



CSN-103: Fundamentals of Object Oriented Programming

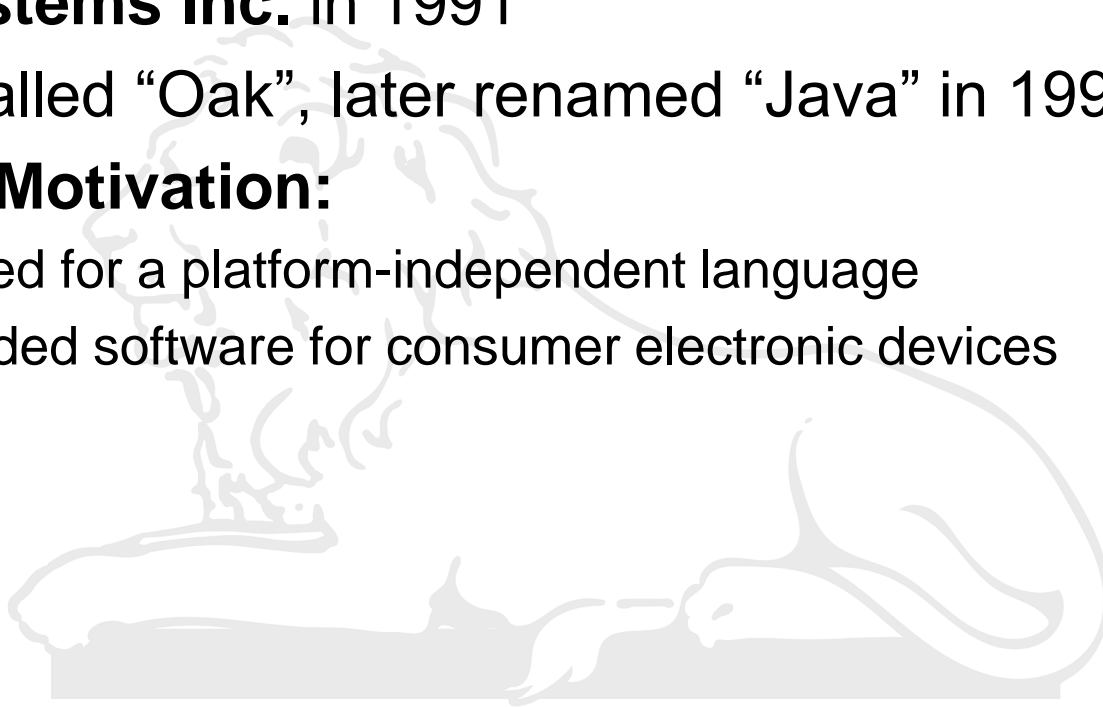
Instructor: Dr. Rahul Thakur

Assistant Professor, Computer Science and Engineering, IIT Roorkee



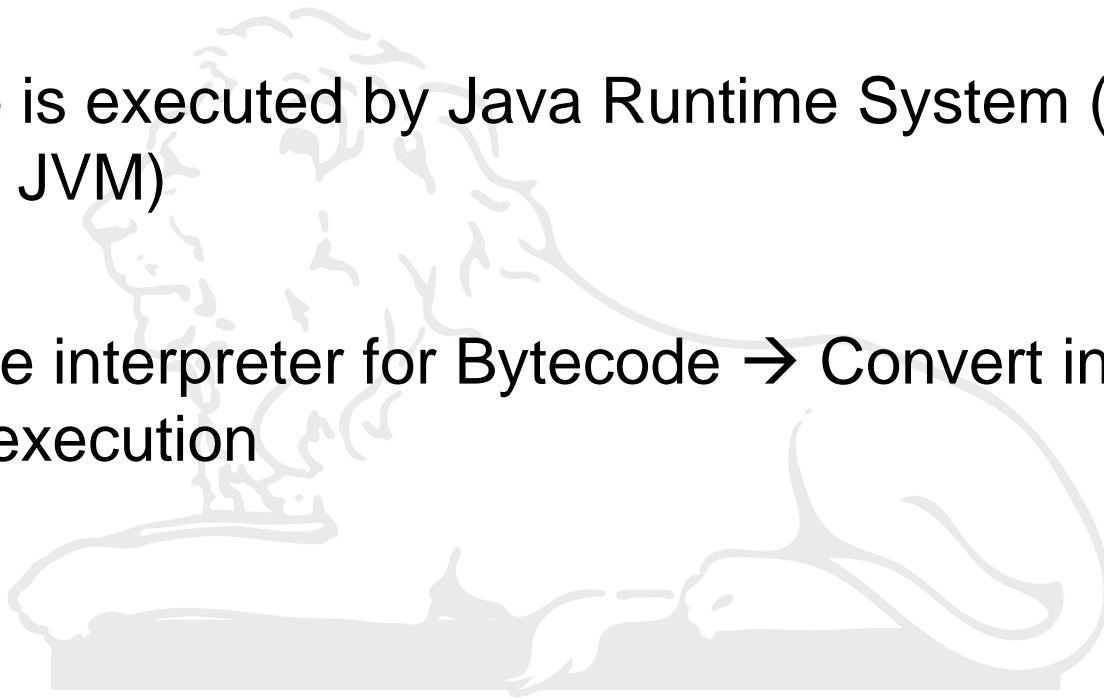
The Creation of Java

- Idea was proposed by James Gosling, Patrick Naughton, and Chris Warth, Ed Frank, and Mike Sheridan at **Sun Microsystems Inc.** in 1991
- Initially called “Oak”, later renamed “Java” in 1995
- **Primary Motivation:**
 - The need for a platform-independent language
 - Embedded software for consumer electronic devices



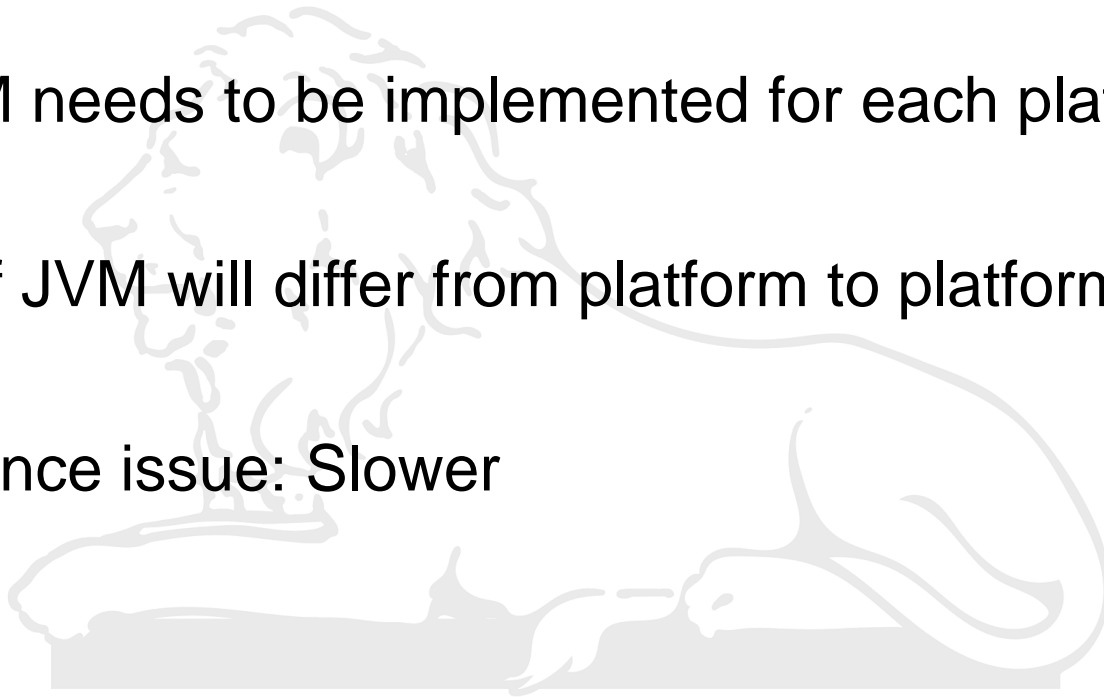
Java Bytecode

- Output of a Java compiler is not an executable code but it is a **Bytecode**
- Bytecode is executed by Java Runtime System (Java Virtual Machine- JVM)
- JVM is the interpreter for Bytecode → Convert into machine code for execution



Java Bytecode

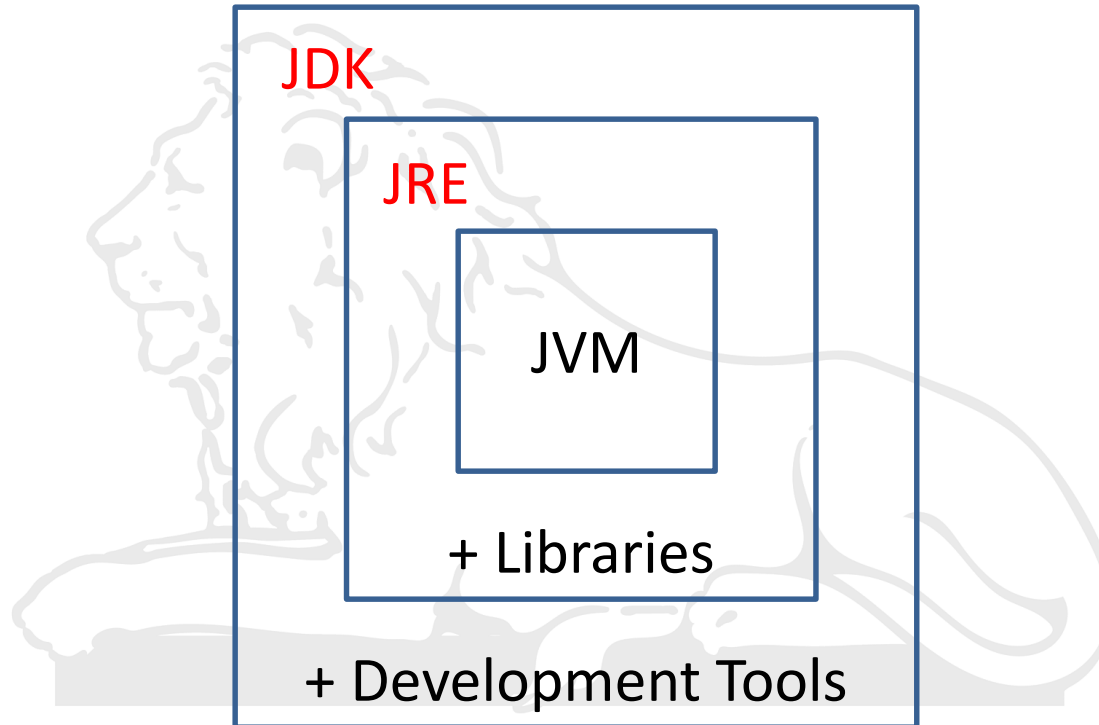
- Bytecode makes it much easier to execute a program in wide variety of environments: **Portable**
- Only JVM needs to be implemented for each platform
- Details of JVM will differ from platform to platform
- Performance issue: Slower



JVM vs. JRE vs. JDK

- **JVM – Java Virtual machine(JVM)**
 - JVM is responsible for executing the java bytecode line by line hence it is also known as interpreter
 - JVM allows Java to be a "portable language" (*write once, run anywhere*)
- **JRE – Java Runtime Environment**
 - Provides environment to only run (not develop) the java program onto your machine.
 - JRE includes JVM and libraries
 - JRE is only used by them who **only want** to run the Java Programs i.e. end users of your system
- **JDK – Java Development Kit**
 - The JDK is a superset of the JRE, and contains everything that is in the JRE, plus tools such as the compilers and debuggers necessary for developing programs and applications
 - Note : JDK is meant for Java Developers

JVM vs. JRE vs. JDK



Java Prerequisites

- You (as a Programmer) must have:
 - A text editor
 - The Java Development Kit (JDK)
 - Includes the Java Compiler



Setting Up Java

1. Download Java (JDK)
2. Install Java (JDK)
3. Update Path environmental variable
4. Verify Installation

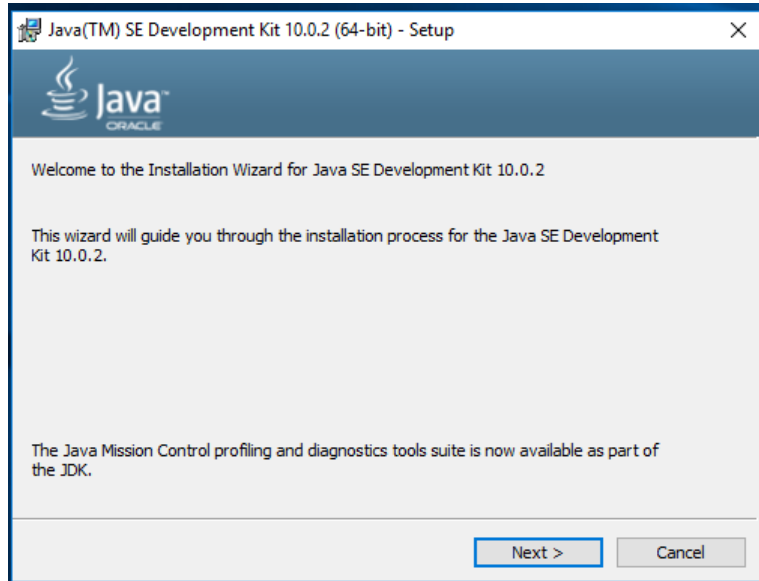


Downloading Java

- Downloading and installing Java is easy and free. There are a couple ways by which you can get Java
 - Online download
 - Offline download
- It can be downloaded here for different platforms:
 - <https://www.oracle.com/technetwork/java/javase/downloads/index.html>
 - Accept License Agreement
 - Select OS
 - OR
 - Click on the following link
<https://drive.google.com/file/d/1UWOepkl9r1zRu8BEFSkRXe4sac1hdPe9/view?usp=sharing>

Installing Java (Windows)

- Once the file is downloaded successfully, double-click on the saved file to start the installation process
- Click the **Next** button to continue with the installation

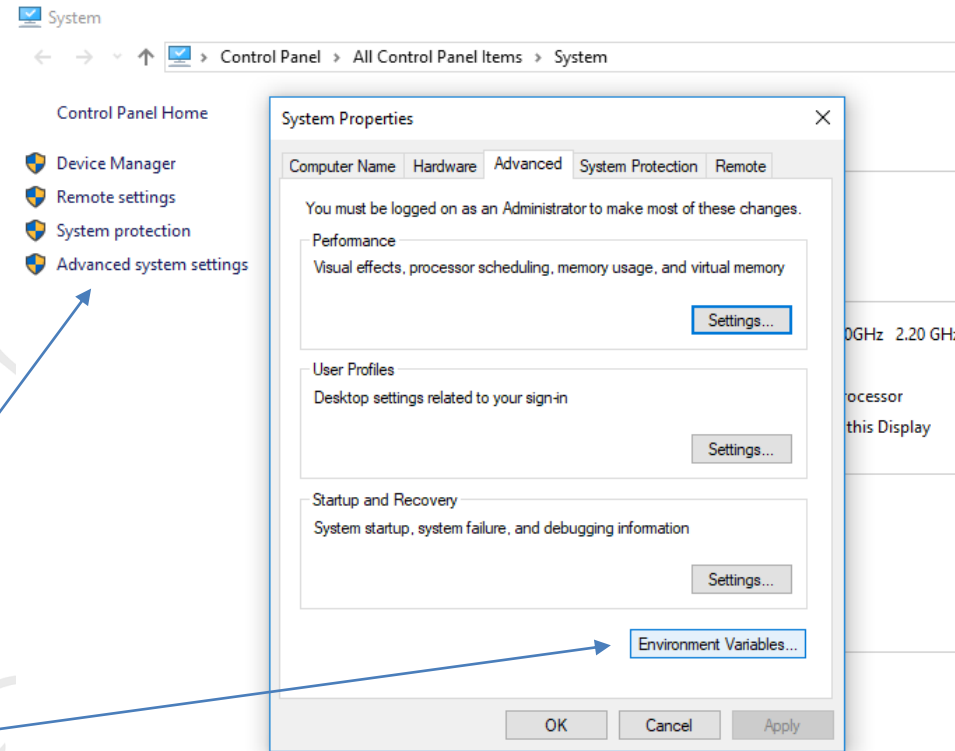


- Click on Close button to finish the installation



Set the Path (Windows)

- The **Path** environmental variable should be updated to include path to bin directory
- Right Click **My Computer** (or This PC) → Select Properties
- Select **Advanced System Settings**
- In **Advanced** tab → Select **Environment Variables**



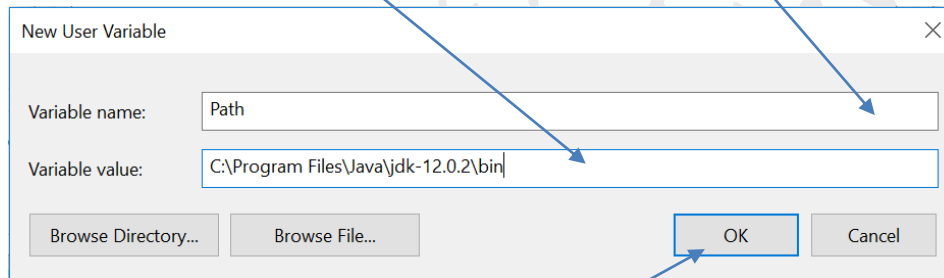
Set the Path (Windows)

- Click on **New** button
- Set the following entries

Variable name: Path

Variable Value:

C:\Program Files\Java\jdk-12.0.2\bin

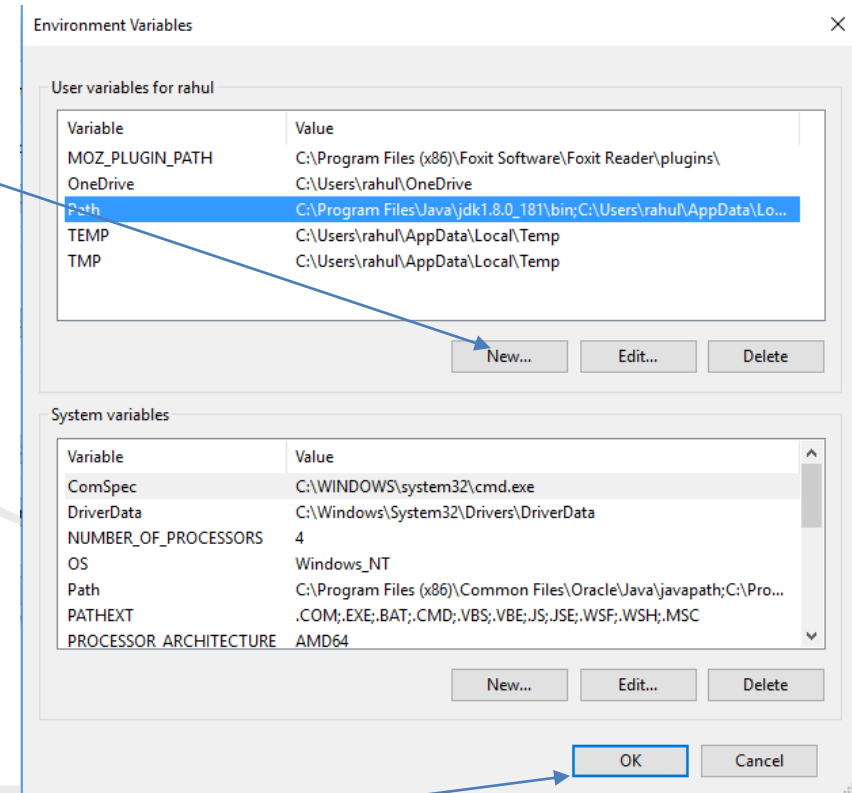


New User Variable

Variable name: Path

Variable value: C:\Program Files\Java\jdk-12.0.2\bin

Browse Directory... Browse File... OK Cancel



Environment Variables

User variables for rahul

Variable	Value
MOZ_PLUGIN_PATH	C:\Program Files (x86)\Foxit Software\Foxit Reader\plugins\
OneDrive	C:\Users\rahu\OneDrive
Path	C:\Program Files\Java\jdk1.8.0_181\bin;C:\Users\rahu\AppData\Lo...
TEMP	C:\Users\rahu\AppData\Local\Temp
TMP	C:\Users\rahu\AppData\Local\Temp

New... Edit... Delete

System variables

Variable	Value
ComSpec	C:\WINDOWS\system32\cmd.exe
DriverData	C:\Windows\System32\Drivers\DriverData
NUMBER_OF_PROCESSORS	4
OS	Windows_NT
Path	C:\Program Files (x86)\Common Files\Oracle\Java\javapath;C:\Pro...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE	AMD64

New... Edit... Delete

OK Cancel

- Press **OK** button and you are done

Verify Java

- Go to command prompt/terminal and type **javac**
- It should display **javac** usage with options if installed correctly



A Simple Java Program

```
class Example
```

```
{
```

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

```
    {
```

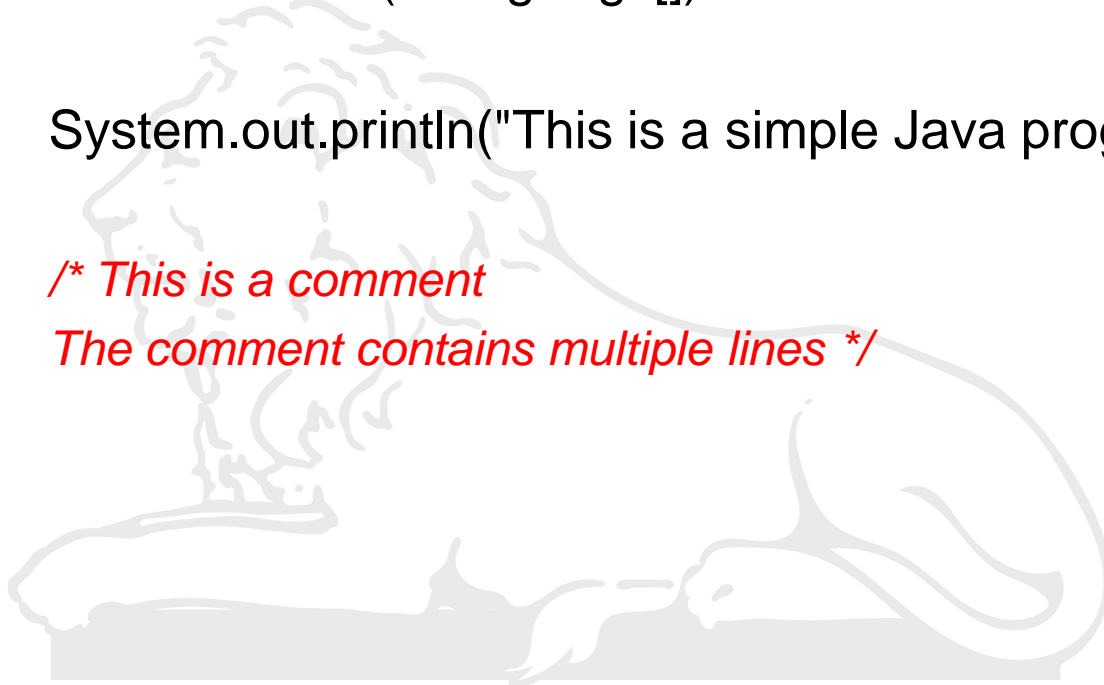
```
        System.out.println("This is a simple Java program");
```

```
    }
```

```
        /* This is a comment
```

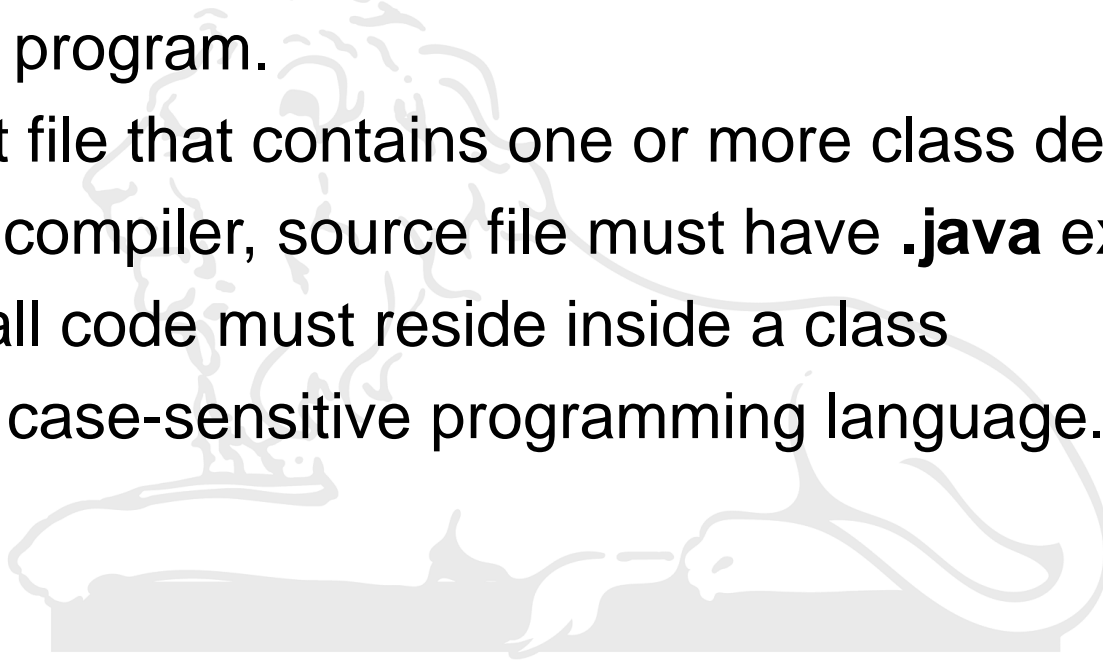
```
        The comment contains multiple lines */
```

```
}
```



Things to remember

- The name of the source file is very important.
 - In previous example, the name of the file will be **Example.java**
- The name of the class should match the name of file that holds the program.
- It is a text file that contains one or more class definitions.
- For Java compiler, source file must have **.java** extension.
- In Java, all code must reside inside a class
- Java is a case-sensitive programming language.



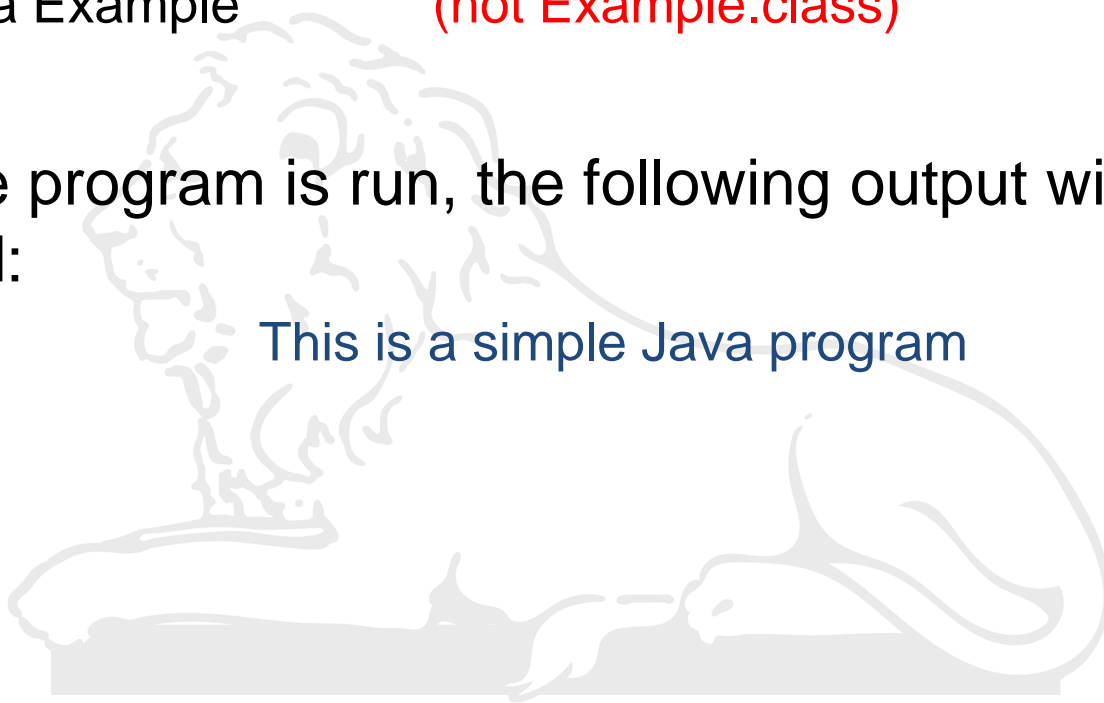
Compiling the Program

- **Change the Current Working Directory**
 - Using cd (change directory command)
 - Locate where you have saved your program
- Execute the java compiler (**javac**)
 - C:\>javac Example.java
- Javac compiler will create **Example.class** file
- .class file contains the **bytecode** version of the program
- To execute a bytecode, we need **JVM**

Executing the Program

- To run the program, we need Java Application Launcher called **java**
 - C:\>java Example (not Example.class)
- When the program is run, the following output will be displayed:

This is a simple Java program



Single-File Source-Code Programs

- Early stages of learning Java
 - Writing small utility programs
- Two Steps
 - Compilation: javac
 - Execution: java
- How about running a program supplied as a single file of Java source code?

C:\>java Example.java

- ONLY supported by JDK 11 and 12.

Compiling and Running Java Program

