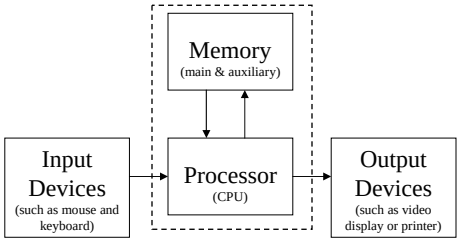
CSE 201
Elementary Computer Programming

Computer Basics

- Computer system: hardware + software
- Hardware: the physical components
- Software: the instructions that tell the hardware what to do

Common Hardware Components

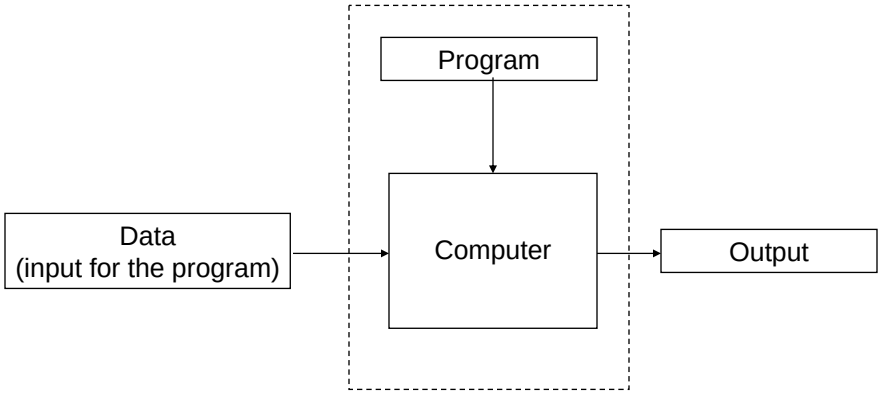
Standard Hardware Organization



- Processor (CPU)
  - Central Processing Unit
  - Interprets and executes the instructions
- Memory
  - main & auxiliary
  - holds data and instructions
- Input device(s)
  - mouse, keyboard, etc.
- Output device(s)
  - video display, printer, etc.
- CPU and memory are physically housed together

Running a Program

Program—a set of instructions for a computer to follow



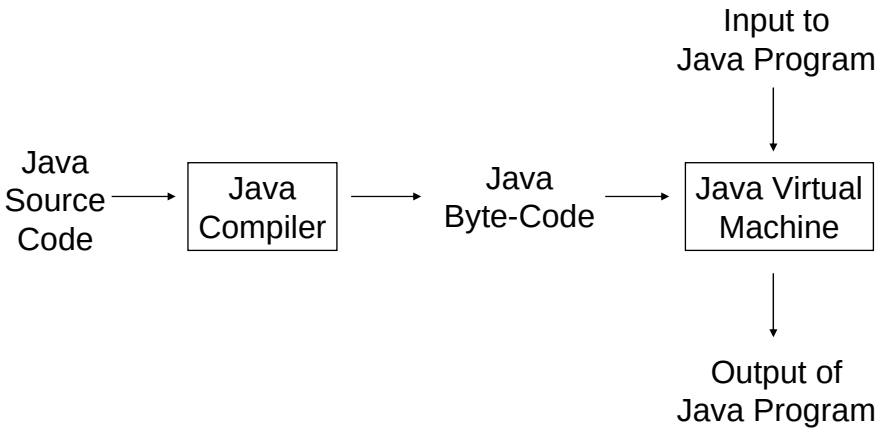
Programming Languages

- Needed to write software
- High-level languages (e.g., Java)
  - relatively easy for people to write and understand
  - not directly understood by computers
- Low-level languages (machine language)
  - directly understood by computer
  - computer-dependent

The Compiler

- A program written in a high-level language (know as the ***source* code**) cannot be executed directly by the computer
- A **compiler** is a program that translates source code into machine code that does the same thing (known as the ***object* code**)

Java Program Translation and Execution



Java Translation/Execution cont.

- Java byte-code is portable (hardware-independent)
- The Java Virtual Machine (JVM) executes Java byte-code on a real machine
- The java compiler is called **javac**
- The JVM emulator is called **java**

Algorithmic Thinking

- *Algorithm* - a set of instructions (steps) for solving a problem.
  - must be precise
  - must be complete
  - can be written in an arbitrary notation (e.g., natural language, programming language, diagram, mix, etc.)
- *Algorithmic thinking* is fundamental to computer science and programming

Example of an Algorithm

Algorithm that determines the total cost of a list of items:

1. Write the number 0 on the blackboard.
2. Do the following for each item on the list:
   a. Add the cost of the item to the number on the blackboard.
   b. Replace the old number on the board by this sum.
3. Announce that the answer is the number written on the board.

First Java Program

```
public class FirstProgram
{
  public static void main(String[] args)
  {
    System.out.println("Hello out there.");
    System.out.println("How's it going?");
    System.out.println(
      "Hope you are having a good day.");
    System.out.println("Good-bye.");
  }
}
```


Language Syntax

- **Syntax** of a language is a set of (grammar) rules that describe the correct way to write sentences (programs) in the language.
- Programming languages have a very precise syntax: If you break the rules, you'll get one (or more) errors.

Structure of a Java Program

```
// import needed libraries

public class ProgramName
{
   public static void main(String[] args)
   {
      // statements go here to describe
      // actions to be taken by the program
   }
}
```


A Java Statement

```
System.out.println(“some message here”);
```

- Outputs the message in quotes to the screen (without the quotes)

What Does FirstProgram Do?

- Take a look at the program and see if you can figure out what the program does.
- It outputs the following:

Programming Errors

- *Syntax* errors—violation of language's syntax rules, e.g., misspelling a word, forgetting a ;, etc. Caught by the compiler!
- *Runtime* errors—execution errors, e.g., division by zero.
- *Logical* errors—the program compiles and runs without runtime errors, but it does not do what it is supposed to.