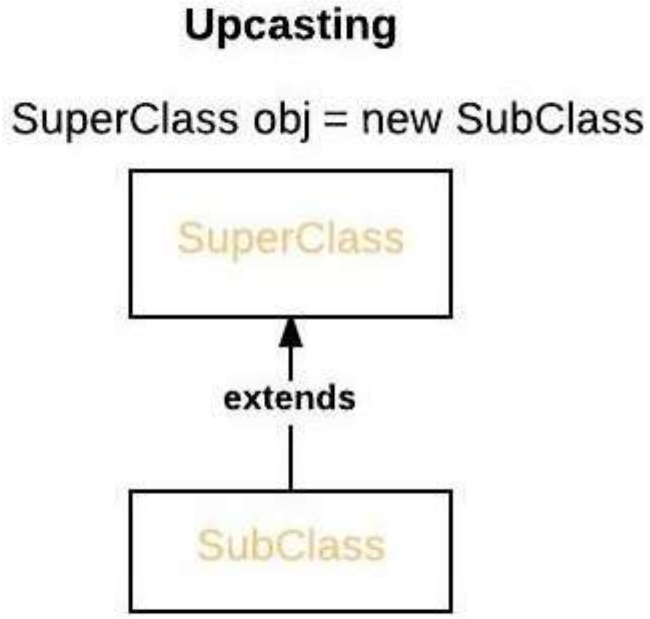
Dynamic Method Dispatch or Runtime Polymorphism

Method overriding is one of the ways in which Java supports Runtime Polymorphism.

Dynamic method dispatch is the mechanism by which a call to an overridden method is resolved at run time, rather than compile time.

- When an overridden method is called through a superclass reference, Java determines which version(superclass/subclasses) of that method is to be executed based upon the type of the object being referred to at the time the call occurs. Thus, this determination is made at run time.
- At run-time, it depends on the type of the object being referred to (not the type of the reference variable) that determines which version of an overridden method will be executed
- A superclass reference variable can refer to a subclass object. This is also known as upcasting. Java uses this fact to resolve calls to overridden methods at run time.



Therefore, if a superclass contains a method that is overridden by a subclass, then when different types of objects are referred to through a superclass reference variable, different versions of the method are executed. Here is an example that illustrates dynamic method dispatch:

```
// A Java program to illustrate Dynamic Method Dispatch using hierarchical inheritance
class A
{
   void m1()
   {
      System.out.println("Inside A's m1 method");
   }
}

class B extends A
{
   // overriding m1()
   void m1()
   {
      System.out.println("Inside B's m1 method");
   }
}
```

```
class C extends A
{
    // overriding m1()
    void m1()
    {
        System.out.println("Inside C's m1 method");
    }
}

// Driver class
class Dispatch
{
    public static void main(String args[])
    {
        // object of type A
        A a = new A();

        // object of type B
        B b = new B();

        // object of type C
        C c = new C();

        // obtain a reference of type A
        A ref;

        // ref refers to an A object
        ref = a;

        // calling A's version of m1()
        ref.m1();

        // now ref refers to a B object
        ref = b;

        // calling B's version of m1()
        ref.m1();

        // now ref refers to a C object
        ref = c;

        // calling C's version of m1()
        ref.m1();
    }
}
```

Output:

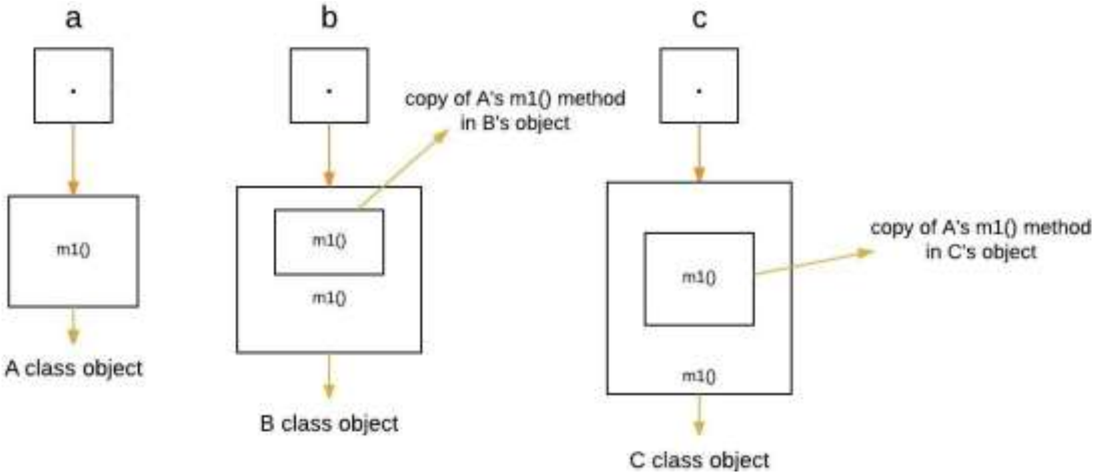
```
Inside A's m1 method
Inside B's m1 method
Inside C's m1 method
```

Explanation :

The above program creates one superclass called A and it’s two subclasses B and C. These subclasses overrides m1( ) method.

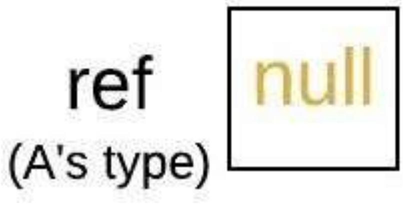
1. Inside the main() method in Dispatch class, initially objects of type A, B, and C are declared.

```
A a = new A(); // object of type A
B b = new B(); // object of type B
C c = new C(); // object of type C
```



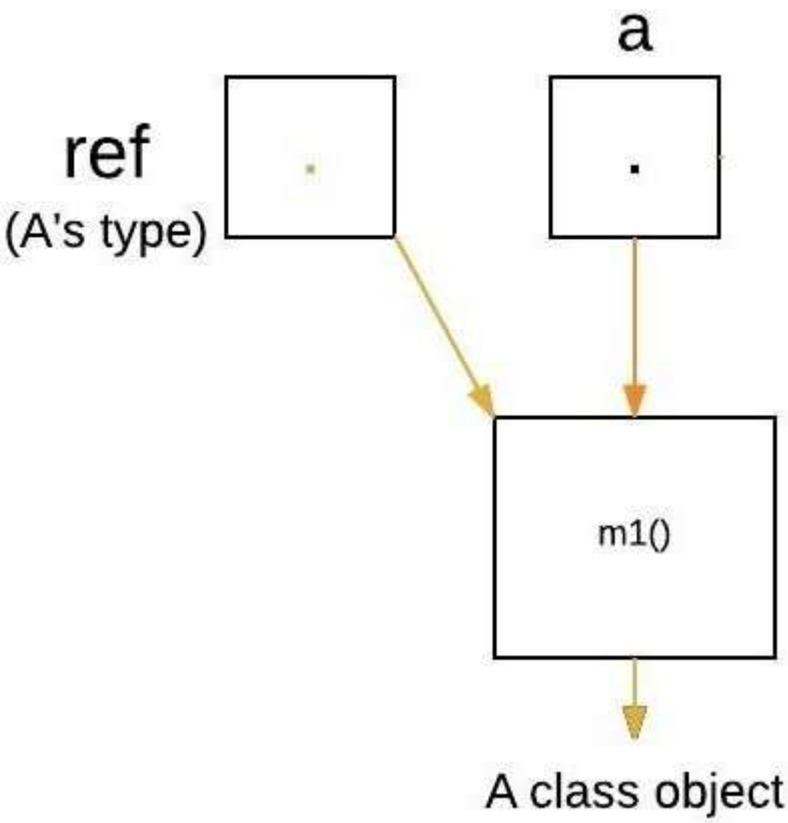
2. Now a reference of type A, called ref, is also declared, initially it will point to null.

```
A ref; // obtain a reference of type A
```



3. Now we are assigning a reference to each type of object (either A’s or B’s or C’s) to *ref*, one-by-one, and uses that reference to invoke m1( ). As the output shows, the version of m1( ) executed is determined by the type of object being referred to at the time of the call.

```
ref = a; // r refers to an A object
ref.m1(); // calling A's version of m1()
```


a
ref
(A's type)
m1()
A class object