Programming Techniques (2.2.1)

Sequence: Any set of instructions that are executed one after another. Iteration / Loop: Commands repeat until a condition is met. Branching / Selection: Commands execute if a condition is True. Count-controlled iteration command: FOR loop. Condition-controlled iteration command: WHILE loop.

Use a DO...WHILE loop when the program statements inside the loop should always be executed at least once. With a WHILE loop, the program statements may not be executed at all. Instead of multiple clauses in a selection block, use Nested Selection statements or Switch Case.

Iteration:
- Where a single set of program statements is either executed again, or the program moves on to the next program statements, based on the value of a Boolean condition.
- Advantages: More Memory Efficient
- Disadvantages: More lines of code, may need many FOR loops, the number of FOR loops may depend on the input

Recursion:
- Where a subroutine calls itself from within its own subroutine.
- Needs a stopping condition which must be reachable within a finite number of times.
- Advantages: Fewer Lines of code
- Disadvantages: Not Memory Efficient; with each call, the processor must store where it was before, and the values of all previous variables; Too many recursive calls will cause a stack overflow

A local variable is:
- Declared inside a subroutine
- Only accessible by that subroutine
- Created when the subroutine is called
- Destroyed when the subroutine ends.

A global variable is:
- Declared at the top of a program, outside of any subroutine
- Accessible throughout the program
- Created when the program starts
- Destroyed when the program ends

Scope: Where a variable or constant can be accessed (local or global). Global variables can make programs hard to debug, since subroutines are no longer self-contained. The same variable can be used in multiple subroutines. When changing one subroutine, you will need to consider effects on other subroutines. Therefore, they're considered poor programming practice. Sometimes, global variables are needed, however, local variables should be used as much as possible.

Benefits of subroutines:
- They break program code into smaller sections, so programs are easier to read and understand
- Subroutines can be tested and created in isolation, making them easier to debug
- You can give different programmers different subroutines to write, these can be combined at the end

ByVal: makes a copy of the data. ByRef: makes a reference to the original data. An IDE: A program that provides a set of tools designed to maximise productivity.

Tools for Writing:
- Syntax Highlighting
- Autocompletion
    - Automatically adding closing brackets or speech marks
    - Provides a list of variable names and subroutines
- Interpreter
    - Allows for development while the program is running without requiring full compilation whenever the code is edited

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Inbuilt Interpreter:

- Thus, the programmer can run the code
- Without this, to check for errors in the code, the programmer would need to load Command Prompt, find the python file in the correct folder, and run it
- Before running the file, the programmer would also need to manually run the compiler from Command Prompt to compile the python file and create a Python bytecode file

Tools For Debugging:

- Error Report
- Stepping / Breakpoints
    - Step through program instruction by instruction, checking the values of variables along the way
- Interpreter: Program can be run even with syntax errors