



ITCS106/113

Computer Programming I

Chapter (1)

Introduction to Computers and Java

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أوقات الدروس



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1.1 COMPUTER BASIC



Computer system can be divided into two parts:

part1 - Hardware :

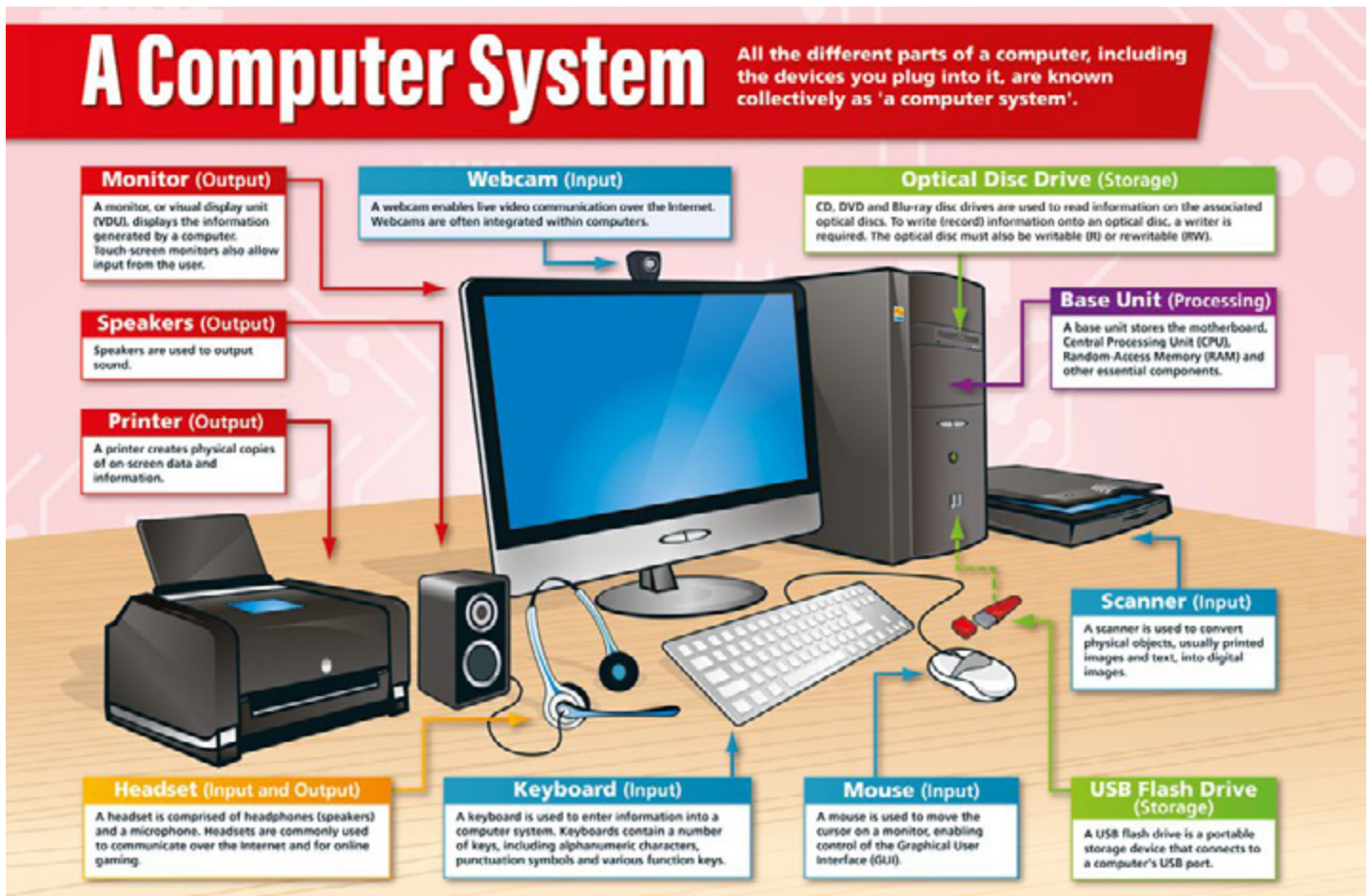
is a physical components of a computer such as CPU, Memory, Monitor, Printer, Keyboard and Mouse.

part2 : Software:

is a set of instructions for the computer to follow, we called as **program**, such as Operating System, Applications, Programming Language.

Part1 - Hardware :

It has four main categories: Processor(CPU), input devices, output devices, and Memory (Storage).



1 - The processor

Also called Central Processing Unit (CPU) : It's act as the brain of the devices for processing and executing instructions.



1 - Memory

Memory holds programs, data for the computer to process, and the result of the computer's intermediate calculations. we have two kinds of memory: main memory and auxiliary memory.

- *Random Access Memory (RAM) :*

RAM is the main memory in a computer, It is much faster to read from and write to than other kinds of storage, It is used to store current working data, so they can be quickly reached by the processor.

- RAM is volatile, that means data will disappears when you shut down your computer.



Auxiliary Memory (Secondary Memory):

The data in auxiliary memory exists even when the computer's power is off, It is like a various storage media on which a computer can stored data and programs.

Examples of Auxiliary Memory:

- Hard disk drive (HDD)
- Solid State disk (SSD)
- CDs, DVDs, flash drives



Bits, Bytes and Addresses

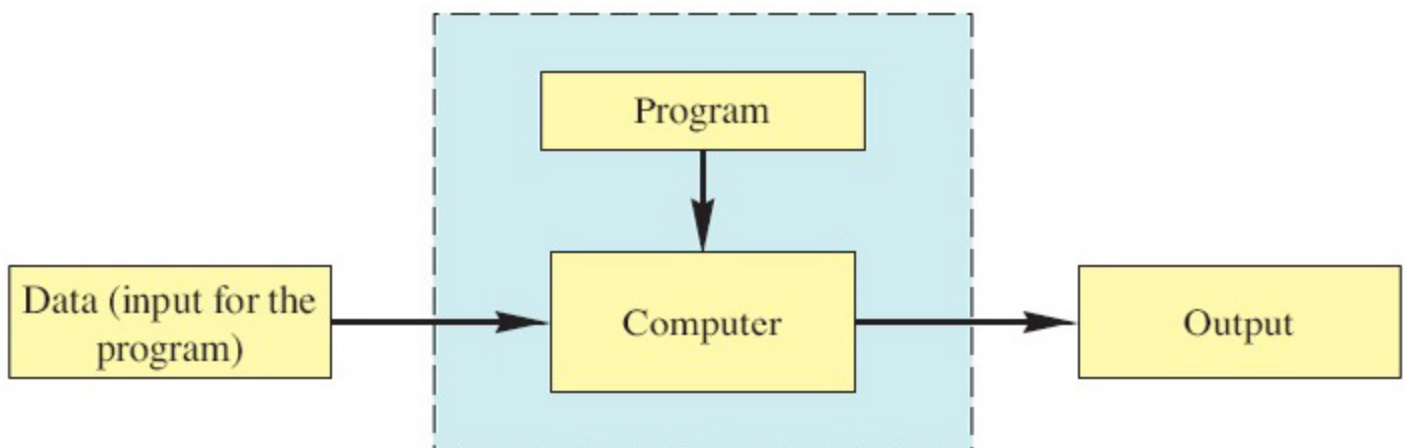
- A bit is a digital with a value of either 0 or 1.
- A byte is a quantity of memory, and it's the smallest addressable unit of memory.
- 1 byte contains 8 bits, The number of byte is called address.
- Each byte in main memory resides at a numbered location called its address.
- Both main memory and auxiliary memory are measured in bytes.
- all kinds of data encoded and stored using 1s and 0s.

Files

- It's a large group of bytes in auxiliary memory (HDD or SSD).
- Files are organized into groups called Folders, and each file has a name.
- Java programs are stored in files.
- We copy program files from auxiliary memory to main memory in order to be run.

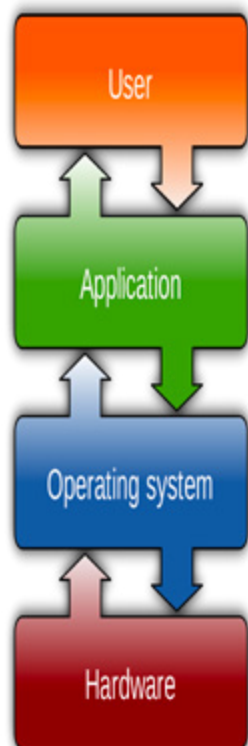
Part2 - Software (program):

- Program is a set of instructions for a computer to follow.
- The input is the data needed by the program.
- The output (Result) produced by following the instructions in the program.



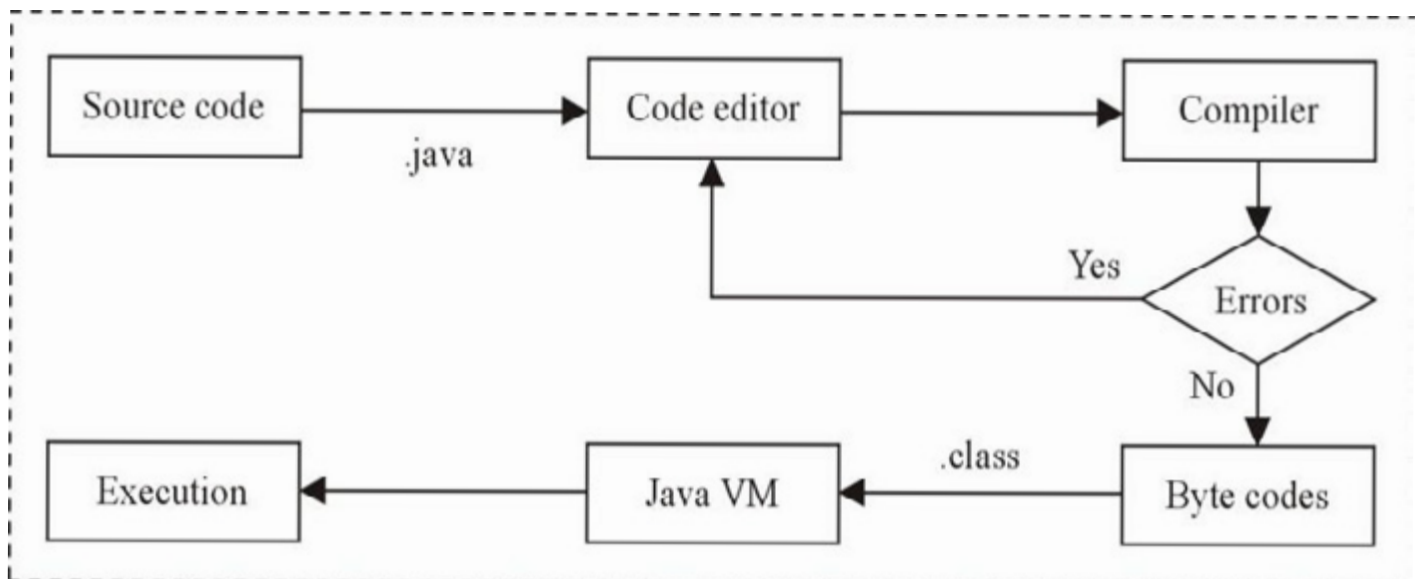
Operating System (OS):

- An operating system is a program that acts as an interface between computer user and computer hardware, and controls the execution programs, such as Microsoft Windows, Apple Mac OS, Linux.



Programming Languages:

- Java, C#, C++, Visual Basic, Python, Ruby are a high level languages.
- Computer hardware does not understand high level languages, can only deals with low level langues, so must translate an program written with high level language to low level language.
- A **compiler** is a program that translates a program from a high level language to a low level language.
- The **Java compiler (javac)** is a program that translates a java program into byte code.
- When a Java program is compiled, the byte code of the program has the same name, but ending is changed from .java to .class.
- An **interpreter** is a program that alternates the translation and execution of satementes in a program written in a high level language. (*translate each byte-code instruction into machine code*)
- **JVM (Java Virtual Machine)** : translate the Java byte code to machine code.
- **JIT (Just-In-Time)** : Compiling bytecodes to native machine code at run time.
- **Classes** : pieces of code.
- **class Loader**: The bytecode of various classes connected together to run the program.



1.2 A SIP OF JAVA



We have two kinds of java programs: applications and applets.

Application: is just a regular program, meant to be run on your computer.

Applets: is a little application can be sent to another location on the internet and run there.

A First Java Application:

```
public class FirstProgram
{
    public static void main(String[] args)
    {
        // Write your code here
        System.out.println("Welcome to OL Academy");
    }
}
```

Some Terminology:

Programmer: The person who writes a program.

User: The person who interacts with the program.

Variable: is something that can store a piece of data.

Statement : An instruction to the computer; it ends with a semicolon.

Syntax: The grammar rules for a programming language.

IDE (Integrated Development Enviroment): Combines a text editor with commands for com-

piling and running Java programs.

Examples: IntelliJ IDEA, Eclipse, NetBeans, Visual Studio.



Printing to the Screen

```
System.out.println("Whatever you want to print");
```

- System.out is an object for sending output to the screen.
- println is a method to print whatever is in parentheses to the screen.

Compiling a Java Program or Class

- A Java program consists of one or more classes, which must be compiled before running the program.
- Each class should be in a separate file.
- The name of the file should be the same as the name of the class.
- The Java program can involve any number of classes, but class to run must be contain the main method somewhere in the file.

The main method:

```
public static void main(String[] args)
{
}
}
```

1.3 PROGRAMMING BASICS



Some basics and helpful techniques that experienced programmers have found, they apply to almost any programming Language.

Object-Oriented Programming (OOP)

- OOP is a programming methodology that views a program as similar consisting of objects that can act alone or interact with one another. Objects can perform actions which effect themselves and other objects in the world.

- Treats a program as a collection of objects that interact by means of actions.

Three main design principles are:

- Encapsulation : information hiding.
- Polymorphism : many forms - allows the same program instruction to mean different things in different contexts.
- Inheritance: is a way of organizing classes, The information is shared between classes, a class at lower level inherits all the characteristics of classes above it in the hierarchy.

Algorithm: is a set of instructions for solving a problem.

Errors : An error in a program is called a bug.

debugging: Eliminating errors.

We have three kinds of errors:

Syntax errors: Grammatical mistakes. Ex: not write a semicolon at the end of statement.

Runtime errors: Error that are detected when your program is running. Ex: divide by 0

Logic errors: Errors which produce incorrect results. Ex: to calculate the hours of 1 week and multiply number of days by 42 instead of 24.

Multiple Choice Questions:

1. This part of the computer fetches instructions, carries out the operations commanded by the instructions, and produces some outcome or resultant information.

- (A) Memory
- (B) CPU**
- (C) secondary storage
- (D) input device

2. Each byte in the memory is assigned a unique _____.

- (A) address**
- (B) CPU
- (C) variable
- (D) bit

3. Can hold data even when the computer's power is off.

- (A) RAM
- (B) main memory
- (C) Auxiliary memory**
- (D) CPU

4. How many bytes does 4 kilobytes represent?

- (A) 512
- (B) 1024
- (C) 4096**
- (D) 8192

5- It is a set of instructions for a computer to follow.

- (A) Hardware
- (B) Input
- (C) Output
- (D) Program**

6- Java is a _____ programming language.

- (A) Low-level
- (B) High-level**
- (C) machine
- (D) None of these

7. A _____ translates high-level language into low-level language.

- (A) programmer
- (B) syntax detector
- (C) compiler**
- (D) class loader

8. The input program to a compiler or interpreter is called _____.

- (A) Object code
- (B) Byte code
- (C) source code**
- (D) Assembly language code

9- _____ translates Java bytecode into machine language instructions.

- (A) JVM**
- (B) programmer
- (C) Compiler
- (D) None of these

10- The file produced by the Java compiler contains _____ that are executed by the Java Virtual Machine.

- (A) Bits
- (B) Bytes
- (C) Bytecode**
- (D) None of these

11- The information stored in _____ typically is volatile, that means is disappears when you shut down your computer.

- (A) HDD
- (B) SSD
- (C) Main memory**
- (D) Auxiliary memory

12- The smallest addressable unit of memory.

- (A) bit
- (B) byte**
- (C) Migabyte
- (D) Gigabyte

13- Which of the following is an output device?

- (A) Keyboard
- (B) Mouse
- (C) Scanner
- (D) Monitor**

14- What unit of storage is used to represent 10^6 bytes?

- (A) KB
- (B) MB**
- (C) GB
- (D) TB

15-Which type of program acts as an intermediary between a user of a computer and the computer hardware?

- (A) Operating system**
- (B) User thread
- (C) Superuser thread
- (D) Application program

16- RAM stands for:

- (A) Remote Access Memory
- (B) Read Access Memory
- (C) Remote Access Memory
- (D) Random Access Memory**

16- One byte is equivalent to _____.

- (A) 4 bits
- (B) 8 bits**
- (C) 6 bits
- (D) 12 bits

17- The most basic circuitry-level computer language, which consists of 1 and 0, is _____.

- (A) a high-level language
- (B) machine language**
- (C) Java
- (D) C++

18- A Java program is portable means it _____.

- (A) Can run on any machine**
- (B) Can write on any machine
- (C) Can read from as well as write to any machine
- (D) All of the above

19- Java programs can be executed in computer after

- (A) converting them to bytecode
- (B) converting them into machine code**
- (C) can be executed directly
- (D) None of the above

20- The process of instructing the computer to solve a problem is called _____.

- (A) Compiling
- (B) Programming**
- (C) Processing
- (D) Controlling

21- When a Java program is compiled, the file produced by the compiler ends with the _____ file extension.

- (A) .java
- (B) .class**
- (C) .cpp
- (D) .exe

22- _____ is a little application that is designed to be transmitted over the Internet and run in a Web browser

- (A) Application
- (B) Applet**
- (C) Machine language
- (D) Source code

23- _____ is not an Object-Oriented design principle

- (A) Inheritance
- (B) Encapsulation
- (C) Polymorphism
- (D) Sequence**

24- Inheritance means _____.

- (A) Many Java methods
- (B) Information is put in one place with methods
- (C) Information is shared between classes**
- (D) Write variable names correctly

25- Encapsulation means _____.

- (A) Methods with the same name but different functionality
- (B) Information hiding**
- (C) Information is shared between classes
- (D) Writing statements after each other

26- Polymorphism means _____.

- (A) Many forms**
- (B) Part of a class hidden and another is visible
- (C) Information defined in one class can be used by another class
- (D) Writing a Java program

27. An algorithm is _____.

- (A) a set of directions for solving a problem**
- (B) a source program
- (C) a programming language
- (D) a type of main memory

28. Pseudocode is

- (A) used to write an algorithm**
- (B) a machine language
- (C) used to generate a byte code
- (D) used to test a program

29. A syntax error _____.

- (A) is a grammatical mistake in your program
- (B) is the same as a logical error
- (C) cannot be discovered
- (D) cannot be corrected

30. Runtime errors are _____.

- (A) Grammatical mistakes in a program
- (B) Errors that are detected during compilation
- (C) Errors that are detected when your program is running, but not during compilation
- (D) Errors that do not stop the program from running when they occur.

31. The rules of a programming language constitute its _____.

- (A) objects
- (B) logic
- (C) format
- (D) syntax

32. An error in a program is called a _____.

- (A) mistake
- (B) bug
- (C) loophole
- (D) virus

33. Reused components _____.

- (A) Are likely better tested piece of software, and more reliable than newly created software
- (B) Does not save time and money
- (C) Should not be used to produce new programs.
- (D) Are garbage collection data components