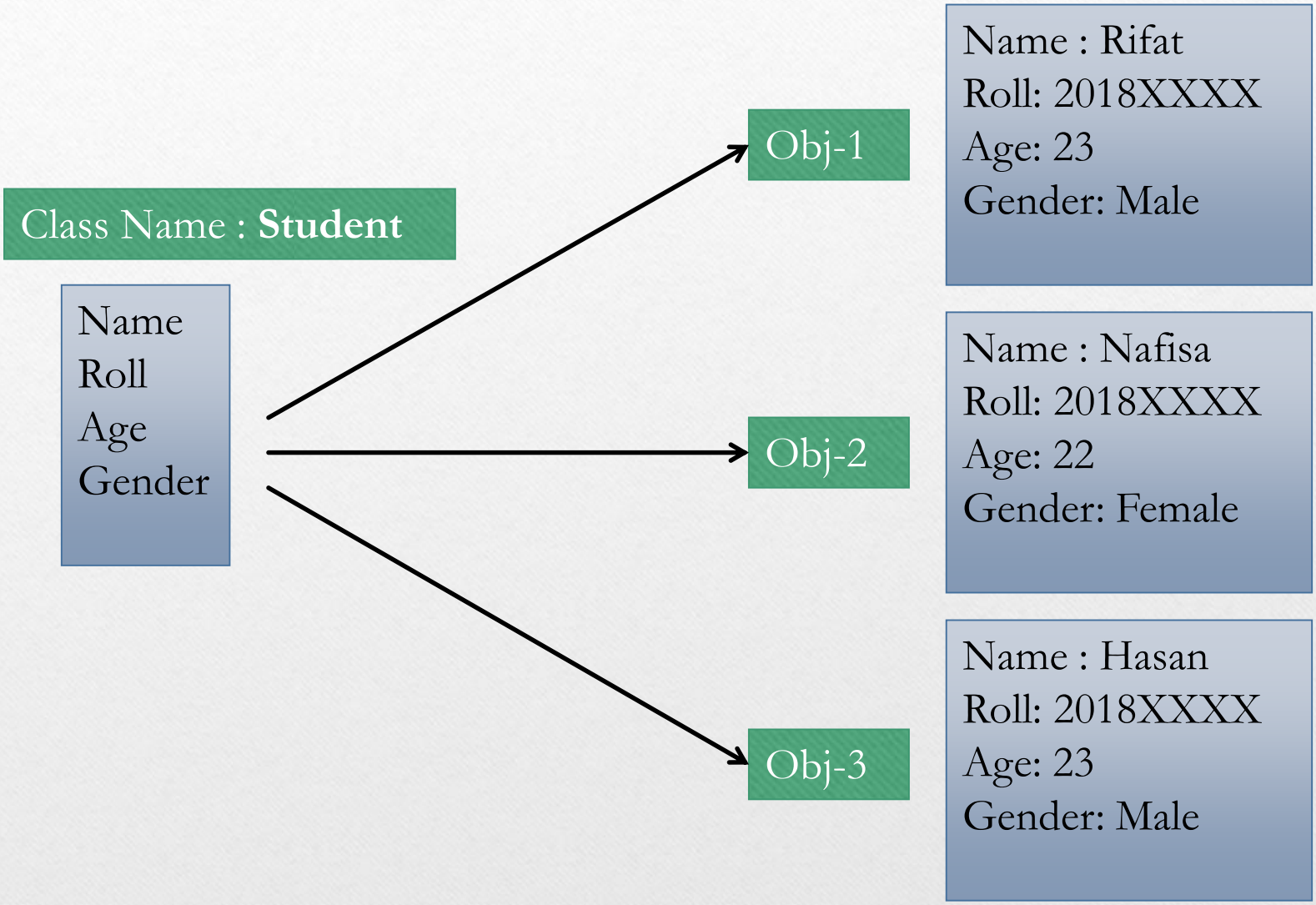
Java Classes and References

CSE-220

Covered Topics

- Introducing Classes
- General Form of a Class
- Declaring Objects
- Adding Methods
- Types of Object

Understanding Class and Objects



Class Declaration

class *class_name* {

\\variables

\\methods

}

Creating a class

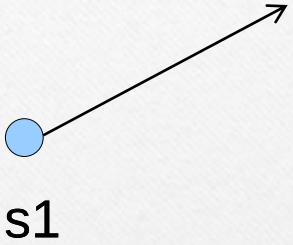
```
class Student
{
    int term1;
    int term2;
    int term3;
}

public class LabDemo {

    public static void main(String[] args) {



    }
}
```

Declaring an object

```
1 class Student
2 {
3     int term1;
4     int term2;
5     int term3;
6 }
7
8 public class LabDemo {
9
10     public static void main(String[] args) {
11
12         Student s1;
13         s1 = new Student();
14
15     }
16 }
```

Taking a look at the reference

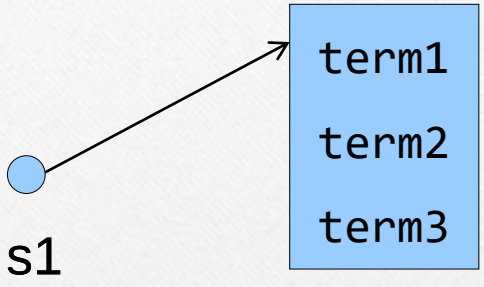
```
Student s1;
```



Taking a look at the reference

```
Student s1;
```

```
s1 = new Student();
```



Assigning values

```
public class LabDemo {

    public static void main(String[] args) {

        Student s1 = new Student();
        s1.term1 = 20;
        s1.term2 = 15;
        s1.term3 = 17;

    }
}
```

Method Declaration

```
type  method_name(parameter list)
{

}
```

Adding a method

```
class Student
{
    int term1;
    int term2;
    int term3;
    double getAverage()
    {
        return (term1+term2+term3)/3.0;
    }
}
```

```
public class LabDemo {
    public static void main(String[] args) {
        Student s1 = new Student();
        s1.term1 = 20;
        s1.term2 = 15;
        s1.term3 = 17;
        System.out.println(s1.getAverage());
    }
}
```

Parameterized methods

```
class Student
{
    int roll;
    int term1;
    int term2;
    int term3;
    void setRoll(int r)
    {
        roll = r;
    }
    double getAverage()
    {
        return (term1+term2+term3)/3.0;
    }
}
```

Constructor

```
public Student(int r, int t1, int t2, int t3)
{
    roll = r;
    term1 = t1;
    term2 = t2;
    term3 = t3;
}
```

Constructor Calling

```
public Student(int r, int t1, int t2, int t3)
{
    roll = r;
    term1 = t1;
    term2 = t2;
    term3 = t3;
}
```

```
Student s1 = new Student(1, 20, 15, 17);
```

Overloading Constructor

```
Student()
{
    roll = term1 = term2 = term3 = 0;
}
```

```
public Student(int r, int t1, int t2, int t3)
{
    roll = r;
    term1 = t1;
    term2 = t2;
    term3 = t3;
}
```

```
Student s1 = new Student(1, 20, 15, 17);
```

Using this keyword

```
//Warning! This code might not work
Student(int roll, int term1, int term2, int term3)
{
    roll = roll;
    term1 = term1;
    term2 = term2;
    term3 = term3;
}
```

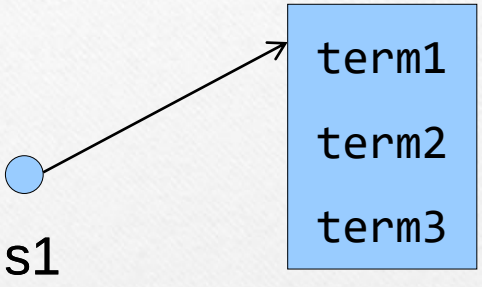
Using this keyword

```
Student(int roll, int term1, int term2, int term3)
{
    this.roll = roll;
    this.term1 = term1;
    this.term2 = term2;
    this.term3 = term3;
}
```

Destructor?

```
Student s1;
```

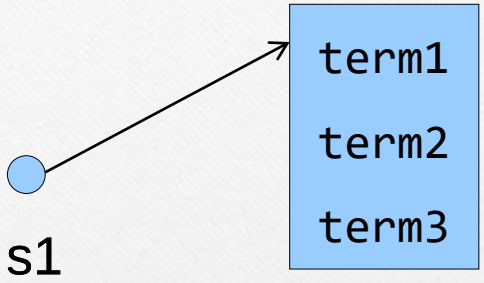
```
s1 = new Student();
```



Destructor?

```
Student s1;
```

```
s1 = new Student();
```




```
Student s2;
```

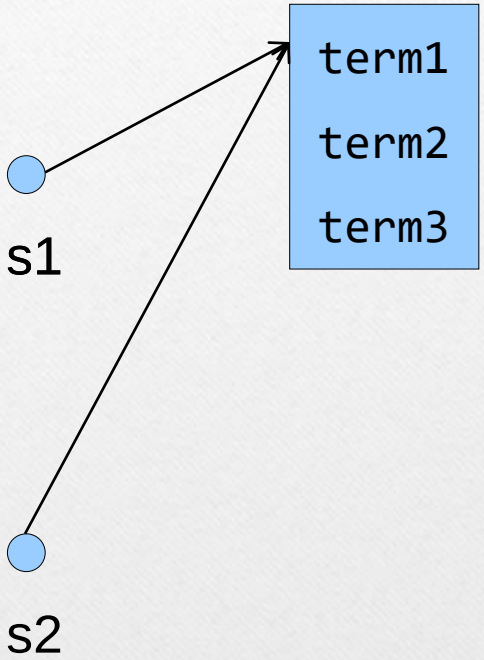
Destructor?

```
Student s1;
```

```
s1 = new Student();
```

```
Student s2;
```

```
s2 = s1;
```



Destructor?

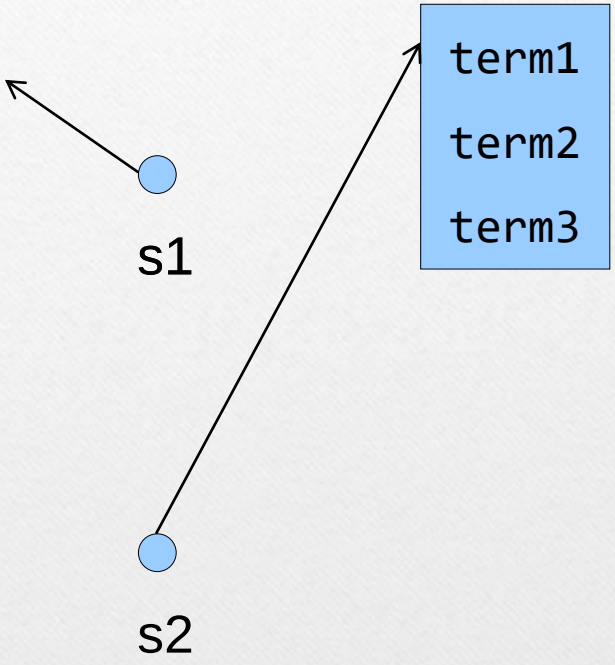
```
Student s1;
```

```
s1 = new Student();
```

```
Student s2;
```

```
s2 = s1;
```

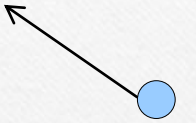
```
s1 = null;
```



Destructor?

```
Student s1;
```

```
s1 = new Student();
```



s1

term1

term2

term3

```
Student s2;
```

```
s2 = s1;
```

s2

```
s1 = null;
```

```
s2 = null;
```

Destructor?

```
Student s1;
```

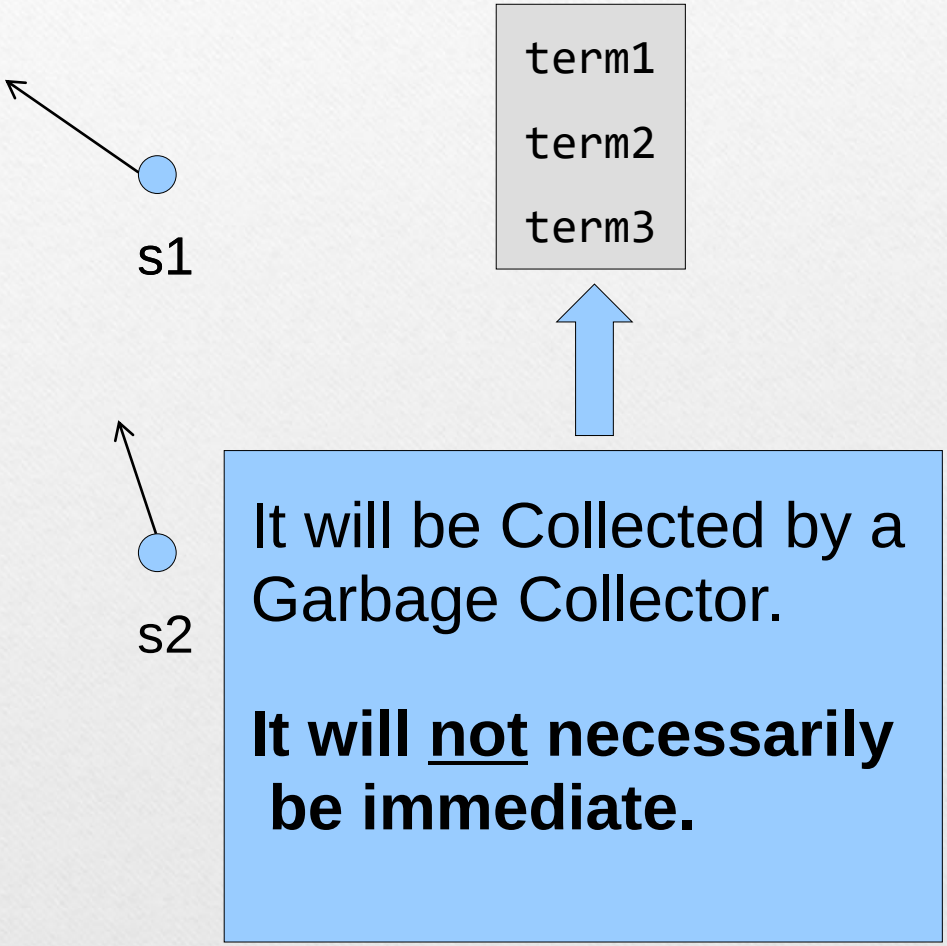
```
s1 = new Student();
```

```
Student s2;
```

```
s2 = s1;
```

```
s1 = null;
```

```
s2 = null;
```



Garbage Collector

When GC collects an object, `finalize()` method is called.

```
term1
term2
term3
```

It will be Collected by a Garbage Collector.

It will <u>not</u> necessarily be immediate.

Garbage Collector

When GC collects an object, `finalize()` method is called.

```
System.gc();
```

In main file

In Class file

```
protected void finalize()
{
    System.out.println("This is destructor");
}
```

```
term1
term2
term3
```

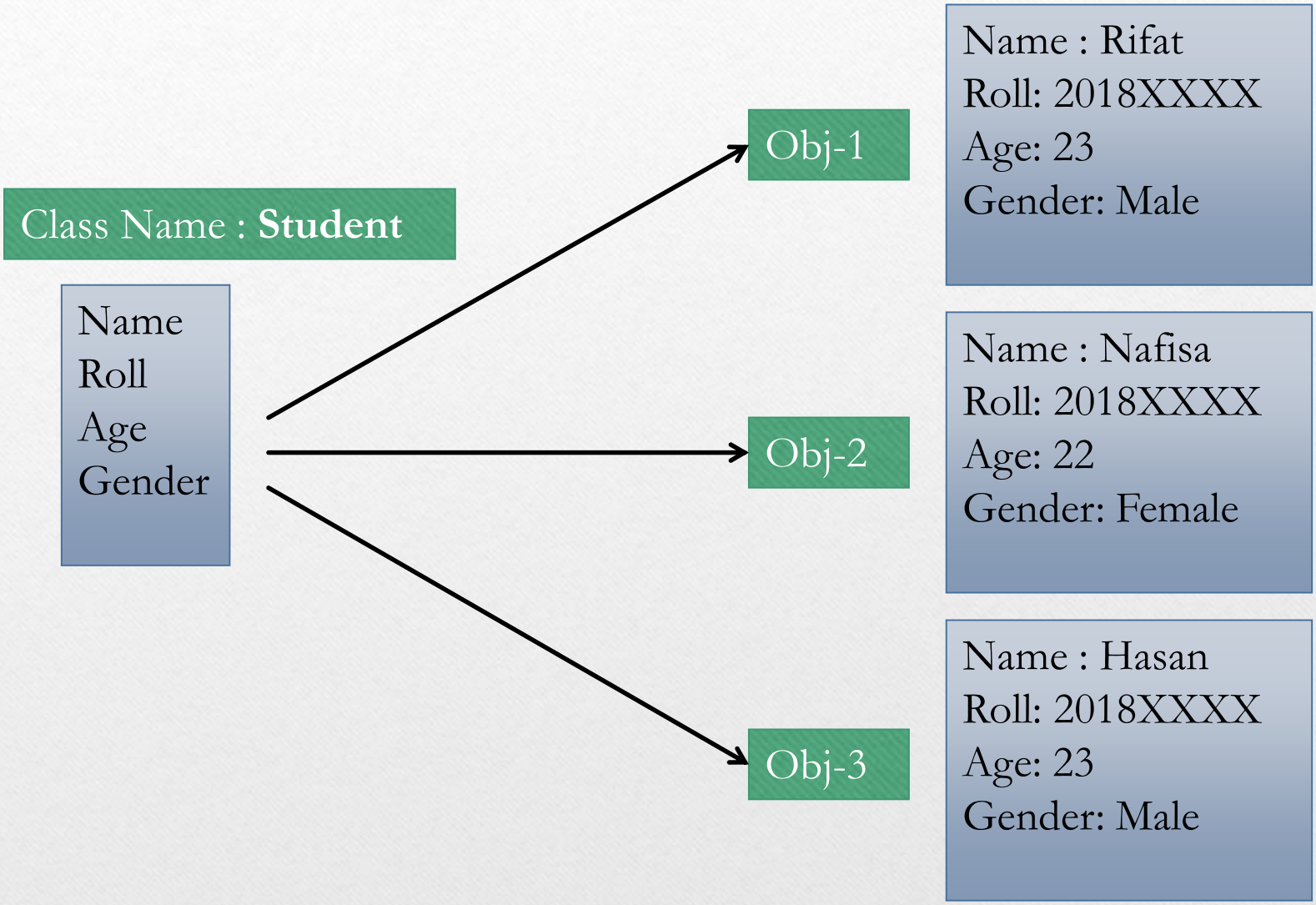
It will be Collected by a Garbage Collector.

It will <u>not</u> necessarily be immediate.

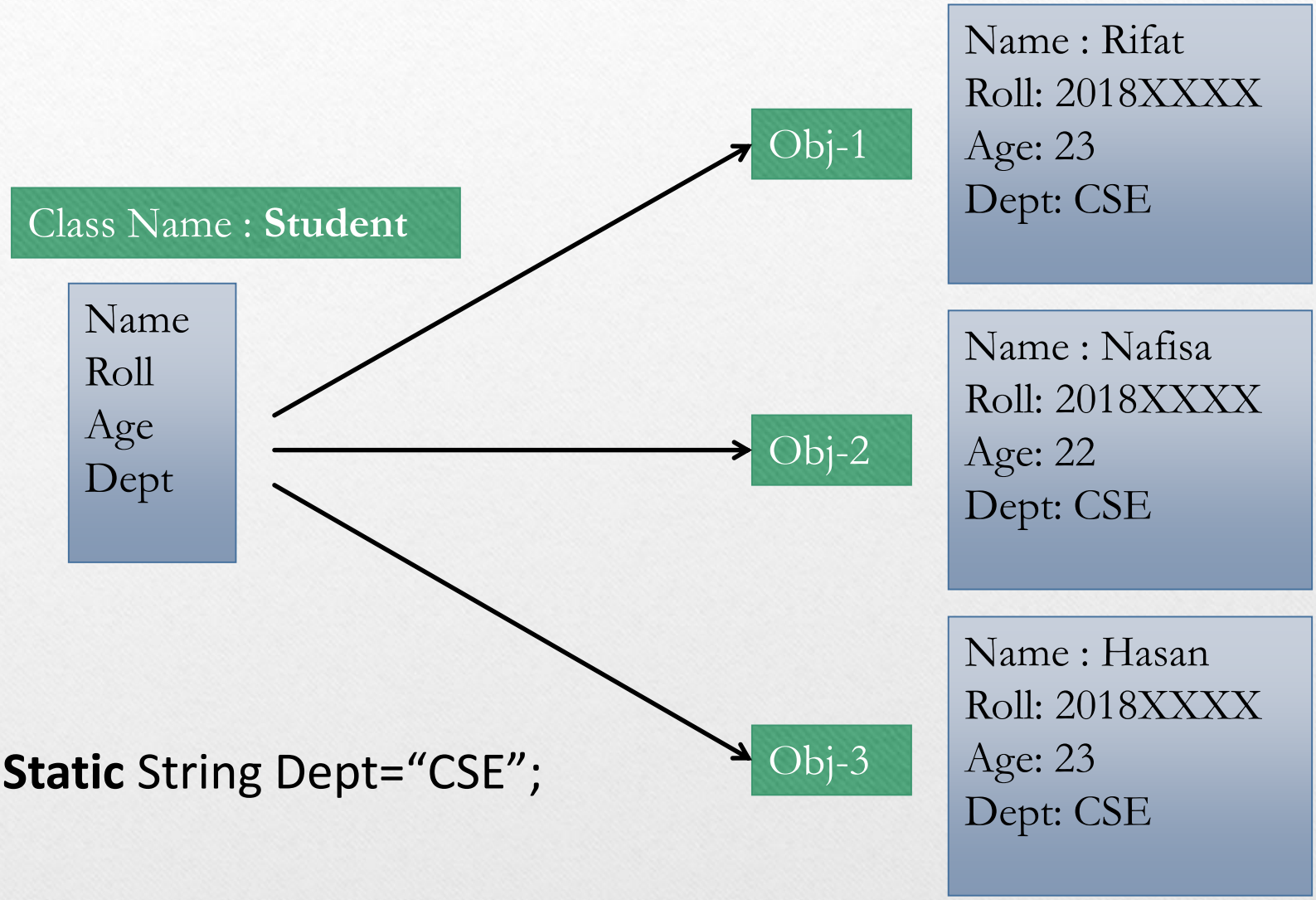
The `static` keyword in class member

Only one instance is created

The `static` keyword in class member



The `static` keyword in class member



Static String Dept="CSE";

The `static` keyword in class member

Only one instance is created

```
class Student
{
    static int count = 0;
    int term1, term2, term3;

    public Student()
    {
        count++;
    }

    int getTotalStudent()
    {
        return count;
    }
}
```

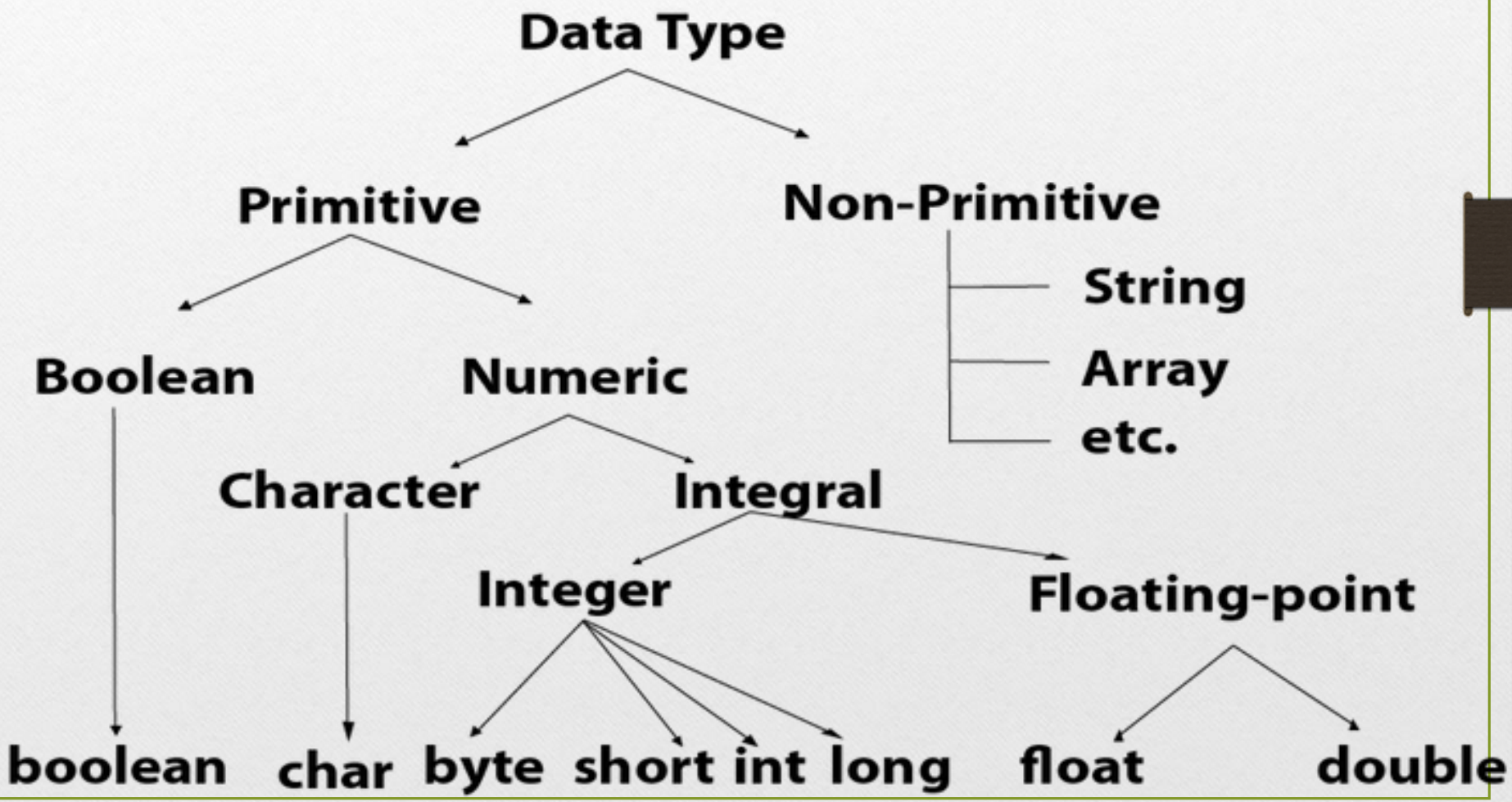
The `static` keyword in class member

Only one instance is created

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

{
    Student s1 = new Student();
    System.out.println(s1.getTotalStudent());
    Student s2 = new Student();
    System.out.println(s2.getTotalStudent());

}
```

Passing Value Through Methods

Pass by value vs. Pass by reference



Methods

Pass by value vs. Pass by reference

```
public class LabWork {
    static void increase(int a)
    {
        a++;
    }

    public static void main(String [] args)
    {
        int a = 5;
        System.out.println(a);
        increase(a);
        System.out.println(a);
    }
}
```

Methods

Pass by value ~~vs. Pass by reference~~

```
public class LabWork {
    static void increase(int a)
    {
        a++;
    }

    public static void main(String [] args)
    {
        int a = 5;
        System.out.println(a);
        increase(a);
        System.out.println(a);
    }
}
```

Methods

Passing object. Is it the reference that is passed?

```
public class LabWork {
    static void greet(String name)
    {
        name = "Hello " + name;
    }

    public static void main(String [] args)

    {
        String s = "Someone";
        System.out.println(s);
        greet(s);
        System.out.println(s);
    }
}
```

Methods

Only the ‘value’ of reference is passed

```
public class LabWork {
    static void greet(String name)
    {
        name = "Hello " + name;
    }

    public static void main(String [] args)

    {
        String s = "Someone";
        System.out.println(s); //Output: "Someone"
        greet(s);
        System.out.println(s); //Output: "Someone"
    }
}
```

Methods

Passing an array. What will be the outputs?

```
public class LabWork {
    static void change2ndElem(int []ara)
    {
        ara[1] = 300;
    }

    public static void main(String [] args)

    {
        int a[] = {1, 2, 3, 4};
        System.out.println(a[1]);
        change2ndElem(a);
        System.out.println(a[1]);
    }
}
```

Methods

Passing an array.

```
public class LabWork {
    static void change2ndElem(int []ara)
    {
        ara[1] = 300;
    }

    public static void main(String [] args)

    {
        int a[] = {1, 2, 3, 4};
        System.out.println(a[1]);   //Output: 2
        change2ndElem(a);
        System.out.println(a[1]);  //Output: 300
    }
}
```

Two types of Object

Mutable vs. Immutable

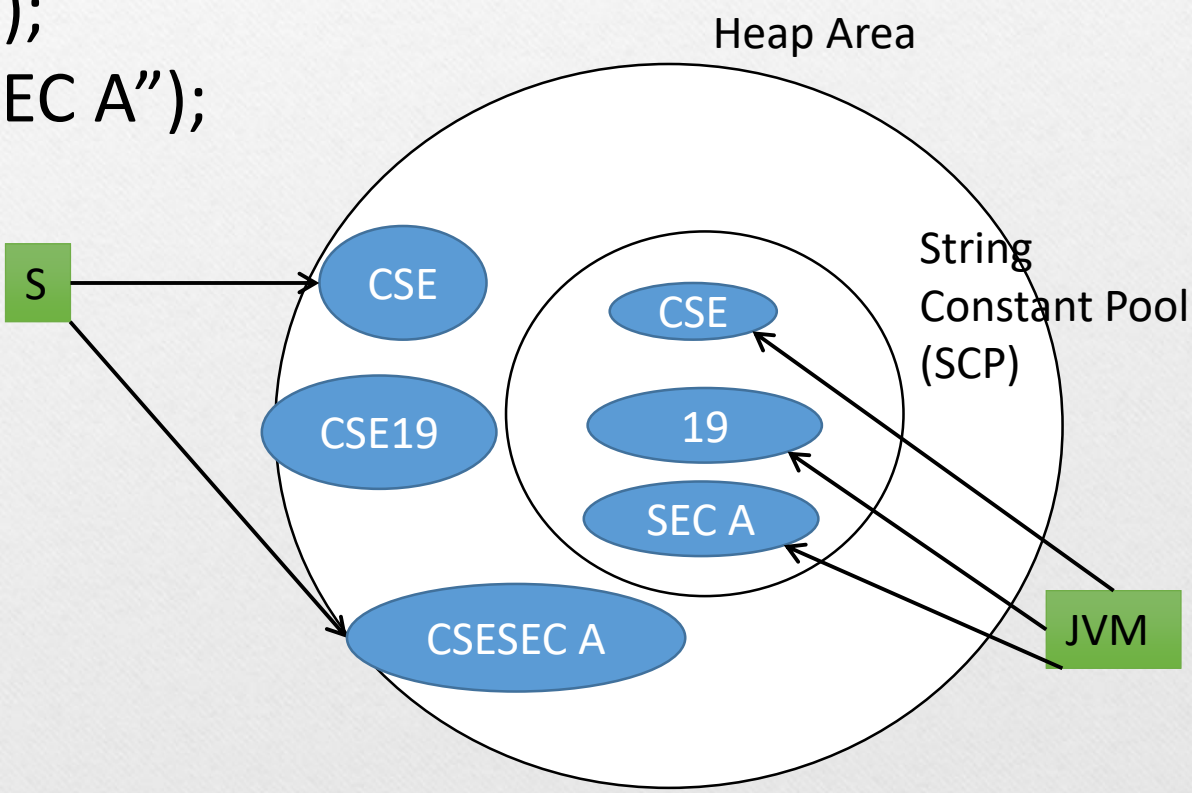
Array Object

String Object

Immutable String Object

String S=new String(“CSE”);

S.concat(“19”);
S=S.concat(“SEC A”);



Two types of Object

Mutable vs. Immutable

Array Object Mutable

String Object Immutable

Mutable or Immutable?

```
class Student
{
    int term1;
    int term2;
    int term3;
}
```

Mutable or Immutable?

```
class Student
{
    int term1;
    int term2;
    int term3;
}
```

Mutable

How to create Immutable Class?

How to create Immutable Class?

Use the **`final`** keyword

How to create Immutable Class?

Use the **`final`** keyword

```
final class A
{
    final int i;
    public A(int i)
    {
        this.i = i;
    }
}
```

How to create Immutable Class?

Use the `final` keyword

```
final class A
{
    final int i;
    public A(int i)
    {
        this.i = i;
    }
}
```

```
public class LabWork {
    public static void main(String [] args)
    {
        A imm_obj = new A(10);
        System.out.println(imm_obj.i);
    }
}
```

How to create Immutable Class?

Use the `final` keyword

```
final class A
{
    final int i;
    public A(int i)
    {
        this.i = i;
    }
}
```

The above class is immutable because:

- The instance variable of the class is final i.e. we cannot change the value of it after creating an object.
- The class is final so we cannot create the subclass.
- There is no setter methods i.e. we have no option to change the value of the instance variable.

How to create Immutable Class?

Use the `final` keyword

Further study:

https://www.javatpoint.com/final-keyword

Thank You