



## Track 1

### Variable Types and Its size

Type	Size (bits)	Minimum	Maximum	Examples
<i>byte</i>	8	$-2^7$	$2^7 - 1$	<i>byte b = 100;</i>
<i>short</i>	16	$-2^{15}$	$2^{15} - 1$	<i>short s = 30_000;</i>
<i>int</i>	32	$-2^{31}$	$2^{31} - 1$	<i>int i = 100_000_000;</i>
<i>long</i>	64	$-2^{63}$	$2^{63} - 1$	<i>long l = 100_000_000_000_000;</i>
<i>float</i>	32	$-2^{-149}$	$(2-2^{-23}) \cdot 2^{127}$	<i>float f = 1.456f;</i>
<i>double</i>	64	$-2^{-1074}$	$(2-2^{-52}) \cdot 2^{1023}$	<i>double f = 1.456789012345678;</i>
<i>char</i>	16	0	$2^{16} - 1$	<i>char c = 'c';</i>
<i>boolean</i>	1	—	—	<i>boolean b = true;</i>

### Keywords in Java

1. **abstract** Specifies that a class or method will be implemented later, in a subclass
2. **assert** Assert describes a predicate placed in a java program to indicate that the developer thinks that the predicate is always true at that place.
3. **boolean** A data type that can hold True and False values only
4. **break** A control statement for breaking out of loops.
5. **byte** A data type that can hold 8-bit data values
6. **case** Used in switch statements to mark blocks of text
7. **catch** Catches exceptions generated by try statements
8. **char** A data type that can hold unsigned 16-bit Unicode characters
9. **class** Declares a new class
10. **continue** Sends control back outside a loop

11.	<b>default</b>	Specifies the default block of code in a switch statement
12.	<b>do</b>	Starts a do-while loop
13.	<b>double</b>	A data type that can hold 64-bit floating-point numbers
14.	<b>else</b>	Indicates alternative branches in an if statement
15.	<b>enum</b>	A Java keyword is used to declare an enumerated type. Enumerations extend the base class.
16.	<b>extends</b>	Indicates that a class is derived from another class or interface
17.	<b>final</b>	Indicates that a variable holds a constant value or that a method will not be overridden
18.	<b>finally</b>	Indicates a block of code in a try-catch structure that will always be executed
19.	<b>float</b>	A data type that holds a 32-bit floating-point number
20.	<b>for</b>	Used to start a for loop
21.	<b>if</b>	Tests a true/false expression and branches accordingly
22.	<b>implements</b>	Specifies that a class implements an interface
23.	<b>import</b>	References other classes
24.	<b>instanceof</b>	Indicates whether an object is an instance of a specific class or implements an interface
25.	<b>int</b>	A data type that can hold a 32-bit signed integer
26.	<b>interface</b>	Declares an interface
27.	<b>long</b>	A data type that holds a 64-bit integer
28.	<b>native</b>	Specifies that a method is implemented with native (platform-specific) code
29.	<b>new</b>	Creates new objects
30.	<b>null</b>	This indicates that a reference does not refer to anything
31.	<b>package</b>	Declares a Java package
32.	<b>private</b>	An access specifier indicating that a method or variable may be accessed only in the class it's declared in
33.	<b>protected</b>	An access specifier indicating that a method or variable may only be accessed in the class it's declared in (or a subclass of the class it's declared in or other classes in the same package)
34.	<b>public</b>	An access specifier used for classes, interfaces, methods, and variables indicating that an item is accessible throughout the application (or where the class that defines it is accessible)
35.	<b>return</b>	Sends control and possibly a return value back from a called method
36.	<b>short</b>	A data type that can hold a 16-bit integer
37.	<b>static</b>	Indicates that a variable or method is a class method (rather than being limited to one particular object)
38.	<b>strictfp</b>	A Java keyword is used to restrict the precision and rounding of floating-point calculations to ensure portability.
39.	<b>super</b>	Refers to a class's base class (used in a method or class constructor)
40.	<b>switch</b>	A statement that executes code based on a test value
41.	<b>synchronized</b>	Specifies critical sections or methods in multithreaded code

42. **this** Refers to the current object in a method or constructor
43. **throw** Creates an exception
44. **throws** Indicates what exceptions may be thrown by a method
45. **transient** Specifies that a variable is not part of an object's persistent state
46. **try** Starts a block of code that will be tested for exceptions
47. **void** Specifies that a method does not have a return value
48. **volatile** This indicates that a variable may change asynchronously
49. **while** Starts a while loop

0	<NUL>	32	<SPC>	64	@	96	`	128	Ä	160	†	192	¿	224	‡
1	<SOH>	33	!	65	A	97	a	129	Å	161	°	193	¡	225	•
2	<STX>	34	"	66	B	98	b	130	Ç	162	¢	194	¬	226	,
3	<ETX>	35	#	67	C	99	c	131	É	163	£	195	√	227	"
4	<EOT>	36	\$	68	D	100	d	132	Ë	164	§	196	ƒ	228	‰
5	<ENQ>	37	%	69	E	101	e	133	Ö	165	•	197	≈	229	Â
6	<ACK>	38	&	70	F	102	f	134	Ü	166	¶	198	Δ	230	Ê
7	<BEL>	39	'	71	G	103	g	135	á	167	β	199	«	231	Á
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9	<TAB>	41	)	73	I	105	i	137	â	169	©	201	...	233	È
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16	<DLE>	48	0	80	P	112	p	144	ê	176	∞	208	-	240	Ⓜ
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18	<DC2>	50	2	82	R	114	r	146	í	178	≤	210	"	242	Ú
19	<DC3>	51	3	83	S	115	s	147	ì	179	≥	211	"	243	Û
20	<DC4>	52	4	84	T	116	t	148	î	180	¥	212	'	244	Ü
21	<NAK>	53	5	85	U	117	u	149	ï	181	μ	213	'	245	ı
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24	<CAN>	56	8	88	X	120	x	152	ò	184	Π	216	ÿ	248	—
25	<EM>	57	9	89	Y	121	y	153	ô	185	π	217	Ÿ	249	˘
26	<SUB>	58	:	90	Z	122	z	154	ö	186	ƒ	218	/	250	˙
27	<ESC>	59	;	91	[	123	{	155	õ	187	ª	219	€	251	˚
28	<FS>	60	<	92	\	124		156	ú	188	º	220	<	252	¸
29	<GS>	61	=	93	]	125	}	157	ù	189	Ω	221	>	253	˝
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31	<US>	63	?	95	_	127	<DEL>	159	ü	191	ø	223	fl	255	˜

Figure 1 Ascii Chart

## Execution for a JAVA code

Editors	IDE
<ul style="list-style-type: none"><li>• Notepad</li><li>• Notepad ++</li><li>• Visual Code</li><li>• Sublime Text</li></ul>	<ul style="list-style-type: none"><li>• Eclipse</li><li>• Intelli J</li><li>• NetBeans</li></ul>

JVM, JRE and JDK are platform **dependent** because the configuration of each OS differs. **But Java is platform-independent.**

1. **Java Development Kit (JDK)** is a software development environment used for developing Java applications and applets. It includes the Java Runtime Environment (JRE), an interpreter/loader (Java), a compiler (javac), an archiver (jar), a documentation generator (Javadoc), and other tools needed in Java development.

JDK usage [Build, Compile, and Execute Application]

Java follows WORA (Write once read anywhere)

2. **JRE** (Java Runtime Environment) is an installation package that provides an environment to only run (not develop) the java program (or application) onto your machine. JRE is only used by those who only want to run Java programs that are end-users of your system.
3. **JVM** (Java Virtual Machine) is a very important part of both JDK and JRE because it is contained or inbuilt in both. Whatever Java program you run using JRE or JDK goes into JVM and JVM is responsible for executing the java program line by line, hence it is also known as an interpreter.

## Installation Of JDK

1. Download jdk8
2. Set Environment Path Variables
3. Test the installation using the following commands

```
C:\Users\suman>javac -version
javac 17.0.2
C:\Users\suman>java -version
java version "17.0.2" 2022-01-18 LTS
Java(TM) SE Runtime Environment (build 17.0.2+8-LTS-86)
Java HotSpot(TM) 64-Bit Server VM (build 17.0.2+8-LTS-86, mixed mode, sharing)
C:\Users\suman>
```

*Not the above result is for JDK 17, JDK 8 result might differ*

A computer only understands Binary Numbers 0, 1

### Steps to Execute JAVA Code

1. Write your Java code in a .java file [Source Code]
2. The compilation (Conversion of a Source code to a more machine-friendly language)  
The compilation will give you a .class file (.class file is also known as *ByteCode*)
3. Execution  
Run the compiled .class file using the following commands.

```
C:\Users\suman\Downloads\Y Hills\Source Code\Basics>javac Main.java  
C:\Users\suman\Downloads\Y Hills\Source Code\Basics>java Main  
Light Speed2.9979445867687994E8  
Light Speed@
```

### RULES

- You must have to obey
- Apart from imports, annotations and package names, all will reside inside a class
- The name of the file should match the class name

### Convention [Good Habits]

You should follow

- Class Names -> Use PascalCase
- Variable and Method[function] names -> we use camelCase

KushankJain

kushankJain

## Packages

### Package Intro

A java package is a group of similar types of classes, interfaces and sub-packages.

#### Advantage of Java Packages

- Java package is used to categorize the classes and interfaces so that they can be easily maintained.
- Java package provides access protection.
- Java package removes naming collision.

#### Naming Convention

Say Website is: [www.jdk8.com](http://www.jdk8.com)

So package name will start as **com.jdk8.####**

Internally it will create a nested folder structure like



## Loops

### Scope Of Variables

The reach of a variable will depend on where it is declared.

### Continue and Break Statements

- Continue
- Break

The above two keywords can be used to further control the loops

### While Loop

While loop can be also used for looping

- do while
- while

*The basic difference between do-while and while loop is that do while will at least execute for one time.*



## Track 2

### Wrapper Classes

#### Intro

The Wrapper class in Java provides the mechanism to convert primitive into object and object into primitive.

#### Autoboxing and Unboxing

We also have **autoboxing** and **unboxing** features that convert primitives into objects and objects into primitives automatically. The automatic conversion of a primitive into an object is known as autoboxing and vice-versa unboxing.

```
Integer num = 9;  
Character ch = 'c';
```

## WrapperClass.java

```
package com.jdk8.oop.basics;

public class WrapperClass {

    public static void main(String[] args) {

        String name = "rishav";
        // Primitive Variables
        int number = 10;
        boolean isSad = false;
        // Wrapping int to an Integer Object
        Integer integer = new Integer(10);

        // Wrapping boolean to an Boolean Object
        Boolean boolean1 = new Boolean(true);

        byte by = 8;
        int p = by;

        // Generally You cannot fit a higher space data in lower space [Bucket - Mug
        // Analogy]
        // int m = 8;
        // byte c=m;

        // Here we have exception as long[64bit] is getting stored in float[32 bit],
        // The reason is that both have different storing algorithms, and floating
        numbers is getting stored using higher efficiency IEEE algo
        long lon = Long.MAX_VALUE;
        float fl = lon;
        System.out.println(fl);

        byte b = 10;
        short s = 20;
        int i = 30;
        long l = 40;
        float f = 50.0F;
        double d = 60.0D;
        char c = 'a';
        boolean b2 = true;

        // Autoboxing: Converting primitives into objects
        // With this mechanism So no need of "new" keyword
        Byte byteobj = b;
        Short shortobj = s;
        Integer intobj = i;
        Long longobj = l;
        Float floatobj = f;
        Double doubleobj = d;
        Character charobj = c;
        Boolean boolobj = b2;

        // Unboxing: Converting Objects to Primitives Automatically ,again no use of
        // "new" keyword
        byte bytevalue = byteobj;
        short shortvalue = shortobj;
        int intvalue = intobj;
        long longvalue = longobj;
        float floatvalue = floatobj;
        double doublevalue = doubleobj;
        char charvalue = charobj;
        boolean boolvalue = boolobj;

    }

}
```

## OOP [Object Orientation Programming] Intro

### Intro

Object-oriented programming (OOP) is a computer programming model that organizes software design around data, or objects, rather than functions and logic. An object can be defined as a data field that has unique attributes and behaviour.

Say a **mixer grinder**

1. Its Properties [has]
  - a. Wattage
  - b. Colour
  - c. Speed
2. Its Functionality [does]
  - a. grind()
  - b. blend()
  - c. juiceOut()

**We use classes in OOP,**

Classes are just like Formula/Recipe or a prototype for an Object.

Think like to make a Cake we need a Recipe

Recipe ---> Cake

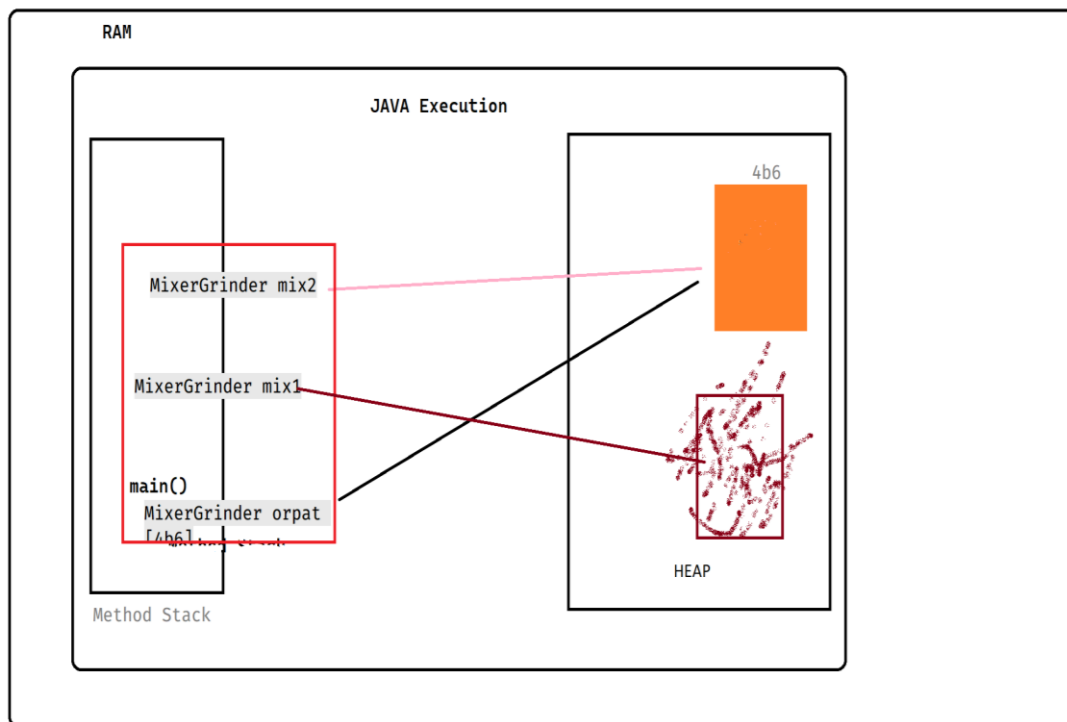


Figure 2 OOP Memory Discussion

#### MixerGrinder.java

```
package com.jdk8.oop.basics;

public class MixerGrinder {

    //Instance variable/Object Variables
    int wattage;
    String color;
    int speed;

    void grind(){
        System.out.println("GRINDING");
    }

    void mixing(){
        System.out.println("MIXING");
    }

    void blending(){
        System.out.println("BLENDING");
    }

    void readOutSpecs() {
        System.out.println("Wattage -> "+wattage);
        System.out.println("Speed -> "+speed);
        System.out.println("Color -> "+color);
    }

}
```

## MixerBuy.java

```
package com.jdk8.oop.basics;

public class MixerBuy {

    public static void main(String[] args) {
        // TODO Auto-generated method stub

        MixerGrinder orpat =new MixerGrinder();//orpat as a Object Reference
        //MixerGrinder()
        System.out.println(orpat);//By default it will print the memory address

        orpat.readOutSpecs();// preint the defaulyt values

        //      Default Values
        //      integer --> 0
        //      float/double -> 0.0
        //      Objetct refer nce - null
        //      String - null
        //      char -> null char
        //      boolean --> false

        orpat.color="Pink";
        orpat.speed=20000;
        orpat.wattage=240;

        orpat.readOutSpecs();

        System.out.println("\n\n\n mix1");
        MixerGrinder mix1;
        mix1 = new MixerGrinder();
        System.out.println(mix1);
        mix1.readOutSpecs();

        MixerGrinder mix2= orpat;
        System.out.println(mix2);
        mix2.readOutSpecs();

        orpat.readOutSpecs();
        // mix1.readOutSpecs();

        mix1=null;
        orpat=null;

    }

}
```

## Garbage and Garbage Collector

Garbage collection in Java is the process by which Java programs perform automatic memory management. Java programs compile to bytecode that can be run on a Java Virtual Machine, or JVM for short. When Java programs run on the JVM, objects are created on the heap, which is a portion of memory dedicated to the program. Eventually, some objects will no longer be needed. The garbage collector finds these unused objects and deletes them to free up memory.

Java garbage collection is an automatic process. Automatic garbage collection is the process of looking at heap memory, identifying which objects are in use and which are not, and deleting the unused objects. An in-use object, or a referenced object, means that some part of your program still maintains a pointer to that object. An unused or unreferenced object is no longer referenced by any part of your program. So, the memory used by an unreferenced object can be reclaimed. **The programmer does not need to mark objects to be deleted explicitly.** The garbage collection implementation lives in the JVM.

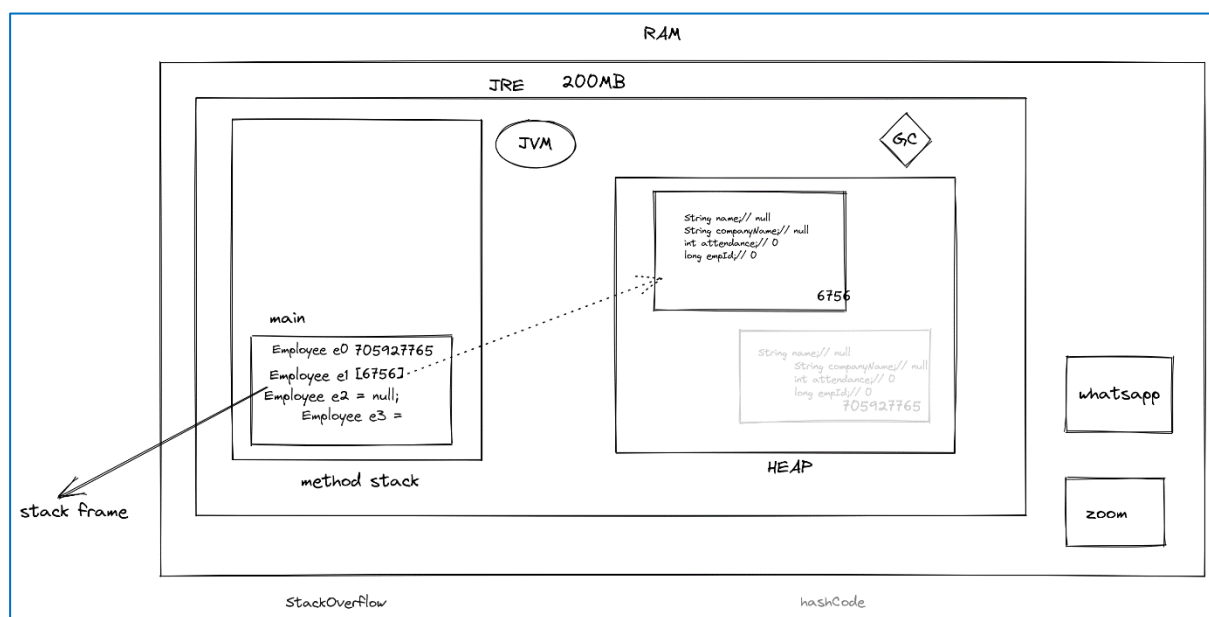


Figure 3 Memory Working in Java

## Scanner Class

Scanner is a class in java.util package used for obtaining the input of the primitive types like int, double, etc. and strings. It is the easiest way to read input in a Java program.

### ScannerInput.java

```
package com.jdk8.basics;

import java.util.Scanner;

public class ScannerInput {

    public static void main(String[] args) {

        //          Scanner Class [Inbuilt Class for taking input]
        Scanner sc = new Scanner(System.in);

        //          printing
        System.out.println("Enter your Age");// this will go to next line after
        //          printing
        System.out.print("Enter your name");// this will not change the line after
        System.out.println();// blank empty line
        //          System.out.print();//Error
        //          String next = sc.next();//inputs only one word
        String next = sc.nextLine();// inputs whole sentence
        System.out.println(next);

        float height = sc.nextFloat();
        System.out.println("Height ~> " + height);
        System.out.println("Enter a number to be squared");
        int integer = sc.nextInt();
        int result = findSqr(integer);
        System.out.println(result);

        sc.close();// closing the Scanner resource

    }

    static int findSqr(int x) { // formal parameters
        int result = x * x;
        return result;
    }

}
```

### ScannerInputCornerCase.java

```
package com.jdk8.basics;

import java.util.Scanner;

public class ScannerInputCornerCase {

    public static void main(String[] args) {

        //          Scanner Class [Inbuilt]
        System.out.println("START");
        Scanner sc = new Scanner(System.in);
```

```
        System.out.println("Enter the age");
        int age = sc.nextInt();
        System.out.println("AGE -> " + age);

        System.out.println("Enter the name");
        sc.nextLine();// Flushing
        String name = sc.nextLine();
        System.out.println("NAME -> " + name);

        System.out.println("END");

    }

}
```