For Loop in Java
Detailed Notes
A for loop in Java is a control flow statement that allows you to execute a block of code repeatedly when the number

Syntax
java
```java
for (initialization; condition; increment/decrement) {
    // statements to be executed
}
```
Initialization: Executed once before the loop starts. Used to declare and initialize loop control variables.

Condition: Tested before each iteration. If true, the loop continues; if false, loop terminates.

Increment/Decrement: Updates loop variables after each iteration.

How it works:
Initialization is done once.

Condition is evaluated; if true, statements execute.

Increment/decrement runs.

Repeat condition check and loop.

Example:
java
```java
for (int i = 1; i <= 5; i++) {
    System.out.println("i = " + i);
}
```
Output:

text
```
i = 1
i = 2
i = 3
i = 4
i = 5
```
Characteristics
Best used when the number of iterations is predetermined.

Variables declared inside for parentheses are scoped to the loop.

Supports multiple variables and expressions separated by commas.

Nested For Loop
You can use one for loop inside another:

java
```java
for (int i = 1; i <= 3; i++) {
    for (int j = 1; j <= 2; j++) {
        System.out.println(i + " " + j);
    }
}
```
Sample Programs
Print numbers 1 to 10:

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

Sum numbers 1 to 100:

```java
int sum = 0;
for(int i = 1; i <= 100; i++) {
    sum += i;
}
System.out.println("Sum = " + sum);
```

Print multiplication table of a number:

```java
int num = 7;
for(int i = 1; i <= 10; i++) {
    System.out.println(num + " x " + i + " = " + (num * i));
}
```

Using multiple variables:

```java
for (int i = 0, j = 10; i <= j; i++, j--) {
    System.out.println("i = " + i + ", j = " + j);
}
```

Interview Questions and Answers: For Loop

What is a for loop in Java and when should it be used?
A for loop is a control flow statement that runs a block of code a specified number of times. It is ideal when you knoing through an array or counting from one number to another.

Describe the components of a for loop and their purpose.

Initialization: sets the starting point (e.g., int i = 0).

Condition: loop runs while this evaluates to true.

Increment/Decrement: updates the loop variable each iteration.
Together, these control the loop execution.

What is the scope of a loop variable declared in the for loop?
Loop variables declared inside the for parentheses (e.g., for(int i = 0; ...)) have block scope limited to the loop body ar

Can multiple variables be initialized or updated in the for loop? Give an example.
Yes, separated by commas:

```java
for (int i = 0, j = 10; i < j; i++, j--) {
    System.out.println(i + " " + j);
}
```

This initializes two variables and updates them within the loop.

What happens if the condition in the for loop is omitted?
If omitted, the condition defaults to true, making the loop infinite unless a break statement is used inside.

When would nested for loops be necessary?
Nested loops are used when you need to perform repetitive actions inside repetitive actions, for example, iterating c

Can the initialization statement be omitted?
Yes, if the loop variable has been declared outside, only condition and increment parts are needed:

```java
int i = 0;
for (; i < 5; i++) { ... }
```

Explain the difference between a for loop and a while loop.

A for loop is generally used when the number of iterations is known, combining init, condition, and update in one lin
ertain and the termination depends upon a condition evaluated before execution.

Is it possible to have an empty for loop?
Yes. For example:

```java
for(;;) {
    // Infinite loop
}
```
What is loop unrolling and why might it be used?
Loop unrolling is manually expanding a loop so it executes multiple iterations per loop, reducing overhead. It's an op
mizations.

Assignments: For Loop
Write a program to print all even numbers between 1 and 100 using a for loop.

Calculate and print the factorial of a given number using a for loop.

Display the Fibonacci series up to n terms using a for loop.

Generate a pyramid pattern of stars (*) for a given number of rows.

Find the sum of digits of an integer input using a for loop.

If this format looks good, I'll continue with While Loop next. Just let me know!