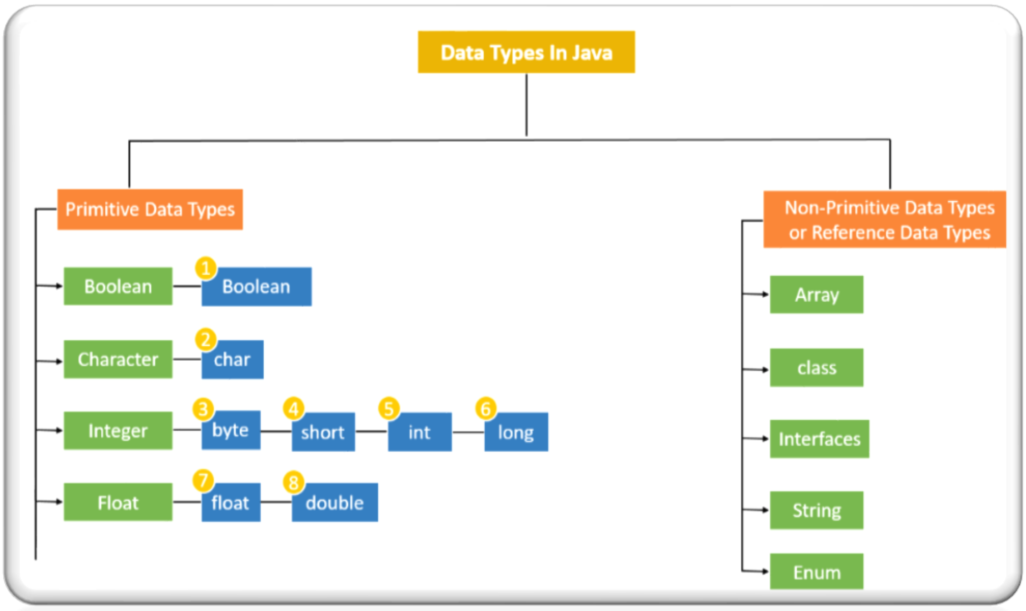
DATA TYPE IN JAVA

Data types in Java specify how memory stores the values of the variable. Each variable has a data type that decides the value the variable will hold. Moreover, Primitive Data Types are also used with functions to define their return type.

Data Types in Java

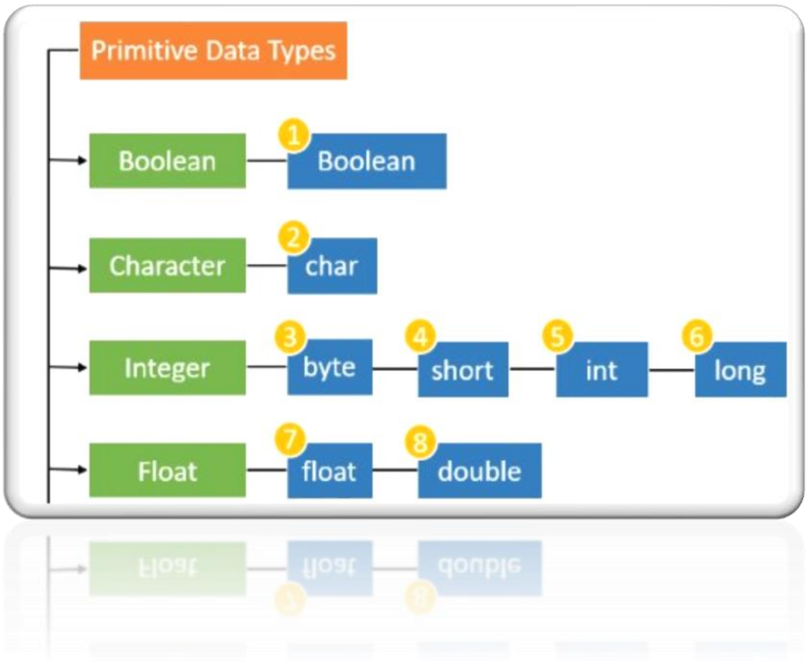
Data types in Java are divided into **2** categories:

1. **Primitive Data Types**
2. **Non-Primitive Data Types**



1. Primitive Data Types

Primitive data types specify the size and type of variable values. They are the building blocks of data manipulation and cannot be further divided into simpler data types.

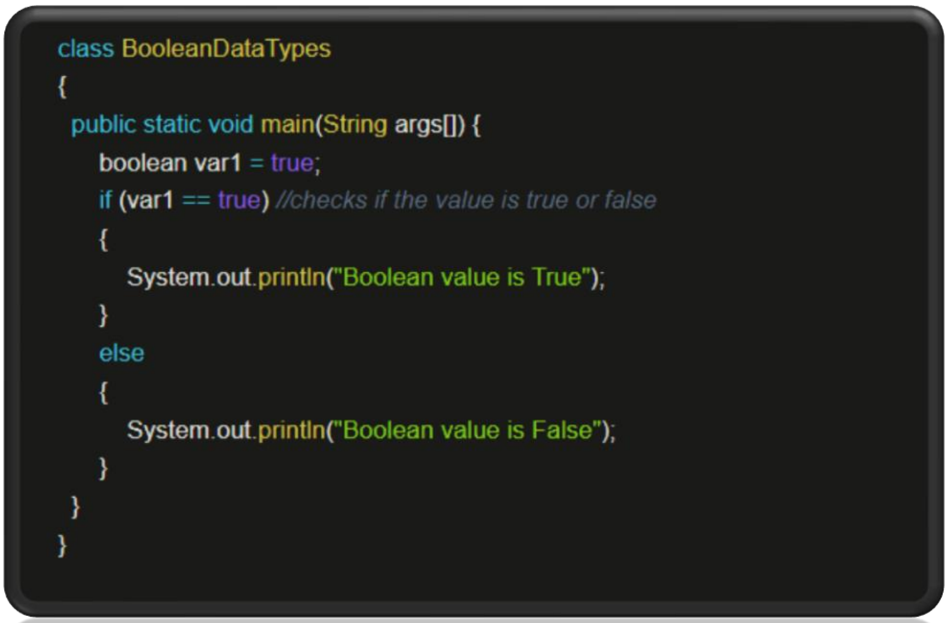


Boolean type – Boolean

A boolean data type can store either **True or False**. They can be used to check whether two values are equal or not (basically in conditional statements to return True or False). Typically, programmers use it as a flag variable to track true or false conditions.

The default boolean value is False. Moreover, the boolean type’s size depends on the Java Virtual Machine. Therefore, it fluctuates on different platforms.

Example-



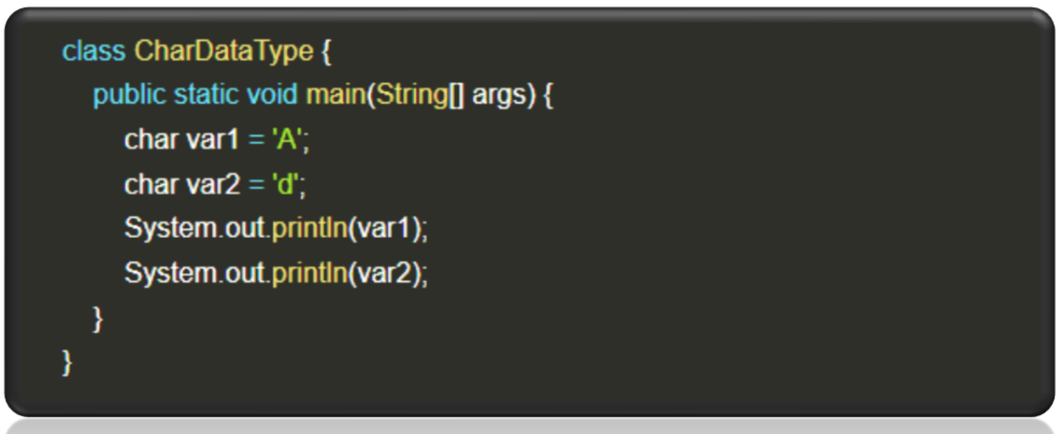
```
class BooleanDataTypes
{
  public static void main(String args[]) {
     boolean var1 = true;
     if (var1 == true) //checks if the value is true or false
     {
        System.out.println("Boolean value is True");
     }
     else
     {
        System.out.println("Boolean value is False");
     }
  }
}
```

Output: Boolean value is True

Character type – char:

The **char data type** stores a **single character**. It stores lowercase and uppercase characters, which must be enclosed in single quotes. The char data type in Java supports Unicode characters and provides provision to multiple languages like English, French, German, etc. It takes memory space of 16 bits or 2 bytes. The values stored range between 0 to 65536.

Example:-



```
class CharDataType {
    public static void main(String[] args) {
        char var1 = 'A';
        char var2 = 'd';
        System.out.println(var1);
        System.out.println(var2);
    }
}
```

Output: A d

Integer type:

An integer type stores an integer number with no fractional or decimal places. Java has four integer types – **byte, short, int, and long.**

- **Byte**

The byte is the smallest data type among all the integer data types. It is an 8-bit signed two's complement integer. It stores whole numbers ranging from -128 to 127.

Syntax: **`byte byteVariable;`**

- **Short**

Short is a 16-bit signed two's complement integer. It stores whole numbers with values ranging from -32768 to 32767. Its default value is 0.

Syntax: **`short shortVariable;`**

- **Int**

Int is a 32-bit signed two's complement integer that stores integral values ranging from 2147483648 (-2^31) to 2147483647 (2^31 -1). Its default value is 0.

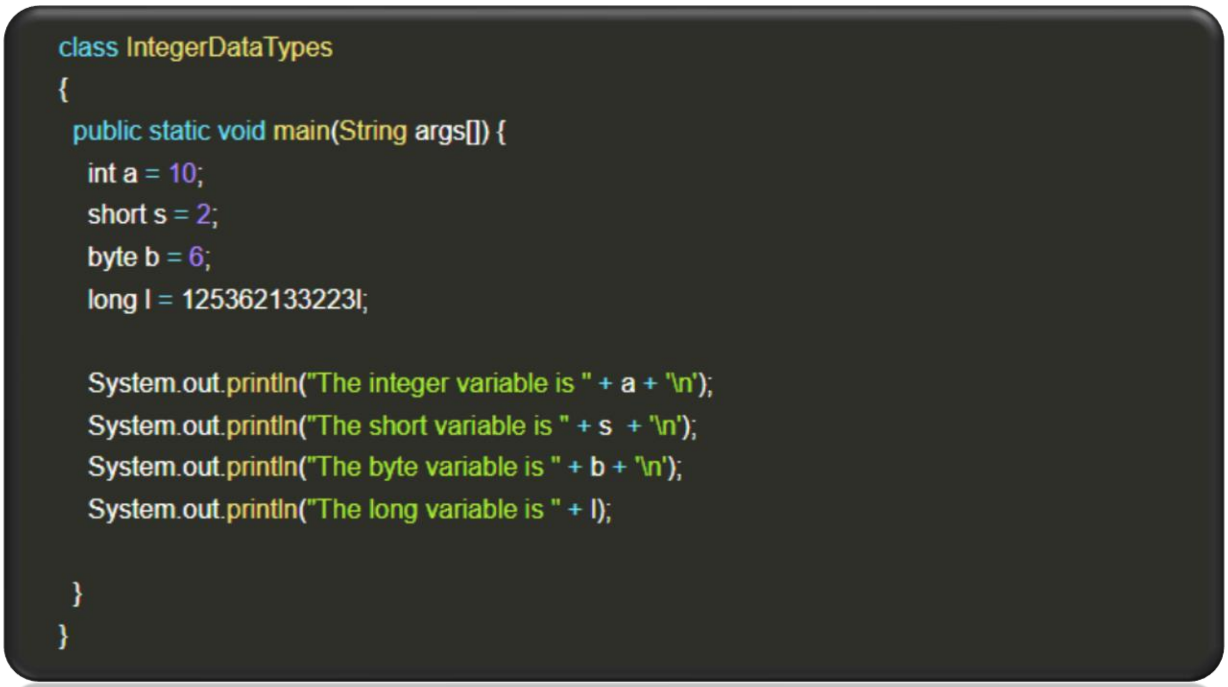
Syntax: **`int intVariable;`**

- **Long**

long is a 64-bit signed two's complement integer that stores values ranging from -9223372036854775808(-2^63) to 9223372036854775807(2^63 -1). It is used when we need a range of values more than those provided by int. Its default value is 0L. This data type ends with 'L' or 'l'.

Syntax: **`long longVariable;`**

Example:



```
class IntegerDataTypes
{
 public static void main(String args[]) {
   int a = 10;
   short s = 2;
   byte b = 6;
   long l = 125362133223l;

   System.out.println("The integer variable is " + a + '\n');
   System.out.println("The short variable is " + s  + '\n');
   System.out.println("The byte variable is " + b + '\n');
   System.out.println("The long variable is " + l);

 }
}
```

Output:

```
The integer value is 10

The short variable is 2

The byte variable is 6

The long variable is 125362133223
```

Float type:

Floating-point is used for expressions involving fractional precision. It has two types: **float and double.**

1. Float

It is a floating-point data type that stores the values, including their decimal precision. It is not used for precise data such as currency or research data.

A Float value:

- is a single-precision **32-bit or 4 bytes** IEEE 754 floating-point
- can have a 7-digit decimal precision
- ends with an ‘f’ or ‘F’
- default value = 0.0f
- stores fractional numbers ranging from 3.4e-038 to 3.4e+038

Syntax: `float floatVariable;`

2. Double

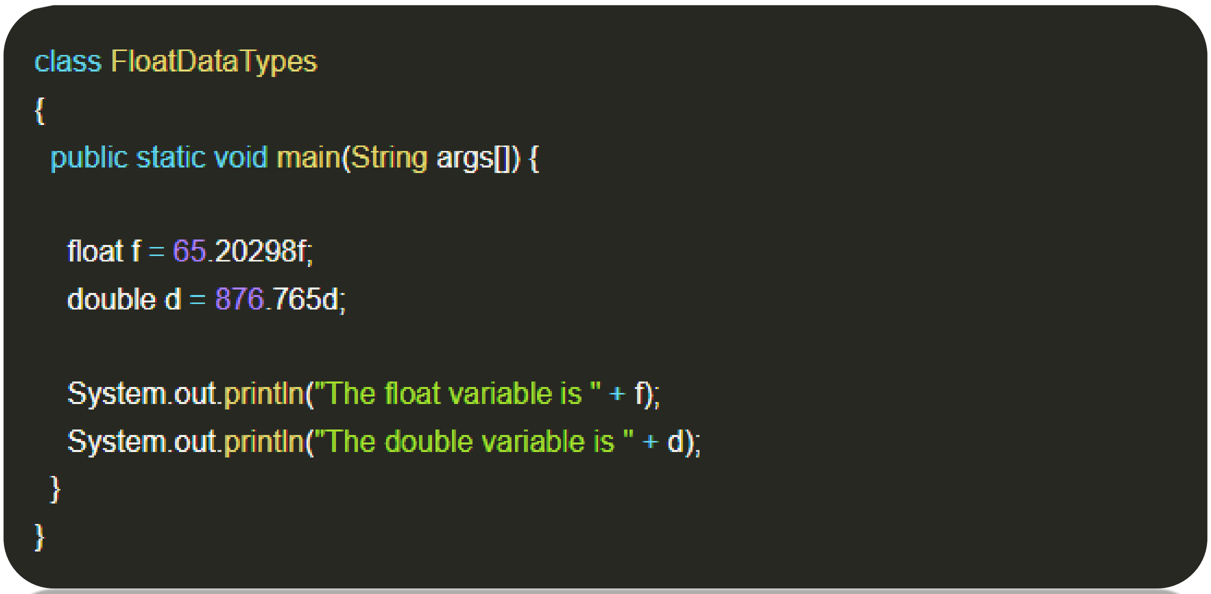
The double data type is similar to float. The difference between the two is that is double twice the float in the case of decimal precision. It is used for decimal values just like float and should not be used for precise values.

A double value:

- is a double-precision **64-bit or 8** bytes IEEE 754 floating-point
- can have a 15-digit decimal precision
- default value = 0.0d
- stores fractional numbers ranging from 1.7e-308 to 1.7e+308

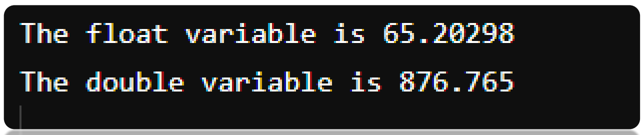
Syntax: `double doubleVariable;`

Example:



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

    float f = 65.20298f;
    double d = 876.765d;

    System.out.println("The float variable is " + f);
    System.out.println("The double variable is " + d);
  }
}
```

Output:



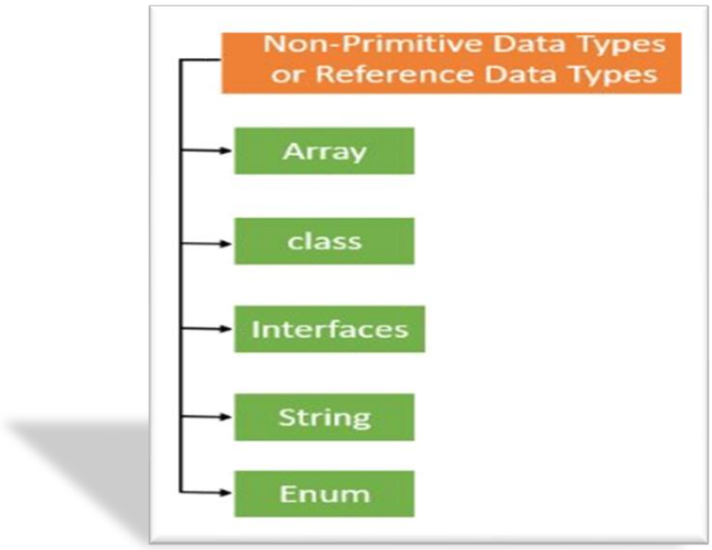
```
The float variable is 65.20298
The double variable is 876.765
```

Primitive Data Types Table – Default Value, Size, and Range:

Data Type	Default Value	Default size	Range
byte	0	1 byte or 8 bits	-128 to 127
short	0	2 bytes or 16 bits	-32,768 to 32,767
int	0	4 bytes or 32 bits	2,147,483,648 to 2,147,483,647
long	0	8 bytes or 64 bits	9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	0.0f	4 bytes or 32 bits	1.4e-045 to 3.4e+038
double	0.0d	8 bytes or 64 bits	4.9e-324 to 1.8e+308
char	'\u0000'	2 bytes or 16 bits	0 to 65536
boolean	FALSE	1 byte or 2 bytes	0 or 1

2.Non-Primitive Data Types

Non-primitive data types or reference data types refer to instances or objects. They cannot store the value of a variable directly in memory. They store a memory address of the variable. Unlike primitive data types we define by Java, non-primitive data types are user-defined. Programmers create them and can be assigned with null. All non-primitive data types are of equal size.

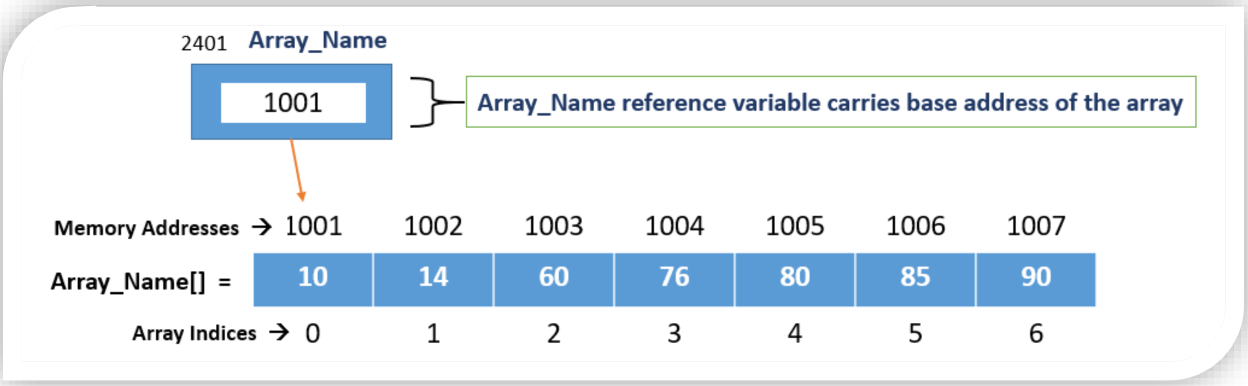


Array

An array holds elements of the same type. It is an object in Java, and the array name (used for declaration) is a reference value that carries the base address of the continuous location of elements of an array.

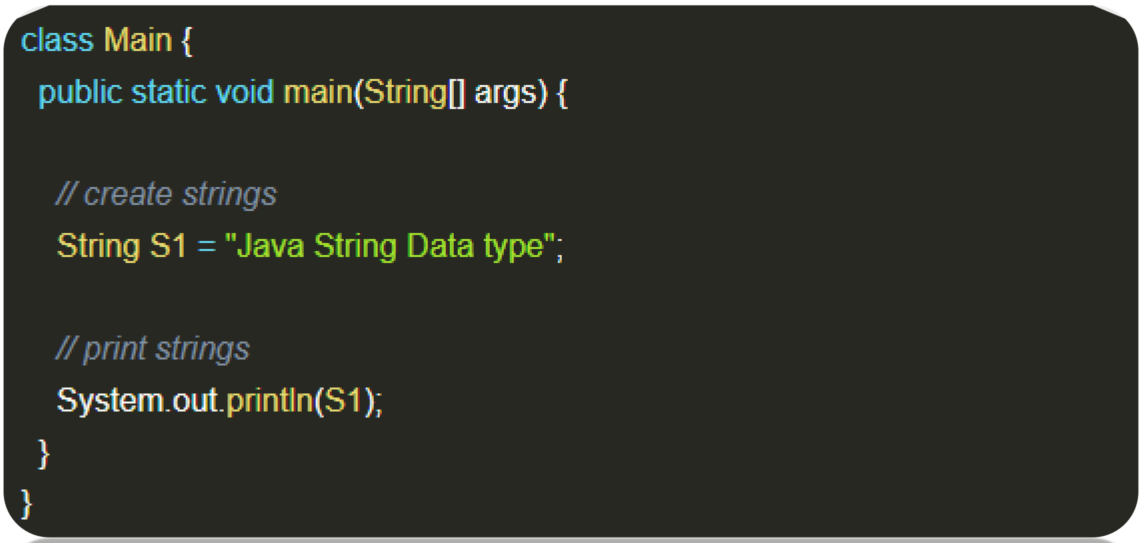
Example:

```
int Array_Name = new int[7];
```


2401 Array_Name
1001
Array_Name reference variable carries base address of the array
Memory Addresses → 1001 1002 1003 1004 1005 1006 1007
Array_Name[] = 10 14 60 76 80 85 90
Array Indices → 0 1 2 3 4 5 6

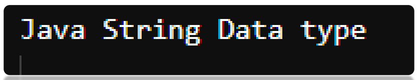
String

The **String** data type stores a sequence or array of characters. A string is a non-primitive data type, but it is predefined in Java. String literals are enclosed in double quotes.



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

    // create strings
    String S1 = "Java String Data type";

    // print strings
    System.out.println(S1);
  }
}
```

Output:



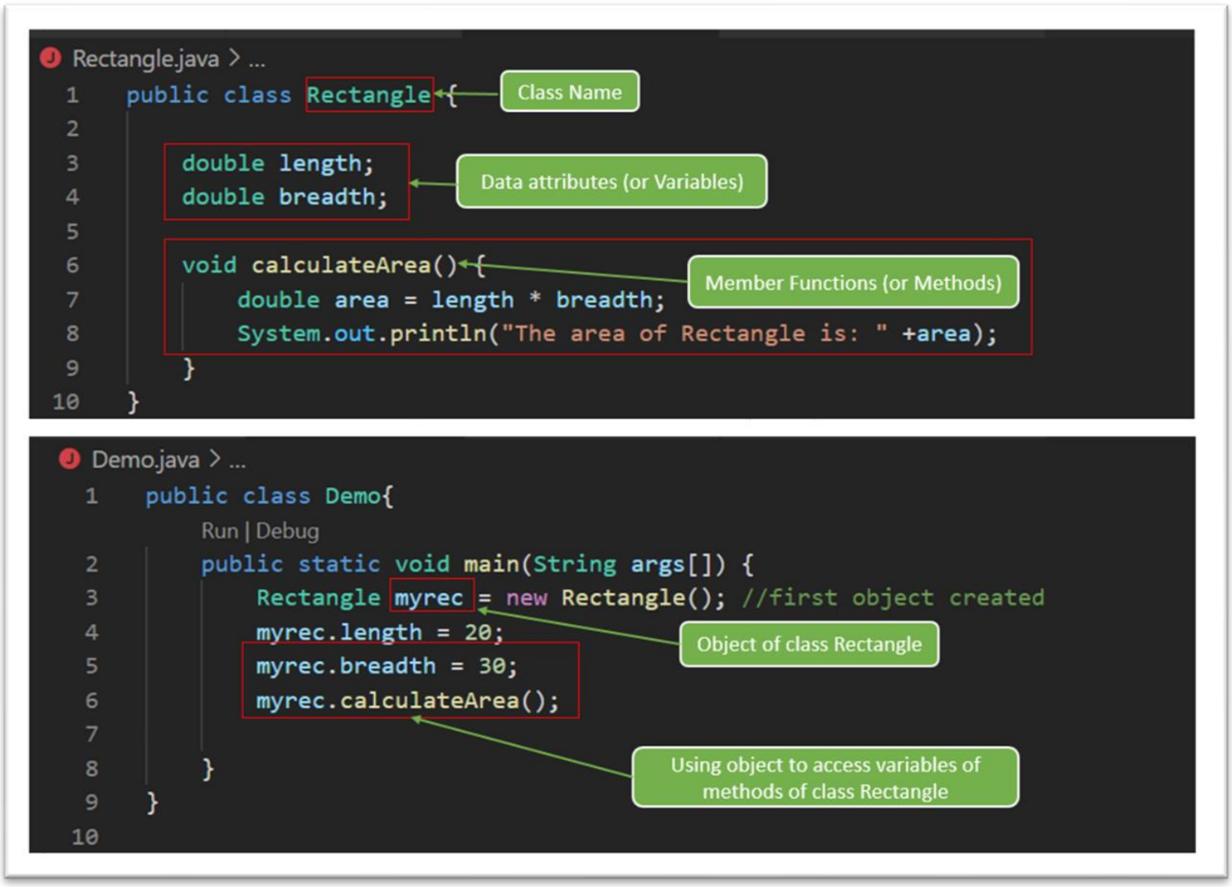
```
Java String Data type
```

Class

A **class** is a user-defined data type from which objects are created. It describes the set of properties or methods common to all objects of the same type. It contains fields and methods that represent the behaviour of an object. A class gets invoked by the creation of the respective object.

There are two types of classes: a blueprint and a template. For instance, the architectural diagram of a building is a class, and the building itself is an object created using the architectural diagram.

Example:



Rectangle.java > ...

```java
public class Rectangle{

    double length;
    double breadth;

    void calculateArea(){
        double area = length * breadth;
        System.out.println("The area of Rectangle is: " +area);
    }
}
```

Demo.java > ...

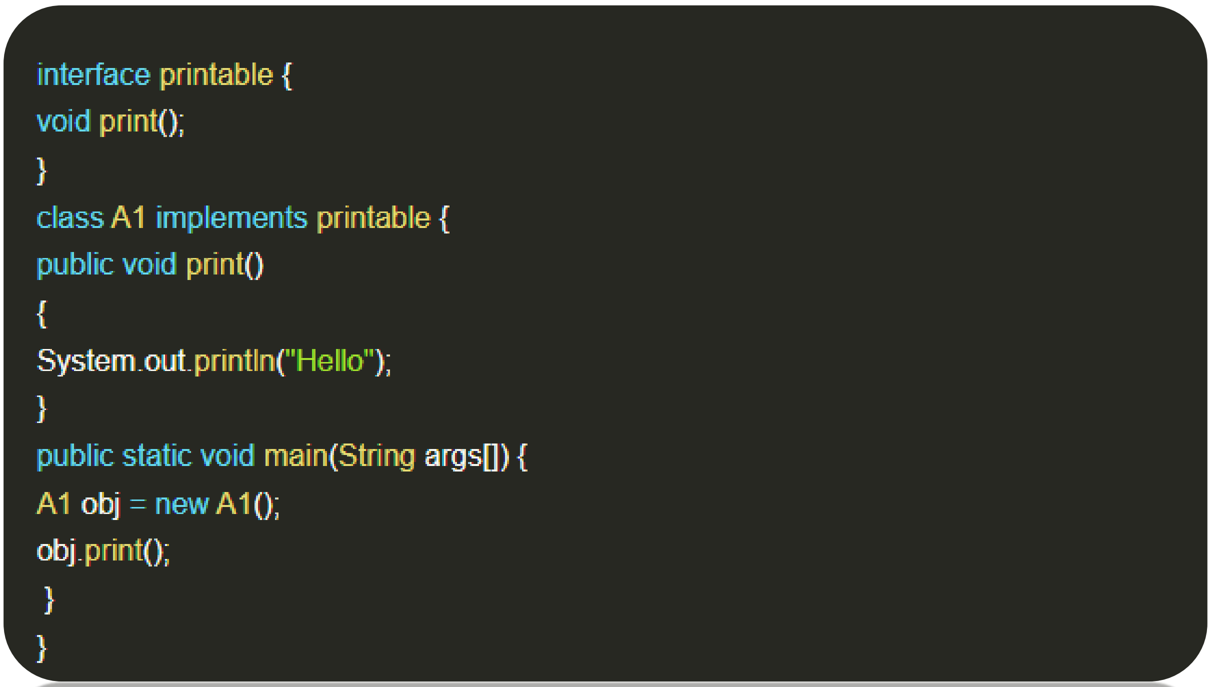
```java
public class Demo{
    Run | Debug
    public static void main(String args[]) {
        Rectangle myrec = new Rectangle(); //first object created
        myrec.length = 20;
        myrec.breadth = 30;
        myrec.calculateArea();

    }
}
```

Class Name
Data attributes (or Variables)
Member Functions (or Methods)
Object of class Rectangle
Using object to access variables of methods of class Rectangle

Interface

An **interface** is declared like a class. The key difference is that the interface contains abstract methods by default; they have nobody.

Example:



```
interface printable {
void print();
}
class A1 implements printable {
public void print()
{
System.out.println("Hello");
}
public static void main(String args[]) {
A1 obj = new A1();
obj.print();
 }
}
```

Enum

An enum, similar to a class, has attributes and methods. However, unlike classes, enum constants are public, static, and final (unchangeable – cannot be overridden). Developers cannot use an enum to create objects, and it cannot extend other classes. But, the enum can implement interfaces.

Declaration of an Enum:

```
enum Level {
  LOW,
  MEDIUM,
  HIGH
}
```