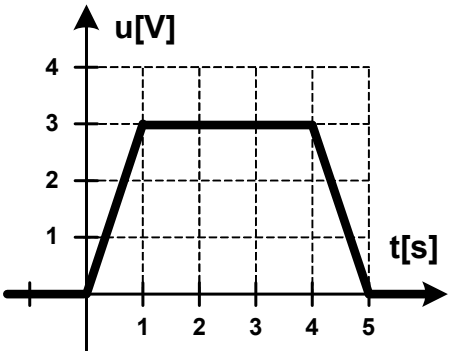

Fig. 1. Trapezoidal pulse waveform

9. Write a program that solves a quadratic equation:

$$ax^2 + bx + c = 0 \tag{1}$$

Read the coefficients **a**, **b**, and **c** from the keyboard. If the entered data indicates that it is not a quadratic equation, display an appropriate message. Example values of quadratic equation coefficients and the obtained roots are presented in Table 1.

Table 1. Example coefficients and roots of the quadratic equation

a	b	c	delta	x_1	x_2
2	-8	6	16	1	3
2	-4	2	0	1	
2	-2	1	-4	no roots	

10. Write a program that checks whether a point with coordinates (**x**, **y**) entered from the keyboard lies within the area marked in Figure 2 (including its boundary).

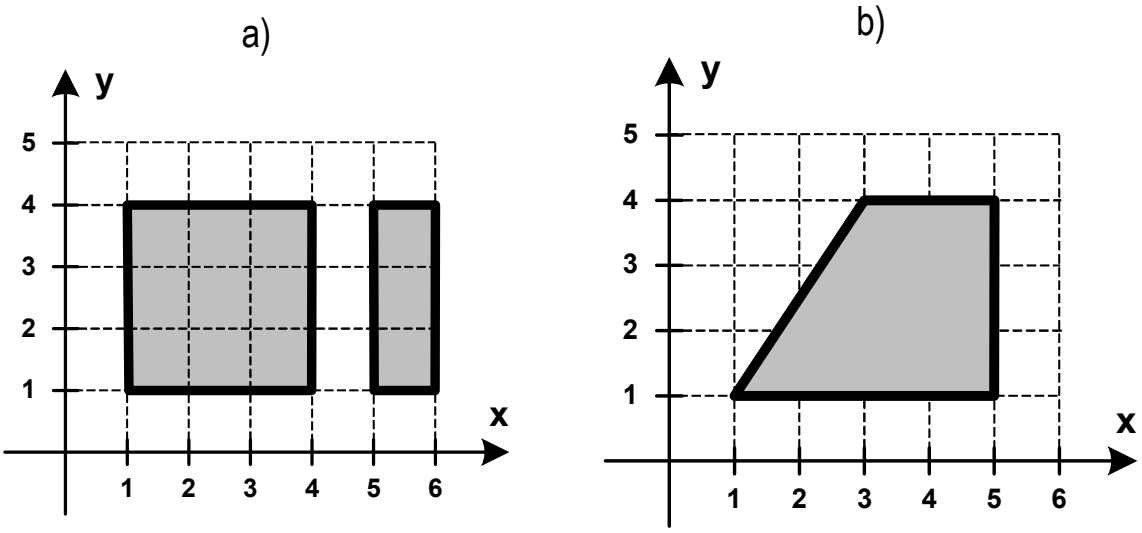

Fig. 2. Area designation for task 10

3. Literature

[1] Ramalho L., Fluent Python: clear, concise, and effective programming. Sebastopol, O'Reilly, 2022.

[2] Matthes E., Python Crash Course, San Francisco, CA, No Starch Press, 2019.

[3] Sweigart A., Automate the Boring Stuff with Python, San Francisco, CA, No Starch Press, 2020.

[4] Lutz M., Learning Python, Sebastopol, CA, O'Reilly Media, 2013.

[5] https://www.python.org/doc/ Python, documentation.

4. Health and Safety Requirements

To begin the practical part of the exercise, it is mandatory to familiarize yourself with the health and safety instructions and fire safety guidelines and to adhere to the rules contained therein.

During laboratory sessions, the following rules must be observed:

- Verify that the devices available at the laboratory workstation are complete and show no signs of physical damage.
- If possible, adjust the workstation conditions to suit individual ergonomic needs. Position the computer monitor to ensure constant and comfortable visibility for all team members.
- Check the correctness of device connections.
- The computer may only be turned on with the instructor’s permission.
- Eating and drinking are prohibited while working with the computer.
- Upon completion of work, log out before leaving the workstation. The operating system may only be shut down upon explicit instruction from the instructor.
- Making any modifications, switching components, or replacing elements of the workstation is strictly prohibited.
- Changing the computer's configuration, including the operating system and software, is not allowed unless it is part of the class program and performed under the instructor’s supervision.
- In the event of a power failure, immediately turn off all devices.
- Any missing equipment or malfunctions must be reported to the instructor.
- It is forbidden to operate, manipulate, or use devices not included in the current exercise.
- In case of electric shock, immediately disconnect the workstation from the power supply. Do not touch the affected person before the power is turned off.