INTRODUCTION

210301301

CORE JAVA

210301305

PRACTICAL ON CORE JAVA

BY:

Prof. (Dr.) Ankit Bhavsar

210301301 CORE JAVA

UNIT	MODULES	WEIGHTAGE
1	Introduction to Java	20 %
2	Java Programming Constructs, Classes, Vectors and Arrays	20 %
3	Inheritance, Interface and Packages	20 %
4	Exception Handling and Multi - Threading	20 %
5	Applets	20 %

Unit – I
Introduction to Java

Index

- Object Oriented Concepts
- Basics of Java

Object Oriented Concepts

- Introduction
- Need of OOP
- Principles of OOP
- Java v/s Procedural Language v/s OOP
- History of Java
- Java Essentials
- Java Features
- Java Program Structure
- Java Architecture
- Introduction to Java framework
- Real Time Java Applications

INTRODUCTION

What is Java?

- Java is a popular programming language, **created in 1995.**
- It is **owned by Oracle,** and more than 3 billion devices run Java.

It is used for:

- Mobile applications (specially Android apps)
- Artificial Intelligence
- Big Data
- Serverless Architecture
- Spring Framework
- Cloud based Models
- Remote Access Solutions

Need of OOP

Disadvantages of OOP :

- Data is exposed to whole program, so no security for data.
- Difficult to relate with real world objects.
- Importance is given to the operation on data rather than the data.
- Difficult to create new data types reduces extensibility.

Examples of Procedural languages :

- BASIC
- C
- Pascal
- FORTRAN

Need of OOP

Advantages of OOP :

- OOP provides a clear **modular structure** for programs.
- It is good for defining **abstract data type**s.
- Implementation details are **hidden from other modules** and other modules has a clearly defined interface.
- It is **easy to maintain and modify existing code** as new objects can be created with small differences to existing ones.
- **Objects, methods, instance, message passing, inheritance** are some important properties provided by these particular languages.
- **Ecapsulation, polymorphism, abstraction are al**so counts in these fundamentals of programming language.
- It implements real life scenario.

Introduction to OOP

- Object + Oriented + Programming
- Deals with object to build program & software
- Object = Identity + Attributes + Behaviour

Principles of OOP

- Class
- Object
- Data Abstraction
- Data Encapsulation
- Polymorphism
- Inheritance

Principles of OOP Language

- **Classes:** Collection of similar objects
- **Objects:** Instance of class
- **Abstraction:** Hiding the implementation details and showing only functionality to the user.
- **Inheritance:** Adopt the characteristics of one class into another class
- **Encapsulation:** Wrapping of data in single unit
- **Polymorphism:**Perform a single action by different ways

What is JAVA ?

- Java is a popular programming language, created in 1995.
- It is owned by Oracle, and more than 3 billion devices run Java.
- Java is a high level, robust, secured and object-oriented programming language.
- “Java is a programming language and a platform.”
- Java Applications are called **WORA** (Write Once Run Anywhere)
- **Platform**: Any hardware or software environment in which a program runs, is known as a platform. Since Java has its own runtime environment (JRE) and API, it is called platform.

Common devices that run Java

- Airplane Systems
- ATMs
- BlackBerry Smartphones
- Blu-ray Disc Players
- Cable Boxes
- Cell Phones
- Computers
- Credit Cards
- CT Scanners
- Government IDs
- Home Security Systems
- Kindle E-Readers
- Livescribe Smartpens
- Lottery Systems
- MRIs
- On-Board Computer Systems
- Parking Meters
- PlayStation Consoles
- Printers
- Public Transportation Passes
- Robots
- Routers
- Smart Grid Meters
- TVs
- Vehicle Diagnostic Systems
- VoIP Phones

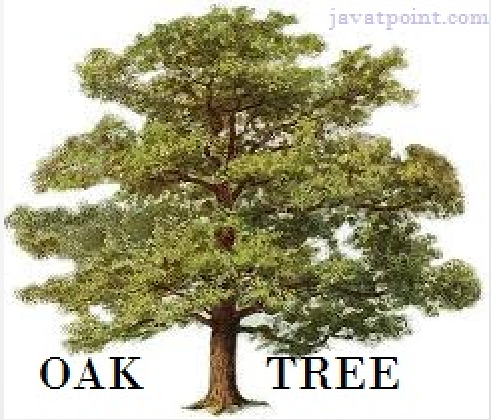
History of Java

- James Gosling, Mike Sheridan, and Patrick Naughton **initiated the Java language project in June 1991.**
- The small team of sun engineers called **Green Team.**
- Originally designed for small, embedded systems in electronic appliances like **set-top boxes.**
- Firstly, it was called "**Greentalk"** by James Gosling and file extension was .gt.
- After that, **it was called Oak and was developed as a part of the Green project.**

History of Java

Why Sun choosed "Oak" name?

- Why Oak? Oak is a symbol of strength and choosen as a **national tree of many countries like U.S.A.,** France, Germany, Romania etc.
- In **1995, Oak was renamed as "Java" because it was already a trademark by Oak Technologies.**



History of Java

Why sun choosed "Java" name?

- The team gathered to choose a new name.
- The suggested words were "dynamic", "revolutionary", "Silk", "jolt", "DNA" etc. They wanted something that reflected the essence of the technology: revolutionary, dynamic, lively, cool, unique, and easy to spell and fun to say.
- According to James Gosling "**Java was one of the top choices along with Silk".**
- Since java was so unique, most of the team members preferred java.
- **Java is an island of Indonesia where first coffee was produced (called java coffee).**
- **JDK 1.0 released in(January 23, 1996).**

History of Java

- Java SE 17 (September 2021)
- Java SE 18 (to be released by March 2022)

C v/s C++ v/s JAVA

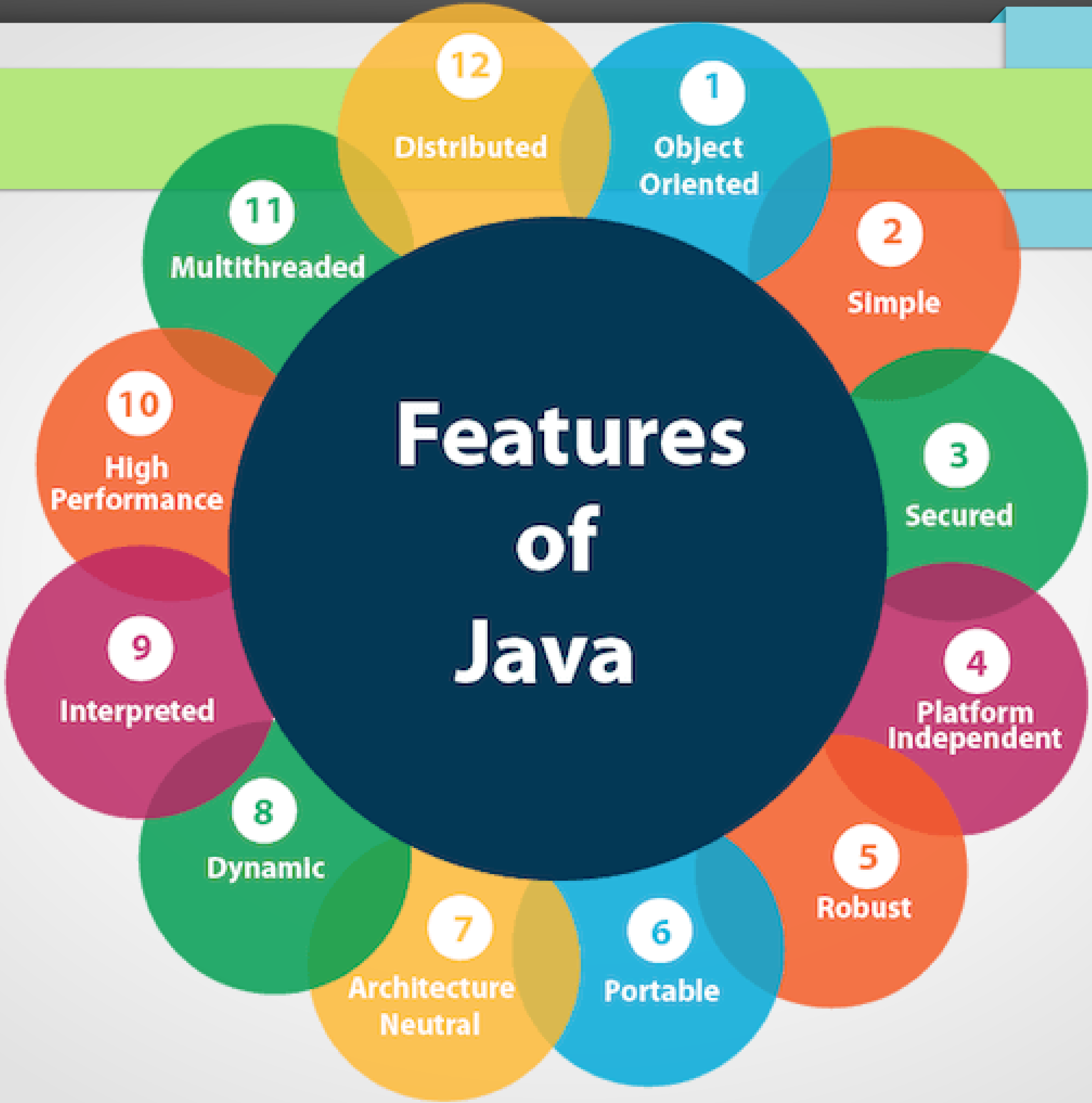
Metrics	C	C++	Java
Programming Paradigm	Procedural language	Object-Oriented Programming (OOP)	Pure Object Oriented Oriented
Origin	Based on Assembly language	Based on C language	Based on C and C++
Developer	Dennis Ritchie in 1972	Bjarne Stroustrup in 1979	James Gosling in 1991
Translator	Compiler only	Compiler only	Interpreted language (**Compiler + interpreter**)
Platform Dependency	Platform Dependent	Platform Dependent	Platform Independent
Code execution	Direct	Direct	Executed by JVM (**Java Virtual Machine**)
Approach	Top-down approach	Bottom-up approach	Bottom-up approach

C v/s C++ v/s JAVA

Metrics	C	C++	Java
File generation	.exe files	.exe files	.class files
Pre-processor directives	Support header files (#include, #define)	Supported (#header, #define)	Use Packages (import)
keywords	Support 32 keywords	Supports 63 keywords	50 defined keywords
Datatypes (union, structure)	Supported	Supported	Not supported
Inheritance	No inheritance	Supported	Supported except Multiple inheritance
Overloading	No overloading	Support Function overloading (Polymorphism)	Operator overloading is not supported
Pointers	Supported	Supported	Not supported

C v/s C++ v/s JAVA

Metrics	C	C++	Java
Allocation	Use malloc, calloc	Use new, delete	Garbage collector
Exception Handling	Not supported	Supported	Supported
Templates	Not supported	Supported	Not supported
Destructors	No constructor neither destructor	Supported	Not supported
Multithreading/ Interfaces	Not supported	Not supported	Supported
Database connectivity	Not supported	Not supported	Supported
Storage Classes	Supported (auto, extern)	Supported (auto, extern)	Not supported



Features of Java

1 Object Oriented

2 Simple

3 Secured

4 Platform Independent

5 Robust

6 Portable

7 Architecture Neutral

8 Dynamic

9 Interpreted

10 High Performance

11 Multithreaded

12 Distributed

Java Features

- **Object Oriented** − In Java, **everything is an Object**. Java can be **easily extended** since it is based on the Object model.
- **Platform Independent** − Unlike many other programming languages including C and C++, when Java is compiled, it is not compiled into platform specific machine, rather into **platform independent byte code.** This byte code is distributed over the web and interpreted by the Virtual Machine (JVM) on whichever platform it is being run on.
- **Simple** − Java is designed to be easy to learn. If you understand the basic concept of OOP Java, it would be easy to master.
- **Secure** − With **Java's secure feature it enables to develop virus-free, tamper-free systems**. Authentication techniques are based on public-key encryption.

Java Features

- **Portable** − Being **architecture-neutral** and having no implementation dependent aspects of the specification makes Java portable.
- **Robust** − Java makes an effort to **eliminate error prone situations** by emphasizing mainly on compile time error checking and runtime checking.
- **Multithreaded** − With Java's multithreaded feature it is **possible to write programs that can perform many tasks simultaneously.** This design feature allows the developers to construct interactive applications that can run smoothly.
- **Architecture-neutral -** Java is architecture neutral because **there are no implementation dependent features,** for example, the size of primitive types is fixed.

Java Features

- **Interpreted** − Java byte code is translated on the fly to native machine instructions and is not stored anywhere. The development process is more rapid and analytical since the linking is an incremental and light-weight process.
- **High Performance** − With the use of Just-In-Time compilers, Java enables high performance.
- **Distributed** − Java is designed for the distributed environment of the internet.
- **Dynamic** − Java is considered to be more dynamic than C or C++ since it is designed to adapt to an evolving environment. Java programs can carry extensive amount of run-time information that can be used to verify and resolve accesses to objects on run-time.

Java Version

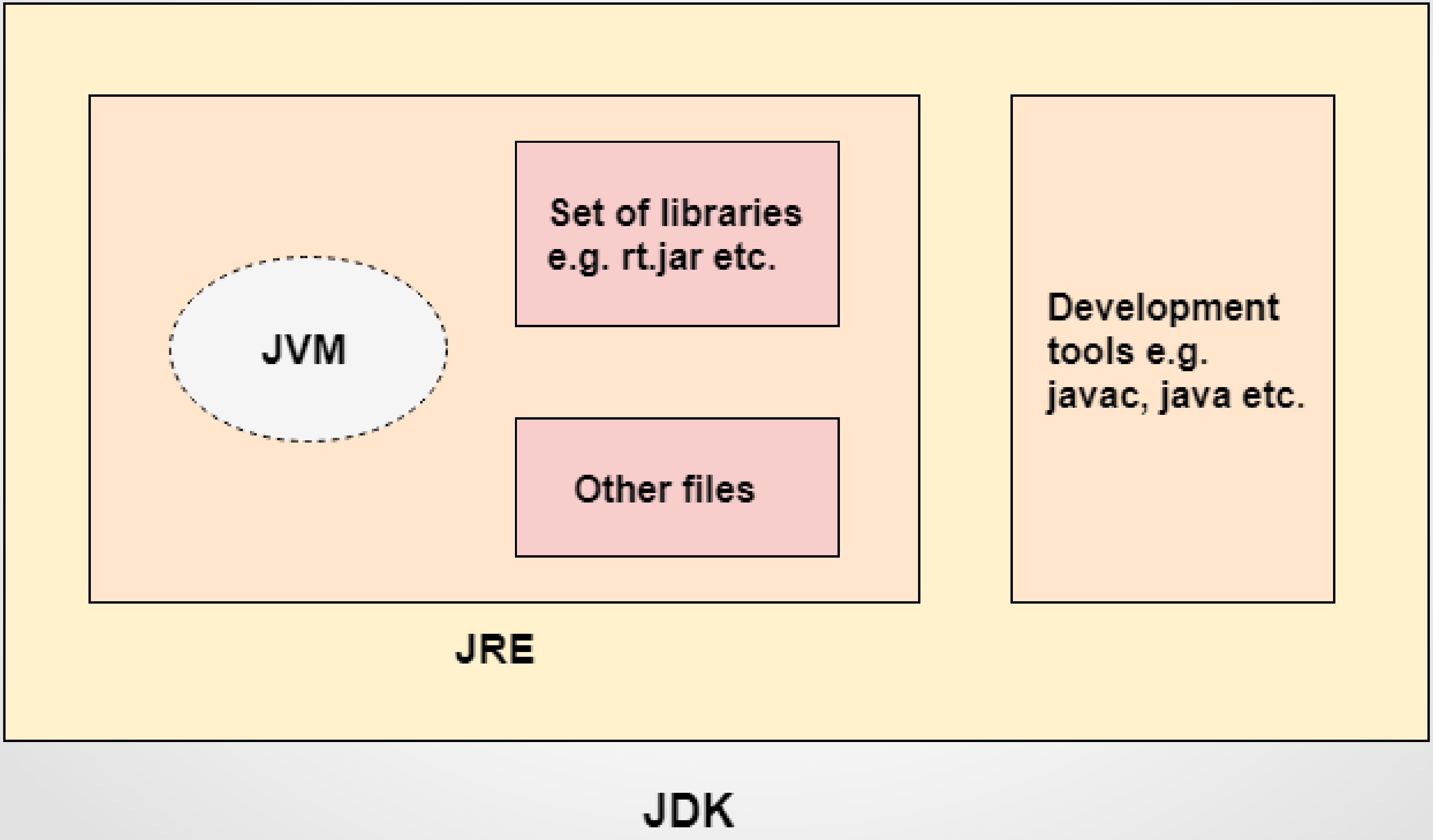
- JDK Alpha and Beta (1995)
- JDK 1.0 (23rd Jan 1996)
- JDK 1.1 (19th Feb 1997)
- J2SE 1.2 (8th Dec 1998)
- J2SE 1.3 (8th May 2000)
- J2SE 1.4 (6th Feb 2002)
- J2SE 5.0 (30th Sep 2004)
- Java SE 6 (11th Dec 2006)
- Java SE 7 (28th July 2011)
- Java SE 8 (18th Mar 2014)
- Java SE 9 (21st Sep 2017)
- Java SE 10 (20th Mar 2018)
- Java SE 11 (September 2018)
- Java SE 12 (March 2019)
- Java SE 13 (September 2019)
- Java SE 14 (Mar 2020)
- Java SE 15 (September 2020)
- Java SE 16 (Mar 2021)
- Java SE 17 (September 2021)
- Java SE 18 (to be released by March 2022)

Why use Java?

- Java works on **different platforms** (Windows, Mac, Linux, Raspberry Pi, etc.)
- It is one of the most popular programming language in the world
- It is easy to learn and simple to use
- It is **open-source and free**
- It is **secure, fast and powerful**
- It has a huge community support (tens of millions of developers)
- Java is an object oriented language which gives a clear structure to programs and allows code to be reused, lowering development costs
- As Java is close to C++ and C#, it makes it easy for programmers to switch to Java or vice versa.

Common Terminologies used in Java

- Java Virtual Machine (JVM)
- Bytecode
- Java Development Kit (JDK)
- Java Runtime Environment (JRE)
- Garbage Collector
- ClassPath

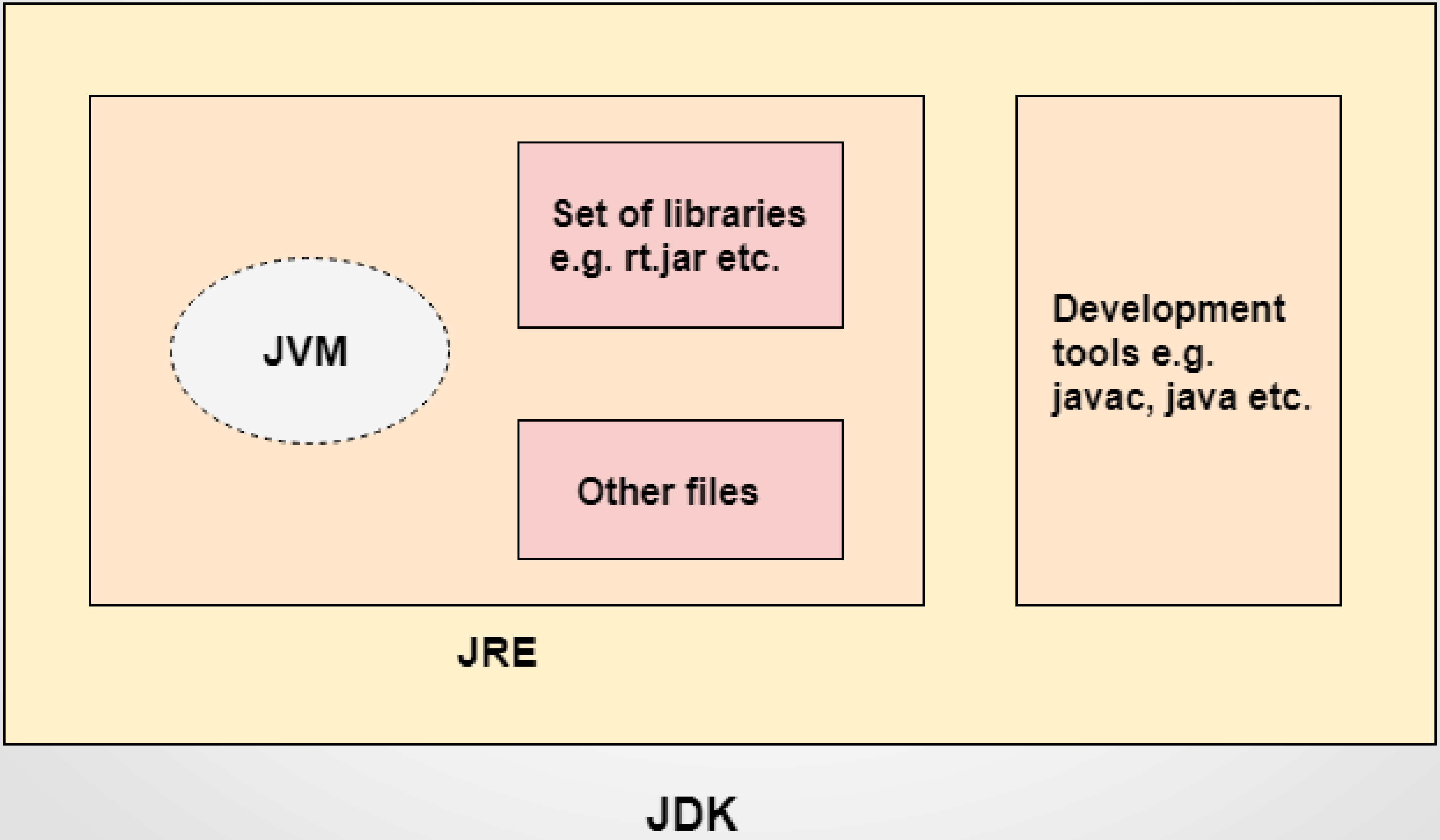

Set of libraries e.g. rt.jar etc.
JVM
Other files
Development tools e.g. javac, java etc.
JRE
JDK

Java Virtual Machine(JVM):

- This is generally referred to as JVM.
- There are three execution phases of a program. They are writting a program, compiling it and running the program.
- Writing a program is done by a java programmer.
- **The compilation is done by the JAVAC compile**r which is a primary Java compiler included in the Java development kit (JDK). **It takes Java program as input and generates bytecode as output.**
- In the Running phase of a program, JVM executes the bytecode generated by the compiler.
- The function of Java Virtual Machine is to execute the bytecode produced by the compiler.
- Every Operating System has a different JVM but the output they produce after the execution of bytecode is the same across all the operating systems. Thus Java is known as a platform-independent language.

Bytecode

- Bytecode is generated in the Development process:
- The Javac compiler of JDK compiles the java source code into bytecode so that it can be executed by JVM.
- It is saved as .class file by the compiler.
- To view the bytecode, a disassembler like javap can be used.
- The javap tool is used to get the information of any class or interface.
- The javap command (also known as the Java Disassembler) disassembles one or more class files.



JVM

Set of libraries e.g. rt.jar etc.

Other files

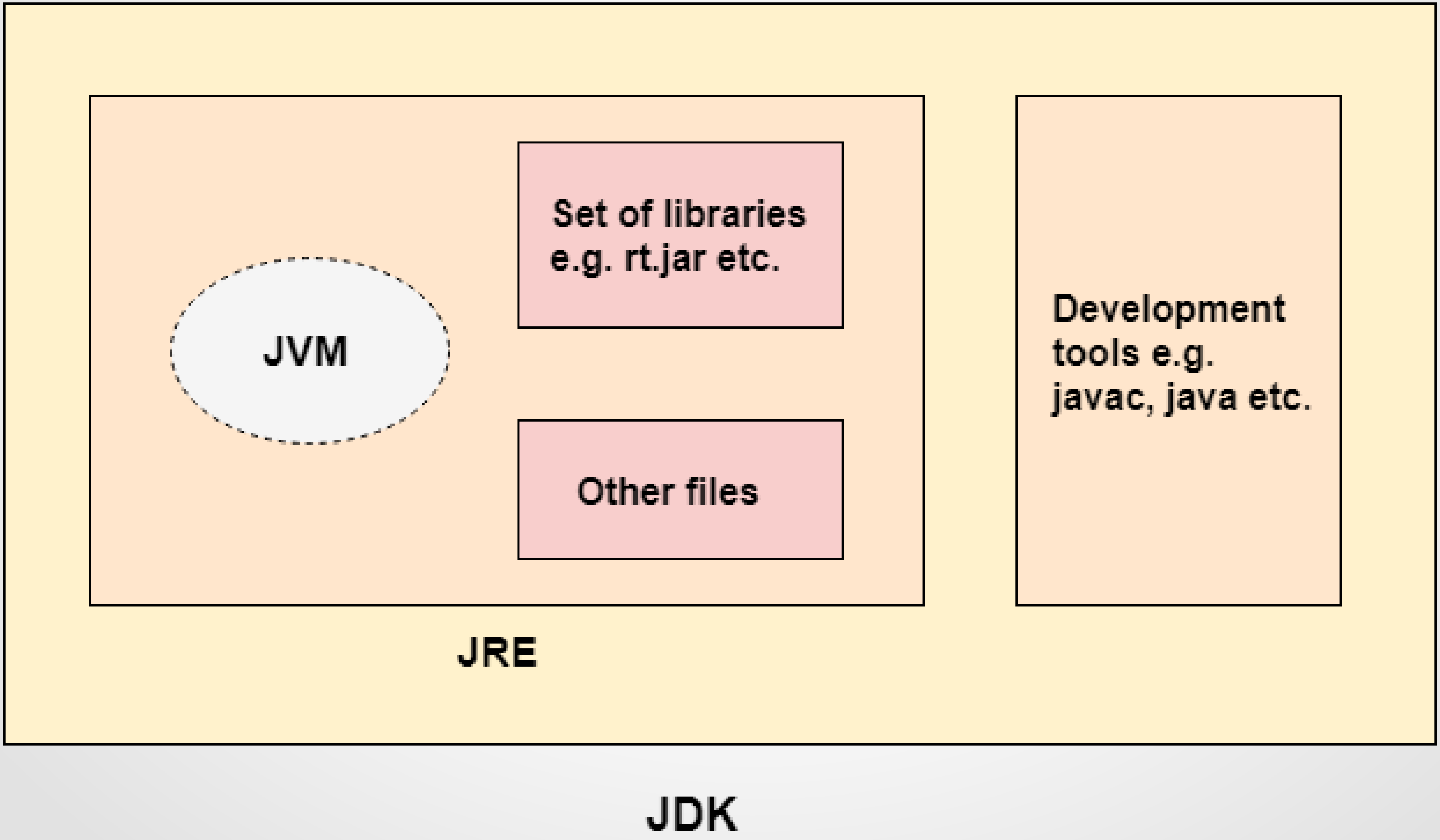
JRE

Development tools e.g. javac, java etc.

JDK

Java Runtime Environment (JRE):

- JDK includes JRE.
- JRE installation on our computers allows the java program to run, however, we cannot compile it.
- JRE includes a browser, JVM, applet supports, and plugins.
- For running the java program, a computer needs JRE.



JVM

Set of libraries e.g. rt.jar etc.

Other files

JRE

Development tools e.g. javac, java etc.

JDK

Java Development Kit(JDK):

- It is a complete Java development kit that includes everything including compiler, Java Runtime Environment (JRE), java debuggers, java docs, etc.
- For the program to execute in java, we need to install JDK on our computer in order to create, compile and run the java program.
- The JDK is a development environment for building applications, applets, and components using the Java programming language.
- The **JDK includes tools useful for developing and testing programs** written in the Java programming language and running on the Java platform.

How to install JDK?

- https://www.oracle.com/java/technologies/downloads/
  - Use the above link to download and install

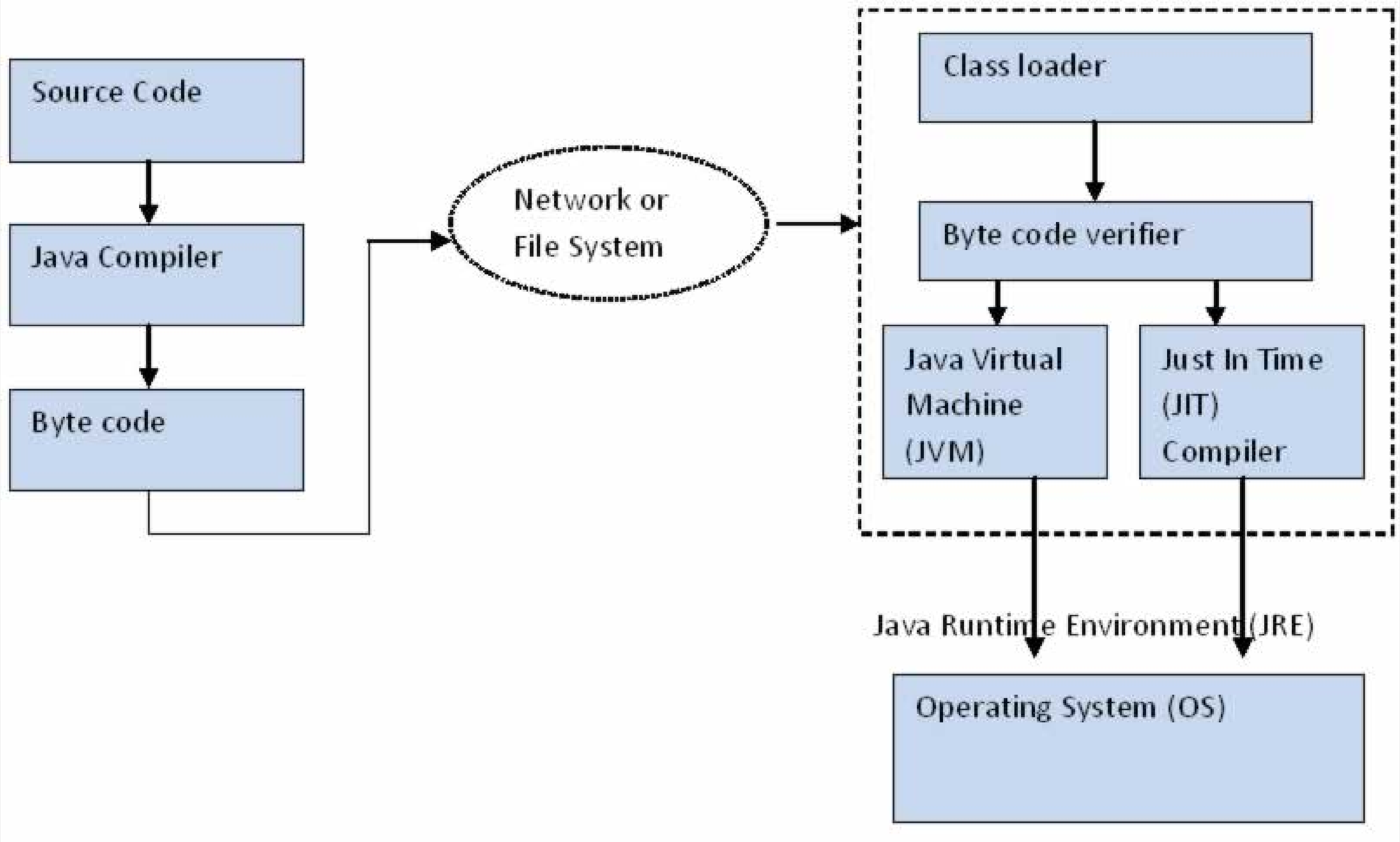
Garbage Collector:

- In Java, programmers can’t delete the objects.
- To delete or recollect that memory JVM has a program called Garbage Collector.
- Garbage Collectors can recollect the of objects that are not referenced.

ClassPath:

- The classpath is the file path where the java runtime and Java compiler look for .class files to load.
- By default, JDK provides many libraries.
- If you want to include external libraries they should be added to the classpath.

Java Architecture

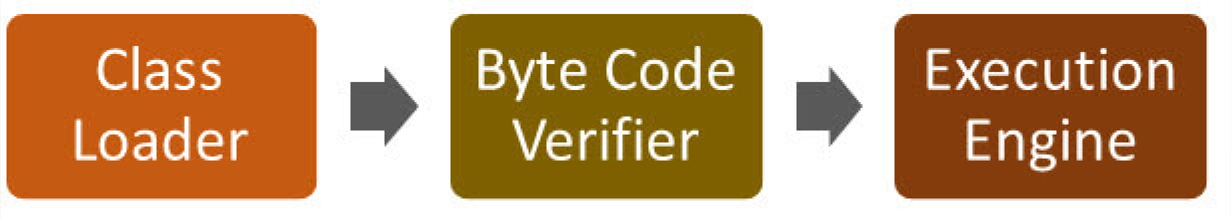


Java Architecture

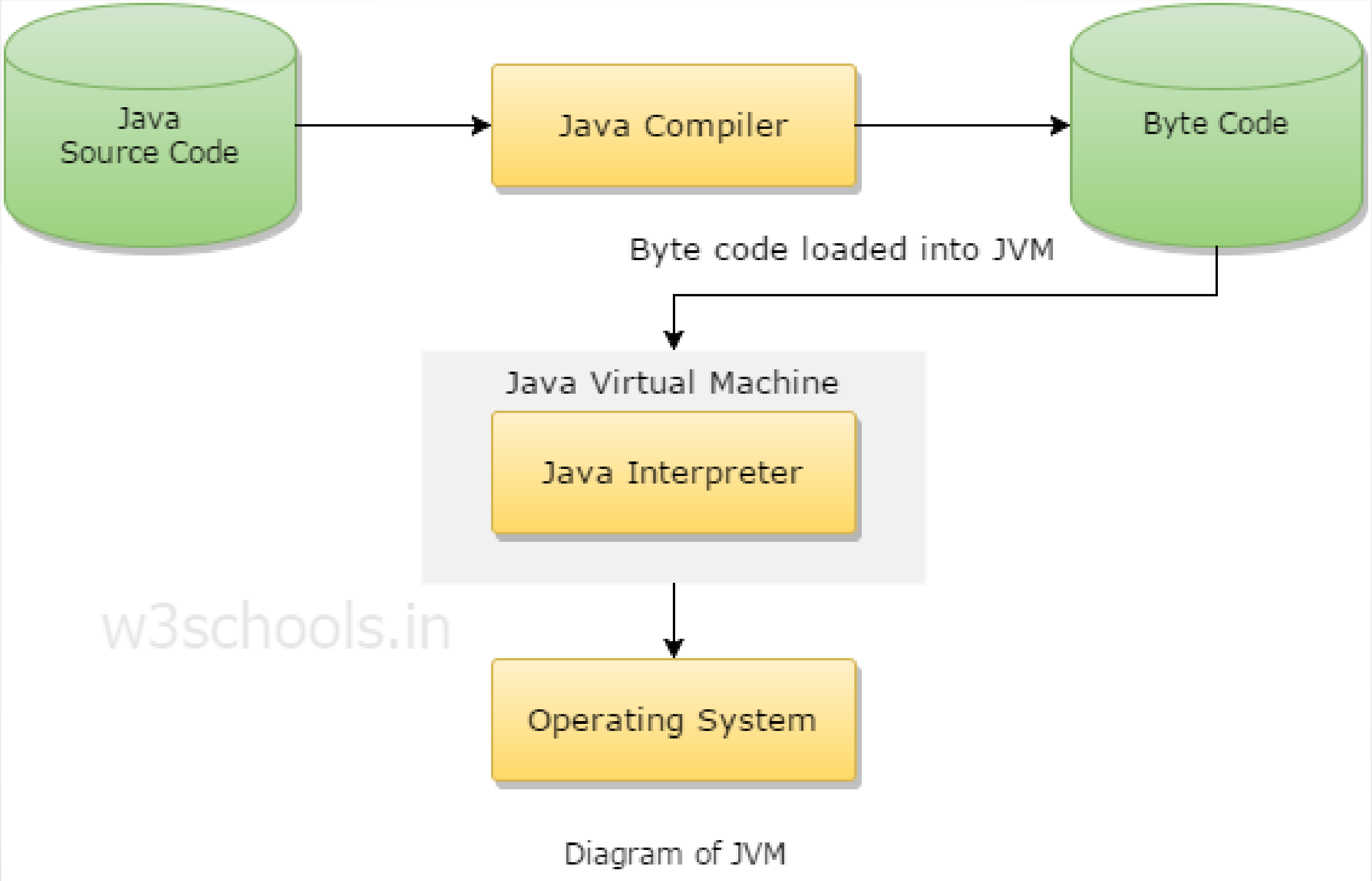
- In Java, there is a process of compilation and interpretation.
- The code written in Java, is converted into byte codes which is done by the **Java Compiler**.
- The **Just-In-Time (JIT) compiler** is a an essential part of the JRE i.e. **Java Runtime Environment,** that is responsible for performance optimization of java based applications at run time.
- The byte codes, then are converted into machine code by the **JVM**.
- The Machine code is executed directly by the machine.

Java Architecture

- **Java Virtual Machine (JVM)** is a engine that provides runtime environment to drive the Java Code or applications.
- It converts Java bytecode into machines language. JVM is a part of Java Run Environment (JRE).
- JVM is responsible for allocating memory space.



Java Architecture



w3schools.in

Diagram of JVM

Java Architecture

- There are three main components of Java language:
  - JVM, JRE, and JDK.
- Java Virtual Machine, Java Runtime Environment and Java Development Kit respectively.

Java Programming Structure

```
class Simple
{
    public static void main(String args[])
    {
    System.out.println("Hello Java");
     }
}
```

To compile: javac Simple.java

To execute: java Simple

Java Programming Structure

- **class** keyword is used to declare a class in java.
- **public** keyword is an access modifier which represents visibility, it means it is visible to all.
- **static** is a keyword, if we declare any method as static, it is known as static method. The core advantage of static method is that there is no need to create object to invoke the static method. The main method is executed by the JVM, so it doesn't require to create object to invoke the main method. So it saves memory.
- **void** is the return type of the method, it means it doesn't return any value.
- **main** represents startup of the program.
- **String[] args** is used for command line argument. We will learn it later.
- **System.out.println()** is used print statement. We will learn about the internal working of System.out.println statement later.

Demo_1_1 Demo_1 Demo_2

Introduction to Java framework

- **Frameworks are large bodies of pre-written code** to which you add your own code in order to solve a problem.
- **You make use of a framework by calling its methods, inheritance, and supplying callbacks, listeners, or other implementations of the patterns.**
- A framework will often dictate the structure of an application.
- Some frameworks even supply so much code that you have to do very little to write your application.

Top Java Frameworks used

- Spring
- Hibernate
- JavaServer Faces [JSF]
- Struts
- Google web toolkit [GWT]
- Grails
- Vaadin
- Blade
- Dropwizard
- Play

Real Time Java Applications

1) Android Apps

2) Server Apps at Financial Services Industry

3) Java Web applications

4) Software Tools

5) Trading Application

6) J2ME Apps

7) Embedded Space

8) Big Data technologies

9) High Frequency Trading Space

10) Scientific Applications

Variables

“ Variable is a name of memory location “

int data=123;

Variable is a symbolic name refer to a memory location used to store values that can change during the execution of a program.

Example:

int a = 10;

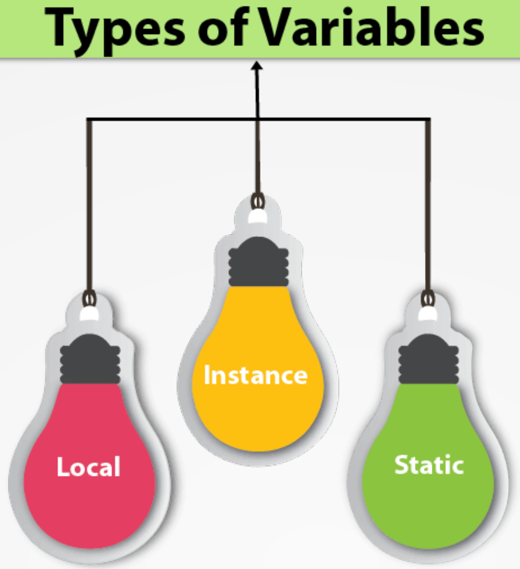
Here, int = data type

a = identifier

10 = literal

- There are three types of variables in java: local, instance and static.

Variables



1) Local Variable
A variable which is declared inside the method is called local variable.

2) Instance Variable
A variable which is declared inside the class but outside the method, is called instance variable . It is not declared as static.

3) Static variable
A variable that is declared as static is called static variable. It cannot be local.

Variables

```
class A
{
      int data=50;//instance variable
      static int m=100;//static variable

        void method()
        {
                  int n=90;//local variable
        }
}
```

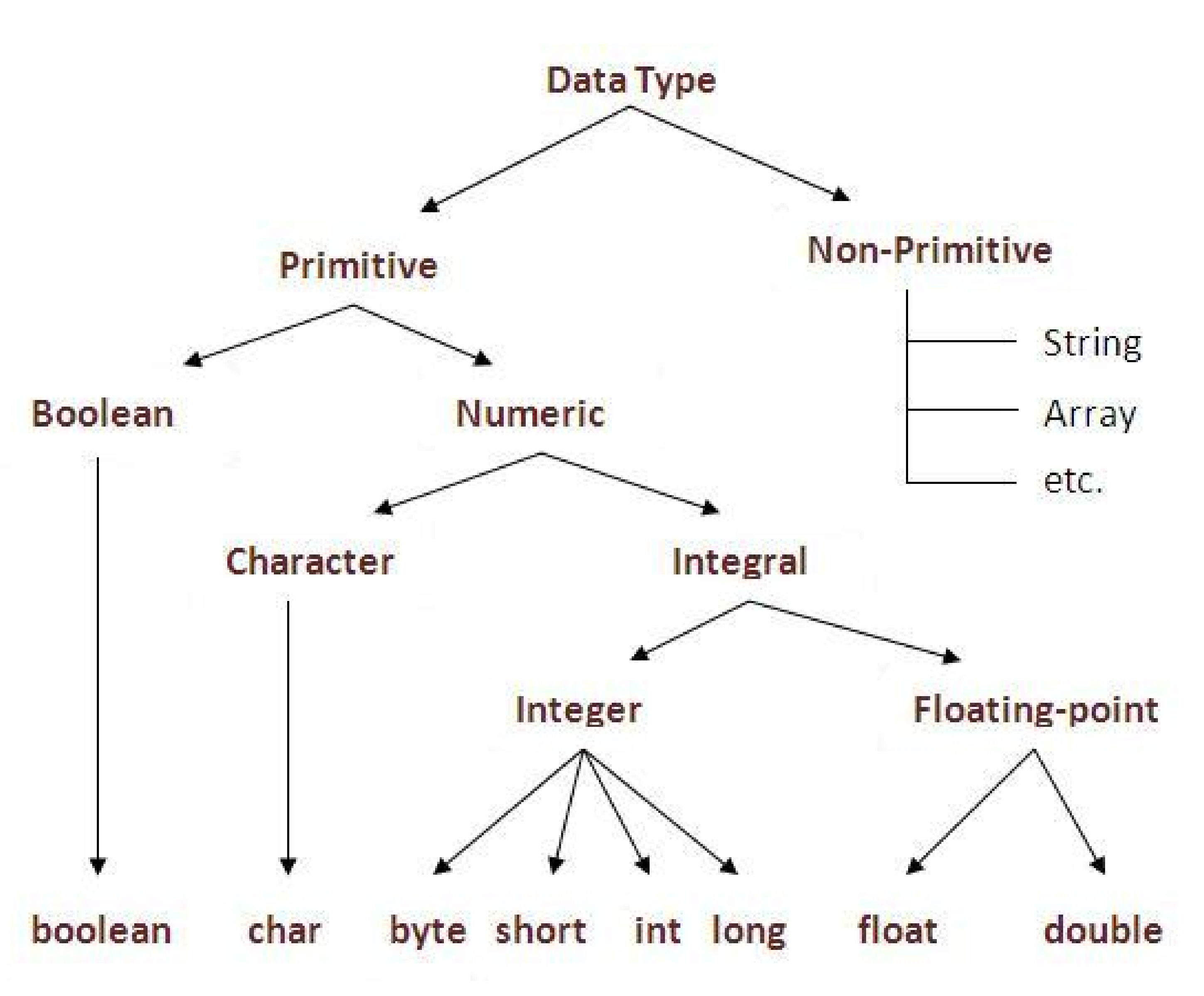
MarksDemo.java

Student1.java

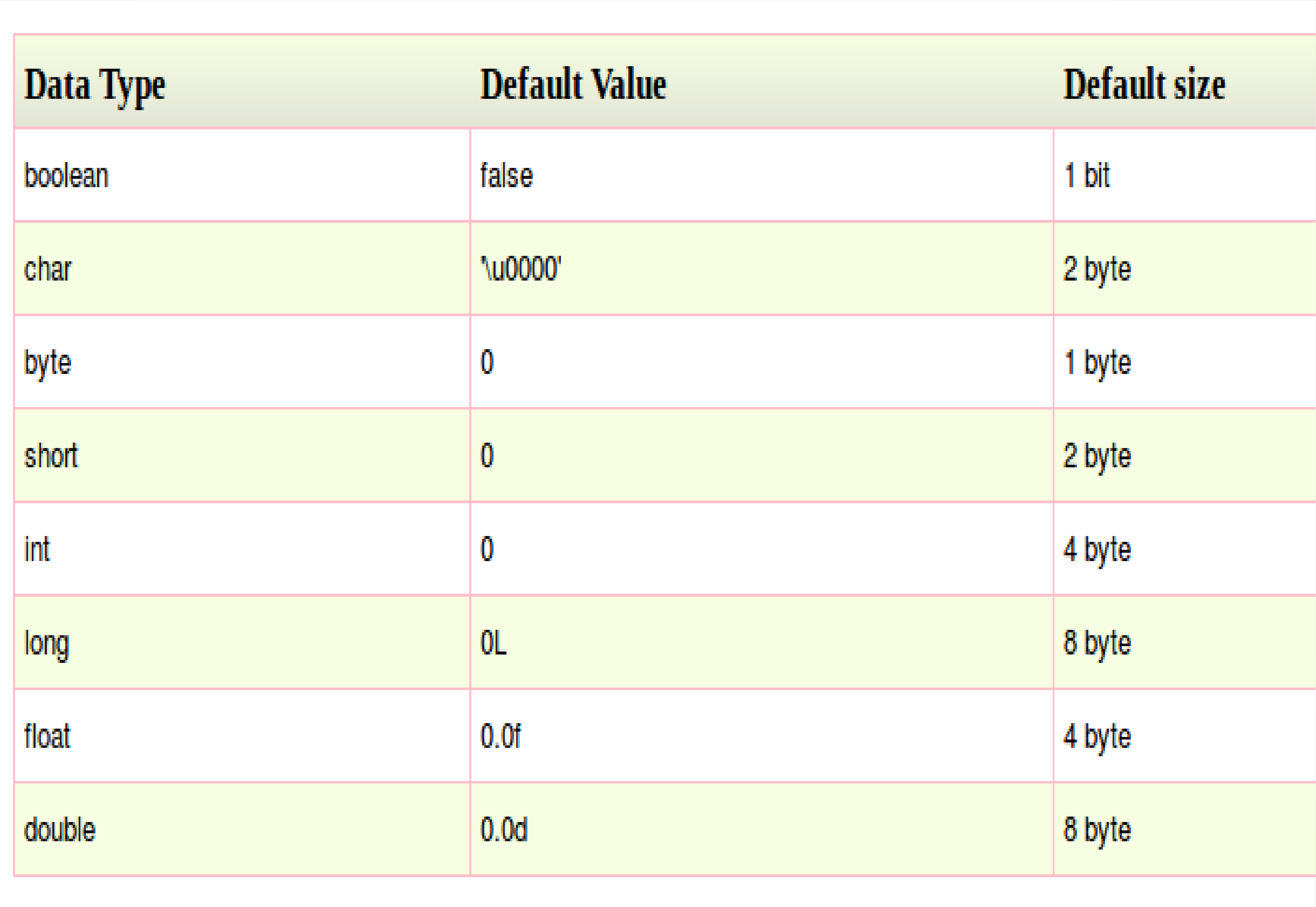
Data Types

- There are two types of data types in java:
  - primitive
  - non-primitive
- Primitive data types are the basic blocks of any programming language.
- It can have only one value at a time.

Data Types


Data Type
Primitive
Non-Primitive
String
Array
etc.
Boolean
Numeric
Character
Integral
Integer
Floating-point
boolean
char
byte
short
int
long
float
double

Data Types



Data Type	Default Value	Default size
boolean	false	1 bit
char	'\u0000'	2 byte
byte	0	1 byte
short	0	2 byte
int	0	4 byte
long	0L	8 byte
float	0.0f	4 byte
double	0.0d	8 byte

Data Types

- Non primitive data types are also referred to as **derived types**.
- Java supports non primitive data types like classes, interfaces, and arrays.

Identifiers

- Are **names assigned to variables, methods,constant,classes,packages and interfaces.**
- No limit has been specified for length.
- **Rules:**

1. first letter must be a letter,underscore,dollar sign
2. subsequent can be letter,underscore,dollar,digit
3. white space is not allowed
4. identifiers are case sensitive
5. don't use keywords.

Identifiers

- Class or Interface Identifiers
- Variable or Method Identifiers
- Constant Identifiers
- Package Identifiers

Naming Convention

- **Class or Interface Identifiers**
  - Must begin with a capital letter.
  - First alphabet of internal word should also be capitalized.
  - Example:
    - public class MyClass
    - public class Employee

- **Variable or Method Identifiers**
  - Must begin with a small case letter.
  - First alphabet of internal word should also be capitalized.
  - Example:
    - int myNumber

Naming Convention

- **Constant Identifiers**
  - Must be specified in upper case.
  - _ is used to separate internal words.
  - Example:
    - final double RATE = 2.6

- **Package Identifiers**
  - Must be specified in small case letters.
  - Example:
    - Package mypackage.subpackage.x;

Keywords

- Are predefined identifiers meant for specific purpose.
- Reserve words
- All keywords are in lower case.

  Ex: case,catch,if,float,int,package,while,do,long

Literals

- Is a value that can be passed to a variable or constant in a program.
- Numeric : binary,octal(0-7,017),hexa
- Boolean: 0’s and 1’s
- Character : enclosed with quotes
- String : zero or more characters
- Null : assigned to object reference variable

Operators

- Using one or more operands
- Unary operator(++)
- Binary operator(/)
- Ternary operator(?:)

Assignment/Arithmetic operator

- Sets the value of a variable to some new value.
- Right to left associativity
- a=b=0
- Ex: +=,-=,|=
- **a+=b**

ArithmaticDemo

Relational operator

- Java return either true or false

- Equal to ==
- Not equal to !=
- Less than <
- Greater than >
- Less than or equal to <=
- Greater than or equal to >=

Boolean logical operators

- Conditional OR ||
- Conditional AND &&
- Logical OR |(TRUE: one is true)
- Logical AND &(FALSE: one is false)
- Logical XOR ^(FALSE: T & T)
- Unary logical NOT !

Ex:

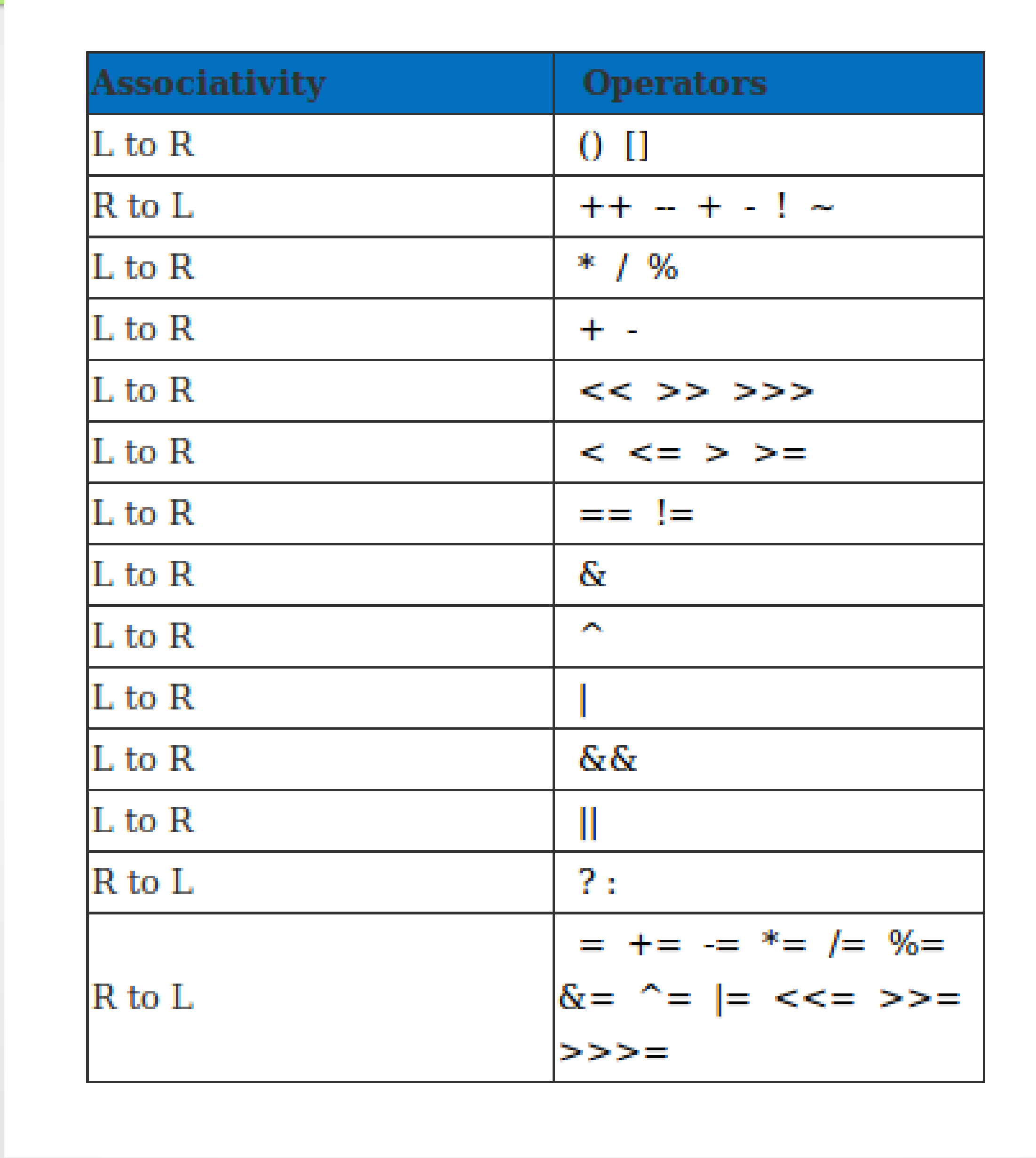
bolean a=true;

bolean b=false;

Expression

- An expression is a construct made up of variables, operators, and method invocations, which are constructed according to the syntax of the language, that evaluates to a single value.
- Int ans= 1 + 10;

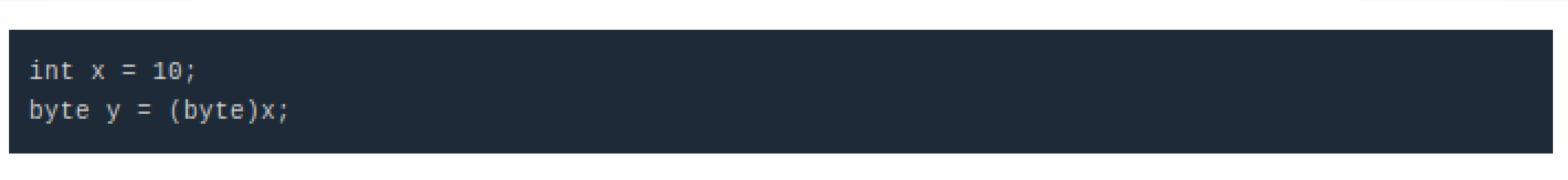
Precedence Rule & Associativity



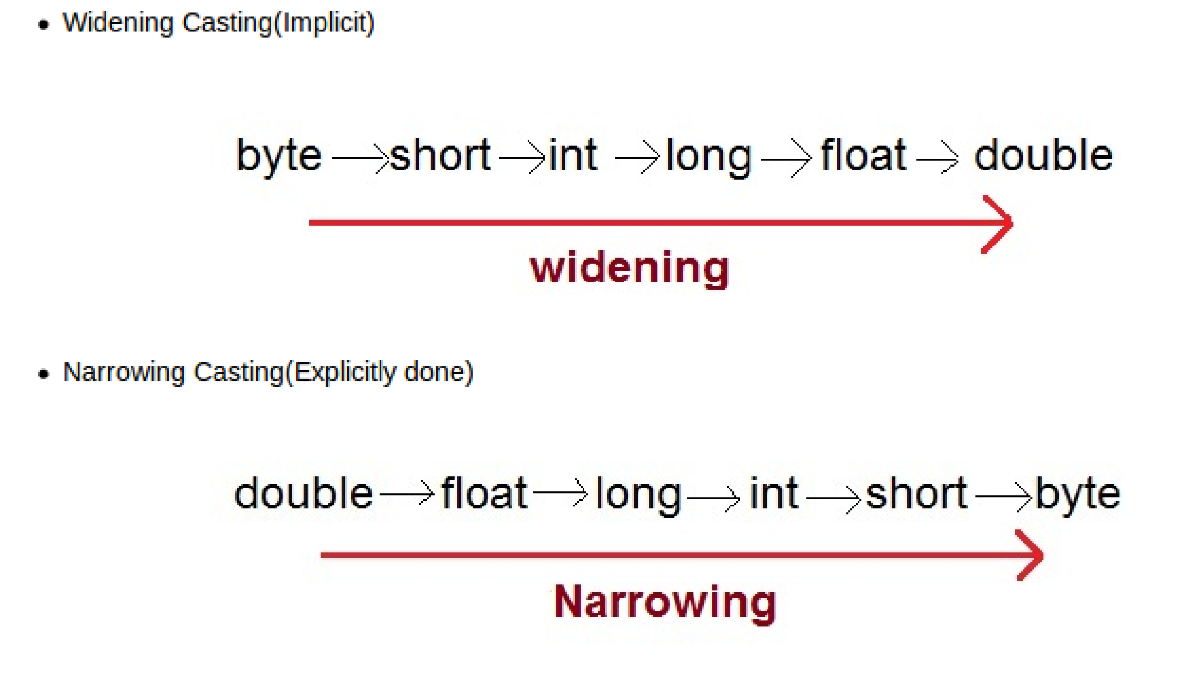
Associativity	Operators
L to R	() []
R to L	++ -- + - ! ~
L to R	* / %
L to R	+ -
L to R	<< >> >>>
L to R	< <= > >=
L to R	== !=
L to R	&
L to R	^
L to R	|
L to R	&&
L to R	||
R to L	? :
R to L	= += -= *= /= %= &= ^= |= <<= >>= >>>=

Primitive type conversion & casting

- Assigning a value of one type to a variable of another type is known as **Type Casting.**



```
int x = 10;
byte y = (byte)x;
```



- Widening Casting(Implicit)

byte → short → int → long → float → double

widening

- Narrowing Casting(Explicitly done)

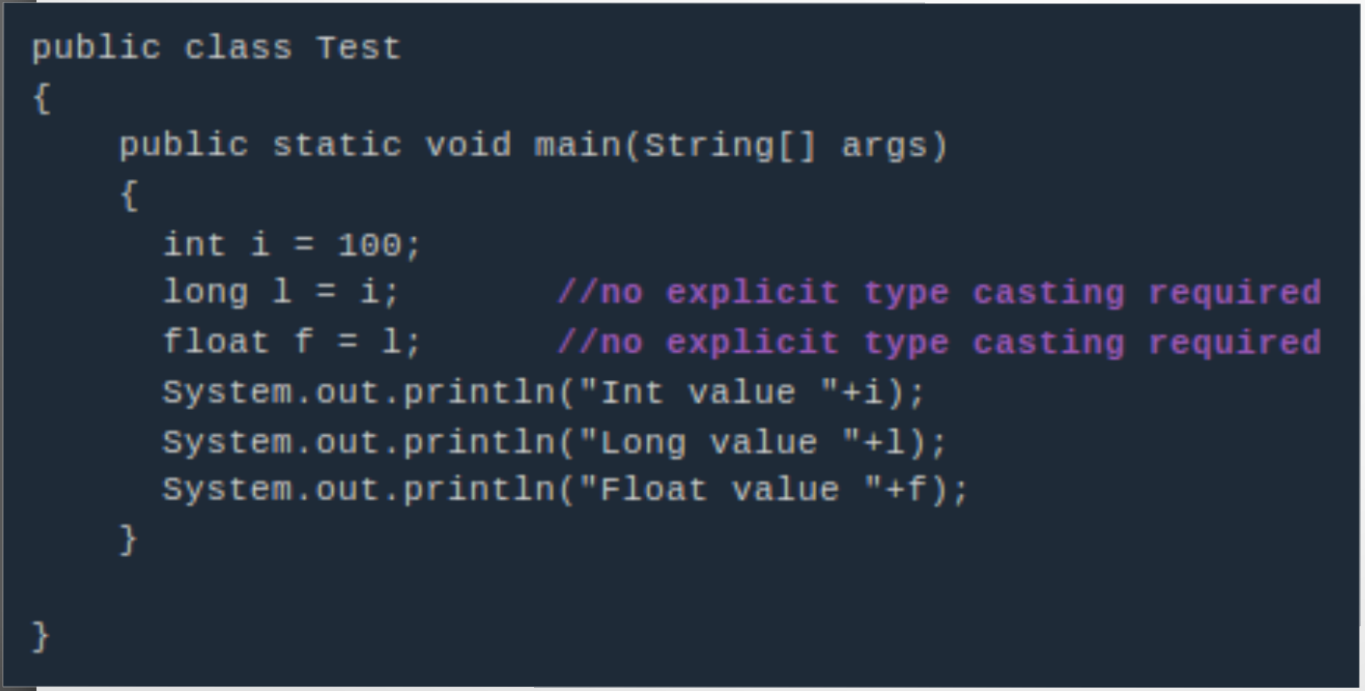
double → float → long → int → short → byte

Narrowing

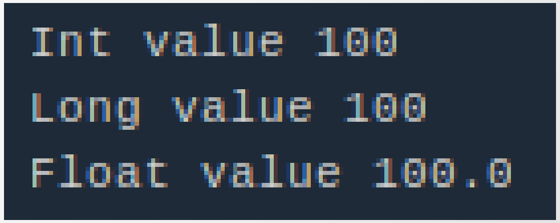
Convert.java

Widening or Automatic type converion

- Automatic Type casting take place when,
- the two types are compatible
- the target type is larger than the source type



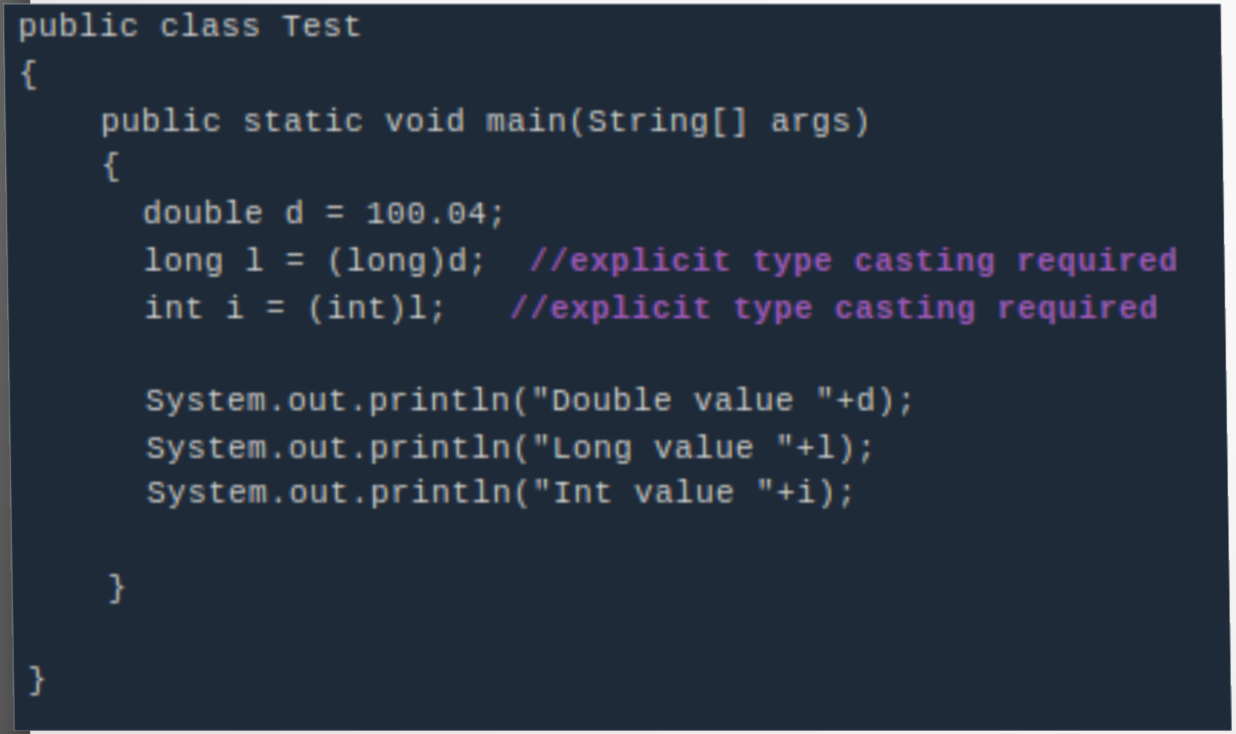
```
public class Test
{
    public static void main(String[] args)
    {
      int i = 100;
      long l = i;        //no explicit type casting required
      float f = l;       //no explicit type casting required
      System.out.println("Int value "+i);
      System.out.println("Long value "+l);
      System.out.println("Float value "+f);
    }

}
```



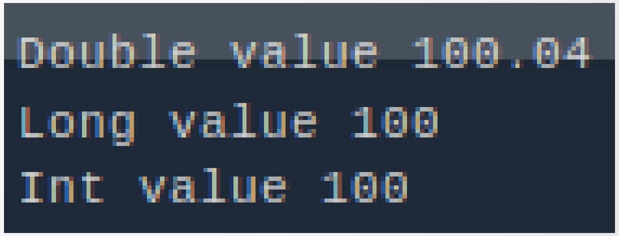
```
Int value 100
Long value 100
Float value 100.0
```

Narrowing or Explicit type conversion

- When you are assigning a larger type value to a variable of smaller type, then you need to perform explicit type casting.



```
public class Test
{
    public static void main(String[] args)
    {
      double d = 100.04;
      long l = (long)d;  //explicit type casting required
      int i = (int)l;   //explicit type casting required

      System.out.println("Double value "+d);
      System.out.println("Long value "+l);
      System.out.println("Int value "+i);

    }

}
```



```
Double value 100.04
Long value 100
Int value 100
```

Data Input

- There are 2 ways to take input in Java
  - JOptionPane class
  - **Scanner class**

Scanner Class Terminal

- The java.util.Scanner class is a simple text scanner which can parse primitive types and strings using regular expressions.
- This Scanner class is found in java.util package.
- Following are the important points about Scanner:
  - The Java Scanner class breaks the input into tokens using a delimiter that is white space.
  - Java Scanner class is widely used to parse text for string and primitive types using regular expression.
  - A Scanner is not safe for multithreaded use without external synchronization.

Scanner Class Terminal

- It is the simplest way to get input in Java.
- By the help of Scanner in Java, we can get input from the user in primitive types such as int, long, double, byte, float, short, etc.

Scanner Class Terminal

Method	Inputs
nextInt()	Integer
nextFloat()	Float
nextDouble()	Double
nextLong()	Long
nextShort()	Short
next()	Single word
nextLine()	Line of Strings
nextBoolean()	Boolean

The only difference between the methods nextLine() and next() is that nextLine() reads the entire line including white spaces, whereas next() reads only upto the first white space and then stops.

ScannerDemo1 ScannerDemo2 ScannerDemo3

Scanner Class Terminal

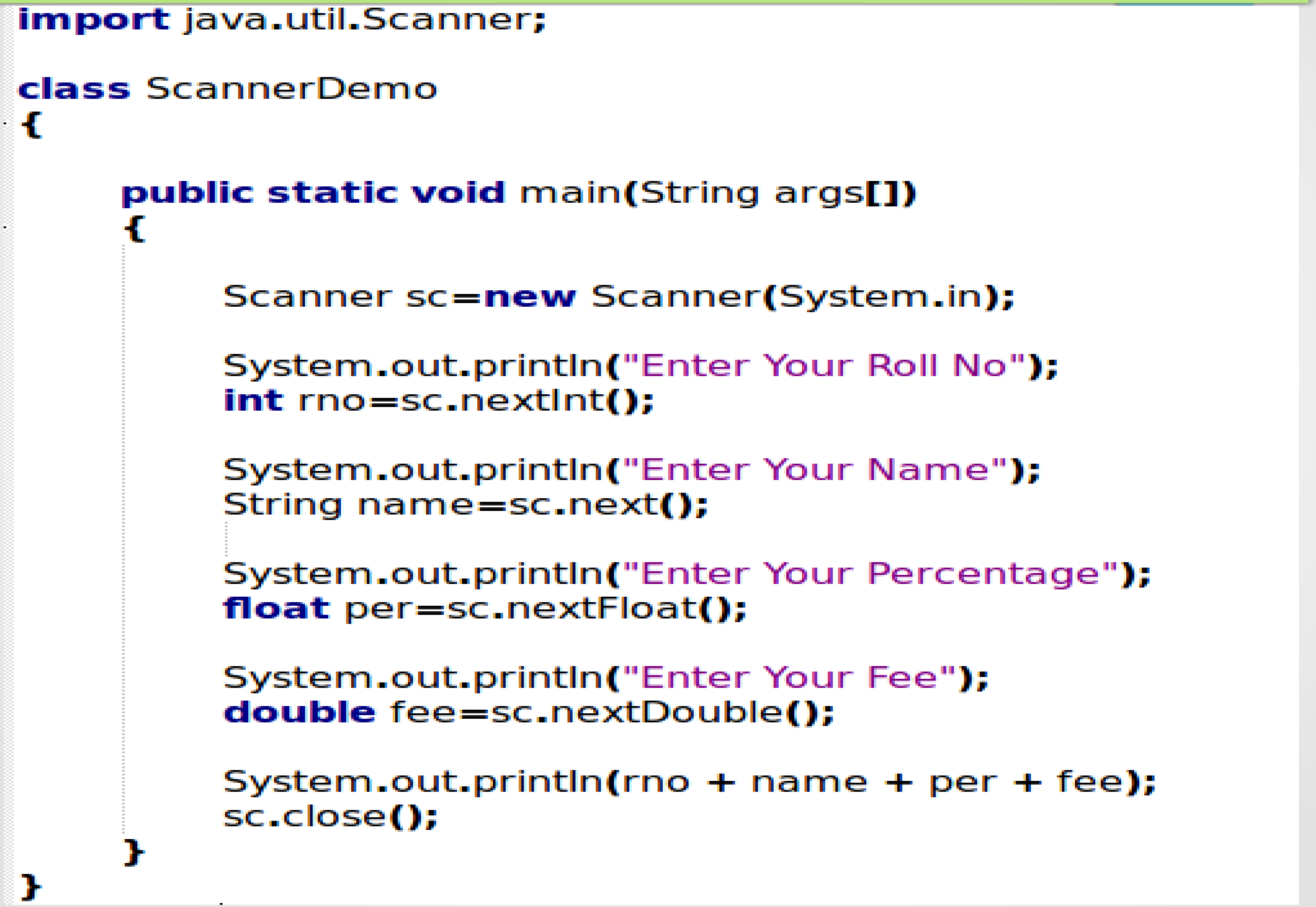
- How to take Input

```
int n;
n = s.nextInt();      //   s is object of Scanner class
```

Statement n = s.nextInt(); is used to input the value of an integer variable 'n' from the user.

Here, nextInt() is a method of the object s of the Scanner class.

Scanner Class Terminal



```
import java.util.Scanner;

class ScannerDemo
{

        public static void main(String args[])
        {

                Scanner sc=new Scanner(System.in);

                System.out.println("Enter Your Roll No");
                int rno=sc.nextInt();

                System.out.println("Enter Your Name");
                String name=sc.next();

                System.out.println("Enter Your Percentage");
                float per=sc.nextFloat();

                System.out.println("Enter Your Fee");
                double fee=sc.nextDouble();

                System.out.println(rno + name + per + fee);
                sc.close();
        }
}
```

Conditional Statements

Java has the following conditional statements:

- if
- if-else
- nested-if
- if-else-if
- switch-case

Demoof_if Demoof_switch

Loops

Java has following looping constructs:

- while
- do-while
- for
- for-each

Demoof_for Demoof_while Demoof_dowhile

For-each loop

- It starts with the keyword for like a normal for-loop.
- Instead of declaring and initializing a loop counter variable, you declare a variable that is the same type as the base type of the array, followed by a colon, which is then followed by the array name.
- In the loop body, you can use the loop variable you created rather than using an indexed array element.
- It’s commonly used to iterate over an array or a Collections class (eg, ArrayList)
- It makes the code more readable.
- It eliminates the possibility of programming errors.

For-each loop

Syntax:

```
for (type var : array)
{
    statements using var;
}
```

is equivalent to:

```
for (int i=0; i<arr.length; i++)
{
    type var = arr[i];
    statements using var;
}
```

Demo_foreach

For-each loop

Example:

```
 for(int i:arr)
{
    System.out.println(i);
}
```

Limitations of for-each loop

For-each loops are not appropriate when you want to modify the array:

```
for (int num : marks)
{
    // only changes num, not the array element
    num = num*2;   }
```

For-each loops do not keep track of index. So we can not obtain array index using For-Each loop

```
for (int num : numbers)
{
    if (num == target)
    {
        return ???;   // do not know the index of num
    }}
```

Limitations of for-each loop

For-each only iterates forward over the array in single steps

```
// cannot be converted to a for-each loop
for (int i=numbers.length-1; i>0; i--)
{
      System.out.println(numbers[i]);}
```

For-each cannot process two decision making statements at once

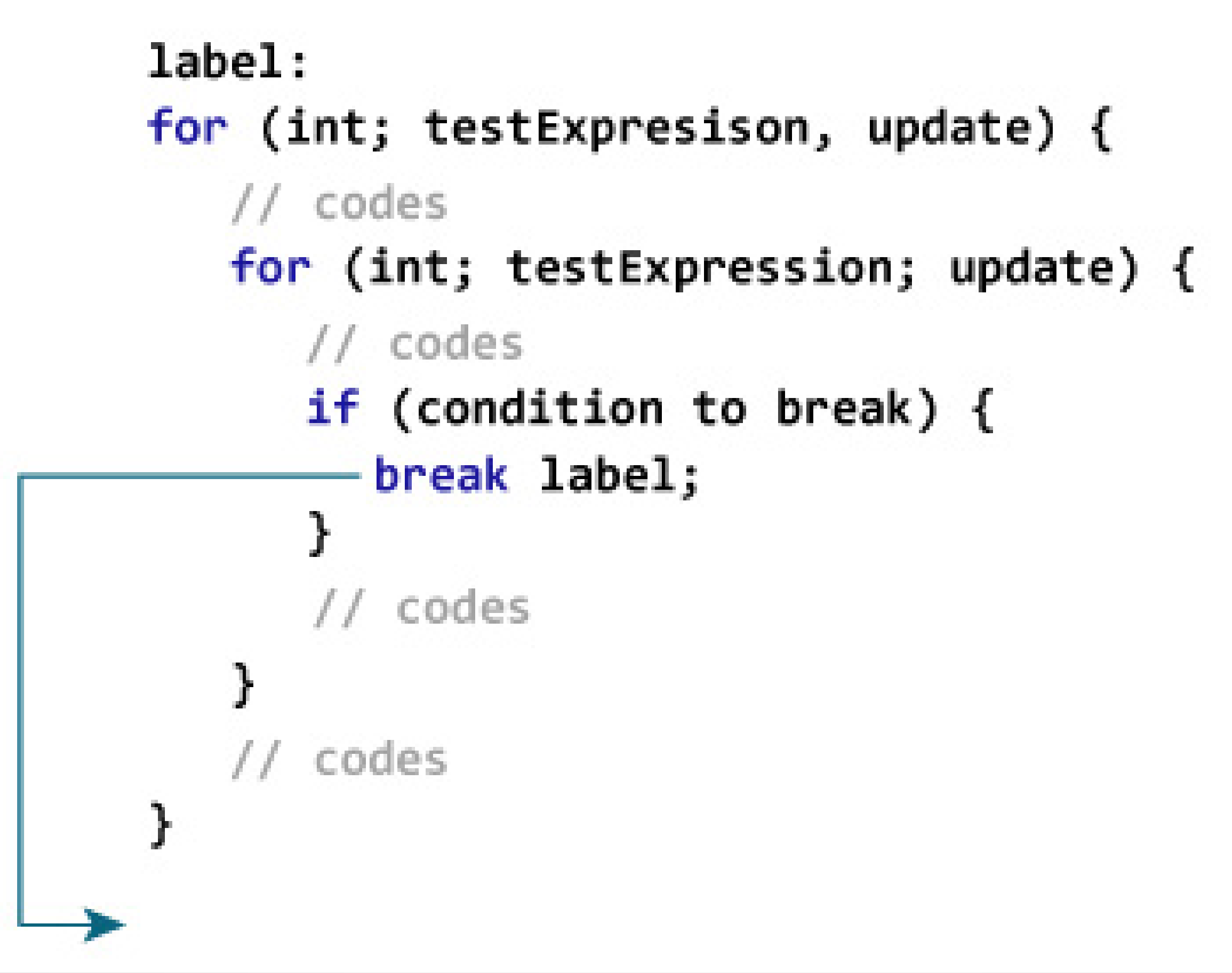
```
// cannot be easily converted to a for-each loop
for (int i=0; i<numbers.length; i++)
{
    if (numbers[i] == arr[i])
    { ...
    } }
```

Breaking mechanism

- Break
- Continue
- Return

Demoof_continue Demoof_break SampleReturn1

Labeled break statement



```
label:
for (int; testExpresison, update) {
    // codes
    for (int; testExpression; update) {
        // codes
        if (condition to break) {
            break label;
        }
        // codes
    }
    // codes
}
```

Labeled break statement

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

    first:
    for( int i = 1; i < 5; i++) {
      second:
      for(int j = 1; j < 3; j ++ ) {
        System.out.println("i = " + i + "; j = " +j);

        if ( i == 2)
        break first;
      }
    }
  }
}
```

UNIT 1 COMPLETED

- **Assignment Submission – /07/2023**
- **CEC exam for unit 1 on – /07/2023**