Programming

Introduction to Programming

In this lesson, the difference between machine, assembly and high-level programming languages is explained as well as the function of tools such as editors, compilers, interpreters and debuggers in the software development process.

Ⓘ Lesson Outcomes

By the end of the lesson, you should be able to:
*   Explain the difference between high-level programming languages, assembly languages and machine language

◎ Lesson notes

Remember that a computer understands only 0s and 1s. Specific bit patterns are recognised as instructions by the computer. A set of bit patterns, each of which represents a different instruction for a particular computer, is known as the machine language of that computer. A program is a set of machine language instructions that the computer executes one by one. Machine languages are machine-dependent, that is, a particular machine language can be used on only one type of computer.

An assembly language uses English-like abbreviations to represent the machine instructions. A software tool called an assembler, translates assembly language to machine language.

High-level languages are much more English-like and also use many of the same symbols that we use in maths. For example, in Java we are able to write: **cost = price + VAT**

A compiler is a software tool that translates a program written in a high-level language (the source code) to machine language (the object code). In general, a particular compiler translates a program written in a particular high-level language, like C++, to machine code for a particular machine. Instead of translating a whole source code file to object code, an interpreter translates <u>and executes</u> a program one line at a time.

In order for Java programs to be portable, the Java developers defined a 'virtual' machine with its own machine language called bytecode. A Java source program is compiled into bytecode.

To be able to execute on a particular computer, an interpreter is needed that will translate the bytecode into that computer's own machine language.

Regardless of which programming language we use, we must first create a source code file on the hard disk. To do that, we must type our program into an editor, such as Notepad, and save it in a file on disk. Next, we must run the compiler with the source code as input. The compiler will produce a file with the object code as output. Then we give a command to the operating system to load and run this object code.

A program that provides a programmer with an easy way to use the tools that he or she needs to write, compile, run and debug a program is called an 'Integrated Development Environment', or IDE

❓ Task

1. Explain the difference between a high-level programming language, an assembly programming language and machine language.