JAVA TUTORIAL

What Is the Java™ Technology?

• Java technology is:

• A programming language

• An application environment

• It is similar in syntax to C++.

• It is used for developing both applets and applications.

Primary Goals of the Java Technology

• Provides an easy-to-use language by:

• Avoiding many pitfalls of other languages

• Being object-oriented

• Enabling users to create streamlined and clear code

• Provides an interpreted environment for:

• Improved speed of development

• Code portability

• Enables users to run more than one thread of activity

• Loads classes dynamically; that is, at the time they are actually needed

• Supports changing programs dynamically during runtime by loading classes from disparate sources

• Furnishes better security

The following features fulfil these goals:

The Java Virtual Machine (JVM™) 1

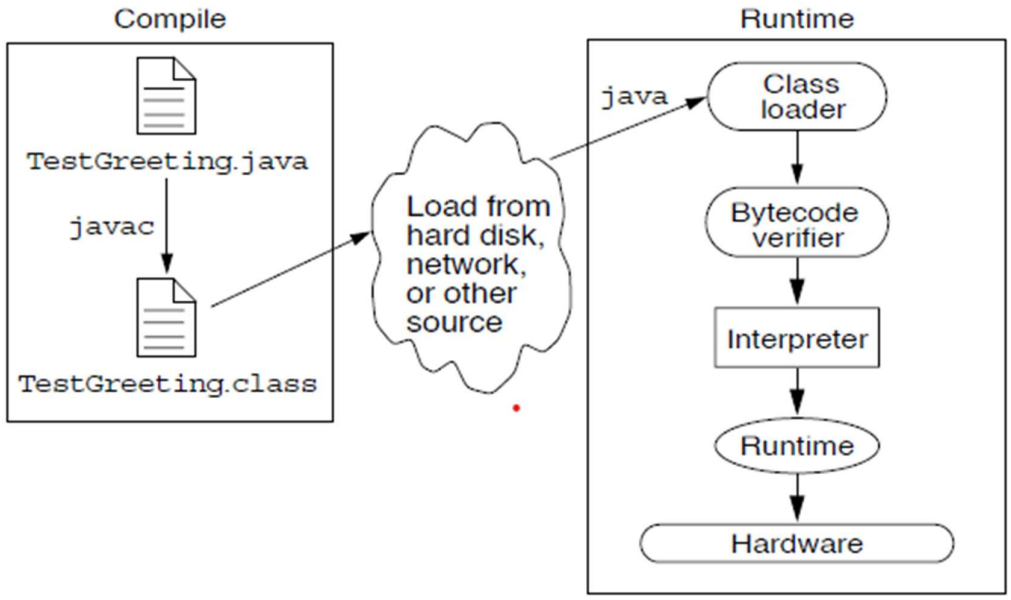
- Provides hardware platform specifications
- Reads compiled byte codes that are platform-independent
- Is implemented as software or hardware
- Is implemented in a Java technology development tool or a Web browser
- Instruction set (central processing unit [CPU])
- Register set
- Class file format
- Stack

- Garbage-collected heap
- Memory area
- Fatal error reporting
- High-precision timing support

Garbage collection

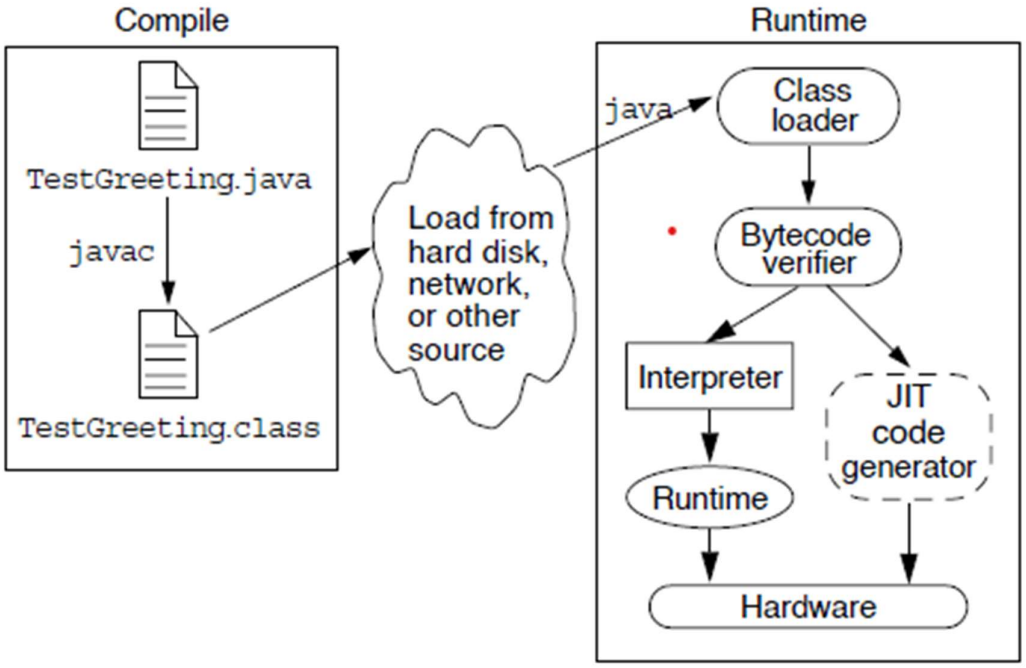
- Allocated memory that is no longer needed should be deallocated.
- In other languages, deallocation is the programmer's responsibility.
- The Java programming language provides a system-level thread to track memory allocation.
- Garbage collection has the following characteristics:
- Checks for and frees memory no longer needed
- Is done automatically
- Can vary dramatically across JVM implementations

The Java Runtime Environment (JRE)



JVM tool interface

Operation of the JRE with a Just-In-Time (JIT) Compiler



The Class Loader: Loads all classes necessary for the execution of a program Maintains classes of the local file system in separate namespaces Prevents spoofing

The Bytecode Verifier: The code adheres to the JVM specification. The code does not violate system integrity. The code causes no operand stack overflows or underflows. The parameter types for all operational code are correct. No illegal data conversions (the conversion of integers to pointers) have occurred.

FEATURES OF JAVA

- Simple
- Object-oriented
- Secure, Portable and Robust
- Multithreaded
- Architecture-neutral
- Interpreted & High performance
- Distributed
- Dynamic

Structure of Java Program

```
1 package gross_calculator;                          //Package Section
2 import java.util.Scanner;                          // Import Section
3 public class GrossPayCalculator {                  //Class Section or definition
4   public static void main(String[] args) {         //Main Section
5     //1.Get the number of hours worked             //Comments
6     int  hours = 0;                                //Variables
7     System.out.println("Enter Hours you worked : "); //Output
8      Scanner sc = new Scanner (System.in);         //Input
9       hours = sc.nextInt();
10    //2. Get the hourly pay rate
11     double payRate = 0;
12    System.out.println("Enter Pay Rate per hours : ");
13     payRate = sc.nextDouble();
14    //3. Multiply hours and pay rate
15    double grossPay = hours * payRate;
16    //4. Display result
17    System.out.println("Gross Pay : "+ grossPay);
18  }
19  }
```

Line by Line explanation of program

Line No. **Explanation**

1 : **Package** Its Container or directory contains classes
2 : Its import library. Syntax: import<Pkg_name><sub_pkg_name>*.
3 : It's the source-code blueprint for a run-time object Class entry here
4 : Its entry point of program every class have main function
5 ,10,14,16 : Comment its documentation its **single line** // comments here

Multi-line

```
/*
Comments
Here */
```

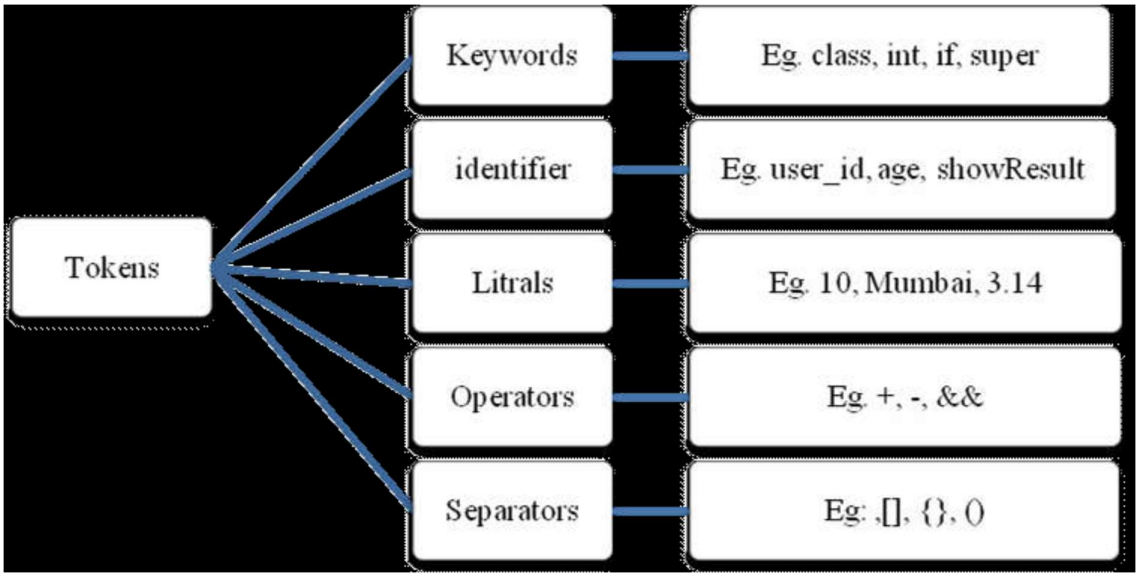
6 : int is integer data and hours is Variables its location in memory. Variables are data type

7 ,12,17 : Its print output of program the System “S” is capital and ("Enter Hours you worked: ") In Parentheses are Massage or Variables
System.out.println("Gross Pay : "+ grossPay); the + connect Variable with massage

8 : Take input from keyboard Scanner “S” is capital “sc” is user defined object

9 : Take input using Scanner and stored in hours variable

Java Tokens - Tokens are the basic building blocks of the java programming language that are used in constructing expressions, statements and blocks. The different types of tokens in java are:



Keywords - These words are already been defined by the language and have a predefined meaning and use. Key words cannot be used as a variable, method, class or interface etc.

Java Programming Language Keywords

abstract	continue	for	new	switch
assert	default	goto	package	synchronized
boolean	do	if	private	this
break	double	implements	protected	throw
byte	else	import	public	throws
case	enum	instanceof	return	transient
catch	extends	int	short	try
char	final	interface	static	void
class	finally	long	strictfp	volatile
const	float	native	super	while

Identifiers - Identifiers are used to name a variable, method, block, class or interface etc. Java is case-sensitive. Identifier may be any sequence of uppercase and lowercase letters, numbers, or the underscore characters.

Literals - Literals are the value assigned to a variable; Example: 10, "Mumbai", 3.14, 'Y', '\n' etc.

Operators - Operators are the symbols that performs operations. Java contains different types of operators like.

Arithmetic Operator (/, *, -, +, %,)

Assignment Operators (+=, -=, *=, /=, %=)

Comparison Operator (<, >, <=,>=, ==, !=)

Logical Operator (&&, ||, !)

Unary Operator (++, --)

Bitwise Operators (~ – Complement & – AND ^ – XOR | – OR)

Shift Operators (Right-Shift Operators >> and >>> Left-shift (<<))

OPERATOR PRECEDENCE

Operators	Associative
++ -- + *unary* - *unary* ~ ! (*<data_type>*)	R to L
* / %	L to R
+ -	L to R
<< >> >>>	L to R
< > <= >= instanceof	L to R
== !=	L to R
&	L to R
^	L to R
|	L to R
&&	L to R
||	L to R
<boolean_expr> ? *<expr1>* : *<expr2>*	R to L
= *= /= %= += -= <<= >>= >>>= &= ^= |=	R to L

	Operator	Associativity	Precedence
() [] . ->	Function call Array subscript Dot (Member of structure) Arrow (Member of structure)	Left-to-Right	Highest 14
! ~ - ++ -- & * (type) sizeof	Logical NOT One's-complement Unary minus (Negation) Increment Decrement Address-of Indirection Cast Sizeof	Right-to-Left	13
* / %	Multiplication Division Modulus (Remainder)	Left-to-Right	12
+ -	Addition Subtraction	Left-to-Right	11
<< >>	Left-shift Right-shift	Left-to-Right	10
< <= > >=	Less than Less than or equal to Greater than Greater than or equal to	Left-to-Right	8
== !=	Equal to Not equal to	Left-to-Right	8
&	Bitwise AND	Left-to-Right	7
^	Bitwise XOR	Left-to-Right	6
|	Bitwise OR	Left-to-Right	5
&&	Logical AND	Left-to-Right	4
||	Logical OR	Left-to-Right	3
? :	Conditional	Right-to-Left	2
=, += *=, etc.	Assignment operators	Right-to-Left	1
,	Comma	Left-to-Right	Lowest 0

Symbol Name	Description
;	Semicolon Used to separate the statements. Every statement end with semicolon
	Space Used to separate tokens.
( )	Parentheses Used to contain the lists of parameters in method definition and invocation. Also used for defining the precedence in expressions, containing expressions in control statements, and surrounding cast types.
{ }	Braces Used to contains the values of automatically initialized arrays. Also used to define a block of code, for classes, methods, and local scopes.
[ ]	Brackets Used to declare array types. Also used when dereferencing array values.
,	Comma separates consecutive identifiers in a variable declarations. Also used to chain statements together inside a for statement
.	Period Used to separate packages names from sub packages and classes. Also used to separate a variable or method from a reference variable.

DATA TYPES:-

Primitive Data: Predefined or built in data types &

Non Primitive Data: User defined data type. They are String, Array, Classes and Interface …etc.

Primitive Data:

Refer https://docs.oracle.com/javase/tutorial/java/nutsandbolts/datatypes.html

Data Type	Size	Example
Integer (int)	By default, the int data type is a 32-bit signed two's complement integer, which has a minimum value of -231 and a maximum value of 231-1. In Java SE 8 and later, you can use the int data type to represent an unsigned 32-bit integer, which has a minimum value of 0 and a maximum value of 232-1. Use the Integer class to use int data type as an unsigned integer. See the section The Number Classes for more information. Static methods like compareUnsigned, divideUnsigned etc have been added to the Integer class to support the arithmetic operations for unsigned integers.	Int grossPay = 2000;
long	The long data type is a 64-bit two's complement integer. The signed long has a minimum value of -263 and a maximum value of 263-1. In Java SE 8 and later, you can use the long data type to represent an unsigned 64-bit long, which has a minimum value of 0 and a maximum value of 264-1. Use this data type when you need a range of values wider than those provided by int. The Long class also contains methods like compareUnsigned, divideUnsigned etc to support arithmetic operations for unsigned long.	Long int grossPay = 200000;
Double	The double data type is a double-precision 64-bit IEEE 754 floating point. Its range of values is beyond the scope of this discussion, but is specified in the Floating-Point Types, Formats, and Values section of the Java Language Specification. For decimal values, this data type is generally the default choice. As mentioned above, this data type	double d1 = 35.25d;

	should never be used for precise values, such as currency.	
Short	The short data type is a 16-bit signed two's complement integer. It has a minimum value of -32,768 and a maximum value of 32,767 (inclusive). As with byte, the same guidelines apply: you can use a short to save memory in large arrays, in situations where the memory savings actually matters.	Stores whole numbers from -32,768 to 32,767
Byte	The byte data type is an 8-bit signed two's complement integer. It has a minimum value of -128 and a maximum value of 127 (inclusive). The byte data type can be useful for saving memory in large arrays, where the memory savings actually matters. They can also be used in place of int where their limits help to clarify your code; the fact that a variable's range is limited can serve as a form of documentation.	byte x = 10;
Float	The float data type is a single-precision 32-bit IEEE 754 floating point. Its range of values is beyond the scope of this discussion, but is specified in the Floating-Point Types, Formats, and Values section of the Java Language Specification. As with the recommendations for byte and short, use a float (instead of double) if you need to save memory in large arrays of floating point numbers. This data type should never be used for precise values, such as currency. For that, you will need to use the java.math.BigDecimal class instead. Numbers and Strings covers BigDecimal and other useful classes provided by the Java platform.	Float grossPay = 2000.52;
Char	The char data type is a single 16-bit Unicode character. It has a minimum value of '\u0000' (or 0) and a maximum value of '\uffff' (or 65,535 inclusive).	char choice = 'A';
Boolean	The Boolean data type has only two possible values: true and false. Use this data type for simple flags that track true/false conditions. This data type represents one bit of information, but its "size" isn't something that's precisely defined.	a=10; b=20; bool a==b;

Print format		Example
%d	Int	System.out.print("%d"+ grossPay);
%f	Float	System.out.print("%f"+ grossPay);
%c	Char	System.out.print("%c"+ choice);
%S	String	System.out.print("%S"+ name);

NAMING CONVENTION FOR VARIABLES:-

1. Don't start variables name start with digit Example: int 1sale
2. Variables name are case sensitive Example: int sale & int Sale are different
3. Should not be a keyword
4. White space not allowed
5. Can contain alphabets, $ and _underscore and digit
6. Use Pascal Convention for classes Example: public class GreenTree;
7. Use camel Case Convention for functions and variables Example: getInput(), getPrint()
8. Package name should lower-case

Examples:

1. Write a java program to add three numbers
2. Write java program to calculate percentage of given student in CBSE board exam. His marks from 5 subjects must be taken input from the keyboard.
3. Write a java program which asks the user to enter his/her name and greeting them with " Hello <name>, have a good day" text.
4. Write a java program to converts kilometres to miles
5. Write a java program to detect whether a number entered by the user is integer or not
6. How will you write following expression in java
   - x-y/2, b^2-4ac/2a,
   - V^2-u^2, a *b-d
7. What is the value of following
   - Int y=7;
     Int x= ++y*8
8. What will be the result of following expression
   a = 7/4* 9/2
9. User comparison operator to find out whether a given number is greater than the user enter number or not.
10. Write the following expression in a java program v^2-u^2/ 2a5
11. Write a java program to convert a string to lower case.