# Contents

# Method Overloading

- Methods that have different parameter lists and different definitions.

- It is used when objects are required to perform similar tasks but using different input parameters.

- When we call a method in an object, Java matches up the method name first and then the number and type of parameters to decide which one of the definitions to execute.

- This process is known as “**Compile time polymorphism**” or “**static polymorphism.”**

## Different Number of parameters in argument list

```
class DisplayOverloading
{
        public void disp(char c)
          {
                System.out.println(c);
           }
        public void disp(char c, int num)
           {
                 System.out.println(c + " "+num);
              } }

class Sample
{
       public static void main(String args[])
          {
                 DisplayOverloading obj = new DisplayOverloading();
                  obj.disp('a');
                  obj.disp('a',10);
           }
}
```

## Difference in data type of parameters

```
class DisplayOverloading2
{
public void disp(char c)
 {
System.out.println(c);
}
public void disp(int c)
{
System.out.println(c );
}
}

class Sample2
 {
public static void main(String args[])
{
DisplayOverloading2 obj = new DisplayOverloading2();
obj.disp('a');
obj.disp(5);
}
 }
```

## Sequence of data type of arguments

```
class DisplayOverloading3
{
public void disp(char c, int num)
{
System.out.println("I m the first definition of method disp”+c+num);
}
public void disp(int num, char c)
{
System.out.println("I m the 2nd definition of method disp”+num+c );
} }

class Sample3
{
public static void main(String args[])
{
DisplayOverloading3 obj = new DisplayOverloading3();
obj.disp('x', 51 );
obj.disp(52, 'y');
}}
```

## Method return type doesn’t matter in case of overloading.

```
class Demo2
 {
     public double myMethod(int num1, int num2)
     {
          System.out.println("First myMethod of class Demo");
          return num1+num2;
     }
     public int myMethod(int var1, int var2)
       {
           System.out.println("Second myMethod of class Demo");
          return var1-var2;
        } }
class Sample5
 {
        public static void main(String args[])
        {
              Demo2 obj2= new Demo2();
               obj2.myMethod(10,10);
                obj2.myMethod(20,12);
} }   //compile time error
```

## Static Members(Variables/methods)

- Every time the class is instantiated , a new copy of instance variables and instance methods is created, they are accessed using the objects.

- We want to define a member that is common to all objects and accessed without using a particular object.

- Such members can be defined as follows:

**static** int count;
**static** int max(int x,int y);

## Static Members(Variables/methods)

- Since these members are associated with the class ,they are referred to as **class variables** and **class methods.**
- Static variables and static methods can be called without using the objects.
- They are also available for use by other classes.
- Java class libraries contain a large number of class methods.
- Math class for math operations:min(), max(), avg(), sin(), cos(), tan(), round(),pow()

e.g. double x=Math.sqrt(25.0);

# Inheritance

**Inheritance**

# Inheritance

- Reusability
- Deriving a new class from an old one
- Inheritance allows subclasses to inherit all the variables and methods of their parent classes.
- Forms:

➢ Single inheritance
➢ Multiple inheritance
➢ Hierarchical inheritance
➢ Multilevel inheritance

# Defining a subclass

```
class subclassname extends superclassname
{
   variable declaration;
    methods declaration;
}
```

- The keyword extends signifies that the properties of the superclassname are extended to subclassname.
- The subclass will now contain its own variables and methods as well those of the superclass.

# Subclass Constructor

- A subclass constructor is used to construct the instance variables of both the subclass and the superclass .
- The subclass constructor uses the keyword super to invoke the constructor method of the superclass.
- The keyword **super** is used provided:

➢ Super may only be used within a subclass constructor method.

➢ The call to superclass constructor must appear as the first statement within the subclass constructor.

➢ The parameters in the super class must match the order and type of the instance variable declared in the superclass.

# Multilevel Inheritance

```
Class A
{
  -----
  ------
}
Class B extends A
{
------
------
}
Class C extends B
{
-----
------
}
```

## Overriding Methods

- A method defined in a super class is inherited by its subclass and is used by the objects created by the subclass.
- If we want an object to respond to the same method but have different behaviour when that method is called. We override the method defined in the superclass.
- This is possible by defining a method in the subclass that has the same name, same arguments and same return type as a method in the superclass.
- When that method is called, the method defined in the subclass is invoked and executed instead of the one in the superclass.
- This is known as **method overriding.**

## Final variables and methods

- All methods and variables can be overridden by default in subclasses.
- If we wish to prevent the subclasses from overriding the members of the superclass, we can declare them as final using the keyword **final** as a modifier.

**final** int SIZE=100;
**final** void showstatus();

# Final classes

- Sometimes we may like to prevent a class being further subclasses for security reasons.
- A class that cannot be subclassed is called a final class.

**final** class abc{………}
**final** class pqr extends someclass{……..}

- Any attempt to inherit these classes will cause an error and the compiler will not allow it.

# Abstract methods and classes

- To indicate that a method must always be redefined in a subclass, thus making overriding compulsory.
- This is done using the modifier keyword **abstract** in the method definition.

```
  abstract class shape
  {
………
    abstract void draw();
………
}
```

- When a class contains one or more abstract methods ,it should be declared **abstract**

## Dynamic Method Dispatch

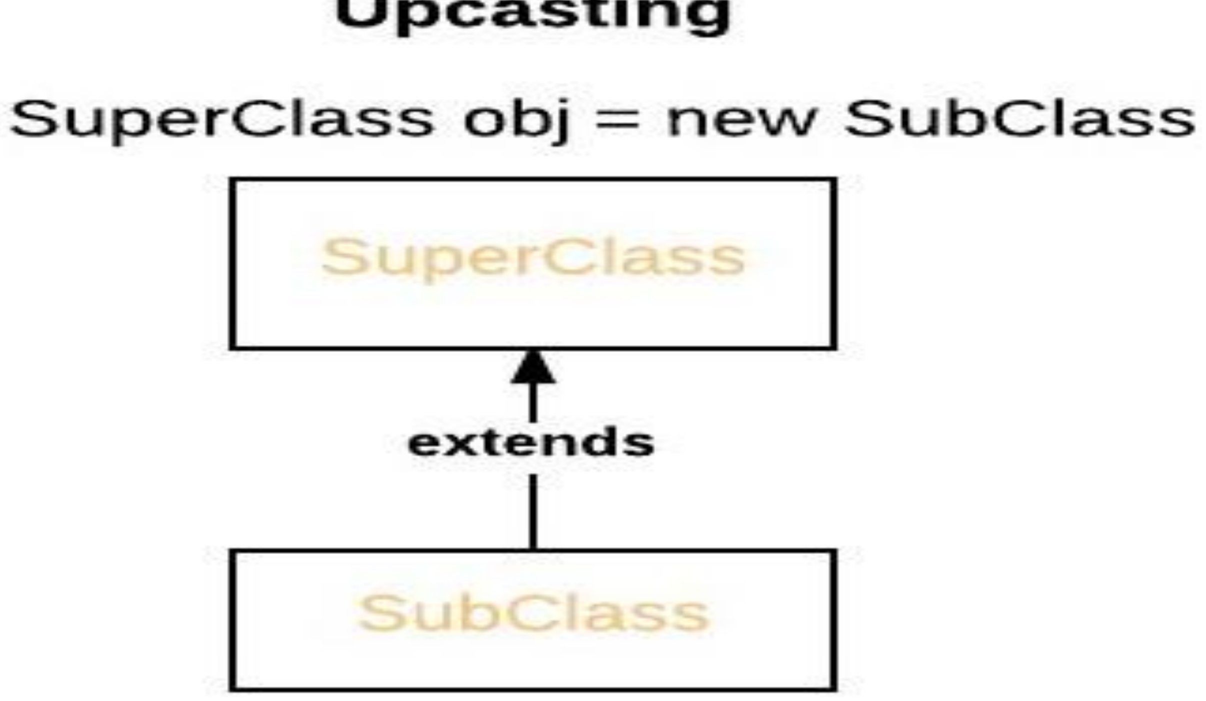
- Method overriding is one of the ways in which Java supports Runtime Polymorphism.
- Dynamic method dispatch is the mechanism by which a call to an overridden method is resolved at run time, rather than compile time.
- When an overridden method is called through a superclass reference, Java determines 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.

## Dynamic Method Dispatch

- 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.

# Dynamic Method Dispatch

- 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.


Upcasting
SuperClass obj = new SubClass
SuperClass
extends
SubClass