static Keyword in Java

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The **static keyword** in Java is mainly used for memory management. The static keyword in Java is used to share the same variable or method of a given class. The users can apply static keywords with variables, methods, blocks, and nested classes. The static keyword belongs to the class than an instance of the class. The static keyword is used for a constant variable or a method that is the same for every instance of a class.

The *static* keyword is a non-access modifier in Java that is applicable for the following:

1. Blocks
2. Variables
3. Methods
4. Classes

> ***Note:*** *To create a static member(block, variable, method, nested class), precede its declaration with the keyword static.*

When a member is declared static, it can be accessed before any objects of its class are created, and without reference to any object. For example, in the below java program, we are accessing static method *m1()* without creating any object of the *Test* class.

```
// Java program to demonstrate that a static member
// can be accessed before instantiating a class

class Test
{
    // static method
    static void m1()
    {
        System.out.println("from m1");
    }

    public static void main(String[] args)
```

```
    {
        // calling m1 without creating
        // any object of class Test
         m1();
    }
}
```

Output

```
from m1
```

Static blocks

If you need to do the computation in order to initialize your **static variables**, you can declare a static block that gets executed exactly once, when the class is first loaded.

Consider the following java program demonstrating the use of static blocks.

```
// Java program to demonstrate use of static blocks

class Test
{
    // static variable
    static int a = 10;
    static int b;

    // static block
    static {
        System.out.println("Static block initialized.");
        b = a * 4;
    }

    public static void main(String[] args)
    {
       System.out.println("from main");
       System.out.println("Value of a : "+a);
       System.out.println("Value of b : "+b);
    }
}
```

Output

```
Static block initialized.
from main
Value of a : 10
Value of b : 40
```

For a detailed article on static blocks, see static blocks

Static variables

When a variable is declared as static, then a single copy of the variable is created and shared among all objects at the class level. Static variables are, essentially, global variables. All instances of the class share the same static variable.

Important points for static variables:

- We can create static variables at the class level only. See here
- static block and static variables are executed in the order they are present in a program.

Below is the Java program to demonstrate that static block and static variables are executed in the order they are present in a program.

```
// Java program to demonstrate execution
// of static blocks and variables

class Test
{
    // static variable
    static int a = m1();

    // static block
    static {
        System.out.println("Inside static block");
    }

    // static method
    static int m1() {
        System.out.println("from m1");
        return 20;
```

```
    }

    // static method(main !!)
    public static void main(String[] args)
    {
       System.out.println("Value of a : "+a);
       System.out.println("from main");
    }
}
```

Output

```
from m1
Inside static block
Value of a : 20
from main
```

Static methods

When a method is declared with the *static* keyword, it is known as the static method. The most common example of a static method is the *main( )* method. As discussed above, Any static member can be accessed before any objects of its class are created, and without reference to any object. Methods declared as static have several restrictions:

- They can only directly call other static methods.
- They can only directly access static data.
- They cannot refer to this or super in any way.

Below is the java program to demonstrate restrictions on static methods.

```
// Java program to demonstrate restriction on static methods

class Test
{
    // static variable
    static int a = 10;

    // instance variable
```

```
    int b = 20;

    // static method
    static void m1()
    {
        a = 20;
        System.out.println("from m1");

         // Cannot make a static reference to the non-static field b
         b = 10; // compilation error

         // Cannot make a static reference to the
                 // non-static method m2() from the type Test
         m2();  // compilation error

         //  Cannot use super in a static context
         System.out.println(super.a); // compiler error
    }

    // instance method
    void m2()
    {
        System.out.println("from m2");
    }



    public static void main(String[] args)
    {
        // main method
    }
}
```

Output:

```
prog.java:18: error: non-static variable b cannot be referenced from a static
         b = 10; // compilation error
         ^
prog.java:22: error: non-static method m2() cannot be referenced from a static
         m2();  // compilation error
         ^
prog.java:25: error: non-static variable super cannot be referenced from a sta
         System.out.println(super.a); // compiler error
                            ^
prog.java:25: error: cannot find symbol
         System.out.println(super.a); // compiler error
                                 ^
```

```
                ^
  symbol: variable a
4 errors
```

When to use static variables and methods?

Use the static variable for the property that is common to all objects. For example, in class Student, all students share the same college name. Use static methods for changing static variables.

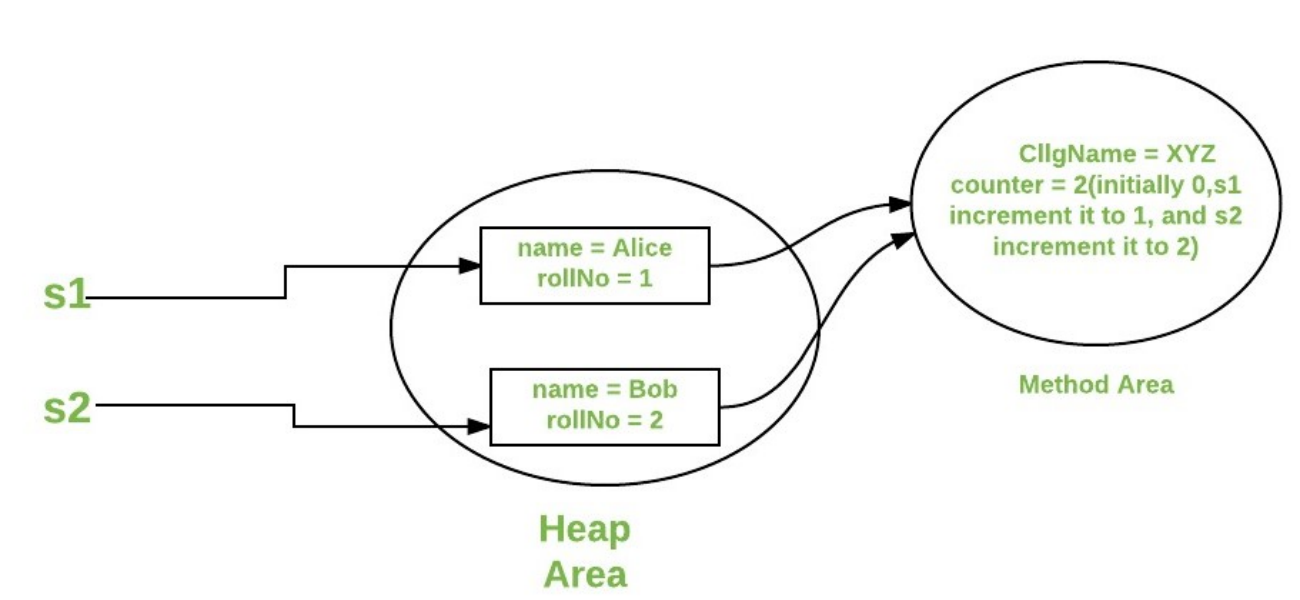
Consider the following java program, that illustrates the use of *static* keywords with variables and methods.

```
// A java program to demonstrate use of
// static keyword with methods and variables

// Student class
class Student {
    String name;
    int rollNo;

    // static variable
    static String cllgName;

    // static counter to set unique roll no
    static int counter = 0;

    public Student(String name)
    {
        this.name = name;

        this.rollNo = setRollNo();
    }

    // getting unique rollNo
    // through static variable(counter)
    static int setRollNo()
    {
        counter++;
        return counter;
    }

    // static method
    static void setCllg(String name) { cllgName = name; }
```

```
    // instance method
    void getStudentInfo()
    {
        System.out.println("name : " + this.name);
        System.out.println("rollNo : " + this.rollNo);

        // accessing static variable
        System.out.println("cllgName : " + cllgName);
    }
}

// Driver class
public class StaticDemo {
    public static void main(String[] args)
    {
        // calling static method
        // without instantiating Student class
        Student.setCllg("XYZ");

        Student s1 = new Student("Alice");
        Student s2 = new Student("Bob");

        s1.getStudentInfo();
        s2.getStudentInfo();
    }
}
```

Output

```
name : Alice
rollNo : 1
cllgName : XYZ
name : Bob
rollNo : 2
cllgName : XYZ
```



Static Classes

A class can be made **static** only if it is a nested class. We cannot declare a top-level class with a static modifier but can declare nested classes as static. Such types of classes are called Nested static classes. Nested static class doesn't need a reference of Outer class. In this case, a static class cannot access non-static members of the Outer class.

> ***Note:*** *For static nested class, see a static nested class in java*

Implementation:

```
// A java program to demonstrate use
// of static keyword with Classes

import java.io.*;

public class GFG {

    private static String str = "GeeksforGeeks";

    // Static class
    static class MyNestedClass {

        // non-static method
```

```
        public void disp(){
          System.out.println(str);
        }
    }

    public static void main(String args[])
    {
        GFG.MyNestedClass obj
            = new GFG.MyNestedClass();
        obj.disp();
    }
}
```

Output

```
GeeksforGeeks
```

This article is contributed by **Gaurav Miglani**. If you like GeeksforGeeks and would like to contribute, you can also write an article using write.geeksforgeeks.org or mail your article to review-team@geeksforgeeks.org. See your article appearing on the GeeksforGeeks main page and help other Geeks. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above.