

Introduction to Computer Programming

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Key concepts, terminology, and practical steps for beginners

1. What Is Computer Programming?

Aspect	Description
Definition	The process of designing, writing, testing, and maintaining code that tells a computer how to perform tasks.
Goal	Transform a problem or requirement into a set of precise instructions that a machine can execute.
Outcome	A program (executable file, script, or application) that solves a specific problem or provides a service.

2. Core Concepts

Concept	Explanation	Example
Algorithm	A step-by-step logical procedure for solving a problem.	Sorting a list of numbers from smallest to largest.
Syntax	The set of rules that define how code must be written in a particular language.	In Python, a line ends with a newline; in C, statements end with ;.
Semantics	The meaning behind syntactically correct statements.	<code>x = 5</code> stores the value 5 in variable x.
Variable	A named storage location that holds a value which can change during execution.	<code>int age = 30;</code>
Data Type	Classification of data that determines the operations possible on it.	<code>int, float, string, bool.</code>
Control Flow	Structures that dictate the order in which statements are executed.	<code>if/else, for, while.</code>
Function / Procedure	A reusable block of code that performs a specific task.	<code>def add(a, b): return a + b</code> (Python).

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Concept	Explanation	Example
Debugging	The systematic process of locating and fixing errors (bugs).	Using print statements or a debugger tool.
Compilation / Interpretation	Translating source code to machine code (compiled) or executing it line-by-line (interpreted).	C ? compiled; Python ? interpreted.

3. Programming Languages – A Quick Overview

Language	Paradigm(s)	Typical Use Cases	Learning Curve
Python	Imperative, Object-Oriented, Functional	Web scripts, data science, automation	Gentle
JavaScript	Event-driven, Functional, Object-Oriented	Web front-end, Node.js back-end	Moderate
Java	Object-Oriented	Enterprise apps, Android	Moderate
C	Procedural	System software, embedded	Steep
C++	Multi-paradigm (procedural, OO, generic)	Game engines, high-performance apps	Steep
Ruby	Object-Oriented, Dynamic	Web apps (Rails)	Gentle
SQL	Declarative (domain-specific)	Database queries	Gentle

Tip: Start with a language that matches your interests and has abundant learning resources (Python is a popular first choice).

4. The Typical Development Workflow

1. Problem Analysis

- Understand requirements.
- Break the problem into smaller sub-tasks (decomposition).

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2. Algorithm Design

- Write pseudocode or draw flowcharts.
- Identify inputs, processing steps, and outputs.

3. Coding

- Translate the algorithm into syntactically correct code.
- Follow naming conventions and style guides.

4. Testing

- **Unit tests** for individual functions.
- **Integration tests** for combined components.