02A Lesson Proper for Week 9

What are the Basic Concepts of Inheritance as feature of OOP and how to use it?
Inheritance can be defined as the process where one class acquires the properties (methods and fields) of another. With the use of inheritance the information is made manageable in a hierarchical order.

The class which inherits the properties of other is known as subclass (derived class, child class) and the class whose properties are inherited is known as superclass (base class, parent class).

extends Keyword

extends is the keyword used to inherit the properties of a class. Following is the syntax of extends keyword.

Syntax

```
class Super {
   .....
   .....
}
class Sub extends Super {
   .....
   .....
}
```

Sample Code

Using extends keyword, the My_Calculation inherits the methods addition() and Subtraction() of Calculation class.

Example

```
class Calculation {
   int z;

   public void addition(int x, int y) {
      z = x + y;
      System.out.println("The sum of the given numbers:"+z);
   }

   public void Subtraction(int x, int y) {
      z = x - y;
      System.out.println("The difference between the given numbers:"+z);
   }
}
```

```
public class My_Calculation extends Calculation {
   public void multiplication(int x, int y) {
      z = x * y;
      System.out.println("The product of the given numbers:"+z);
   }

   public static void main(String args[]) {
      int a = 20, b = 10;
      My_Calculation demo = new My_Calculation();
      demo.addition(a, b);
      demo.Subtraction(a, b);
      demo.multiplication(a, b);
   }
}
```

Compile and execute the above code as shown below.

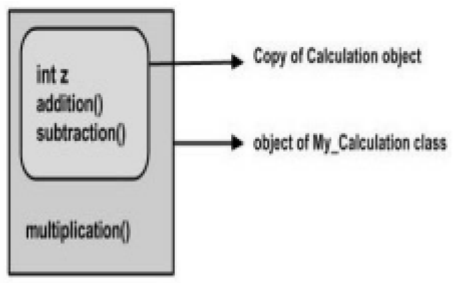
```
javac My_Calculation.java
java My_Calculation
```

After executing the program, it will produce the following result −

Output

```
The sum of the given numbers:30
The difference between the given numbers:10
The product of the given numbers:200
```

In the given program, when an object to My_Calculation class is created, a copy of the contents of the superclass is made within it. That is why, using the object of the subclass you can access the members of a superclass.



The Superclass reference variable can hold the subclass object, but using that variable you can access only the members of the superclass, so to access the members of both classes it is recommended to always create reference variable to the subclass.

If you consider the above program, you can instantiate the class as given below. But using the superclass reference variable (cal in this case) you cannot call the method multiplication(), which belongs to the subclass My_Calculation.

```
Calculation demo = new My_Calculation();
demo.addition(a, b);
demo.Subtraction(a, b);
```

Note − A subclass inherits all the members (fields, methods, and nested classes) from its superclass. Constructors are not members, so they are not inherited by subclasses, but the constructor of the superclass can be invoked from the subclass.

The super keyword

The **super** keyword is similar to this keyword. Following are the scenarios where the super keyword is used.

- It is used to differentiate the members of superclass from the members of subclass, if they have same names.
- It is used to invoke the superclass constructor from subclass.

Differentiating the Members

If a class is inheriting the properties of another class. And if the members of the superclass have the names same as the sub class, to differentiate these variables we use super keyword as shown below.

super.variable

super.method();

Sample Code

This section provides you a program that demonstrates the usage of the **super** keyword.

In the given program, you have two classes namely Sub_class and Super_class, both have a method named display() with different implementations, and a variable named num with different values.

We are invoking display() method of both classes and printing the value of the variable num of both classes. Here you can observe that we have used super keyword to differentiate the members of superclass from subclass.

Copy and paste the program in a file with name Sub_class.java.

Example

```
class Super_class {
  int num = 20;
  // display method of superclass
  public void display() {
    System.out.println("This is the display method of superclass");
  }
}
public class Sub_class extends Super_class {
  int num = 10;
```

```
  // display method of sub class
```

```
  public void display() {
    System.out.println("This is the display method of subclass");
  }
  public void my_method() {
    // Instantiating subclass
    Sub_class sub = new Sub_class();
    // Invoking the display() method of sub class
    sub.display();
    // Invoking the display() method of superclass
    super.display();
    // printing the value of variable num of subclass
    System.out.println("value of the variable named num in sub class:"+ sub.num);
    // printing the value of variable num of superclass
    System.out.println("value of the variable named num in super class:"+ super.num);
  }
  public static void main(String args[]) {
    Sub_class obj = new Sub_class();
    obj.my_method();
  }
}
```

Compile and execute the above code using the following syntax.

```
javac Super_Demo
java Super
```

On executing the program, you will get the following result −

Output

```
This is the display method of subclass
This is the display method of superclass
value of the variable named num in sub class:10
value of the variable named num in super class:20
```

Invoking Superclass Constructor

If a class is inheriting the properties of another class, the subclass automatically acquires the default constructor of the superclass. But if you want to call a parameterized constructor of the superclass, you need to use the super keyword as shown below.

super(values);

Sample Code

The program given in this section demonstrates how to use the super keyword to invoke the parametrized constructor of the superclass. This program contains a superclass and a subclass, where the superclass conta parameterized constructor which accepts a integer value, and we used the super keyword to invoke the parameterized constructor of the superclass.

Copy and paste the following program in a file with the name Subclass.java

Example

```
class Superclass {
   int age;
   Superclass(int age) {
      this.age = age;
   }
   public void getAge() {
      System.out.println("The value of the variable named age in super class is: " +age);
   }
}
public class Subclass extends Superclass {
   Subclass(int age) {
      super(age);
   }
   public static void main(String args[]) {
      Subclass s = new Subclass(24);
      s.getAge();
   }
}
```

Compile and execute the above code using the following syntax.

```
javac Subclass
java Subclass
```

On executing the program, you will get the following result −

Output

```
The value of the variable named age in super class is: 24
```

IS-A Relationship

IS-A is a way of saying: This object is a type of that object. Let us see how the extends keyword is used to achieve inheritance.

```
public class Animal {
}
public class Mammal extends Animal {
}
public class Reptile extends Animal {
}
public class Dog extends Mammal {
}
```

Now, based on the above example, in Object-Oriented terms, the following are true −

- Animal is the superclass of Mammal class.
- Animal is the superclass of Reptile class.
- Mammal and Reptile are subclasses of Animal class.
- Dog is the subclass of both Mammal and Animal classes.

Now, if we consider the IS-A relationship, we can say −

- Mammal IS-A Animal
- Reptile IS-A Animal
- Dog IS-A Mammal

- Hence: Dog IS-A Animal as well

With the use of the extends keyword, the subclasses will be able to inherit all the properties of the superclass except for the private properties of the superclass.

We can assure that Mammal is actually an Animal with the use of the instance operator.

Example

```
class Animal {
}
class Mammal extends Animal {
}
class Reptile extends Animal {
}
public class Dog extends Mammal {

  public static void main(String args[]) {
    Animal a = new Animal();
    Mammal m = new Mammal();
    Dog d = new Dog();

    System.out.println(m instanceof Animal);
    System.out.println(d instanceof Mammal);
    System.out.println(d instanceof Animal);
  }
}
```

This will produce the following result −

Output

```
true
true
true
```

Since we have a good understanding of the extends keyword, let us look into how the implements keyword is used to get the IS-A relationship.

Generally, the implements keyword is used with classes to inherit the properties of an interface. Interfaces can never be extended by a class.

Example

```
public interface Animal {
}
public class Mammal implements Animal {
}
public class Dog extends Mammal {
}
```

The instanceof Keyword

Let us use the instanceof operator to check determine whether Mammal is actually an Animal, and dog is actually an Animal.

Example

```
interface Animal{}
class Mammal implements Animal{}
public class Dog extends Mammal {
   public static void main(String args[]) {
      Mammal m = new Mammal();
      Dog d = new Dog();
      System.out.println(m instanceof Animal);
      System.out.println(d instanceof Mammal);
      System.out.println(d instanceof Animal);
   }
}
```

This will produce the following result −

Output

```
true
true
true
```

HAS-A relationship

These relationships are mainly based on the usage. This determines whether a certain class HASA certain thing. This relationship helps to reduce duplication of code as well as bugs.

Lets look into an example −

Example

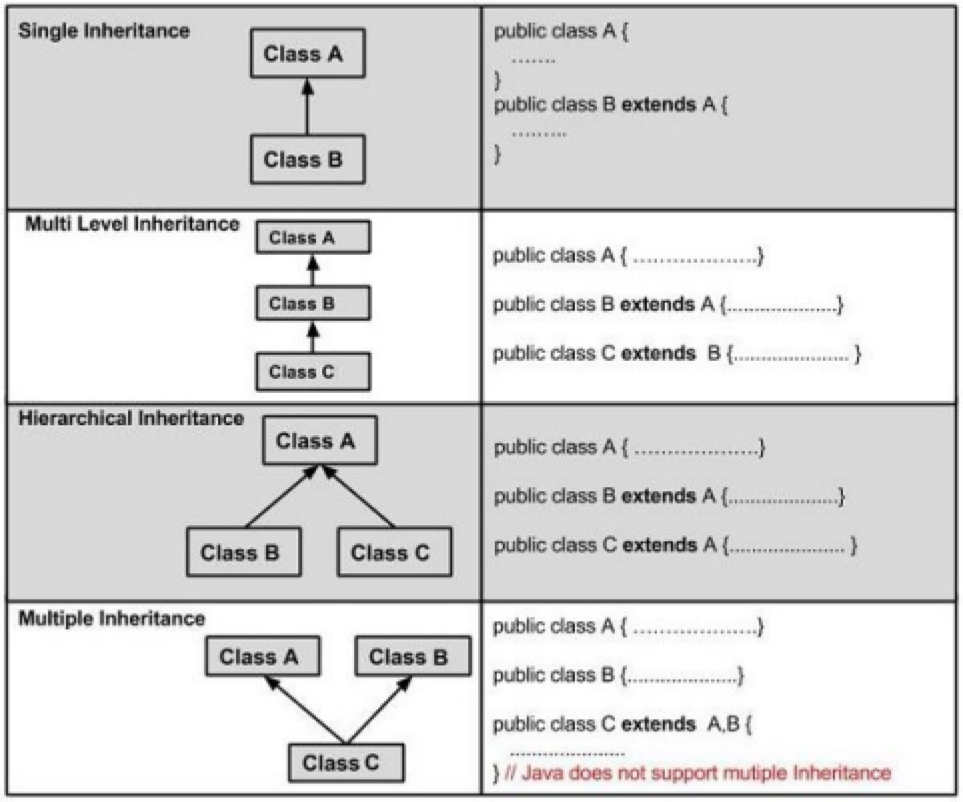
```
public class Vehicle{}
public class Speed{}

public class Van extends Vehicle {
   private Speed sp;
}
```

This shows that class Van HAS-A Speed. By having a separate class for Speed, we do not have to put the entire code that belongs to speed inside the Van class, which makes it possible to reuse the Speed class in multiple applications.

In Object-Oriented feature, the users do not need to bother about which object is doing the real work. To achieve this, the Van class hides the implementation details from the users of the Van class. So, basically what happens is the users would ask the Van class to do a certain action and the Van class will either do the work by itself or ask another class to perform the action.

Types of Inheritance

There are various types of inheritance as demonstrated below.



```
public class A {
    .......
}
public class B extends A {
    .........
}
```

```
public class A { ....................}
public class B extends A {....................}
public class C extends  B {...................... }
```

```
public class A { ....................}
public class B extends A {....................}
public class C extends A {...................... }
```

```
public class A { ....................}
public class B {....................}
public class C extends  A,B {
    .......................
} // Java does not support mutiple Inheritance
```

A very important fact to remember is that Java does not support multiple inheritance.

EXERCISE 1

A student is to create a simple Java program about student enrolment that will classify regular and irregular students. The parent class is public class Enrolment. If the public class Enrolna is a subclass, what will be it's complete Class heading?

____

____

____

EXERCISE 2

Your school would like to create simple enrolment system to help students enrolled in the college. Create a complete program for public class Enrolment and public class Enrolna extends Enrolment.

____

____

____

◄ Preliminary Activity for Week 9

Jump to...

Analysis, Application, and Exploration for Week 9 ►

Navigation

- Home
- Dashboard
  - Site pages
  - My courses
    - 121 - CC106
      - Participants
      - Grades
      - General
      - MODULE 1: WHAT IS APPLICATION DEVELOPMENT?
      - MODULE 2: WHAT ARE THE TECHNICAL SKILLS REQUIRED I...
      - MODULE 3: WHAT ARE THE PROGRAMMING LANGUAGES USED ...
      - MODULE 4: WHAT IS JAVA PROGRAMMING LANGUAGE AS APP...
      - MODULE 5: HOW TO WRITE JAVA PROGRAMMING LANGUAGE A...
      - MODULE 6: PRELIMINARY EXAMINATION
      - MODULE 7: HOW TO WRITE JAVA PROGRAM USING INTEGRAT...
      - MODULE 8: WHAT ARE THE BUILDING BLOCKS OF OBJECT-O...
      - MODULE 9: WHAT ARE THE BASIC CONCEPTS OF INHERITAN...
        - Preliminary Activity for Week 9
        - **02A Lesson Proper for Week 9**
        - Analysis, Application, and Exploration for Week 9
        - Generalization for Week 9
        - Evaluation for Week 9
        - Assignment for Week 9
      - MODULE 10: WHAT ARE THE BASIC CONCEPTS OF ENCAPSUL...
      - MODULE 11: WHAT ARE THE BASIC CONCEPTS OF POLUMORP...
      - Week 12: Midterm Examination
      - MODULE 13: WHAT ARE THE BASIC CONCEPTS OF ABSTRACT...
      - MODULE 14: HOW TO WRITE JAVA PROGRAM USING ABSTRAC...
      - MODULE 15: WHAT IS JAVA DATABASE CONNECTIVITY (JDB...
      - MODULE 16: WHAT ARE THE STEPS OF MANIPULATING DATA...
      - MODULE 17: EMERGING TECHNOLOGIES
    - 121 - BPM101 / DM103
    - 121 - OAELEC2
    - 121 - ITE3
    - 121 - MUL101
    - 121 - ITSP2B
    - 121 - WEB101 / CCS3218
  - Courses

Fair Warning

NOTICE: Please be reminded that it has come to the attention of the Publishing Team of eLearning Commons that learning materials published and intended for ***free use only by students and faculty members within the eLearning Commons network were UNLAWFULLY uploaded in other sites without due and proper permission***.

PROSECUTION: Under Philippine law (Republic Act No. 8293), copyright infringement is punishable by the following: Imprisonment of between 1 to 3 years and a fine of between 50,000 to 150,000 pesos for the first offense. Imprisonment of 3 years and 1 day to six years plus a fine of between 150,000 to 500,000 pesos for the second offense.

COURSE OF ACTION: Whoever has maliciously uploaded these concerned materials are hereby given an ultimatum to take it down within 24-hours. Beyond the 24-hour grace period, our Legal Department shall initiate the proceedings in coordination with the National Bureau of Investigation for IP Address tracking, account owner identification, and filing of cases for prosecution.

2nd Semester Enrollment

visit www.bcp.edu.ph
Enrollment registration is now Ongoing
For 2nd Semester SY 2021 - 2022
We are accepting new students, returnees and transferees.
"Be trained to be the best,
Be linked to success"
bcp-inquire@bcp.edu.ph
(8)442-8601 | (8)518-8050

Activities