Day 3

Java Operators

Operator

An **operator** is a symbol that performs some operation.

Example:

```
int a = 10;

int b = 20;

int c = a + b;
```

In the above example:

- *a* and *b* are **operands**.
- + is an **operator**.

Types of Operators

1. Arithmetic operators
2. Relational/comparison operators
3. Logical operators
4. Increment & Decrement operators
5. Assignment operators
6. Ternary/conditional operator

Arithmetic Operators

Arithmetic operators are used to perform common mathematical operations.

Works with only numeric data types.

Operator	Name	Description	Example
+	Addition	Adds together two values	x + y
-	Subtraction	Subtracts one value from another	x - y
*	Multiplication	Multiplies two values	x * y
/	Division	Divides one value by another	x / y
%	Modulus	Returns the division remainder	x % y

Relational/Comparison Operators

Comparison operators are used to compare two values (or variables).

It returns a boolean value (true/false).

Operator	Name	Example
==	Equal to	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	X<=y

Logical Operators

Logical operators are used to perform logical AND, OR and NOT operations.

It returns a boolean value (true/false).

Operator	Name	Description	Example
&&	Logical and	Returns true if both statements are true	x < 5 && x < 10
||	Logical or	Returns true if one of the statements is true	x < 5 || x < 4
!	Logical not	Reverse the result, returns false if the result is true	!(x < 5 && x < 10)

Truth table to demonstrate Logical Operators:

A	B	A && B	A || B	!A	!B
True	True	True	True	False	False
True	False	False	True	False	True
False	True	False	True	True	False
False	False	False	False	True	True

Increment and decrement operators

Operator	Name	Description	Example
++	Increment	Increases the value of a variable by 1	++x or x++
--	Decrement	Decreases the value of a variable by 1	--x or x--

Pre-increment Vs Post-increment

The **pre-increment (++x)** and **post-increment (x++)** operators are used to increase the value of a variable by 1. However, they differ in when the increment takes effect relative to other operations in the expression.

1. Pre-Increment (++x):

- The variable is incremented first, and then the updated value is used in the expression.
- Example: If x = 5, then ++x increments x to 6, and the value of the expression is 6.

2. Post-Increment (x++):

- The current value of the variable is used in the expression first, and then the variable is incremented.
- Example: If x = 5, then x++ uses the value 5 in the expression, and after the expression is evaluated, x is incremented to 6.

Pre-decrement Vs Post-decrement

The **pre-decrement (--x)** and **post-decrement (x--)** operators are used to decrease the value of a variable by 1. The key difference between them is when the decrement operation takes effect relative to other operations in the expression.

1. Pre-Decrement (--x):

- The variable is decremented first, and then the updated value is used in the expression.
- Example: If x = 5, then --x decrements x to 4, and the value of the expression is 4.

2. Post-Decrement (x--):

- The current value of the variable is used in the expression first, and then the variable is decremented.
- Example: If x = 5, then x-- uses the value 5 in the expression, and after the expression is evaluated, x is decremented to 4.

Java Assignment Operators

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3

Difference between = and == operators:

= Operator (Assignment Operator):

- The = operator is used to assign a value to a variable.
- Example: int x = 5; assigns the value 5 to the variable x.

== Operator (Relational/comparison/equality Operator):

- The == operator is used to compare two values or expressions for equality.

- Example: x == 5 checks if the value of x is equal to 5.

Ternary/conditional operator

The **ternary operator** in Java is a shorthand way of writing an if-else statement. It is also known as the **conditional operator.**

Syntax:

condition? Output 1: Output2;

condition: A boolean expression that is evaluated to either true or false.

output1: The value returned if the condition is true.

output2: The value returned if the condition is false.

Categories of Operators

- **Unary Operators** (Works on single operand)

  ++ -- = += -= *= /= %= !

- **Binary operators** (Works on at least two operands)

  + - * / % > >= < <= != == && ||

- **Ternary operator** (Works on three operands)

  ?:

Lab Assignments

Exercise 1: Create a program that defines two integer variables, a and b. Perform the following operations and print the results:

1. Sum of a and b
2. Difference when b is subtracted from a
3. Product of a and b
4. Quotient when a is divided by b
5. Remainder when a is divided by b

Exercise 2: Write a program to swap the values of two variables, x and y, without using a third variable.

Exercise 3: Create a program to calculate the area and perimeter of a rectangle. Use variables length and width to store the dimensions.

Exercise 4: Write a program to convert a temperature from Celsius to Fahrenheit. Use a variable Celsius to store the temperature.

Exercise 5: Create a program to calculate the simple interest. Use variables principal, rate, and time to store the principal amount, interest rate, and time period, respectively.

Exercise 6: Create a program that calculates the average of three double values. Use variables num1, num2, and num3 for the values.