Lecture 1:
Introduction to Java

MIT-AITI Kenya 2005
Lecture Outline

• What a computer program is
• How to write a computer program
• The disadvantages and advantages of using Java
• How a program that you write in Java is changed into a form that your computer can understand
• Sample Java code and comments
## Computer Program vs. Food Recipe

<table>
<thead>
<tr>
<th>Food Recipe</th>
<th>Computer Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>A <em>chef</em> writes a set of instructions called a <em>recipe</em></td>
<td>A <em>programmer</em> writes a set of instructions called a <em>program</em></td>
</tr>
<tr>
<td>The recipe requires specific <em>ingredients</em></td>
<td>The program requires specific <em>inputs</em></td>
</tr>
<tr>
<td>The <em>cook</em> follows the instructions step-by-step</td>
<td>The <em>computer</em> follows the instructions step-by-step</td>
</tr>
<tr>
<td>The <em>food</em> will vary depending on the amount of <em>ingredients</em> and the <em>cook</em></td>
<td>The <em>output</em> will vary depending on the values of the <em>inputs</em> and the <em>computer</em></td>
</tr>
</tbody>
</table>
Recipe and Program Examples

Ingredient # 1

Recipe

Ingredient # 2

Dinner

Student’s Name

Program

“Bilha got an A on the exam!”

Student’s Grade
What is a computer program?

• For a computer to be able to perform specific tasks (i.e. print what grade a student got on an exam), it must be given instructions to do the task.

• The set of instructions that tells the computer to perform specific tasks is known as a computer program.
Writing Computer Programs

- We write computer programs (i.e. a set of instructions) in programming languages such as C, Pascal, and Java

- We use these programming languages because they are easily understood by humans

- But then how does the computer understand the instructions that we write?
Compiling Computer Programs

• Computers do not understand programs written in programming languages such as Pascal and Java

• Programs must first be compiled or converted into machine code that the computer can run

• A program that translates a programming language into machine code is called a compiler
Compiling Computer Programs

- Because different *platforms*, or hardware architectures along with the operating systems (Windows, Macs, Unix), require different machine code, you must compile most programs separately for each platform.
Compiling Java Programs

- The Java compiler produces bytecode not machine code
- Bytecode is converted into machine code using a Java Interpreter
- You can run bytecode on any computer that has a Java Interpreter installed
Running Programs

Most programs follow a simple format:

Input

Execution

Output

An *input* is something you put into your program that your program can use during its execution.

When you *execute* your program, the computer evaluates the instructions in your program step-by-step.

An *output* is something your program produces after execution.
Running Programs

• Inputs
  - Can come from many sources, such as users, files, and other programs
  - Can take on many forms, such as text, graphics, and sound

• Outputs
  - Can also take on many forms, such as numbers, text, graphics, sounds, or commands to other programs
Running Programs

(string of text)  (number)

Student’s Name  Student’s Grade

Program

“Bilha got an A on the exam!”

(string of text)
Running Programs Pop Quiz

You want to write a program that adds two numbers

• What are the inputs to your program? the two numbers

• What does your program do? adds the two numbers

• What is the output of your program? the sum of the two numbers
Compiling and Running Programs in Java

You only need to compile your Java program once!

Java computer program → Compiler → bytecode → Interpreter → machine code
Advantages of Using Java

• Once a Java program is compiled you can run the bytecode on any machine with a Java interpreter. Because you do not have to recompile the program for each machine, Java is platform independent.

• Java is safe. In other words, the Java language and compiler prevent certain common programming bugs and dangerous operations

• Java standardizes many useful operations such as managing network connections and providing graphical user interfaces
Disadvantages of Using Java

• Running bytecode through an interpreter is not as fast as running machine code, which is specific to each platform.

• Using platform specific features (e.g. Windows taskbar) is difficult in Java because Java is platform-independent.

• In order to run a Java program on multiple machines, you must install a Java Interpreter on each machine.
Running and Compiling Programs Pop Quiz

• How many times do you need to compile a Java program in order to run it on two different platforms? Why?
  Once! Java is platform independent.

• When you compile a Java program, what is the name of the resulting output?
  Bytecode

• Why might running a program in Java be slower than running a program in a language that requires a separate compiler?
  Bytecode has to be run through the interpreter. This process takes more time than running machine code that is specific to each platform.
Example Java Code

• This is part of the code that you will be writing in Lab 0:

```java
/* The HelloWorld class prints “Hello, World!” to the screen */
public class HelloWorld {
    public static void main(String[] args) {
        // Prints “Hello, World!”
        System.out.println("Hello, World!");
    }
}
```
Comments

• *Comments* are used to describe what your code does as an aid for you or others reading your code. The Java compiler ignores them.

• Comments are made using `//`, which comments to the end of the line, or `/* */`, which comments everything inside of it (including multiple lines)

• Two example comments:
  - `/* The HelloWorld class prints “Hello, World!” to the screen */`
  - `// Prints “Hello, World!”`
Comments on Commenting

• You may collaborate on software projects with people around the world who you’ll never meet.

• Should be able to figure out how code works by reading comments alone.

• Anything that is not self-evident needs a comment.

• 50% of your code might be comments.

• Coding is easy; commenting is not.
This lecture covered...

- What a computer program is
- How to write a computer program
- How a program written in Java is changed into a form that a computer can understand
- The disadvantages and advantages of using Java
- An example of Java code and comments