

**Don Bosco Institute of Technology, Kurla(W)**  
**Department of Electronics and Tele-Communication Engineering**  
**ECL304 - Skill Lab: C++ and Java Programming**  
**Sem III**  
**2021-22**

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| <b>Lab Number:</b>   | <b>9</b>               |
| <b>Student Name:</b> | <b>Suraj Kumar Das</b> |
| <b>Roll No :</b>     | <b>42</b>              |

**Title:**

1. Write a java program to create an abstract class named Shape that contains two integers and an abstract method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

**Learning Objective:**

Students will be able to implement abstract class and abstract method programs.

**Learning Outcome:**

- Understanding the abstraction concept and hiding of the unnecessary code.

**Course Outcome:**

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| <b>ECL304.4</b> | 1. Implement different programming applications using packaging. |
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**Theory:**

- **Explain in details about necessity of data hiding in any application / project.**

Data hiding is a software development technique specifically used in object-oriented programming (OOP) to hide internal object details (data members). Data hiding ensures exclusive data access to class members and protects object integrity by preventing unintended or intended changes.

Data hiding also reduces system complexity for increased robustness by limiting interdependencies between software components.

Data hiding is also known as data encapsulation or information hiding.

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- **Explain abstract class and abstract methods.**

**Abstract class:** is a restricted class that cannot be used to create objects (to access it, it must be inherited from another class).

```
// create an abstract class
abstract class Language {
    // fields and methods
}
...

// try to create an object Language
// throws an error
Language obj = new Language();
```

**Abstract method:** can only be used in an abstract class, and it does not have a body. The body is provided by the subclass (inherited from).

```
/ error
// class should be abstract
class Language {

    // abstract method
    abstract void method1();
}
```

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| <b>Algorithm :</b> | <p>Step 1: Create an abstract class named 'Shape' which contains 2 integers and an abstract method named printArea().</p> <p>Step 2: Create 3 classes namely , Rectangle , Triangle and Circle. All the 3 inherited classes of Shape class (using</p> |
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|                 | <p>hierarchical inheritance) has the same method printArea() with formulas for area of the respective shapes.</p> <p>Step 3: For each of the shape take the input values form the user for the sides of the respective shape and then perform the calculation accordingly.</p> <p>Step 4: In the main function, create the 3 objects of the abstract class representing the 3 subclasses and calling each of the 3 methods for displaying the output.</p> <p>(although we now that the object of the abstract class cannot be created but as the objects are calling the methods of the subclasses, we will get the desired output)</p> |
| <b>Program:</b> | <pre> package inheritance;  import java.util.*;  abstract class Shape{     int length,breadth,radius;      Scanner input = new Scanner(System.in);      abstract void printArea(); }  class Rectangle extends Shape{ </pre>   |

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|  | <pre>void printArea() {<br/>    System.out.println("For<br/>finding the Area of Rectangle");<br/><br/>    System.out.print("Enter length<br/>and breadth");<br/><br/>    length = input.nextInt();<br/>    breadth = input.nextInt();<br/><br/>    System.out.println("The area<br/>of Rectangle is: " + length * breadth);<br/><br/>    }<br/>}<br/><br/>class Triangle extends Shape{<br/>    void printArea() {<br/>        System.out.println("For<br/>finding the Area of Triangle");<br/><br/>        System.out.println("Enter<br/>Base and Height:");<br/><br/>        length = input.nextInt();<br/>        breadth = input.nextInt();<br/><br/>        System.out.println("The area<br/>of Triangle is: " + (length * breadth) / 2);<br/>    }<br/>}<br/><br/>class Cricle extends Shape {<br/>    void printArea() {<br/>        System.out.println( "For<br/>finding the Area of Cricle");<br/><br/>        System.out.print("Enter<br/>Radius: ");</pre> |
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|                           | <pre> radius = input.nextInt();  System.out.println("The area of Cricle is: " + 3.14f * radius * radius);      } }  public class abstractshape {     public static void main(String[] args)     {          Shape rec = new Rectangle();         rec.printArea();          Shape tri = new Triangle();         tri.printArea();          Shape cri = new Cricle();         cri.printArea();      } } </pre> |
| <b>Input given:</b>       | <p>L=12    B=6</p> <p>B=2    H=7</p>   |
| <b>Output Screenshot:</b> | <pre> For finding the Area of Rectangle Enter length and breadth 12 2 The area of Rectangle is: 24 For finding the Area of Triangle Enter Base and Height: 6 7 The area of Triangle is: 21 For finding the Area of Cricle Enter Radius: 3 The area of Cricle is: 28.26 </pre>  |