Introduction to Programming

The Components of a Computer

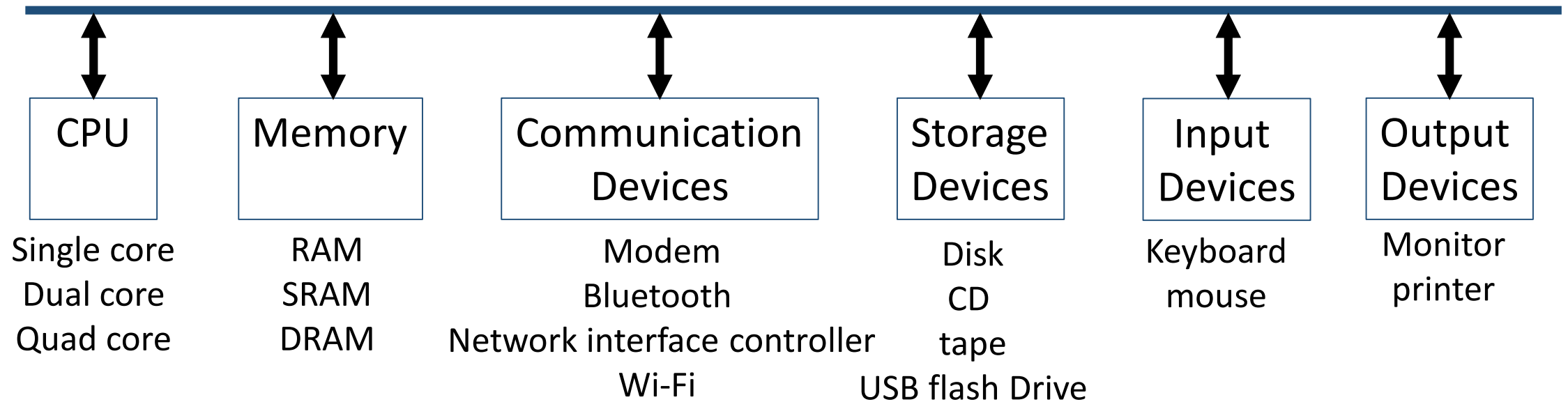| CPU	Memory	Communication Devices	Storage Devices	Input Devices	Output Devices
Single core	RAM	Modem	Disk	Keyboard	Monitor
Dual core	SRAM	Bluetooth	CD	mouse	printer
Quad core	DRAM	Network interface controller	tape		
		Wi-Fi	USB flash Drive		
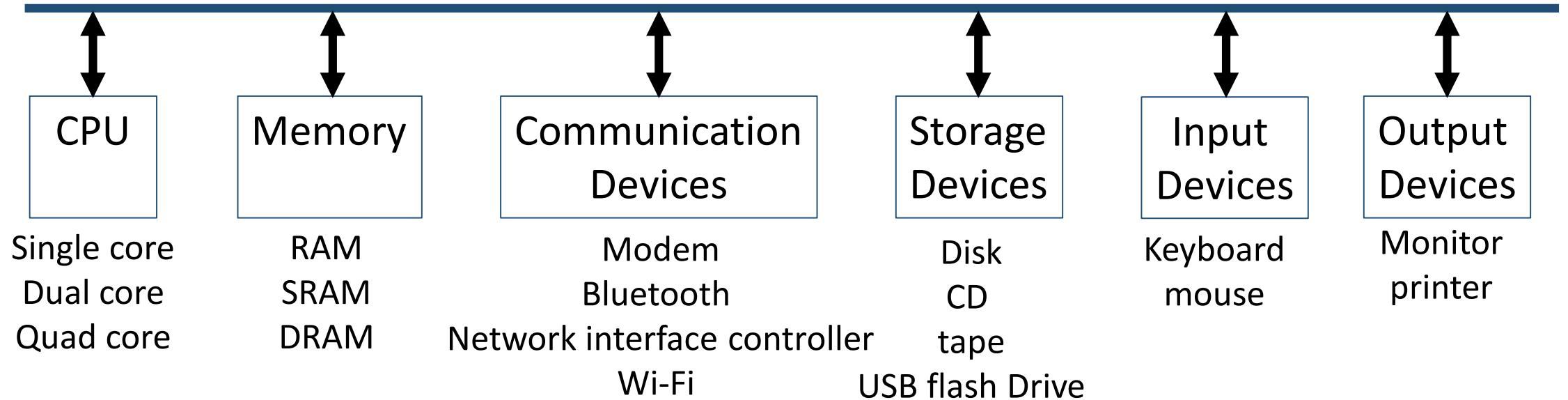
CPU

➢ The central processing unit (CPU) is the brain of a computer.

➢ Execute instructions which are retrieved from memory.

➢ The CPU speed is measured in megahertz (MHz)

➢ One megahertz: 1 million pulses per second.

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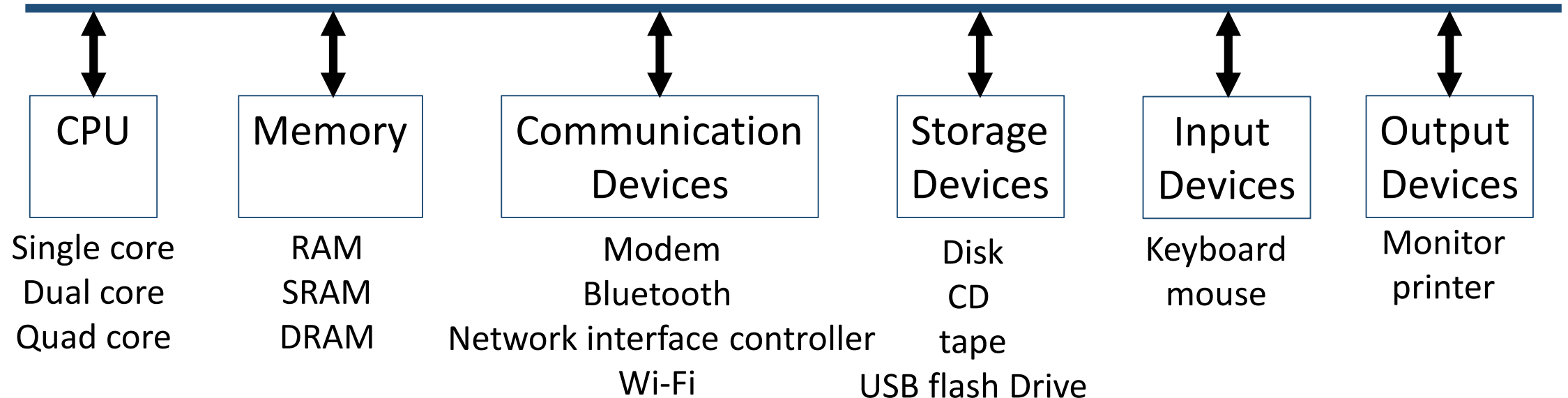
Memory

➢ Memory stores data and program instructions of programs.

➢ A memory unit is an ordered sequence of bytes. One byte consists of eight bits.

➢ A memory byte is non-empty. Its initial content may be meaningless.

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How Data is Stored?

Data types:
numbers, characters, and strings

They are encoded as a series of bits (zeros and ones).

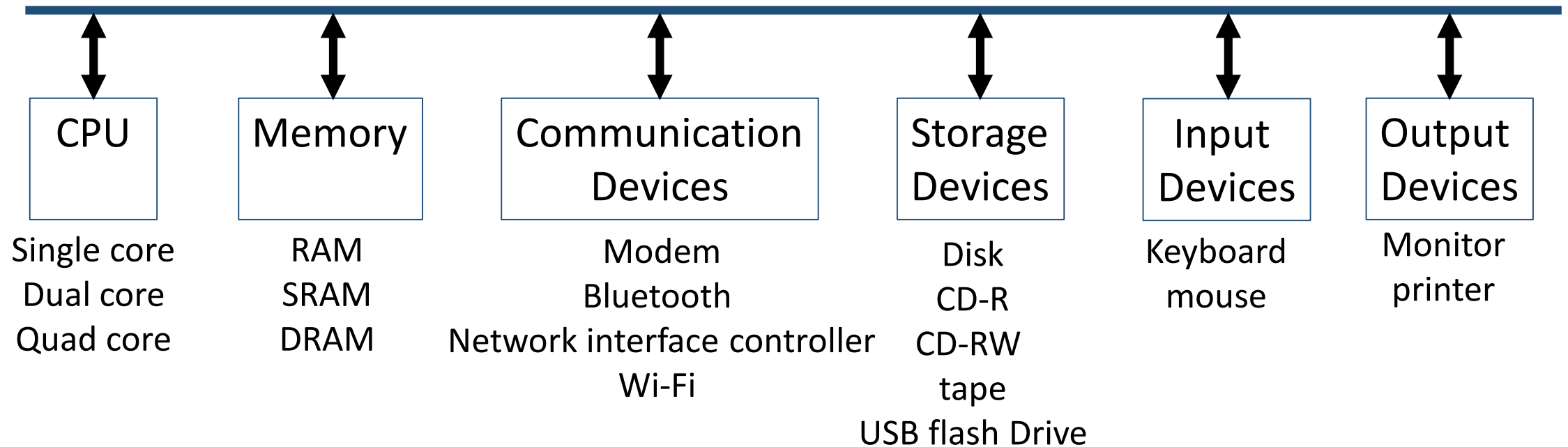Digital devices have two stable states, which are referred to as zero and. Computers use zeros and ones.

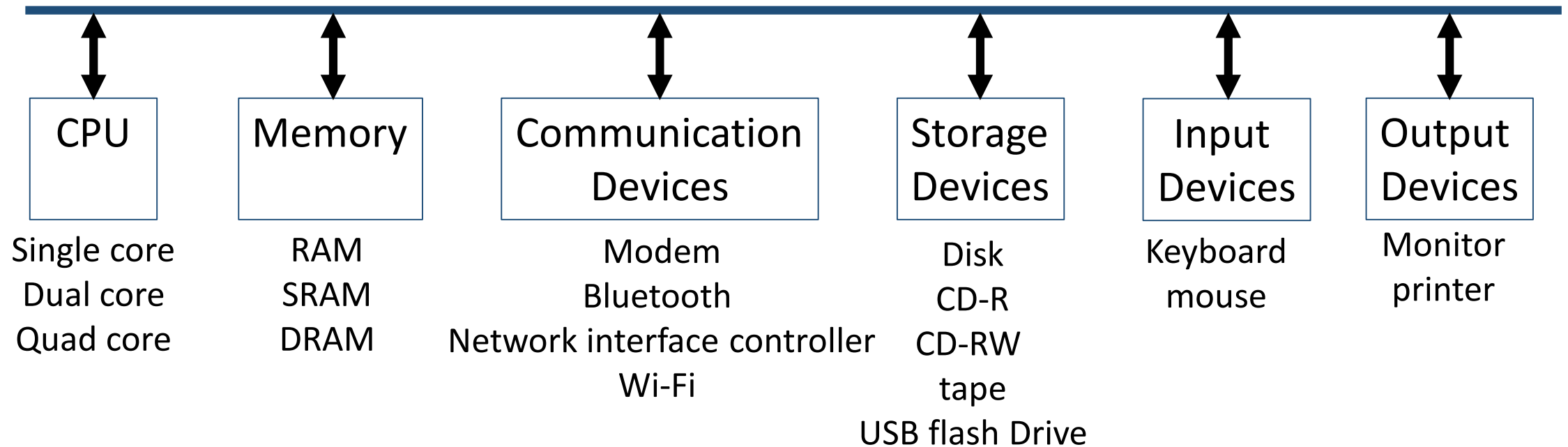| Memory Address	Memory Content
	. . .
2009	0100 1011
200A	0111 1011
200B	0110 1111
200C	1100 1011
	. . .

Storage Devices

➢ Volatile memory loses its contents when the power is turned off.

➢ Programs and data are permanently stored on storage devices, e.g.., hard drives.

➢ They are moved to memory when necessary.

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Single core Dual core Quad core	RAM SRAM DRAM	Modem Bluetooth Network interface controller Wi-Fi	Disk CD-R CD-RW tape USB flash Drive	Keyboard mouse	Monitor printer

Monitor

The monitor displays text and graphics.

The resolution and dot pitch determine the quality of the monitor.

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Programming Languages
Machine Language

Machine language is a set of primitive instructions built into every computer for the CPU. The instructions are in the form of binary code. Entering a program with native machine language is a tedious process. The programs are difficult to read and modify.

Example: We might write an instruction in binary like the following to add two numbers:

```
1101101110011110
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What is this???

Programming Languages
Assembly Language

A program called **assembler** is used to translate assembly language programs into machine code.

Example: We might write an instruction to add two numbers as follows:

    ADDF3 R1, R2, R3

```
// -> 1101101110011110
```

Programming Languages
High-Level Language

The high-level languages are English-like and easy to learn and program. For example, the following is a high-level language statement that computes the area of a circle with radius 5:

area = 5 * 5 * 3.1415;

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x = 5 * 5 * 3.1415; // naming issue

High-Level Languages

- Ada (named for Ada Lovelace)
- BASIC (Beginner All-purpose Symbolic Instructional Code)
- C (whose developer designed B first)
- C++ (an object-oriented language, based on C)
- C# (a Java-like developed my Microsoft)
- COBOL (COmmon Business Oriented Language)
- Delphi (Pascal-like visual language developed by Borland)
- FORTRAN (FORmula TRANslation)
- Java (a popular object-oriented language, similar to C++)
- Pascal (named for Blaise Pascal)
- Python
- Ruby
- Visual Basic (Basic-like visual language developed by Microsoft)