

The `abstract` Keyword in Java

1. Introduction

`abstract` keyword Java te use hoy **abstract classes and abstract methods** declare kortel
Abstract class **complete implementation provide kore na**, kintu **child class** ke method implement korte obligate korel

2. Uses of `abstract` Keyword

1. **Abstract Class** – class er kuch part incomplete thake
 2. **Abstract Method** – method er body na thake, sirf signature thake
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3. Abstract Class and Abstract Method

```
abstract class Animal {
    abstract void sound(); // abstract method

    void eat() {           // normal method
        System.out.println("Animal eats food");
    }
}

class Dog extends Animal {
    @Override
    void sound() {         // provide implementation
        System.out.println("Dog barks");
    }
}

public class TestAbstractClass {
    public static void main(String[] args) {
        Dog d = new Dog();
        d.sound();         // overridden method
        d.eat();           // normal method from parent
    }
}
```

Output:

Dog barks
Animal eats food

4. Rules for Abstract Classes and Methods

1. **Abstract class cannot be instantiated**
2. **Abstract method must be implemented in child class**
3. Abstract class **can have normal methods**
4. **Abstract + concrete methods** same class e thakte parei
5. **Child class override** kore **all abstract methods** na korle, child class o abstract hote hobe!

5. Example: Multiple Abstract Classes

```
abstract class Shape {  
    abstract void draw();  
}  
  
abstract class Polygon extends Shape {  
    void color() {  
        System.out.println("Polygon color is blue");  
    }  
}  
  
class Triangle extends Polygon {  
    @Override  
    void draw() {  
        System.out.println("Drawing triangle");  
    }  
}  
  
public class TestAbstractHierarchy {  
    public static void main(String[] args) {  
        Triangle t = new Triangle();  
        t.draw();  
        t.color();  
    }  
}
```

Output:

Drawing triangle
Polygon color is blue

6. Summary Table

Feature	Description	Example
Abstract Class	Cannot instantiate	<code>abstract class Animal</code>
Abstract Method	No body, must override	<code>abstract void sound()</code>
Concrete Method	Can exist in abstract class	<code>void eat()</code>
Child Obligation	Must implement all abstract methods	<code>Dog</code> implements <code>sound()</code>

7. Points to Remember

1. Abstract keyword **partial abstraction** provide korel
2. Abstract classes can have **constructors, variables, and methods**!
3. Use abstract classes to **define common behavior** and **force implementation** in child classes!
4. Java **does not allow abstract methods in final classes**!