

FAST

National University of Computer and Emerging Sciences Peshawar

Lecture # 02

Software Construction and Development (Java Programming)

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Java Basics

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- 2) Naming Conventions in Java
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Character Set

Character set → keyword(variables or constants) → instructions → programs → software

Character Set:

- 1) Alphabets (A-Z, a-z)
- 2) Digits (0-9)
- 3) Special Symbols

String: Sequence of characters

Naming Conventions in Java

Will follow basic rules of C++ and some extra rules:

- 1) Class
- 2) Methods/functions
- 3) Variables
- 4) Arrays

Naming Conventions in Java

1) Class name

i) If class name is consist of one word then its first alphabet must be capital

Example:

```
class Test
{
    statement(s);
}
```

Naming Conventions in Java...

ii) If class name is consist of more than one word then:

Example: `class MyFirstClass`
 `{`
 `statement(s);`
 `}`

Naming Conventions in Java...

2) Method/Functions

i) `void met()`
 `{ statement(s); }`


ii) `void mySuperClass()`
 `{ statement(s) ; }`


Naming Conventions in Java...

3) Variables

i) `int x;`

ii) `int myAge;`

iii) `final float Pi;` 
`pi =3.14;`

iv) `final float pi=3.14;` 

v) `final float PI =3.14;` (Correct Method)

Java Variables

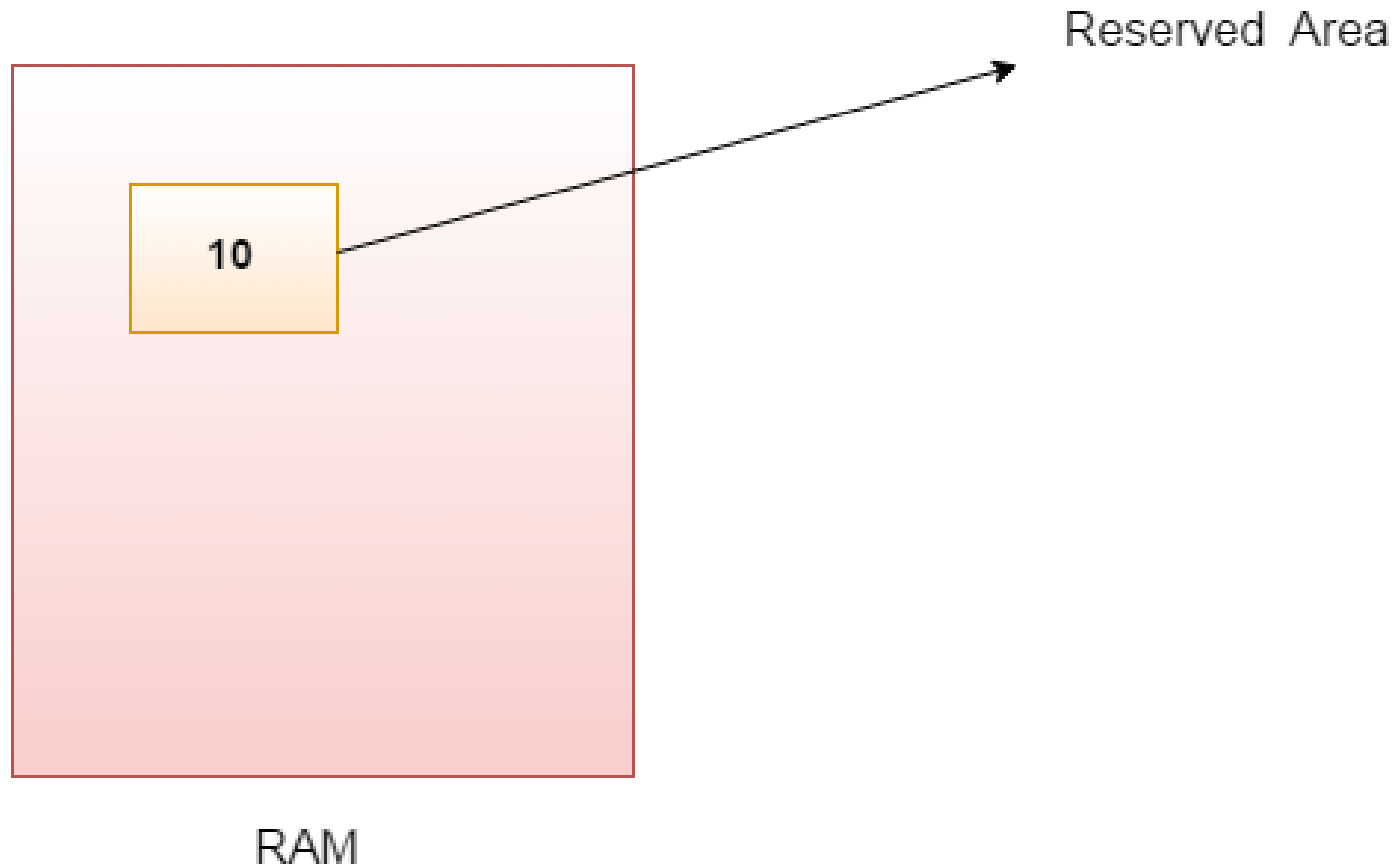
- ❖ A variable is a container which holds the value while the Java program is executed. A variable is assigned with a data type.
- ❖ Variable is a name of memory location. There are three types of variables in java: local, instance and static.
- ❖ There are two types of data types in Java: primitive and non-primitive.

Java Variables...

❖ **Variable** is name of *reserved area allocated in memory*. In other words, it is a *name of memory location*. It is a combination of "vary + able" that means its value can be changed.

❖ `int data=10; // Here data is variable`

Java Variables...

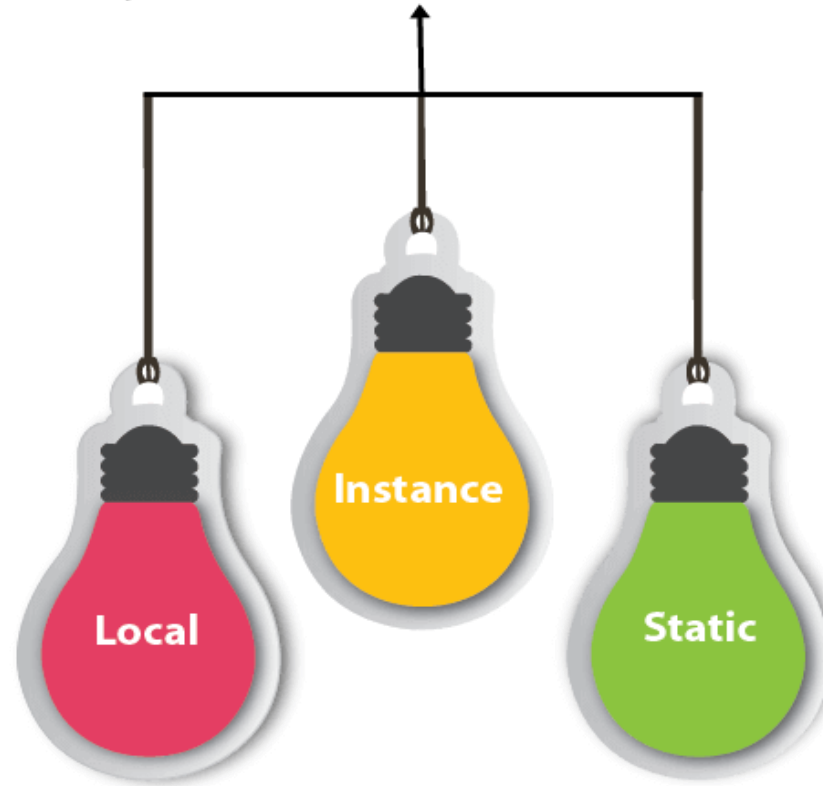


Java Variables...

Types of Variables

1. Local variable
2. Instance variable
3. Static variable

Types of Variables



1) Local Variable

- ❖ A variable declared inside the body of the method is called local variable.
- ❖ You can use this variable only within that method and the other methods in the class aren't even aware that the variable exists.
- ❖ A local variable cannot be defined with "static" keyword.

2) Instance Variable

- ❖ A variable declared inside the class but outside the body of the method, is called instance variable.
- ❖ Instance Variable does not get memory at compile time. It gets memory at run time when object (instance) of the class is created. That is why it is known as instance variable.
- ❖ It is not declared as static.
- ❖ It is called instance variable because its value is instance specific and is not shared among instances.

3) Static variable

- ❖ A variable which is declared as static is called static variable.
- ❖ It cannot be local.
- ❖ You can create a single copy of static variable and share among all the instances of the class.
- ❖ Memory allocation for static variable happens only once when the class is loaded in the memory.

Java Variables...

Example to understand the types of variables in java

```
class A {  
    int data=50;    //instance variable  
    static int m=100;    //static variable  
    void method(){  
        int n=90;    //local variable  
    }  
}    //end of class
```

Data Types in Java

Data types specify the different sizes and values that can be stored in the variable.

Data Types tell us:

- i) Type of data
- ii) Memory reserved (amount of memory)
- iii) Range of value

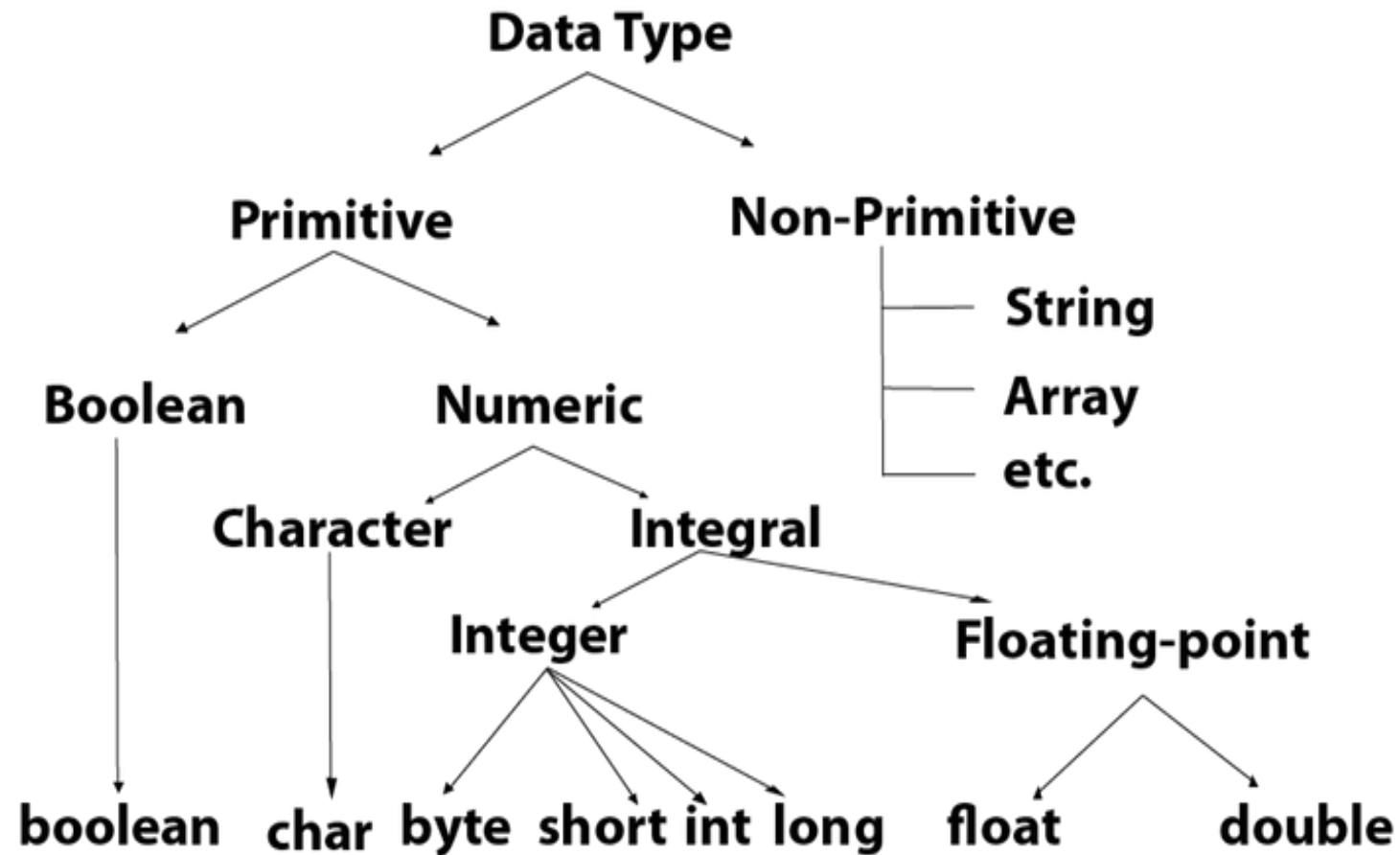
Data Types in Java...

There are two types of data types in Java:

1) Primitive data types: The primitive data types include boolean, char, byte, short, int, long, float and double.

2) Non-primitive data types: The non-primitive data types include Classes, Interfaces, and Arrays.

Data Types in Java...



Java Primitive Data Types...

- ❖ In Java language, primitive data types are the building blocks of data manipulation. These are the most basic data types available in Java language.
- ❖ Java is a statically-typed programming language. It means, all variables must be declared before its use. That is why we need to declare variable's type and name.

There are 8 types of primitive data types:

Java Primitive Data Types

1. boolean data type
2. byte data type
3. char data type
4. short data type
5. int data type
6. long data type
7. float data type
8. double data type

Java Primitive Data Types...

Data Type	Default Value	Default size/Memory reserved	Range Value
boolean	false	1 bit	
char	'\u0000'	2 byte	
byte	0	1 byte	-128 to 127 (inclusive).
short	0	2 byte	-32,768 to 32,767
int	0	4 byte	- 2,147,483,648 to 2,147,483,647
long	0L	8 byte	- 9,223,372,036,854,775,808 to 9,223,372,036,854,775,807.
float	0.0f	4 byte	Its value range is unlimited
double	0.0d	8 byte	Its value range is unlimited

Java Primitive Data Types...

Data Type	Description
int	Integer – 32bit ranging from -2,147,483,648 to 2,147,483,648
byte	8-bit integer ranging from -128 to 127
short	16-bit integer ranging from -32,768 to 32,768
long	64-bit integer from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,808
float	Single-precision floating point, 32-bit
double	Double-precision floating point, 64-bit
char	Character , 16-bit unsigned ranging from 0 to 65,536 (Unicode)
boolean	Can be true or false only

1) Boolean Data Type

- ❖ The Boolean data type is used to store only two possible values: true and false. This data type is used for simple flags that track true/false conditions.
- ❖ The Boolean data type specifies one bit of information, but its "size" can't be defined precisely.
- ❖ **Example:** boolean one = false

2) Byte Data Type

- ❖ The byte data type is an example of primitive data type. It is an 8-bit signed two's complement integer. Its value-range lies between -128 to 127 (inclusive). Its minimum value is -128 and maximum value is 127. Its default value is 0.
- ❖ The byte data type is used to save memory in large arrays where the memory savings is most required. It saves space because a byte is 4 times smaller than an integer. It can also be used in place of "int" data type.
- ❖ **Example:** byte a = 10, byte b = -20

3) Short Data Type

- ❖ The short data type is a 16-bit signed two's complement integer. Its value-range lies between -32,768 to 32,767 (inclusive). Its minimum value is -32,768 and maximum value is 32,767. Its default value is 0.
- ❖ The short data type can also be used to save memory just like byte data type. A short data type is 2 times smaller than an integer.
- ❖ **Example:** short s = 10000, short r = -5000

4) Int Data Type

- ❖ The int data type is a 32-bit signed two's complement integer. Its value-range lies between - 2,147,483,648 (-2^{31}) to 2,147,483,647 ($2^{31} - 1$) (inclusive). Its minimum value is - 2,147,483,648 and maximum value is 2,147,483,647. Its default value is 0.
- ❖ The int data type is generally used as a default data type for integral values unless if there is no problem about memory.
- ❖ **Example:** `int a = 100000, int b = -200000`

5) Long Data Type

- ❖ The long data type is a 64-bit two's complement integer. Its value-range lies between $-9,223,372,036,854,775,808$ (-2^{63}) to $9,223,372,036,854,775,807$ ($2^{63} - 1$) (inclusive).
- ❖ Its minimum value is $-9,223,372,036,854,775,808$ and maximum value is $9,223,372,036,854,775,807$. Its default value is 0.
- ❖ The long data type is used when you need a range of values more than those provided by int.
- ❖ **Example:** `long a = 100000L, long b = -200000L`

6) Float Data Type

- ❖ The float data type is a single-precision 32-bit IEEE 754 floating point. Its value range is unlimited.
- ❖ It is recommended to use a float (instead of double) if you need to save memory in large arrays of floating point numbers.
- ❖ The float data type should never be used for precise values, such as currency. Its default value is 0.0F.
- ❖ **Example:** float f1 = 234.5f

7) Double Data Type

- ❖ The double data type is a double-precision 64-bit IEEE 754 floating point. Its value range is unlimited.
- ❖ The double data type is generally used for decimal values just like float.
- ❖ The double data type also should never be used for precise values, such as currency. Its default value is 0.0d.
- ❖ **Example:** double d1 = 12.3

8) Char Data Type

- ❖ The char data type is a single 16-bit Unicode character. Its value-range lies between '\u0000' (or 0) to '\uffff' (or 65,535 inclusive).
- ❖ The char data type is used to store characters.
- ❖ **Example:** char letterA = 'A'

Java Primitive Data Types Vs Objects

Everything in Java is an “Object”, as every class by default inherits from class “Object”, except a few primitive data types, which are there for efficiency reasons.

Primitive Data types of java

- boolean, byte 1 byte
- char, short 2 bytes
- int, float 4 bytes
- long, double 8 bytes

Java Primitive Data Types Vs Objects...

- ❖ Primitive data types are generally used for local variables, parameters and instance variables (properties of an object).
- ❖ Primitive data types are located on the stack and we can only access their value, while objects are located on heap and we have a reference to these objects.
- ❖ Also primitive data types are always passed by value while objects are always passed by reference in java.

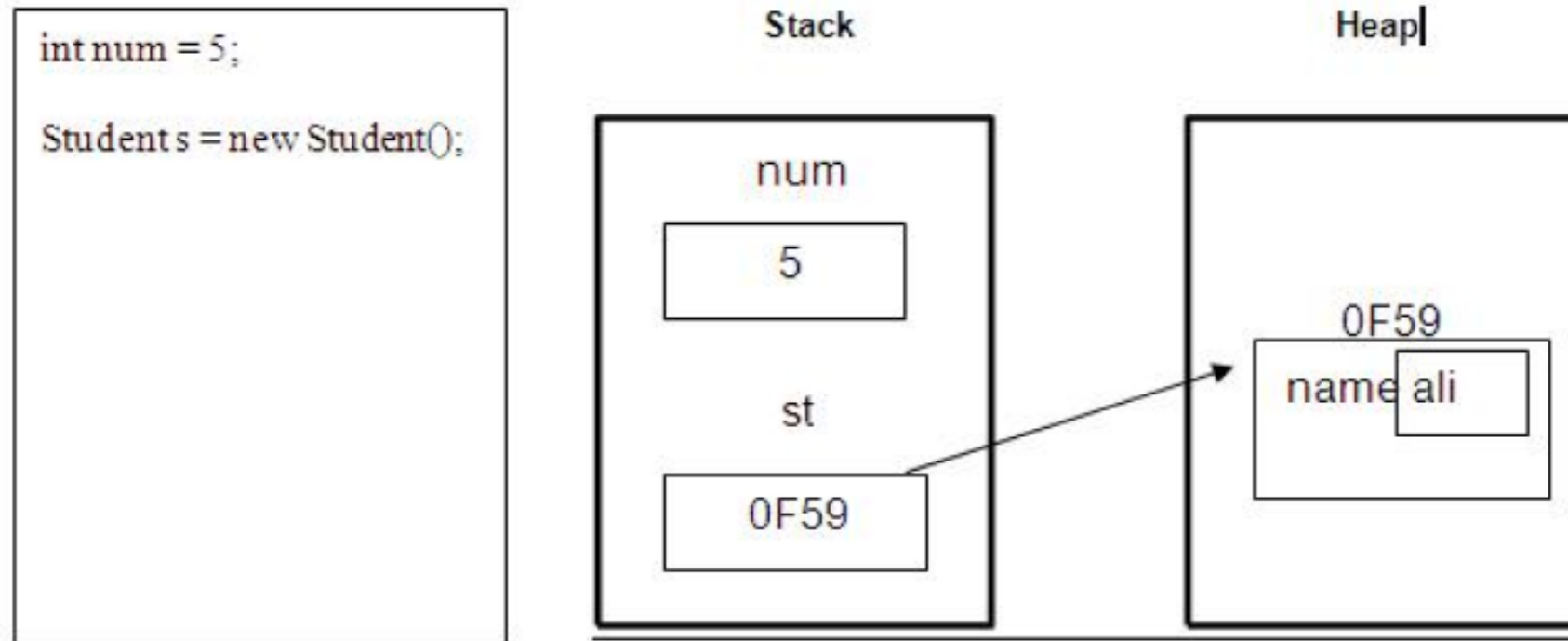
Java Primitive Data Types Vs Objects...

❖ There is no C++ like methods

```
void someMethod(int &a, int &b )    // not available in java
```

Stack vs Heap

Stack and heap are two important memory areas. Primitives are created on the stack while objects are created on heap.



Java Keywords

- ❖ **Java keywords** are also known as **reserved words**.
- ❖ Keywords are particular words which acts as a key to a code.
- ❖ These are predefined words by Java so it cannot be used as a variable or object name.
- ❖ Predefined words in a language.

List of Java Keywords

A list of Java keywords or reserved words are given below:

1) **abstract**: Java abstract keyword is used to declare abstract class. Abstract class can provide the implementation of interface. It can have abstract and non-abstract methods.

2) **boolean**: Java boolean keyword is used to declare a variable as a boolean type. It can hold True and False values only.

3) **break**: Java break keyword is used to break loop or switch statement. It breaks the current flow of the program at specified condition.

List of Java Keywords

4) byte: Java byte keyword is used to declare a variable that can hold an 8-bit data values.

5) case: Java case keyword is used to with the switch statements to mark blocks of text.

6) catch: Java catch keyword is used to catch the exceptions generated by try statements. It must be used after the try block only.

7) char: Java char keyword is used to declare a variable that can hold unsigned 16-bit Unicode characters.

List of Java Keywords...

8) class: Java class keyword is used to declare a class.

9) continue: Java continue keyword is used to continue the loop. It continues the current flow of the program and skips the remaining code at the specified condition.

10) default: Java default keyword is used to specify the default block of code in a switch statement.

11) do: Java do keyword is used in control statement to declare a loop. It can iterate a part of the program several times.

List of Java Keywords...

12) double: Java double keyword is used to declare a variable that can hold a 64-bit floating-point numbers.

13) else: Java else keyword is used to indicate the alternative branches in an if statement.

14) enum: Java enum keyword is used to define a fixed set of constants. Enum constructors are always private or default.

15) extends: Java extends keyword is used to indicate that a class is derived from another class or interface.

16 final: Java final keyword is used to indicate that a variable holds a constant value. It is applied with a variable. It is used to restrict the user.

List of Java Keywords...

17 finally: Java finally keyword indicates a block of code in a try-catch structure. This block is always executed whether exception is handled or not.

18 float: Java float keyword is used to declare a variable that can hold a 32-bit floating-point number.

19) for: Java for keyword is used to start a for loop. It is used to execute a set of instructions/functions repeatedly when some conditions become true. If the number of iteration is fixed, it is recommended to use for loop.

List of Java Keywords...

20) if: Java if keyword tests the condition. It executes the if block if condition is true.

21) implements: Java implements keyword is used to implement an interface.

22) import: Java import keyword makes classes and interfaces available and accessible to the current source code.

23) instanceof: Java instanceof keyword is used to test whether the object is an instance of the specified class or implements an interface.

List of Java Keywords...

24) int: Java int keyword is used to declare a variable that can hold a 32-bit signed integer.

25) interface: Java interface keyword is used to declare an interface. It can have only abstract methods.

26) long: Java long keyword is used to declare a variable that can hold a 64-bit integer.

27) native: Java native keyword is used to specify that a method is implemented in native code using JNI (Java Native Interface).

28) new: Java new keyword is used to create new objects.

List of Java Keywords...

29) null: Java null keyword is used to indicate that a reference does not refer to anything. It removes the garbage value.

30) package: Java package keyword is used to declare a Java package that includes the classes.

31) private: Java private keyword is an access modifier. It is used to indicate that a method or variable may be accessed only in the class in which it is declared.

32) protected: Java protected keyword is an access modifier. It can be accessible within package and outside the package but through inheritance only. It can't be applied on the class.

List of Java Keywords...

33) public: Java public keyword is an access modifier. It is used to indicate that an item is accessible anywhere. It has the widest scope among all other modifiers.

34) return: Java return keyword is used to return from a method when its execution is complete.

35) short: Java short keyword is used to declare a variable that can hold a 16-bit integer.

36) static: Java static keyword is used to indicate that a variable or method is a class method. The static keyword in Java is used for memory management mainly.

List of Java Keywords...

37) strictfp: Java strictfp is used to restrict the floating-point calculations to ensure portability.

38) super: Java super keyword is a reference variable that is used to refer parent class object. It can be used to invoke immediate parent class method.

39) switch: The Java switch keyword contains a switch statement that executes code based on test value. The switch statement tests the equality of a variable against multiple values.

40) synchronized: Java synchronized keyword is used to specify the critical sections or methods in multithreaded code.

List of Java Keywords...

41) this: Java this keyword can be used to refer the current object in a method or constructor.

42) throw: The Java throw keyword is used to explicitly throw an exception. The throw keyword is mainly used to throw custom exception. It is followed by an instance.

43) throws: The Java throws keyword is used to declare an exception. Checked exception can be propagated with throws.

44) transient: Java transient keyword is used in serialization. If you define any data member as transient, it will not be serialized.

List of Java Keywords...

45) try: Java try keyword is used to start a block of code that will be tested for exceptions. The try block must be followed by either catch or finally block.

46) void: Java void keyword is used to specify that a method does not have a return value.

47) volatile: Java volatile keyword is used to indicate that a variable may change asynchronously.

48) while: Java while keyword is used to start a while loop. This loop iterates a part of the program several times. If the number of iteration is not fixed, it is recommended to use while loop.

How to Display Output in Java

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

Basic Syntax of Java

About Java programs, it is very important to keep in mind the following points.

- **Case Sensitivity** - Java is case sensitive, which means identifier **Hello** and **hello** would have different meaning in Java.
- **Class Names** - For all class names the first letter should be in Upper Case.

If several words are used to form a name of the class, each inner word's first letter should be in Upper Case.

Example: *class MyFirstJavaClass*

- **Method Names** - All method names should start with a Lower Case letter.

If several words are used to form the name of the method, then each inner word's first letter should be in Upper Case.

Example: *public void myMethodName()*

Basic Syntax of Java...

- **Program File Name** - Name of the program file should exactly match the class name.

When saving the file, you should save it using the class name (Remember Java is case sensitive) and append '.java' to the end of the name (if the file name and the class name do not match, your program will not compile).

Example: Assume 'MyFirstJavaProgram' is the class name. Then the file should be saved as '*MyFirstJavaProgram.java*'

- **public static void main(String args[])** - Java program processing starts from the main() method which is a mandatory part of every Java program.

Comments in Java

Programmer write comments for their ease. Compiler does not compile comments.

1) Single line Comments : `// This is single line comment`

2) Multiline Comments: `/* this is multiline comment */`

THANK YOU

