Java static keyword

- The static keyword is mainly used for memory management.
- Anything with static mainly belongs to the class.
- The static keyword can be used with:
    - Variable (called as static variable)
    - Method (called as static method)
    - Block (called as static block)
    - Nested class

Static variable

- A variable created with static keyword is called static variable.
- The static variable can be used to refer to the common property of all objects which is not unique for each object.
- For eg, college name will be same for all the students studying in a particular college.
- The static variable gets memory only once during class loading.
- It makes memory efficient by saving memory.

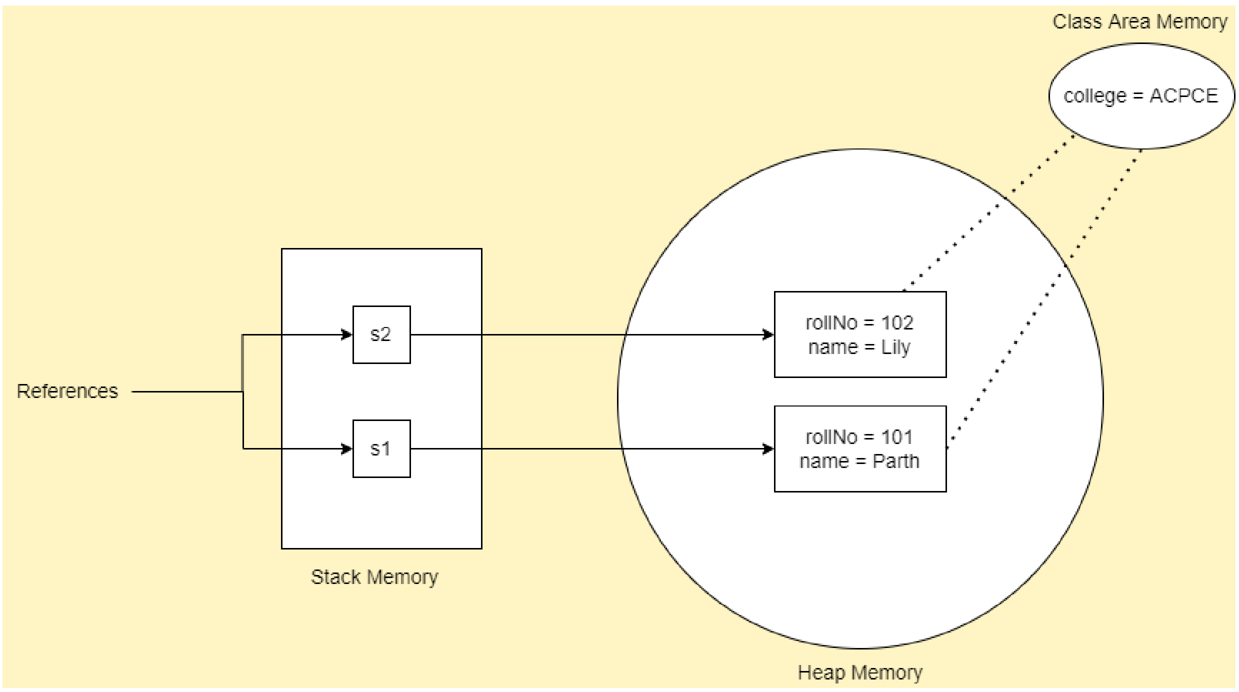
Problem without static variable

```
class Student {
  int rollNo;
  String name;
  String college = "ACPCE";
}
```

- Suppose there are 500 students in your college.
- Now, all instance data members will get memory each time when the object is created.
- All students have their unique rollNo and name, so instance data member is good in this case.
- Here, college refers to the property of all objects which is not unique for each object.
- Every time when an object is created, the college data member will get new memory and for 500 students 500 space of memory will be created.
- To make it more efficient we make college as static.

```
// Student.java
class Student {
  int rollNo;
  String name;

  // Static variable
  static String college = "ACPCE";

  Student(int r, String n) {
    rollNo = r;
    name = n;
  }
  void display() {
    System.out.println(rollNo + " " + name + " " + college);
  }
}

// Main.java
class Main {
  public static void main(String args[]) {
    Student s1 = new Student(101, "Parth");
    Student s2 = new Student(102, "Lily");

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

```
Output:
101 Parth ACPCE
102 Lily ACPCE
```



Counter program without static variable

```
class Counter {
  int count = 0;

  Counter() {
    count++;
    System.out.println(count);
  }

  public static void main(String args[]) {
    Counter c1 = new Counter();
    Counter c2 = new Counter();
    Counter c3 = new Counter();
  }
}
```

```
Output:
1
1
1
```

- Here we have created an instance variable named `count` which is incremented in the constructor.
- Since instance variable gets memory at the time of object creation, each object will have a copy of the instance variable.
- If it is incremented, it won't reflect in other objects.
- So each object will have counter value as 1.

Counter program with static variable

```
class Counter {
  static int count = 1;

  Counter() {
    count++;
    System.out.println(count);
  }

  public static void main(String args[]) {
    Counter c1 = new Counter();
    Counter c2 = new Counter();
    Counter c3 = new Counter();
  }
}
```

```
Output:
1
2
3
```

- Static variable will get memory only once.
- If any object changes the value of the static variable, it retains the changed value.

Static method

- If you apply `static` keyword to any method, it becomes static method.
- A static method belongs more to the class.
- A static method can be invoked without creating the instance of the class.
- A static method can access static data member and change the value of it.

```java
// Student.java
class Student {
  int rollNo;
  String name;
  static String college = "ACPCE";

  // static method to change the value of static variable
  static void changeCollege() {
    college = "IIT";
  }

  Student(int r, String n) {
    rollNo = r;
    name = n;
  }

  void display() {
    System.out.println(rollNo + " " + name + " " + college);
  }
}

// Main.java
public class Main {
  public static void main(String args[]) {
    Student s1 = new Student(101, "Parth");
    s1.display();
    Student s2 = new Student(102, "Lily");
    s2.display();

    System.out.println("Updating college");
    Student.changeCollege(); // calling static method
    s1.display();
    s2.display();
  }
}
```

```
Output:
101 Parth ACPCE
102 Lily ACPCE
Updating college
101 Parth IIT
102 Lily IIT
```

Restrictions for the `static` method

- The static method cannot use non static data member or call non static method directly.
- `this` and `super` cannot be used with `static`.

```java
class A {
  int a = 50; // non-static data member

  public static void main(String args[]) {
    System.out.println(a); // error because static method accessing non
static variable
  }
}
```

static block

- Used to initialize the static data member.
- Executed before the `main()` method at the time of classloading.

```
class A {
  static {
    System.out.println("Static block is invoked");
  }

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

```
Output:
Static block is invoked
Hello Parth
```

Important Questions

Q.1. Why is `main()` method static? Ans. Because object is not required to invoke the `main()`. If it was non-static, JVM will have to create an object first then call `main()` which will lead to extra memory allocation.

Q.2. Can we execute a program without `main()` method? Ans. No, previously there was a way to invoke it by using static block, but since JDK 1.7 it is not possible.