Access Modifiers in Java

1. [Private access modifier](https://www.javatpoint.com/access-modifiers#accessprivate)
2. [Role of private constructor](https://www.javatpoint.com/access-modifiers#accessprivatecons)
3. [Default access modifier](https://www.javatpoint.com/access-modifiers#accessdefault)
4. [Protected access modifier](https://www.javatpoint.com/access-modifiers#accessprotected)
5. [Public access modifier](https://www.javatpoint.com/access-modifiers#accesspublic)
6. [Access Modifier with Method Overriding](https://www.javatpoint.com/access-modifiers#accessoverriding)

There are two types of modifiers in Java: **access modifiers** and **non-access modifiers**.

The access modifiers in Java specifies the accessibility or scope of a field, method, constructor, or class. We can change the access level of fields, constructors, methods, and class by applying the access modifier on it.

There are four types of Java access modifiers:

1. **Private**: The access level of a private modifier is only within the class. It cannot be accessed from outside the class.
2. **Default**: The access level of a default modifier is only within the package. It cannot be accessed from outside the package. If you do not specify any access level, it will be the default.
3. **Protected**: The access level of a protected modifier is within the package and outside the package through child class. If you do not make the child class, it cannot be accessed from outside the package.
4. **Public**: The access level of a public modifier is everywhere. It can be accessed from within the class, outside the class, within the package and outside the package.

There are many non-access modifiers, such as static, abstract, synchronized, native, volatile, transient, etc. Here, we are going to learn the access modifiers only.

### Understanding Java Access Modifiers

Let's understand the access modifiers in Java by a simple table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Access Modifier** | **within class** | **within package** | **outside package by subclass only** | **outside package** |
| **Private** | Y | N | N | N |
| **Default** | Y | Y | N | N |
| **Protected** | Y | Y | Y | N |
| **Public** | Y | Y | Y | Y |

### 1) Private

The private access modifier is accessible only within the class.

**Simple example of private access modifier**

In this example, we have created two classes A and Simple. A class contains private data member and private method. We are accessing these private members from outside the class, so there is a compile-time error.

1. **class** A{
2. **private** **int** data=40;
3. **private** **void** msg(){System.out.println("Hello java");}
4. }
6. **public** **class** Simple{
7. **public** **static** **void** main(String args[]){
8. A obj=**new** A();
9. System.out.println(obj.data);//Compile Time Error
10. obj.msg();//Compile Time Error
11. }
12. }

### Role of Private Constructor

If you make any class constructor private, you cannot create the instance of that class from outside the class. For example:

1. **class** A{
2. **private** A(){}//private constructor
3. **void** msg(){System.out.println("Hello java");}
4. }
5. **public** **class** Simple{
6. **public** **static** **void** main(String args[]){
7. A obj=**new** A();//Compile Time Error
8. }
9. }

### 2) Default

If you don't use any modifier, it is treated as **default** by default. The default modifier is accessible only within package. It cannot be accessed from outside the package. It provides more accessibility than private. But, it is more restrictive than protected, and public.

**Example of default access modifier**

In this example, we have created two packages pack and mypack. We are accessing the A class from outside its package, since A class is not public, so it cannot be accessed from outside the package.

1. //save by A.java
2. **package** pack;
3. **class** A{
4. **void** msg(){System.out.println("Hello");}
5. }
6. //save by B.java
7. **package** mypack;
8. **import** pack.\*;
9. **class** B{
10. **public** **static** **void** main(String args[]){
11. A obj = **new** A();//Compile Time Error
12. obj.msg();//Compile Time Error
13. }
14. }

In the above example, the scope of class A and its method msg() is default so it cannot be accessed from outside the package.

### 3) Protected

The **protected access modifier** is accessible within package and outside the package but through inheritance only.

The protected access modifier can be applied on the data member, method and constructor. It can't be applied on the class.

It provides more accessibility than the default modifer.

**Example of protected access modifier**

In this example, we have created the two packages pack and mypack. The A class of pack package is public, so can be accessed from outside the package. But msg method of this package is declared as protected, so it can be accessed from outside the class only through inheritance.

1. //save by A.java
2. **package** pack;
3. **public** **class** A{
4. **protected** **void** msg(){System.out.println("Hello");}
5. }
6. //save by B.java
7. **package** mypack;
8. **import** pack.\*;
10. **class** B **extends** A{
11. **public** **static** **void** main(String args[]){
12. B obj = **new** B();
13. obj.msg();
14. }
15. }

Output:Hello

### 4) Public

The **public access modifier** is accessible everywhere. It has the widest scope among all other modifiers.

**Example of public access modifier**

1. //save by A.java
3. **package** pack;
4. **public** **class** A{
5. **public** **void** msg(){System.out.println("Hello");}
6. }
7. //save by B.java
9. **package** mypack;
10. **import** pack.\*;
12. **class** B{
13. **public** **static** **void** main(String args[]){
14. A obj = **new** A();
15. obj.msg();
16. }
17. }

Output:Hello

### Java Access Modifiers with Method Overriding

If you are overriding any method, overridden method (i.e. declared in subclass) must not be more restrictive.

1. **class** A{
2. **protected** **void** msg(){System.out.println("Hello java");}
3. }
5. **public** **class** Simple **extends** A{
6. **void** msg(){System.out.println("Hello java");}//C.T.Error
7. **public** **static** **void** main(String args[]){
8. Simple obj=**new** Simple();
9. obj.msg();
10. }
11. }

The default modifier is more restrictive than protected. That is why, there is a compile-time error.

In [Java](https://www.javatpoint.com/java-tutorial), string is basically an object that represents sequence of char values. An [array](https://www.javatpoint.com/array-in-java) of characters works same as Java string. For example:

1. **char**[] ch={'j','a','v','a','t','p','o','i','n','t'};
2. String s=**new** String(ch);

is same as:

1. String s="javatpoint";

**Java String** class provides a lot of methods to perform operations on strings such as compare(), concat(), equals(), split(), length(), replace(), compareTo(), intern(), substring() etc.

The java.lang.String class implements Serializable, Comparable and CharSequence [interfaces](https://www.javatpoint.com/interface-in-java).



## CharSequence Interface

The CharSequence interface is used to represent the sequence of characters. String, [StringBuffer](https://www.javatpoint.com/StringBuffer-class) and [StringBuilder](https://www.javatpoint.com/StringBuilder-class) classes implement it. It means, we can create strings in Java by using these three classes.



The Java String is mutable which means it cannot be changed. Whenever we change any string, a new instance is created. For immutable strings, you can use StringBuffer and StringBuilder classes.

We will discuss immutable string later. Let's first understand what String in Java is and how to create the String object.

### What is String in Java?

Generally, String is a sequence of characters. But in Java, string is an object that represents a sequence of characters. The java.lang.String class is used to create a string object.

### How to create a string object?

There are two ways to create String object:

1. By string literal
2. By new keyword

### 1) String Literal

Java String literal is created by using double quotes. For Example:

1. String s="welcome";

Each time you create a string literal, the JVM checks the "string constant pool" first. If the string already exists in the pool, a reference to the pooled instance is returned. If the string doesn't exist in the pool, a new string instance is created and placed in the pool. For example:

1. String s1="Welcome";
2. String s2="Welcome";//It doesn't create a new instance

In the above example, only one object will be created. Firstly, JVM will not find any string object with the value "Welcome" in string constant pool that is why it will create a new object. After that it will find the string with the value "Welcome" in the pool, it will not create a new object but will return the reference to the same instance.

#### Note: String objects are stored in a special memory area known as the "string constant pool".

### Why Java uses the concept of String literal?

To make Java more memory efficient (because no new objects are created if it exists already in the string constant pool).

### 2) By new keyword

1. String s=**new** String("Welcome");//creates two objects and one reference variable

In such case, [JVM](https://www.javatpoint.com/jvm-java-virtual-machine) will create a new string object in normal (non-pool) heap memory, and the literal "Welcome" will be placed in the string constant pool. The variable s will refer to the object in a heap (non-pool).

### Java String Example

**StringExample.java**

1. **public** **class** StringExample{
2. **public** **static** **void** main(String args[]){
3. String s1="java";//creating string by Java string literal
4. **char** ch[]={'s','t','r','i','n','g','s'};
5. String s2=**new** String(ch);//converting char array to string
6. String s3=**new** String("example");//creating Java string by new keyword
7. System.out.println(s1);
8. System.out.println(s2);
9. System.out.println(s3);
10. }}

[**Test it Now**](https://www.javatpoint.com/opr/test.jsp?filename=StringExample)

**Output:**

java

strings

example

The above code, converts a **char** array into a **String** object. And displays the String objects **s1, s2**, and **s3** on console using **println()** method.

### Java String class methods

The java.lang.String class provides many useful methods to perform operations on sequence of char values.

|  |  |  |
| --- | --- | --- |
| **No.** | **Method** | **Description** |
| 1 | [char charAt(int index)](https://www.javatpoint.com/java-string-charat) | It returns char value for the particular index |
| 2 | [int length()](https://www.javatpoint.com/java-string-length) | It returns string length |
| 3 | [static String format(String format, Object... args)](https://www.javatpoint.com/java-string-format) | It returns a formatted string. |
| 4 | [static String format(Locale l, String format, Object... args)](https://www.javatpoint.com/java-string-format) | It returns formatted string with given locale. |
| 5 | [String substring(int beginIndex)](https://www.javatpoint.com/java-string-substring) | It returns substring for given begin index. |
| 6 | [String substring(int beginIndex, int endIndex)](https://www.javatpoint.com/java-string-substring) | It returns substring for given begin index and end index. |
| 7 | [boolean contains(CharSequence s)](https://www.javatpoint.com/java-string-contains) | It returns true or false after matching the sequence of char value. |
| 8 | [static String join(CharSequence delimiter, CharSequence... elements)](https://www.javatpoint.com/java-string-join) | It returns a joined string. |
| 9 | [static String join(CharSequence delimiter, Iterable<? extends CharSequence> elements)](https://www.javatpoint.com/java-string-join) | It returns a joined string. |
| 10 | [boolean equals(Object another)](https://www.javatpoint.com/java-string-equals) | It checks the equality of string with the given object. |
| 11 | [boolean isEmpty()](https://www.javatpoint.com/java-string-isempty) | It checks if string is empty. |
| 12 | [String concat(String str)](https://www.javatpoint.com/java-string-concat) | It concatenates the specified string. |
| 13 | [String replace(char old, char new)](https://www.javatpoint.com/java-string-replace) | It replaces all occurrences of the specified char value. |
| 14 | [String replace(CharSequence old, CharSequence new)](https://www.javatpoint.com/java-string-replace) | It replaces all occurrences of the specified CharSequence. |
| 15 | [static String equalsIgnoreCase(String another)](https://www.javatpoint.com/java-string-equalsignorecase) | It compares another string. It doesn't check case. |
| 16 | [String[] split(String regex)](https://www.javatpoint.com/java-string-split) | It returns a split string matching regex. |
| 17 | [String[] split(String regex, int limit)](https://www.javatpoint.com/java-string-split) | It returns a split string matching regex and limit. |
| 18 | [String intern()](https://www.javatpoint.com/java-string-intern) | It returns an interned string. |
| 19 | [int indexOf(int ch)](https://www.javatpoint.com/java-string-indexof) | It returns the specified char value index. |
| 20 | [int indexOf(int ch, int fromIndex)](https://www.javatpoint.com/java-string-indexof) | It returns the specified char value index starting with given index. |
| 21 | [int indexOf(String substring)](https://www.javatpoint.com/java-string-indexof) | It returns the specified substring index. |
| 22 | [int indexOf(String substring, int fromIndex)](https://www.javatpoint.com/java-string-indexof) | It returns the specified substring index starting with given index. |
| 23 | [String toLowerCase()](https://www.javatpoint.com/java-string-tolowercase) | It returns a string in lowercase. |
| 24 | [String toLowerCase(Locale l)](https://www.javatpoint.com/java-string-tolowercase) | It returns a string in lowercase using specified locale. |
| 25 | [String toUpperCase()](https://www.javatpoint.com/java-string-touppercase) | It returns a string in uppercase. |
| 26 | [String toUpperCase(Locale l)](https://www.javatpoint.com/java-string-touppercase) | It returns a string in uppercase using specified locale. |
| 27 | [String trim()](https://www.javatpoint.com/java-string-trim) | It removes beginning and ending spaces of this string. |
| 28 | [static String valueOf(int value)](https://www.javatpoint.com/java-string-valueof) | It converts given type into string. It is an overloaded method. |

# Object class in Java

The **Object class** is the parent class of all the classes in java by default. In other words, it is the topmost class of java.

The Object class is beneficial if you want to refer any object whose type you don't know. Notice that parent class reference variable can refer the child class object, known as up casting.

Let's take an example, there is getObject() method that returns an object but it can be of any type like Employee, Student etc, we can use Object class reference to refer that object. For example:

1. Object obj=getObject();//we don't know what object will be returned from this method

The Object class provides some common behaviors to all the objects such as object can be compared, object can be cloned, object can be notified etc.



### Methods of Object class

|  |
| --- |
| The Object class provides many methods. They are as follows: |

|  |  |
| --- | --- |
| **Method** | **Description** |
| public final Class getClass() | returns the Class class object of this object. The Class class can further be used to get the metadata of this class. |
| public int hashCode() | returns the hashcode number for this object. |
| public boolean equals(Object obj) | compares the given object to this object. |
| protected Object clone() throws CloneNotSupportedException | creates and returns the exact copy (clone) of this object. |
| public String toString() | returns the string representation of this object. |
| public final void notify() | wakes up single thread, waiting on this object's monitor. |
| public final void notifyAll() | wakes up all the threads, waiting on this object's monitor. |
| public final void wait(long timeout)throws InterruptedException | causes the current thread to wait for the specified milliseconds, until another thread notifies (invokes notify() or notifyAll() method). |
| public final void wait(long timeout,int nanos)throws InterruptedException | causes the current thread to wait for the specified milliseconds and nanoseconds, until another thread notifies (invokes notify() or notifyAll() method). |
| public final void wait()throws InterruptedException | causes the current thread to wait, until another thread notifies (invokes notify() or notifyAll() method). |
| protected void finalize()throws Throwable | is invoked by the garbage collector before object is being garbage collected. |

# Java Class class

Java Class class instances represent the classes and interfaces in a running java application. Every Array belongs to a class is a Class object and it is shared by all arrays (with same element type and number of dimensions).

## Methods

|  |  |
| --- | --- |
| **Method** | **Description** |
| [forName(String className)](https://www.javatpoint.com/java-class-forname-method) | It returns the Class object associated with the class or interface with the specified string name. |
| [forName(String name, boolean initialize,ClassLoader loader)](https://www.javatpoint.com/java-class-forname-method) | It returns the Class object associated with the class or interface with the specified string name, using the given class loader. |
| [getClasses()](https://www.javatpoint.com/java-class-getclasses-method) | It returns an array containing Class objects representing all the public interfaces and classes that are members of the class and are represented by this Class object. |
| [getInterfaces()](https://www.javatpoint.com/java-class-getinterfaces-method) | It determines the interfaces implemented by the interface or class represented by this object. |
| [getName()](https://www.javatpoint.com/java-class-getname-method) | It returns the name of the entity represented by this Class object, as a String. |
| [getPackage()](https://www.javatpoint.com/java-class-getpackage-method) | It simply gets the package for this class. |
| [getSuperclass()](https://www.javatpoint.com/java-class-getsuperclass-method) | This method returns the Class which represents the superclass of the entity represented by this Class. |
| [isInstance(Object obj)](https://www.javatpoint.com/java-class-isinstance-method) | It checks if the specified Object is assignment-compatible with the object represented by this Class. |
| [isInterface()](https://www.javatpoint.com/java-class-isinterface-method) | It checks if the given Class object represents an interface type. |
| toString() | This method converts the object to a string. |

**public** **class** JavaClassExample1 {

**public** **static** **void** main(String[] args) **throws** ClassNotFoundException, IllegalAccessException, InstantiationException {

        // returns the Class object for the class with the given name

        Class class1 = Class.forName("java.lang.String");

        Class class2 = **int**.**class**;

        System.out.print("Class represented by class1: ");

        // applying toString method on class1

        System.out.println(class1.toString());

        System.out.print("Class represented by class2: ");

        // applying toString() method on class2

        System.out.println(class2.toString());

        String s = "JavaTpoint";

**int** i = 10;

        // checking for Class instance

**boolean** b1 = class1.isInstance(s);

**boolean** b2 = class1.isInstance(i);

        System.out.println("is p instance of String : " + b1);

        System.out.println("is j instance of String : " + b2);

    }

}

Wrapper Classes:

Wrapper classes are the classes which represent the primitive data types.

Data type Wrapper Classes

char Character

byte Byte

short Short

int Integer

long Long

float Float

double Double

boolean Boolean