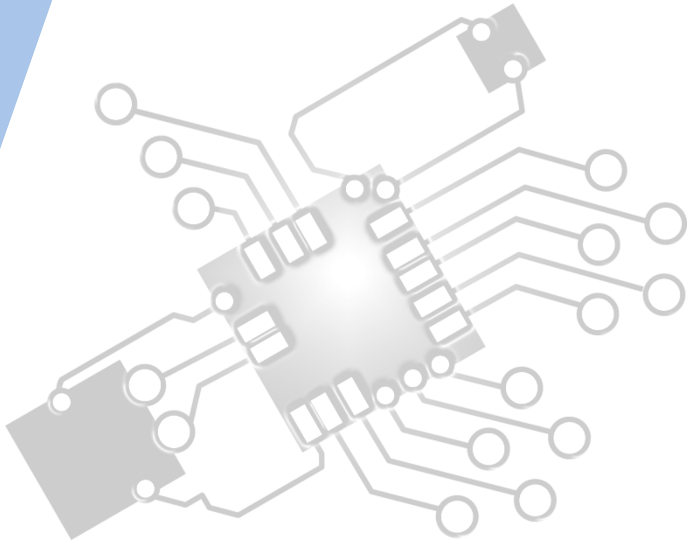
Computational thinking, problem-solving and programming: Introduction to Programming

IB Computer Science



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HL Topics 1-7, D1-4

1: System design

2: Computer Organisation

3: Networks

4: Computational thinking

5: Abstract data structures

6: Resource management

7: Control

D: OOP

HL & SL 4.3 Overview

Nature of programming languages

4.3.1 State the fundamental operations of a computer

4.3.2 Distinguish between fundamental and compound operations of a computer

4.3.3 Explain the essential features of a computer language

4.3.4 Explain the need for higher level languages

4.3.5 Outline the need for a translation process from a higher level language to machine executable code

Use of programming languages

4.3.6 Define the terms: variable, constant, operator, object

4.3.7 Define the operators =, ., <, <=, >, >=, mod, div

4.3.8 Analyse the use of variables, constants and operators in algorithms

4.3.9 Construct algorithms using loops, branching

4.3.10 Describe the characteristics and applications of a collection

4.3.11 Construct algorithms using the access methods of a collection

4.3.12 Discuss the need for sub-programmes and collections within programmed solutions

4.3.13 Construct algorithms using predefined sub-programmes, one-dimensional arrays and/or collections

Topic 4.3.2

Distinguish between **fundamental** and **compound operations** of a computer

Key difference: complexity

- A **fundamental operation** could be something like **add two numbers**, **store a number**, **move a number to another location in RAM** etc.
- These are operations that do not require the processor to go through a large number of sub operations to reach a result.
- A **compound operation** is an operation that **involves a number of stages/other operations**. Think of it as a group of operations that combine together to form an operation.

Fundamental vs Compound

An example of fundamental instructions:

```
LOAD register 34AB39
ADD 29
STORE result
COMPARE result to
register 4
```

Examples of compound/complex instructions:

Find the biggest number in an array

Sort the names alphabetically