Introduction of Java

History Of Java

- **Java technology was created as a computer programming tool in a small, secret effort called "the Green Project" at Sun Microsystems in 1991 .**
- **A device-independent programming language code-named "Oak" was the result**

History Of Java

1. Why Java came in market ?

- ‘write once, run everywhere’
- ‘hardware embedded’ + ‘internet compatible’ .

2. Business Objectives of Java

Java can work on databases, at front-end to implement security .

Applications

Today, we can find Java technology in

- Networks and devices that range from the Internet
- Scientific supercomputers to laptops and
- Cell phones
- Wall Street market simulators
- Home game players

just about everywhere.

Java 2

- Java 2 Standard Edition
- Java 2 Micro Edition
- Java 2 Enterprise Edition

a) **Java SE**

(Java Standard Edition)

provides tools and API's to create diverse applications. Applications developed with Java SE are supported by every operating system, including Linux, Macintosh, Solaris, and Windows.

b) Java EE

Java Enterprise Edition

specifications based on the foundation framework of the standard edition. Java Enterprise Edition are the specifications needed to service the multitier environment, to support the enterprise class service oriented architecture (SOA)

c) Java ME

Java Micro Edition is an accumulation of Java APIs used to develop micro-devices applications like mobile phones, PDAs, TV set-top boxes, game programming. The

platform of micro edition generally consists of an easy user interface, a robust security model and a wide variety of built-in

networks for running Java based application.

Java 2 SDK

- Java 2 Software Development Kit (Java 2 SDK)
  - Java Application or Applet Development
- Java 2 Runtime Environment (JRE)
  - Java Running Environment

Java Development Kit

Tools	Feature
javac	The Java Compiler
java	The Java Interpreter
Jdb	The Java Debugger
appletviewer	Tool to run the applets
javap	to print the Java byte codes
javaprof	Java profiler
javadoc	documentation generator
javah	creates C header files

Javadoc (documentation generator)

- Javadoc –d foldername filename.java

.jar

- in software, **JAR** (**J**ava **AR**chive) is an archive file format typically used to aggregate many Java class files and associated metadata and resources (text, images and so on) into one file to distribute application software or libraries on the Java platform.

- **Executing a JAR file**
- Java -jar MyApp.jar

- In order to create an executable JAR, one of the classes that we include in our JAR must be a main class.

Create a JAR file

jar cf MyApp1.jar C:\Java\MyApp

Extract content of JAR file

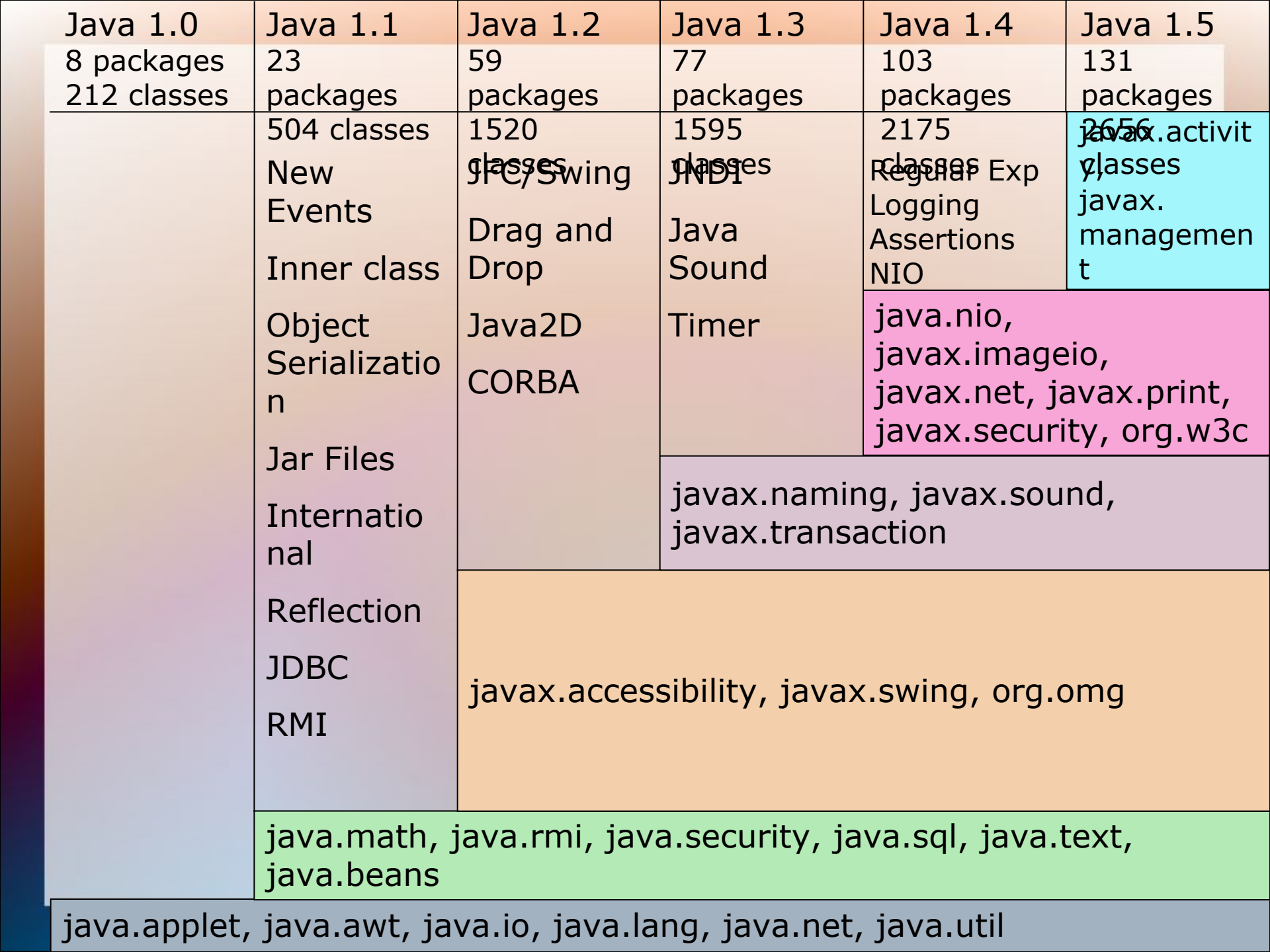
jar xf MyApp1.jar

Extract specific file from JAR file

jar xf MyApp1.jar Test1.class

JDK Versions

- JDK 1.02
- JDK 1.1
- Java 2 SDK v 1.2 (JDK 1.2)
- Java 2 SDK v 1.3 (JDK 1.3)
- Java 2 SDK V 1.4(JDK 1.4)
- Java 2 JDK v 5.0(instead of JDK 1.5)


Java 1.0
8 packages
212 classes
Java 1.1
23 packages
504 classes
New Events
Inner class
Object Serialization
Jar Files
International
Reflection
JDBC
RMI
Java 1.2
59 packages
1520 classes
JFC/Swing
Drag and Drop
Java2D
CORBA
Java 1.3
77 packages
1595 classes
JNDI
Java Sound
Timer
Java 1.4
103 packages
2175 classes
Regular Exp
Logging
Assertions
NIO
Java 1.5
131 packages
2656 classes
javax.activity,
javax.management
java.nio, javax.imageio, javax.net, javax.print, javax.security, org.w3c
javax.naming, javax.sound, javax.transaction
javax.accessibility, javax.swing, org.omg
java.math, java.rmi, java.security, java.sql, java.text, java.beans
java.applet, java.awt, java.io, java.lang, java.net, java.util

IDE
(Integrated development environment)

IDE is a smart editor that equips a programmer with features like editing, compiling, deploying, debugging etc..

Java IDE Tools

- JBuilder
- Microsoft Visual J++
- Net Beans
- Eclipse
- Sun Java Workshop
- Etc..

Java API

API includes hundred of classes and methods grouped into several packages

- Language support packages
- Utility packages (includes date ,time functions
- I/O Packages
- Networking packages
- AWT packages
- Applet Packages

Java Runtime Environment

JRE facilitates the execution of program in Java . It consists of

1. JVM – It Interprets java byte code to machine code and make it portable
2. Runtime class libraries –i.e. core class libraries that are requires for execution of java program
3. User Interface toolkit AWT and swing are example of toolkits

4 Deployment technologies

- Java Plug-in it enable execution of java applet on browser
- Java web start enables remote deployment of application .with web start users can launch an application directly from web browser without going through installation procedure

Features of java

1. Simple :- it can be learned easily

2. Object Oriented:- Any code in java is side a class

3. Distributed:- RMI packages is used for creating distributed server and client application.

Features of java

4. Interpreted:- Java is both compiled and interpreted with a compiler (javac).
5. Robust:- Java does not have permission to access computer memory.
6. Secure:- Java contains built-in security.

Features of java

7. Architecture Neutral (Platform-Independence):- Java compiler produce the byte codes, byte codes are Platform – Independent.
8. Portable:- Java program can run on multiple platforms
9. High performance:- Just-in-Time (JIT) compiler-It can convert byte code into a machine code easily .

Features of java

10. Multithreaded:- It is the ability of an application to perform Multiple task at same time.

11. Dynamic:- Java supports dynamic memory allocation with automatic garbage collection.

Why Java Technology?

1. Write software on one platform and run it on practically any other platform
2. Create programs to run within a web browser and web services
3. Develop server-side applications for online forums, stores, polls, HTML forms processing etc.

Java better than C++ ?

- No Typedefs, Defines, or Preprocessor
- No Global Variables
- No Goto statements
- No Pointers
- No Unsafe Structures
- No Multiple Inheritance
- No Operator Overloading
- Destructors are replaced with finalize () function

Added or Improved over C++

- Interfaces: type Vs. class
- Garbage collection
- Exceptions (More powerful than C++)
- String classes
- Package
- Multi-threads

Java Applications

1. Application programs are mostly in the form of character user interface.
2. They are similar to other programs written in c or c++ .
3. An application is nothing but a program that runs on your computer, under the operating system of the computer
4. You can also create graphical user interface (GUI) applications.
5. These application are used in the windows Environment.

Object-Oriented programming features

Java is Object oriented programming language .Features of OOPs are:

1. Encapsulation
2. Abstraction
3. Inheritance
4. Polymorphism

Classes

A *class* is a collection of objects of similar type. Once a class is defined any number of objects can be created which belong to that class.

How to create Class

Class name_of_the_class (User defined)

{

//body

}

Example:

```
class Television
{
//body
}
```

Object

An object is an instance of class. A software object maintains its states in variables and implements its behavior with methods declaring on object is similar to declaring a variable.

Syntax:

<class-name><object-name>= new class name();

E.g.,

Tv sony; //declare

Sony=new Tv(); //create

Or Tv sony=new Tv(); //declare and create

How to create Object

```
Television tv;              //declaration

tv= new Television();//memory allocation
```

Encapsulation

Encapsulation is the mechanism that binds together code and the data it manipulates and keeps both safe from outside interference and misuse.

Encapsulation: public methods can be used to protect private data

Encapsulation

Storing data and functions in a single unit (class) is *encapsulation.* Data cannot be accessible to the outside world and only those functions which are stored in the class can access it.

Abstraction

Abstraction refers to the act of representing essential features without including the background details or explanations. Classes use the concept of abstraction and are defined as a list of abstract attributes.

Inheritance

Inheritance is the process by which objects can acquire the properties of objects of other class. In OOPs *inheritance* provides reusability, like, adding additional features to an existing class without modifying it.

Polymorphism

Polymorphism means the ability to take more than one form. An operation may exhibit different behaviors in different instances. The behavior depends on the data types used in the operation. Polymorphism is extensively used in implementing Inheritance.

Some basics of the Java language

- Primitive types
  - byte, short, int, long; float, double, boolean, char
- Operators
- arithmetic,logical,comparision,assignment
- Tests (i.e. conditions)
  - if (condition) then { … } else { … }
  - Operators: == != < <= > >= && || !
- Loops
  - for (initialization; test to continue loop; increment at end of loop) {…}
  - while (test to continue loop) { … }
  - do { … } while (test to continue loop);

Keywords

abstract	continue	goto	package	switch
assert	default	if	private	this
boolean	do	implements	protected	throw
break	double	import	public	throws
byte	else	instanceof	return	transient

Keywords

case	extends	int	short	try
catch	final	interface	static	void
char	finally	long	strictfp	volatile
class	float	native	super	while
const	for	new	synchronized	

Java Standard Library (JSL)

1. Java.lang
2. Java.util
3. Java.io
4. Java.awt
5. Java.applet
6. Java.net
7. Javax.swing

Program to print hello message

```
//welcome1.java

public class welcome1
{
  public static void main(String args[])
        {
           System.out.println(“Hello”);
        }
}
```

Main method (in application)

- public : this is access specifier that declare main method unprotected and therefore making it accessible to all classes
- static : which declares method as one that belongs to entire class and not part of any object .
  - Main must be static because interpreter uses this method before any object is created.

Main method (in application)

- void : this states that main does not return any value .

Program 2
//printing a line with multiple statements

```
//welcome2.java


public class welcome2
{
public static void main(String args[]){
    System.out.print(“Welcome to”);
    System.out.println(“Java Programming!”);}
}
```

Implementing Java program

- Installing java JDK from www.java.sun.com
- Configuring java –setting environment variable
- Creating classname.java program
- Compiling (javac classname.java)
- Running program (java classname)

Data Types and Variables

Two data types available in Java:

- Primitive Data Types
- Reference/Object Data Types

Data types in java

1. Primitive data type
    1. Numerical
        1. Integer
        2. Floating Point
    2. Non Numerical
        1. Character
        2. Boolean
2. Non Primitive data type
    1. Classes
    2. Interface
    3. Arrays

- Integer
  - Byte
  - Short
  - Int
  - Long
- Floating
  - Float
  - Double

Table 1 Primitive Types

Type	Description	Size
`int`	The integer type, with range –2,147,483,648 ... 2,147,483,647 (about 2 billion)	4 bytes
`byte`	The type describing a single byte, with range –128 ... 127	1 byte
`short`	The short integer type, with range –32768 ... 32767	2 bytes
`long`	The long integer type, with range –9,223,372,036,854,775,808 ... 9,223,372,036,854,775,807	8 bytes
`double`	The double-precision floating-point type, with a range of about $\pm 10^{308}$ and about 15 significant decimal digits	8 bytes
`float`	The single-precision floating-point type, with a range of about $\pm 10^{38}$ and about 7 significant decimal digits	4 bytes
`char`	The character type, representing code units in the Unicode encoding scheme (see Advanced Topic 4.5)	2 bytes
`boolean`	The type with the two truth values `false` and `true` (see Chapter 6)	1 bit

Standard default values

Data Type	Default Value (for fields)
byte	0
short	0
int	0
long	0L
float	0.0f
double	0.0d
char	'\u0000'
String (or any object)	null
boolean	false

Number Literals

- int i = 34;
- long l = 1000000;
- float f = 100.2f;
  or
  float f = 100.2F;
- double d = 100.2d
  or
  double d = 100.2D;

1. Byte

- The byte data type is an 8-bit signed integer.
- Range -128 to 127 (inclusive).
- The byte data type can be useful for saving memory in large arrays,
- They can also be used in place of int where their limits help to clarify your code;

Reference Data Types:

- They are used to access objects.
- These variables are declared to be of a specific type that cannot be changed. For example, Employee,student
- Class objects, and various type of array variables come under reference data type.
- Default value of any reference variable is null.

Java Variables:

- Local Variables
- Class Variables (Static Variables)
- Instance Variables (Non static variables)

Program 3

```
//welcome3.java
//printing multiple lines with a single //statement
public class welcome3{
    public static void main(String args[])
    {
    System.out.println("welcome\n to\n Java\n Program
    !");
        }}
```

Program to perform addition of numbers

```
class addition
{
int  a,b,c;
public void add()
{
a=10;
b=20;
c=a+b;
System.out.println("sum="+c);
}
public static void main(String
      args[])
{

addition a= new addition();
a.add();
}
}
```

Control Statements

- Selection Statements
  - Using if and if...else
  - Nested if Statements
  - Using switch Statements
  - Conditional Operator
- Repetition Statements
  - Looping: while, do, and for
  - Nested loops
  - Using break and continue

Selection Statements

- if Statements
- switch Statements
- Conditional Operators

if Statements

```
if (booleanExpression)
{
   statement(s);
}
```

Example:

```
if ((i >= 0) && (i <= 10))
{
   System.out.println("i is an " +
  "integer between 0 and 10");
}
```

The if...else Statement

```
if (booleanExpression)
{
   statement(s)-for-the-true-case;
}
else
{
   statement(s)-for-the-false-case;
}
```

if...else Example

```
if (radius >= 0)
{
  area = radius*radius*PI;
  System.out.println("The area for the “
    + “circle of radius " + radius +
    " is " + area);
}
else
{
  System.out.println("Negative input");
}
```

Nested if Statements

```
Class marital
 {
public static void main(String args[])
{
System.out.print(“Marital Status”);
int status=2;//married
If(status==1)
     System.out.print(“Single”);
else if(status==2)
     System.out.print(“Married”);
else if(status==3)
     System.out.print(“Divorced”);
else
     System.out.print(“ please give valid status[1…3]”);
 } }
```

Conditional Operator

```
if (x > 0)
     y = 1
else
     y = -1;
```

is equivalent to

```
y = (x > 0) ? 1 : -1;
```

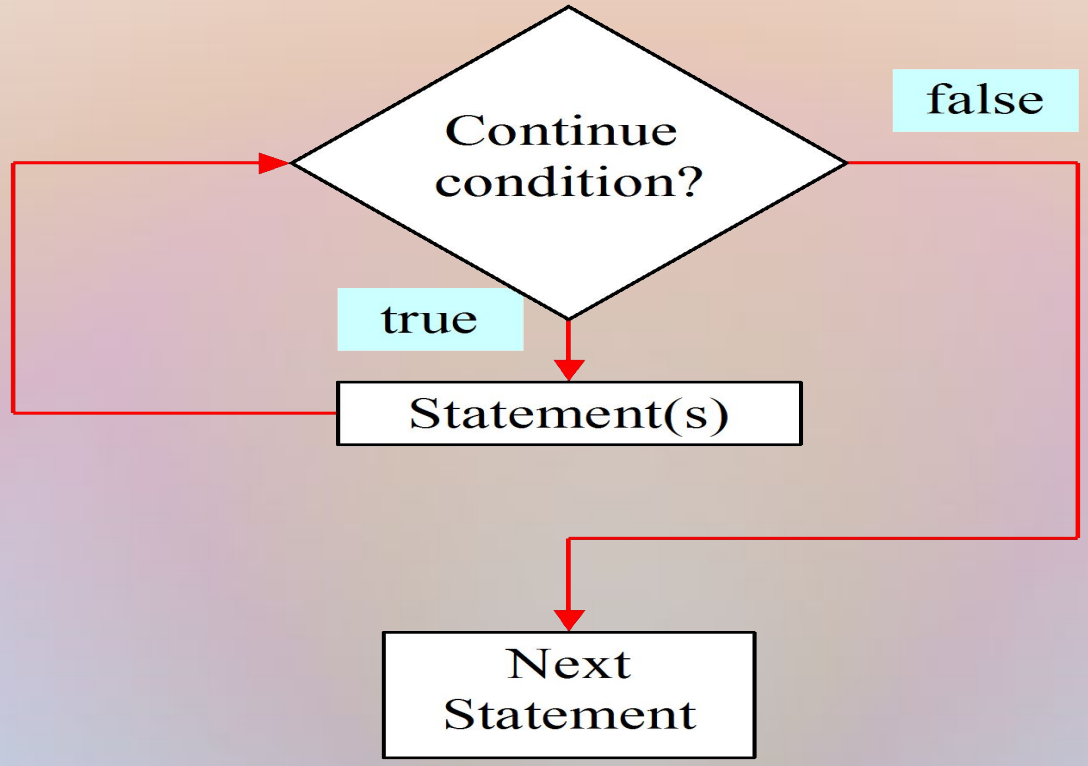
switch Statements

```
switch (year)
{
  case 7:  InterestRate = 7.25;
           break;
  case 15: InterestRate = 8.50;
           break;
  case 30: InterestRate = 9.0;
           break;
  default:
System.out.println("Wrong number of
  years enter 7,15or 30");
}
```

Repetitions

- `while` Loops
- `do` Loops
- `for` Loops

`while` Loop Flow Chart



while Loops

```
while (continue-condition)
{
 // loop-body;
}
```

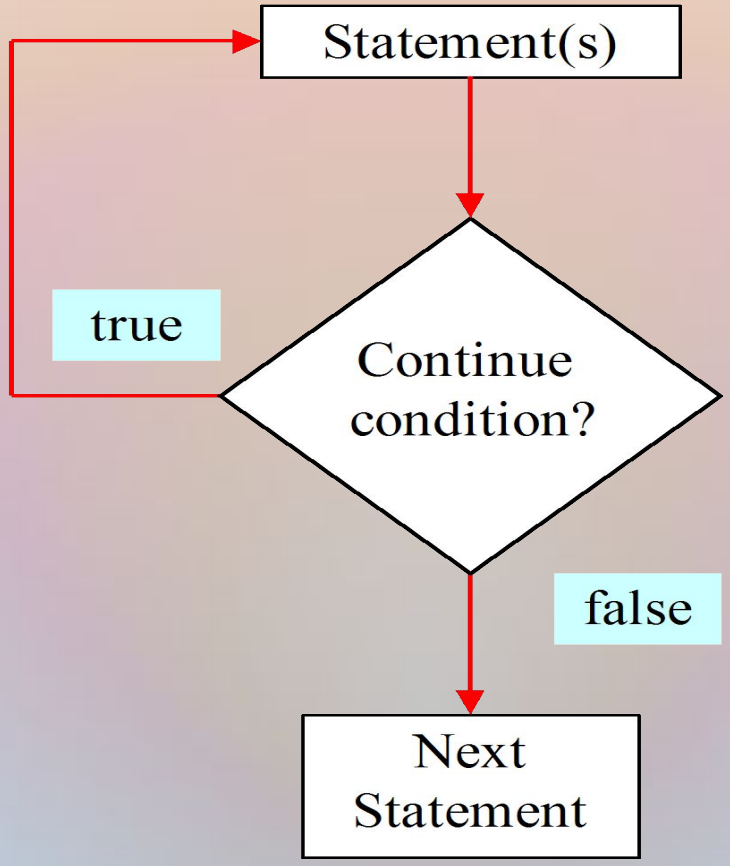
`while` Loop program

```
class whiletest
{
public static void main(String args[])
{
int  n=1;
while(n<=10)
{
System.out.println(n+"");
n=n+1;
}
```

do Loops

```
do
{
   // Loop body;
} while (continue-condition);
```

do Loop



for Loops

Example:

```
int i;
for (i = 0; i<100; i++)
{
  System.out.println("Welcome
 to Java! ” + i);
}
```

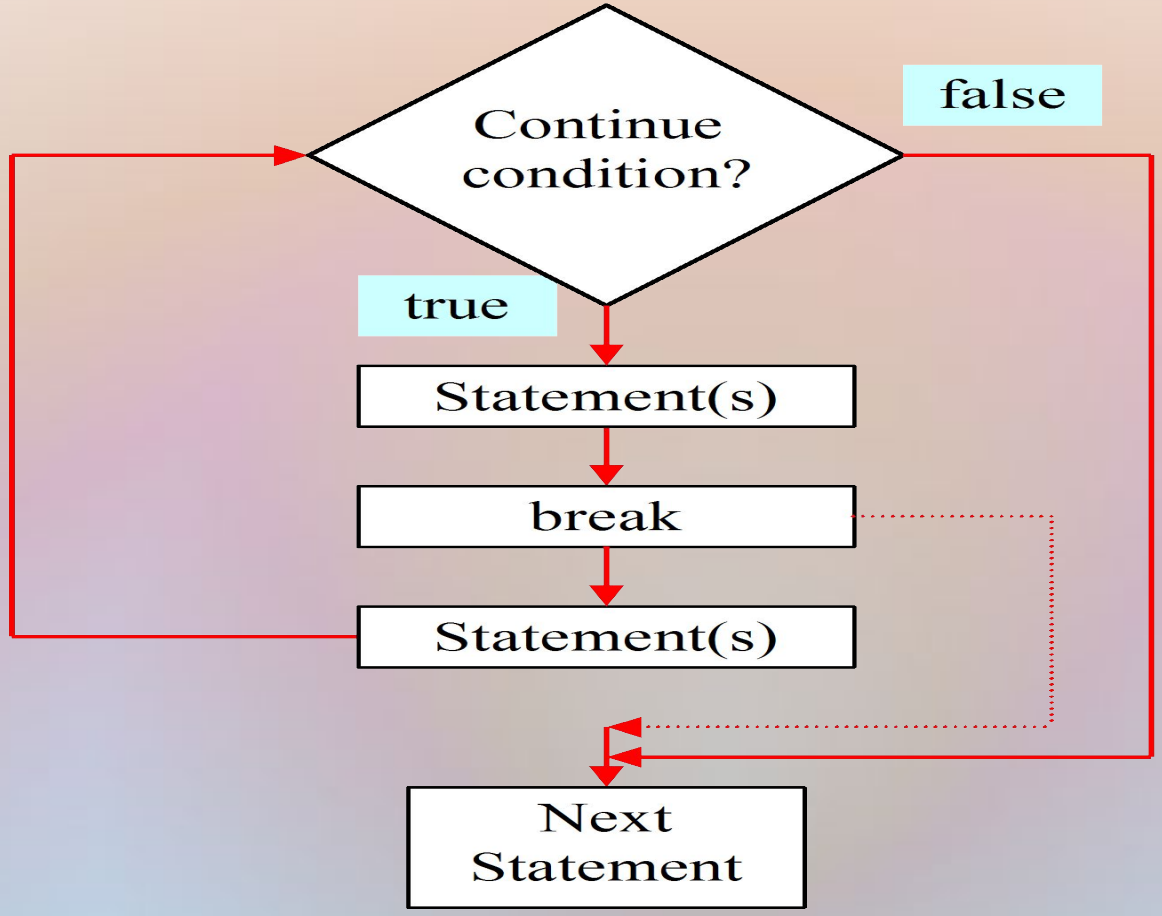
Enhanced for loop

- For each loop
- It help us to retrieve the array elements efficiently rather than using array index .

Example

```
{
   int  r[]={23,45,56,67,78,5};
   for( int k : r)
       System.out.prinltn(k);
}
```

The `break` Keyword



Program on break

```
class testbr
{
public static void main(String args[])
{
for(int j=10;j<=100;j+5)
{
   if(j==50)
 break;  //control to outer
System.out.println(j);
}
System.out.println("Break enabled");
}}
```

Program on continue

```
class conti
{
public static void main(String args[]){
for(int j=0;j<10;j++)
{
    System.out.println(“*”+” ”);
     if(j%2==0)
        continue;
System.out.println(“ “);
}}}
```