

{;}

CODE.
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SOLVE.

Object Oriented Programming

using

JAVA

Concepts | Principles | Practice

```
class Shape {  
    void draw() { }  
}  
  
class Circle extends Shape {  
    @Override  
    void draw() {  
        System.out.println("Circle");  
    }  
}  
  
class Rectangle extends Shape {  
    @Override  
    void draw() {  
        System.out.println("Rectangle");  
    }  
}
```

Sagardeep Ghosh

Raghunath Maji

Shantanu Naskar

Surya Shekhar Santra



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OBJECT-ORIENTED PROGRAMMING USING JAVA

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Raghunath Maji

Shantanu Naskar

Surya Shekhar Santra

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Santra

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Preface

The rapid advancement of computing technologies and the increasing demand for software-driven solutions have made programming an indispensable skill for students and professionals in computer science and engineering disciplines. Among the numerous programming languages available today, Java has emerged as one of the most influential, versatile, and widely adopted object-oriented programming languages. Since its inception, Java has revolutionized software development by providing a platform-independent environment, robust security mechanisms, and extensive libraries that facilitate the development of applications ranging from desktop systems and enterprise solutions to mobile and web-based applications. The book "Object-Oriented Programming Using Java" has been carefully designed to serve as a comprehensive textbook for undergraduate and diploma students pursuing Computer Science, Information Technology, and related disciplines. It aims to provide a strong conceptual foundation in object-oriented programming principles and their practical implementation using Java. The contents of this book have been organized systematically to help readers progress from the fundamental concepts of programming to advanced features of Java in a gradual and learner-friendly manner.

The journey begins with Chapter 1: Introduction to Java, which familiarizes readers with the evolution and significance of Java programming. This chapter introduces the Java Virtual Machine (JVM), bytecode architecture, and the process of setting up the Java development environment. It also provides a comparative study of procedure-oriented and object-oriented programming paradigms, enabling students to appreciate the advantages of object-oriented design. The chapter concludes with the development and execution of the classic "Hello World" program, giving beginners their first practical experience with Java.

Chapter 2: Building Blocks of the Language presents the essential elements of Java programming. This chapter discusses primitive and user-defined data types, variables, constants, identifiers, operators, and control structures. The concepts of arrays, strings, wrapper classes, and garbage collection are explored in detail with suitable examples. Since these concepts form the backbone of programming logic and problem-solving, special emphasis has been placed on clarity and practical understanding.

In Chapter 3: Classes, Objects, and Methods, readers are introduced to the core mechanisms of object-oriented programming in Java. The chapter explains how classes and objects are created and manipulated, along with important concepts such as constructors, method overloading, static members, and the use of keywords such as `this` and `final`. Numerous illustrative examples have been incorporated to help students understand how real-world entities can be modeled through classes and objects.

The true strength of Java lies in its support for object-oriented programming principles, which are comprehensively discussed in Chapter 4: Object-Oriented Programming Concepts. This chapter covers inheritance, packages, interfaces, and abstraction mechanisms that facilitate code reusability and modular software design. Through practical examples and case studies, readers will gain insight into designing efficient and maintainable software systems using object-oriented principles.

Chapter 5: Packages, Interfaces, and Exception Handling extends the discussion by introducing robust error-handling mechanisms and the concept of multithreaded programming. Exception handling is an essential feature for building reliable and fault-tolerant applications, and this chapter systematically explains the use of exceptions, their hierarchy, and the techniques for creating user-defined exceptions. Furthermore, the foundations of multithreading are introduced to familiarize readers with concurrent execution and its applications in modern computing systems.

The final chapter, Chapter 6: Multithreading and Java Applications, explores Java's powerful input/output mechanisms and stream-based architecture. It presents the hierarchy of I/O classes, discusses different stream classes, and demonstrates techniques for file handling through practical examples. Since file management and data persistence are integral components of software development, this chapter equips students with the necessary skills to build real-world applications.

The primary objective of this book is not only to teach the syntax of Java programming but also to cultivate a deeper understanding of object-oriented thinking and software design principles. Throughout the book, theoretical explanations have been supplemented with programming examples, illustrations, and practical exercises to encourage hands-on learning. The language used is simple and accessible, making the book suitable for beginners while also serving as a valuable reference for advanced learners and practitioners.

This book will be particularly beneficial for undergraduate students of Computer Science and Engineering, Information Technology, Bachelor of Computer Applications (BCA), Diploma in Computer Science, and related disciplines. It is also expected to assist educators, competitive examination aspirants, and self-learners who wish to acquire proficiency in Java programming and object-oriented software development. No book can claim absolute perfection, and there is always room for improvement. The authors would be grateful to receive constructive suggestions and feedback from readers, teachers, and professionals, which will undoubtedly help in enhancing the quality and usefulness of future editions.

We hope this book serves as a reliable guide and inspires readers to explore Java programming and object-oriented software development with confidence and enthusiasm.

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