Control Structures

# Before Class

1. Find out what programming language statements are used to handle decisions and performs computations and actions conditionally.
2. Watch the video on using if-then-else conditional statements on the Python Programming Tutorials channel:

<https://youtube.com/playlist?list=PLi01XoE8jYohWFPpC17Z-wWhPOSuh8Er->

1. How, in a computer program, it is possible to execute a program statement multiple time. Familiarise yourself with loop statements (for and while).
2. Watch the video on using the for statement on Python:

<https://youtu.be/94UHCEmprCY>

1. Find out what the term debugging means. Then watch the video explaining how to test your program using the debugger.

<https://youtu.be/QQAqQp06nXo>

# During Class

## Conditional statement

1. The speed limit on the motorway is 130 km / h. Write a program that checks whether a car exceeded the speed limit.
2. X contains any integer value. Write a program to check that the value is even.
3. Paul is 21 and Annie 18. Write a program that checks that both are adults.
4. A user enters two integer numbers from the keyboard. Write a program that checks if at least one of them is positive.

## Loops

1. Write a program that displays the sentence "Practice makes perfect" five times.
2. Write a program that displays integer numbers in the range of <1..20>.
3. Write a program that calculates the sum of integer numbers in the range of <100..150>.
4. Write a program that calculates values for the following fractions: 1/2, 1/3, ..., 1/10. Sample result:

1/1 = 1.0  
1/2 = 0.5  
1/3 = 0.3333333333333333  
…  
1/10 = 0.1

## Debugging

1. Run the program in debug mode to verify that it works properly.

password = "qwerty123"  
if len(password) < 8:  
 print(f"Password too short")  
else:  
 print(f"Password ok")

1. The following program calculates the sum of the integers in the range 1 to 5. Run the program in debug mode and find an error.

sum = 0  
number = 1  
while number < 5:  
 sum = sum + number  
 number = number + 1  
print("Sum of numbers in <1,5> is ", sum)

# After Class

1. Write a program that displays two numbers entered from the keyboard in ascending order.

Enter first number: 27  
Enter second number: 14  
Numbers in ascending order: 14, 27

1. Let x and y denote the coordinates of a point on the plane. Write a program that determines in which quadrant of the coordinate system the point P (x, y) is located or on which axis it is located, or that it is located in the position (0,0) of the coordinate system. Sample result:

x = 5  
y = 2  
Point P(5,2) is in the first quadrant of the coordinate system

1. There are coins of 1, 2 and 5 Polish Zlotys (PLN). Write a program showing any amount (natural number) read from the keyboard with as few coins as possible.

Enter the amount in PLN: 18  
The amount of PLN 18 in coins:  
5 zł – 3   
2 zł – 1   
1 zł – 1

1. Write a program that calculates a dog's age in dog’s years. For the first two years, a dog's life is equal to 10.5 human years. After that, each dog year is equal to 4 human years. Sample result:

Enter the dog's age in human years: 15  
The dog's age in dog’s years is 73 years.

1. Write a program that creates a multiplication table in the range 1 to 10 for any number entered by the user. Sample result:

Enter number: 6  
6 x 1 = 6  
6 x 2 = 12  
6 x 3 = 18  
6 x 4 = 24  
6 x 5 = 30  
6 x 6 = 36  
6 x 7 = 42  
6 x 8 = 48  
6 x 9 = 54  
6 x 10 = 60

1. The 'university' variable contains the name of university where you study. Write a program that displays the contents of the variable with an extra space between characters (add a space between each character).

UEK w Krakowie  
U E K w K r a k o w i e

1. Write a program that displays numbers from 1 to 30. If the number is divisible by 3 then the program displays the word 'THREE'. Next, if the number is divisible by 5 then the program displays the word 'FIVE'. Finally, if the number is divisible by both 3 and 5 then the program displays the word 'BINGO'. Sample result:

1 2 THREE 4 FIVE THREE 7 ...

1. Write a program that creates the following pattern. Sample result:

1  
22  
333  
4444  
55555  
666666  
7777777  
88888888  
999999999

1. Write a program that creates the following pattern. Sample result:

\*   
\* \*   
\* \* \*   
\* \* \* \*   
\* \* \* \* \*   
\* \* \* \*   
\* \* \*   
\* \*   
\*

1. The variables a and b contain the dimensions of the sides of the rectangle. Write a program that creates the following rectangle with dimensions a and b. Example result for a = 4 and b = 15:

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
\* \*  
\* \*  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

1. The payment card is secured with a four-digit PIN code (0805). Write a program that checks if the PIN code entered in the payment terminal is correct. The user has up to three possibilities for entering a PIN code. In case of three unsuccessful attempts, the card is blocked. Sample result:

Enter the PIN code: 2398  
Incorrect...  
Enter the PIN code: 0912  
Incorrect...  
Enter the PIN code: 7860  
Incorrect...  
Sorry, your payment card has been blocked.

1. A computer numeric keyboard has the arrangement of the keys as below. The included program code displays the computer keyboard. Analyse the program in terms of the displayed results. Do you understand each program statement? Then make a change in your program code. Replace the ‘for’ with a ‘while’ statement.

7 8 9  
4 5 6  
1 2 3

for i in range(6,-1,-3):  
 for j in range(1,4):  
 print(f' {i+j}',end='')  
 print()

1. Write a program that displays the first fifty words of the Fibonacci sequence. The sequence is defined as follows: the first term is equal to 0, the second is equal to 1, each subsequent term is the sum of the previous two. Sample result below.

https://en.wikipedia.org/wiki/Fibonacci\_number

0 1 1 2 3 5 8 13 21 34 ...

1. Write a program that calculates the sum and arithmetic mean of numbers entered from the keyboard. Entering 0 ends entering numbers. Sample result:

Enter number: 15  
Enter number: 8  
Enter number: 10  
Enter number: 0  
RESULT: Quantity=3, Sum=33, Mean=11

1. A natural number greater than 1 is called a prime if it has exactly 2 natural factors with the values 1 and this number. Write a program that finds N leading prime numbers. Read the value of N from the keyboard. Using loop statements check that the number N is divisible only by 1 and by N.

Prime numbers: 2 3 5 7 11 …

1. Write a program that displays 20 integer random numbers in the range of 5 to 10.
2. Write a program that displays a lottery coupon (numbers from 1 to 49) in the format as below.

1 8 15 22 29 36 43  
 2 9 16 23 30 37 44  
 3 10 17 24 31 38 45  
 4 11 18 25 32 39 46  
 5 12 19 26 33 40 47  
 6 13 20 27 34 41 48  
 7 14 21 28 35 42 49