

While Loop in Java

Detailed Notes

The while loop in Java is a control flow statement that executes a block of code repeatedly while a condition remains true. It is used when the number of iterations is not known beforehand but depends on dynamic conditions.

Syntax

```
java
while (condition) {
    // statements to execute repeatedly as long as condition is true
}
```

The condition is evaluated before each iteration.

If the condition is true, the loop body executes.

If the condition is false, the loop terminates and control moves out.

The loop may execute zero or more times.

Flow:

Condition evaluated.

If true, run statements inside the loop.

After execution, check condition again.

Repeat or exit.

Example:

```
java
int i = 1;
while (i <= 5) {
    System.out.println("i = " + i);
    i++;
}
```

Output:

```
text
i = 1
i = 2
i = 3
i = 4
i = 5
```

Important Notes

If the condition never becomes false, it creates an infinite loop.

Initialize variables before loop.

Update variables inside the loop to eventually break the loop.

Sample Programs

Print numbers 1 to 10 using while loop:

```
java
int i = 1;
while (i <= 10) {
    System.out.println(i);
    i++;
}
```

Sum of numbers from 1 to n:

```
java
int n = 10;
int sum = 0;
```

```
int i = 1;
while (i <= n) {
    sum += i;
    i++;
}
System.out.println("Sum: " + sum);
Interactive example with break:
```

```
java
Scanner sc = new Scanner(System.in);
while (true) {
    System.out.println("Enter number (0 to stop): ");
    int num = sc.nextInt();
    if (num == 0) break;
    System.out.println("You entered: " + num);
}
```

Interview Questions and Answers: While Loop

What is a while loop and how does it work in Java?

A while loop repeatedly executes a block as long as its Boolean condition is true. The condition is evaluated before every iteration. If the condition is false at the start, the loop body does not execute even once.

When should you use a while loop instead of a for loop?

Use a while loop when you do not know in advance how many times you need to iterate. It depends on conditions evaluated during runtime, like reading input until a sentinel value is found.

What happens if you omit updating the loop control variable inside a while loop?

It will cause an infinite loop because the condition remains true indefinitely, never allowing the loop to terminate.

Is there a difference between while and do-while loops?

Yes, in while the condition is checked before loop execution, so the loop might not run at all if the condition is initially false. In do-while, the loop executes at least once since the condition is checked after execution.

How do you break out of a while loop prematurely?

Using the break statement immediately terminates the loop and transfers control after the loop block.

Can the condition in a while loop be any expression?

Yes, the condition must yield a boolean value. Any expression resulting in true/false can be used.

What's the importance of initializing variables before a while loop?

Initialization sets the starting state. Without proper initialization, the condition may behave unpredictably or cause runtime errors.

Can you have an empty while loop? What does it mean?

Yes, it's syntactically valid but generally meaningless unless used intentionally for waiting or polling, often combined with conditions or thread sleep.

Explain infinite loops in the context of while loops. Why are they dangerous?

Infinite loops occur when the condition never becomes false or no exit point exists. They can cause unresponsive programs, freezing, or excessive CPU use unless intentionally designed.

Give an example where a while loop is preferable to a for loop.

Reading user input until a quit command is entered is best with a while loop because the number of inputs is unknown beforehand.

Assignments: While Loop

Write a program that prints all odd numbers from 1 to 50 using a while loop.

Create a program that asks the user to input positive integers and sums them until the user enters a negative number.

Implement a while loop to reverse the digits of a given integer number.

Write a program to calculate the factorial of a number using a while loop.

Use a while loop to simulate a login system that asks for username and password repeatedly until correct details are entered.

Shall I proceed with Do-While Loop next?