4d 61 6b 65 20 65 76 65 72 79 74 68 69 6e 67 20 61 73 20 73 69 6d 70 6c 65 20 61 73 20 70 6f 73 73 69 62 6c 65 2c 20 62 75 74 20 6e 6f 74 20 73 69 6d 70 6c 65 72 2e

A Level Computer Science

Preparation – Bridging Lesson 2

Objectives

- Python Programming part 2
  - Three programming constructs (explained)
  - Sequence
  - Selection using IF statements (if else)
  - Iteration using FOR loops
  - Iteration using WHILE statements

- Useful Links - Python
  - IF Statements
  - FOR Loops
  - WHILE Loops

Programming Constructs

- In programming, there are three main programming constructs:
  - Sequence – this is where a number of statements are listed one after the other, and they will be carried out in that order without exception.
  - Selection – sometimes called branching, this is where a program statement acts as a question, where a decision is made and, based on that decision, one of two (or more) pathways is taken.
  - Iteration – sometimes called repetition, is a construct that allows the programmer to execute a section of code many times

Programming Constructs - Sequence

- Sequence – Sequence – In programming, instructions are executed one after another. Sequence is **the order in which the instructions are executed**. The sequence of instructions is extremely important as carrying out instructions in the wrong order results in a program performing incorrectly.
- An example of a sequence of instructions is shown below:
  - a = 3
  - b = 2
  - c = a * b + (2 * b)
  - print(c)

Programming Constructs - Sequence

- Exercises
- Exercise 1 – create a program that asks for a user's first and last name separately. The program should create a new variable called fullName which has the user's first name, a space, and then their last name. This should be printed out to the screen.
- Learning point – concatenation is when two or more strings are joined together to form a new string (in Python, the + operator carries out concatenation when used between two strings)
- Exercise 2 – create a program that asks the user to enter four different integers. The program should add these values together and print out the total.
- Learning point – casting is when a variable is changed from one data type to another. In Python, we use the keyword int to change a variable to an integer (provided that the variable contains a valid integer value)

Programming Constructs - Selection

- Selection – In programming, there are occasions when a **decision** needs to be made. Selection is the process of making a decision. **The result of the decision decides which path the program will take next**.
- Selection uses the keyword if and the optional keyword else
- Example: a program could tell a user whether they are old enough to learn how to drive a car. If the user's age meets the required driving age, the program would follow one path and execute one set of instructions. Otherwise, it would follow a different path and execute a different set of instructions. The program could look like this:
  - age = int(input("Enter your age: "))
  - **if** age >= 17:
  - print("You can learn how to drive a car")
  - **else**:
  - print("You are not old enough to learn to drive a car")

Programming Constructs - Selection

- Exercises
- Exercise 3 – create a program that will ask for a user's name. If the user enters "Tom", print a suitable welcome message, otherwise print "You are not Tom"
- Exercise 4 – make a new program that declares a variable called username which should hold the string "user0102" and a variable called password which should hold a suitable value. Ask the user for the correct username and password. If they enter both values correctly, print out the message "user authorised", otherwise the message "incorrect login details – entry denied" should be printed.
- Learning point – logical operators are special keywords as follows:
  - and – this is used between two Boolean conditions. The result will be true ONLY if both variables are true.
  - Investigate the above logical operator as well as the following: or, not.

Programming Constructs - Iteration

- Iteration – There are times when a program needs to repeat certain steps until told otherwise, or until a condition has been met. This process is known as **iteration**. Iteration is also often referred to as **looping**, since the program 'loops' back to an earlier line of code. Sections of code that are iterated are called loops.
- Iteration enables programmers to greatly simplify a program. Instead of writing out the same lines of code again and again, a programmer can write a section of code once, and ask the program to execute it again and again until it is no longer needed.

Programming Constructs - Iteration

- **Count-controlled iteration** – this repeatedly executes a section of code a **fixed number of predetermined times**. This is implemented using a for loop, which uses a control variable to determine what code is repeatedly executed and how many times. This Python program would print out a message six times:
- **for** i in range (0, 6):
- print("hello")

Programming Constructs - Iteration

- Exercises
- Exercise 5 – create a program that will ask for a user's name and then print out "Hello <name>" 7 times.
- Exercise 6 – make a new program that will ask for a number. The program should print out the numbers from 0 to that number (e.g. if the user entered 6, the program would print out 0, 1, 2, 3, 4, 5, 6)

Programming Constructs - Iteration

- Condition-controlled iteration – this repeatedly executes a section of code **until a condition is met - or no longer met**. One common type of condition-controlled iteration is the while loop
- While condition-controlled loops
- While loops test the condition at the beginning of the loop. If the condition is met, the code within the loop is executed before the program loops back to test the condition again. This Python program would print out a message six times.
- count = 0
- while count < 6:
- print("Hello")
- count = count + 1

Programming Constructs - Iteration

- Exercises
- Exercise 7 – create a program that uses a while loop. Ask the user to guess your favourite colour. Keep asking the question until they get the answer right.
- Exercise 8 – make a new program that will ask a user to answer a maths question "What is 7 + 12?" The program should repeat the question until the user enters the correct answer.
- Extension: using exercise 8, add code to –
  - Tell the user how many attempts they had
  - Give them "higher" or "lower" feedback to help them if they get the answer wrong.