Method Overloading in Java

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March 12, 2025

What is Method Overloading?

- Method Overloading is a feature in Java that allows a class to have more than one method with the same name.
- The methods must differ by the number or type of parameters.
- It increases the readability of the program.

Rules for Method Overloading

- Methods must have the same name.
- Methods must differ in the type or number of parameters.
- Method return type can be same or different.

Example 1: Overloading by Number of Parameters

```
class Add {
  int sum(int a, int b) {
    return a + b;
  }

  int sum(int a, int b, int c) {
    return a + b + c;
  }
}
```

- Two methods named `sum` with different number of parameters.

Example 2: Overloading by Type of Parameters

```
class Multiply {
  int product(int a, int b) {
    return a * b;
  }

  double product(double a, double b) {
    return a * b;
  }
}
```

- Two methods named `product`, one uses `int`, the other uses `double`.

Example 3: Overloading with Type Promotion

```java
class Display {
  void show(int a) {
    System.out.println("int:␣" + a);
  }

  void show(double a) {
    System.out.println("double:␣" + a);
  }
}
```

- If `show(5)` is called, `int` version will execute.
- If `show(5.5)` is called, `double` version will execute.

Example 4: Overloading by Sequence of Data Types

```
class Print {
  void printData(int a, double b) {
    System.out.println("int and double: " + a + ", " +
  }

  void printData(double a, int b) {
    System.out.println("double and int: " + a + ", " +
  }
}
```

- Same number and type of parameters but in different sequence.

Example 5: Overloading Constructors

```
class Student {
  String name;
  int age;

  Student(String n) {
    name = n;
  }

  Student(String n, int a) {
    name = n;
    age = a;
  }
}
```

- Constructor overloading with different parameter list.

Example 6: Overloading by Different Return Type (Invalid Alone)

```
class Demo {
  int display() {
    return 1;
  }

  // This alone is invalid overloading
  // Must differ in parameters too
  // double display() { return 2.0; }
}
```

- Return type alone cannot distinguish overloaded methods.

Advantages of Method Overloading

- Improves code clarity and reusability.
- Easier to maintain.
- Allows different behaviors with same method name.

Conclusion

- Method overloading is a fundamental concept in Java.
- Enhances flexibility and readability of programs.
- Used widely in real-world Java applications.