 *DEPARTMENT OF INFORMATION TECHNOLOGY*

Experiment No.11

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| Experiment No | 11 | |
| Experiment Title | Write a program to calculate volume of sphere using multilevel inheritance and demonstrating method overriding. | |
| Resources / Apparatus Required | Java SE(JDK)8u102 ,  gedit text editor | PC |
| Objectives | The objective of this experiment is to learn programs based on “super” keyword concept in java. | |
| Theory | **Super keyword in java**  The super keyword in java is a reference variable that is used to refer immediate parent class object.  Whenever you create the instance of subclass, an instance of parent class is created implicitly i.e. referred by super reference variable.  **Usage of Java super Keyword**   1. super is used to refer immediate parent class instance variable. 2. super() is used to invoke immediate parent class constructor. 3. super is used to invoke immediate parent class method.  Super( ) **Super( )** It is used for calling super class parameterize constructor from the context of derived class constructor.   * It is used inside a sub-class method definition to call a method defined in the super class. Private methods of the super-class cannot be called. Only public and protected methods can be called by the super keyword. * It is also used by class constructors to invoke constructors of its [parent class](https://en.wikipedia.org/wiki/parent_class).   **Syntax:**  super.<method-name>(); 1)super() must be the first statement in constructor otherwise we will get the compilation error message: “Constructor call must be the first statement in a constructor”.2) We can also invoke [parameterized constructor](http://beginnersbook.com/2014/01/parameterized-constructor-in-java-example/) of parent class by providing arguments while calling super.Note: super() is added in each class constructor automatically by compiler.Method Overriding in Java If subclass (child class) has the same method as declared in the parent class, it is known as **method overriding in java**.  In other words, If subclass provides the specific implementation of the method that has been provided by one of its parent class, it is known as method overriding. Usage of Java Method Overriding  * Method overriding is used to provide specific implementation of a method that is already provided by its super class. * Method overriding is used for runtime polymorphism  Rules for Java Method Overriding  1. method must have same name as in the parent class 2. method must have same parameter as in the parent class. 3. must be IS-A relationship (inheritance).  Multilevel inheritance in java Multilevel-Inheritance-Diagram  It’s pretty clear with the diagram that in Multilevel inheritance there is a concept of grand parent class. If we take the example of above diagram then class C inherits class B and class B inherits class A which means B is a parent class of C and A is a parent class of B. So in this case class C is implicitly inheriting the properties and method of class A along with B that’s what is called multilevel inheritance. | |
| Program & output | A)  import java.util.\*;  class Data  {  protected float r;  public void read(float x)  {  r=x;  }  }  class Area extends Data  {  protected float Area;  public void calculate()  {  Area=3.14f\*r\*r;  }  public void display()  {  System.out.println("Area ="+Area);  }  }  class Volume extends Area  {  protected float Volume;  public void compute()  {  Volume=Area\*r\*4/3;  }  public void display()  {  super.display();  System.out.println("Volume ="+Volume);  }  }  class Demo3  {  public static void main(String args[])  {  float x;  Scanner sc=new Scanner(System.in);  System.out.println("Enter the radius:");  x=sc.nextFloat();  Volume a=new Volume();  a.read(x);  a.calculate();  a.compute();  a.display();  }  }  C:\Users\Mahesh\Desktop\oopm exp 7,9,10,11 outputs\exp 11output.png | |
| Conclusion | Thus, we have learnt programs based on “super” keyword concept in java. | |