



Java Learning Journey

Chapter 5 - Loops

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Introduction to Loops

Loops are used to **execute a block of code repeatedly**. They help avoid repetitive code and make programs efficient and readable.

Types of Loops in Java

1. **while** Loop

- **Checks condition first**, then executes the body.
- Use when the number of iterations is **not known in advance**.

Syntax:

```
while (condition) {  
    // body  
}
```

2. **do-while** Loop

- **Executes the body first**, then checks the condition.
- **Guaranteed to run at least once**.

Syntax:

```
do {  
    // body  
} while (condition);
```

3. **for** Loop

- Used when the number of iterations **is known**.
- Combines **initialization**, **condition**, and **increment/decrement** in one line.

Syntax:

```
for (initialization; condition; update) {  
    // body  
}
```

while vs do-while

Feature	while Loop	do-while Loop
Condition Check	Before execution	After execution
Minimum Runs	0	1
Use Case	Unknown iterations	At least one run

Loop Control Statements

1. break

- **Exits the loop immediately.**
- Used to terminate early when a condition is met.

Example:

```
while (true) {
    if (condition) break;
}
```

2. continue

- **Skips the rest of the current iteration** and moves to the next.
- Useful for skipping specific values.

Example:

```
for (int i = 0; i < 10; i++) {
    if (i % 2 == 0) continue;
    System.out.println(i); // prints only odd numbers
}
```

Other Loop Concepts

Sentinel Value

- A special value used to **terminate input** in a loop.
- Example: 0 to end a number input sequence.

Input/Output Redirection

- **Input redirection:** Read from a file instead of the keyboard:
`java Program < input.txt`
- **Output redirection:** Write output to a file:
`java Program > output.txt`

Nested Loops

- A loop inside another loop.
- Commonly used for multi-dimensional data (e.g., matrices).

Example:

```
for (int i = 0; i < 3; i++) {  
    for (int j = 0; j < 3; j++) {  
        System.out.println(i + ", " + j);  
    }  
}
```

⚠ Common Errors & Tips

- **Infinite Loop:** Condition never becomes false.
- **Off-by-One Error:** Loop runs one time too many or too few.
- **Floating-Point Precision:** Avoid using `float`/`double` in loop conditions due to rounding errors.
- **Semicolon After Loop Header:**
`for (int i = 0; i < 10; i++);` → body is empty!

🧠 When to Use Which Loop

Loop Type	When to Use
<code>while</code>	Number of iterations unknown
<code>do-while</code>	Must execute at least once
<code>for</code>	Number of iterations known
<code>break/continue</code>	To exit early or skip an iteration