Programming Basics and Data Analytics with Python

Introduction to Programming

Learning Objectives

By the end of this lesson, you will be able to:

- Explain what is program and programming language

- List the types of programming languages

- Describe an algorithm, pseudocode, and a flowchart

- Differentiate between a compiler and an interpreter

Program

What Is a Program?

A program is a set of instructions a computer follows in order to perform a task.

Here is your program

```
10110011   10000010
00001111   00101010
10111111   01010001
11101001   00010011
11000001   10111100
10011101   11001001
00001000   00001000
00010101   10101011
11000001   11001101
11011101   00111100
```
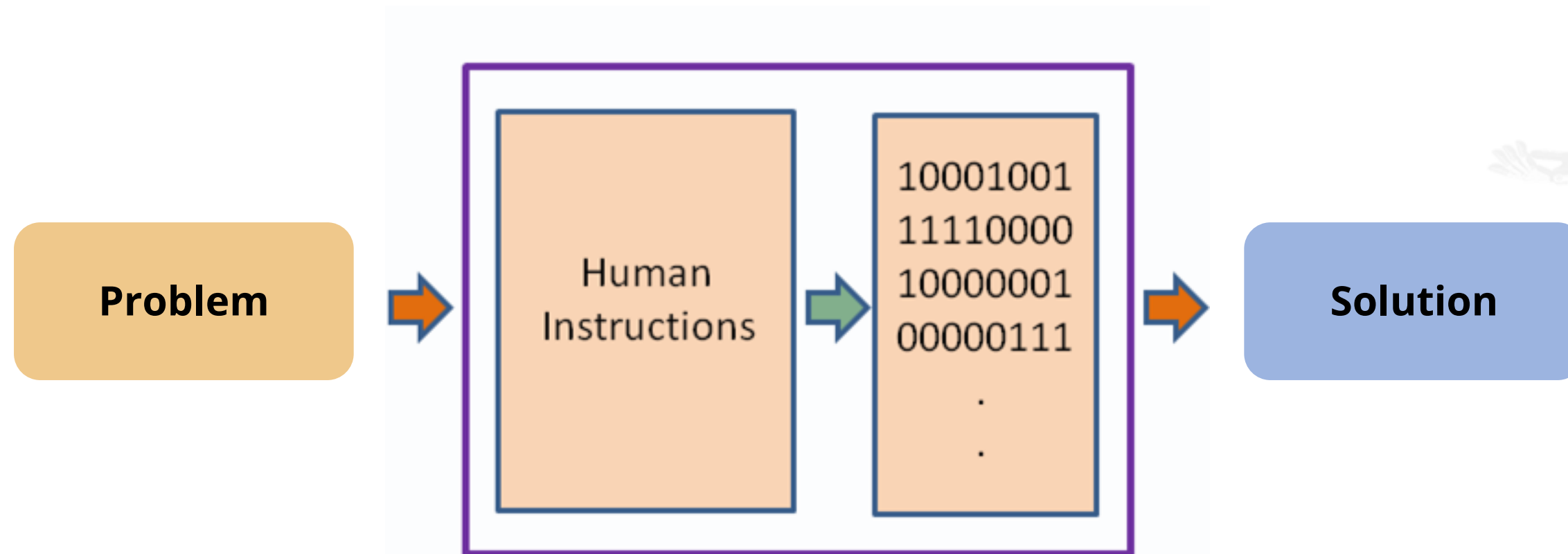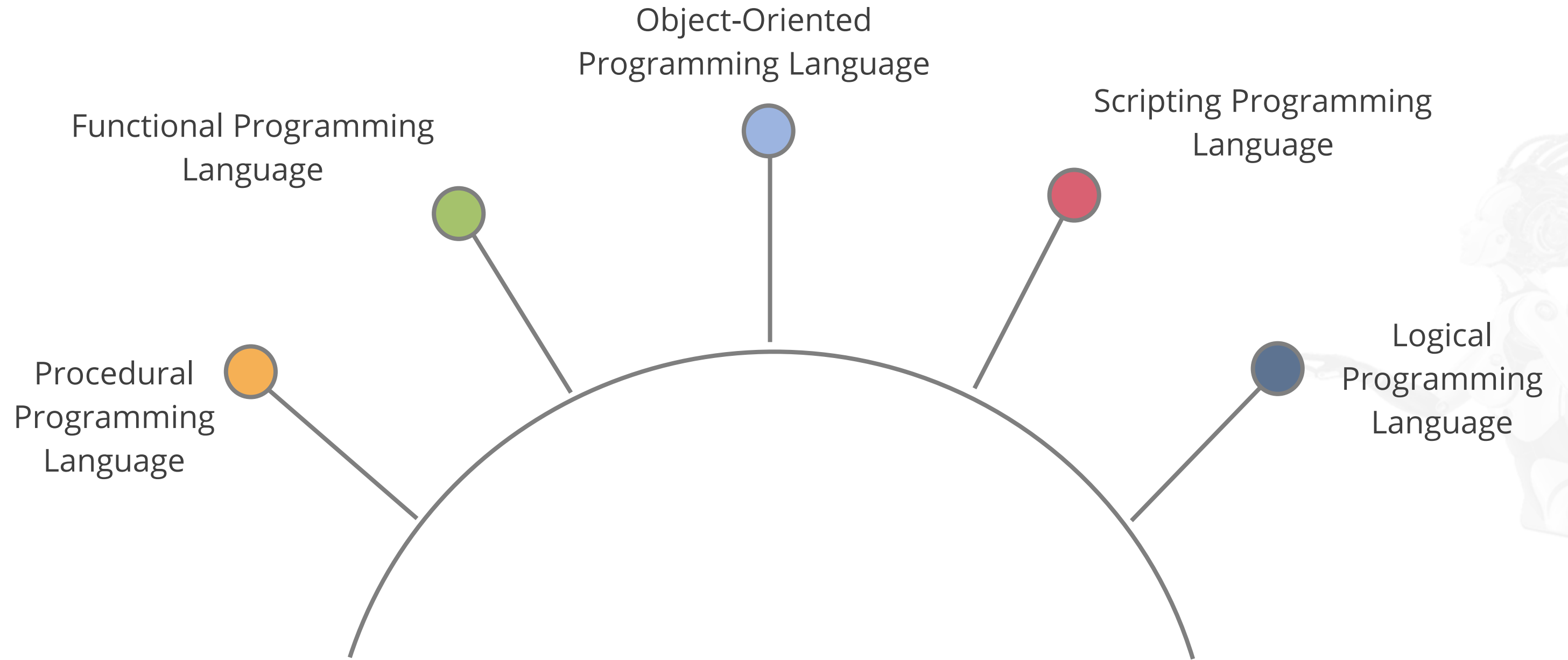
Programming Language

What Is a Programming Language?

- It is a set of rules that instructs a computer on what operations to perform.
- It is a set of rules for communicating an algorithm.

Types of Programming Languages

Object-Oriented
Programming Language

Functional Programming
Language

Scripting Programming
Language

Procedural
Programming
Language

Logical
Programming
Language

Requirements for Programming Languages

Must be simple and easy to learn

Should have good readability

Should be well-structured and documented

Algorithm, Pseudocode, and Flowchart

Algorithm

An algorithm is a detailed step-by-step method to solve a problem.

```
Input → Algorithm → Output
```
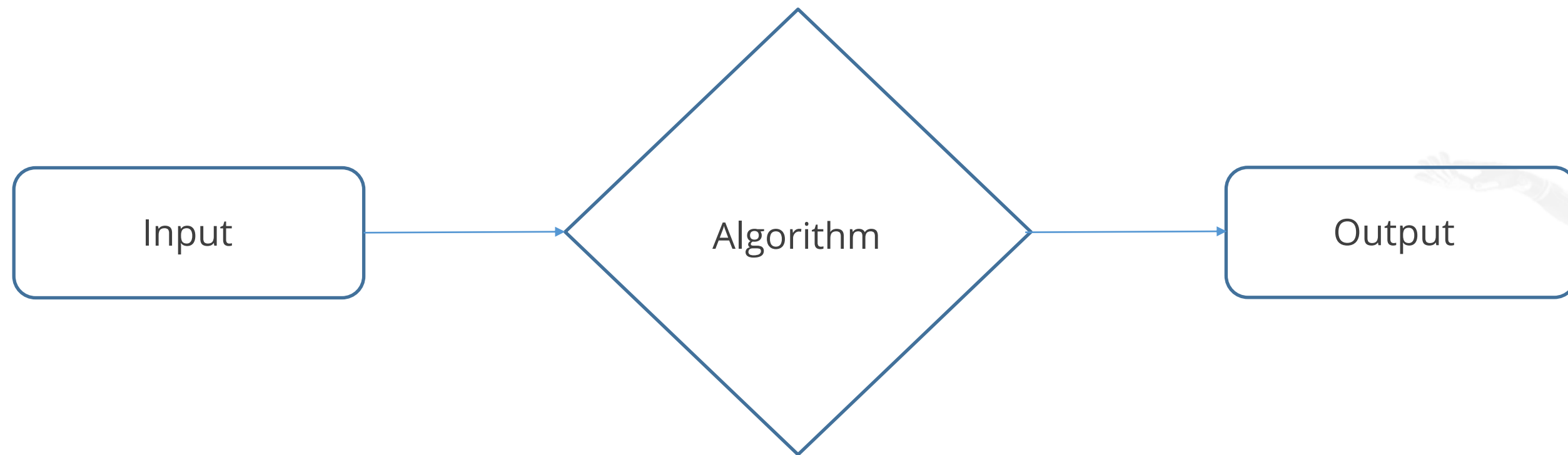
Pseudocode

Pseudocode is a way of writing a program description that includes simple descriptions but does not have precise syntax.

Example:

A pseudocode to find the total of two numbers is as follows.
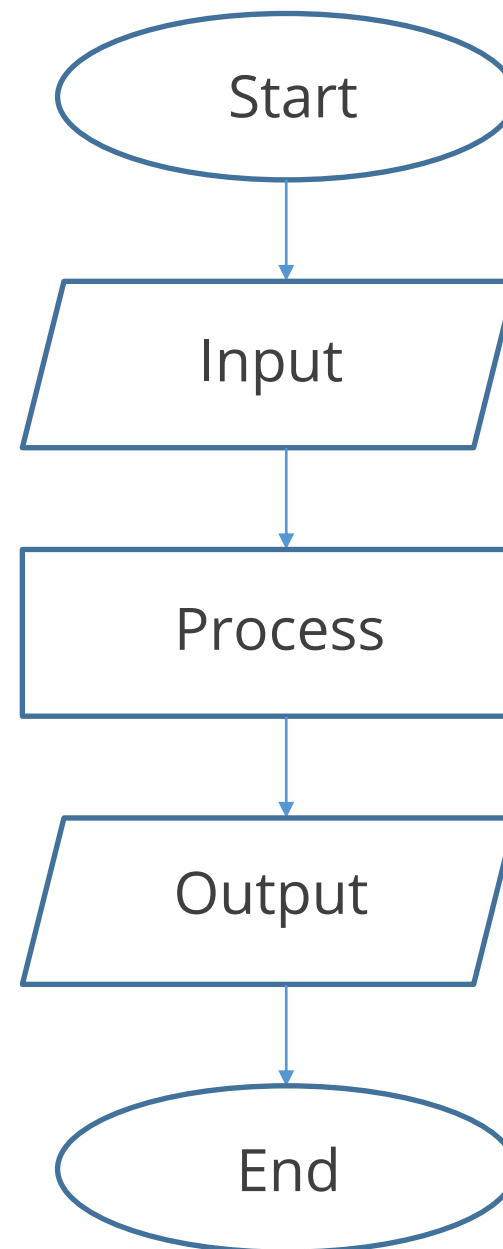
Sum of two numbers:

Begin

        Set sum = 0;
        Read: number 1, number 2;
   sum = number 1 + number 2;
        Print sum;

End

Flowchart

A flowchart represents an algorithm using a diagram.
Flowcharts are commonly used in programming to represent the steps in a program.

```
        Start

        Input

       Process

        Output

         End
```

Pseudocode vs. Flowchart

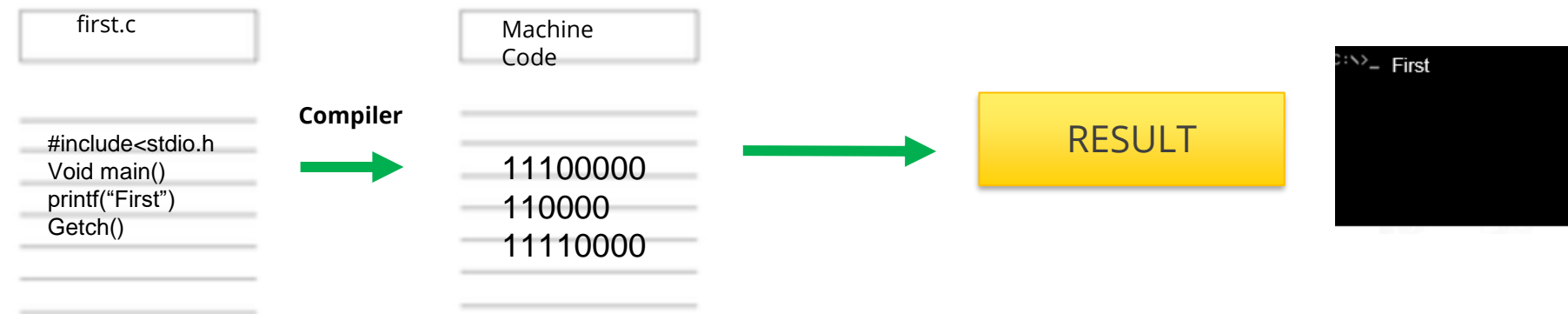| Pseudocode	Flowchart
An informal high-level description of the operating principle of an algorithm	A diagrammatic representation that illustrates a solution model to a given problem
Written in natural language and mathematical notations	Written using various symbols
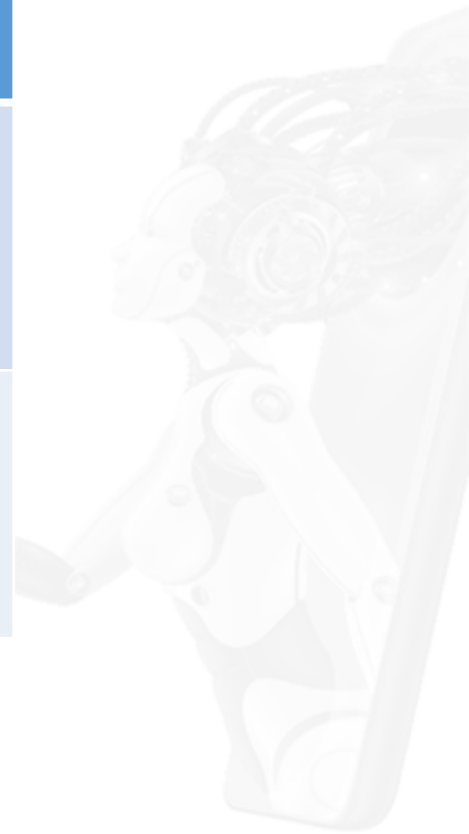
Compiler and Interpreter

Compiler and Interpreter

A **compiler** is a special program that processes statements written in a programming language and converts them into machine language.

first.c		Machine Code
#include<stdio.h Void main() printf("First") Getch()	**Compiler** →	11100000 110000 11110000

RESULT →

```
:\>_ First
```

An **interpreter** is a program that reads and executes each instruction of the code. This includes source code, precompiled code, and scripts.

first.p y		
print("First")	**Interpreter** →	RESULT

```
===========
First
>>> |
```

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Compiler vs. Interpreter

Compiler	Interpreter
Compiler takes an entire program as input.	Interpreter takes a single instruction as input.
Intermediate object code is generated.	No intermediate object code is generated.
Memory requirement is more since object code is generated.	Memory requirement is less.
Program need not to be compiled every time.	Higher level program is converted to lower level program each time.
Errors are displayed after the entire program is checked.	Errors are displayed for every instruction interpreted.
Program execution is fast.	Program execution is slow.
Examples: C, C++	Examples: Visual basic, Python

Knowledge Check

Which of the following is a detailed step-by-step method for solving a problem?

a.   Pseudocode

b.   Compiler

c.   Algorithm

d.   Flowchart

Which of the following is a detailed step-by-step method for solving a problem?

a. Pseudocode

b. Compiler

c. Algorithm

d. Flowchart

The correct answer is   **c**

An algorithm is a detailed step-by-step method for solving a problem.

Knowledge Check

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Which of the following represents an algorithm using a diagram?

a.   Pseudocode

b.   Compiler

c.   Interpreter

d.   Flowchart

Knowledge Check

2

Which of the following represents an algorithm using a diagram?

a.   Pseudocode

b.   Compiler

c.   Interpreter

d.   Flowchart

The correct answer is **d**

A flowchart represents an algorithm using a diagram.

Which of the following options takes a single instruction as input?

a.   Algorithm

b.   Interpreter

c.   Compiler

d.   Pseudocode

Knowledge Check

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Which of the following options takes a single instruction as input?

a.   Algorithm

b.   Interpreter

c.   Compiler

d.   Pseudocode

The correct answer is   **b**

Interpreter takes a single instruction as input.

Key Takeaways

- A program is a set of instructions a computer follows to perform a task.

- An algorithm is a detailed step-by-step method for solving a problem.

- A pseudocode is an informal way of writing a program.

- A flowchart represents an algorithm using a diagram.

- Compiler takes an entire program as input, whereas interpreter takes a single instruction as input.

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