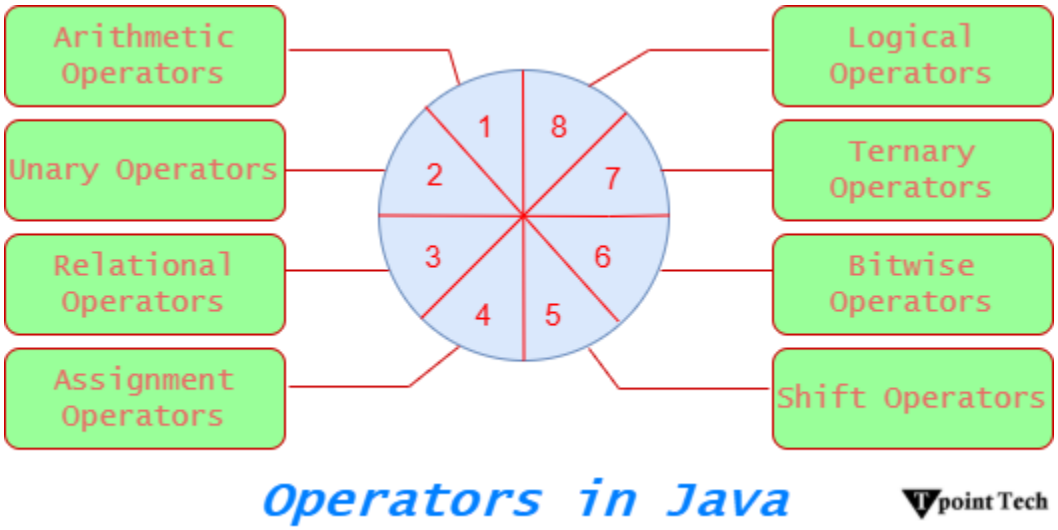
JAVA OPERATOR

Java Operators

Last Updated : 17 Mar 2025

Operators are an essential part of any programming language. In Java, operator is a symbol that is used to perform operations. For example: +, -, *, / etc. These are essential for performing different types of operations on variables and values. In this section, we will discuss different types of operators used in Java programming.



There are mainly eight types of operators in Java:

1. Unary Operator
2. Arithmetic Operator
3. Relational Operator
4. Ternary Operator
5. Assignment Operator
6. Bitwise Operator
7. Logical Operator
8. Shift Operator

Java Unary Operator

The Java unary operators require only one operand. Unary operators are used to perform various operations i.e. incrementing/decrementing a value by one, negating an expression and inverting the value of a Boolean. Observe the following table.

Operator	Name	Description
+	Unary Plus	Unary plus operator; indicates positive value (numbers are positive without this, however)
-	Unary Minus	The Unary Minus operator can be used to make a positive value negative.
!	Logical Complement Operator	The Not operator is used to convert a boolean value. In other words, it is used to reverse the logical state of an operand.

++	Increment	It is used to increase the value of an operand by one. It can be done in two possible ways. One is post-increment (operand++) and other is pre-increment (++operand). In post-increment, the value of the operand is used first, then its value is increased by one. In pre-increment, the value of the operand is incremented first by one, then the incremented value of the operand is used.
--	Decrement	It is used to decrease the value of an operand by one. It can be done in two possible ways. One is post-decrement (operand--) and other is pre-decrement (--operand). In post-decrement, the value of the operand is

		used first, then its value is decreased by one. In pre-increment, the value of the operand is decrement first by one, then the decremented value of the operand is used.

Java Unary Operator Example: ++ and --

Example

```
public class Main {
public static void main(String args[]) {
int x=+10;
System.out.println(x);       //10
System.out.println(-x);   //-10
}
}
```

Output:

```
10
-10
```

Java Unary Operator Example: Pre-increment and Post-increment

Example

```
public class Main {
public static void main(String args[]) {
int x=10;
System.out.println(x++);   //10 (11)
```

```
System.out.println(++x);   //12
}
}
```

Output:

```
10
12
```

Java Unary Operator Example: Pre-decrement and Post-decrement

Example

```
public class Main {
public static void main(String args[]) {
System.out.println(x--);    //10
System.out.println(--x);   //8
}
}
```

Output:

```
10
8
```

Java Unary Operator Example: Logical Complement Operator and Negation

Example

```
public class Main {
public static void main(String args[]) {
int a=10;
int b=-10;
boolean c=true;
boolean d=false;
System.out.println(~a);//-11 (minus of total positive value which starts from 0)
System.out.println(~b);//9 (positive of total minus, positive starts from 0)
System.out.println(!c);//false (opposite of boolean value)
System.out.println(!d);//true
}
```

```
    }
```

Output:

```
-11
9
false
true
```

To read more: Unary Operators in Java

Java Arithmetic Operators

Java arithmetic operators are used to perform addition, subtraction, multiplication, division, and modulo operation. They act as basic mathematical operations.

Operator	Name	Description
+	Addition	Adds two numbers.
-	Subtraction	Subtracts one number from another number.
*	Multiplication	Multiplies two numbers.
/	Division	Divides one number by another number.
%	Modulus	Divides and returns the remainder of two numbers.

Java Arithmetic Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a=10;
int b=5;
System.out.println(a+b);//15
System.out.println(a-b);//5
System.out.println(a*b);//50
System.out.println(a/b);//2
System.out.println(a%b);//0
}
}
```

Output:

```
15
5
50
2
0
```

Java Arithmetic Operator Example: Expression

Example

```
public class Main {
public static void main(String args[]) {
System.out.println(10*10/5+3-1*4/2);
}
}
```

Output:

```
21
```

To read more: Arithmetic Operators in Java

Java Shift Operators

Java shift operator works on the bits of the data. It shifts the bits of the number from left to right or right to left. The following table shows the types of shift operator in Java.

Operator	Operator Name	Description
<<	Left Shift Operator (Signed)	All of the bits shift to left by a given number using this operator.
>>	Right Shift Operator (Signed)	All of the bits shift to right by a given number using this operator.
>>>	Unsigned Right Shift Operator	It is similar to the right shift operator (signed). However, the vacant leftmost position is occupied with 0 in place of the signed bit

Java Left Shift Operator

The Java left shift operator << is used to shift all of the bits in a value to the left side of a specified number of times.

Java Left Shift Operator Example

Example

```
public class Main {
public static void main(String args[]) {
System.out.println(10<<2);//10*2^2=10*4=40
System.out.println(10<<3);//10*2^3=10*8=80
System.out.println(20<<2);//20*2^2=20*4=80
System.out.println(15<<4);//15*2^4=15*16=240
```

```
}
}
```

Output:

```
40
80
80
240
```

Java Right Shift Operator

The Java right shift operator >> is used to move the value of the left operand to right by the number of bits specified by the right operand.

Java Right Shift Operator Example

Example

```
public class Main {
public static void main(String args[]) {
System.out.println(10>>2);//10/2^2=10/4=2
System.out.println(20>>2);//20/2^2=20/4=5
System.out.println(20>>3);//20/2^3=20/8=2
}
}
```

Output:

```
2
5
2
```

Java Shift Operator Example: >> vs >>> (Unsigned Shift)

Example

```
public class Main {
public static void main(String args[]) {
// For positive number, >> and >>> works same
System.out.println(20>>2);
System.out.println(20>>>2);
// For negative number, >>> changes parity bit (MSB) to 0
```

```
        System.out.println(-20>>2);
        System.out.println(-20>>>2);
        }
        }
```

Output:

```
5
5
-5
1073741819
```

To read more: Shift Operators in Java

Java Relational Operators

Java relational or conditional operators are used to check relationship between two operands such as less than, less than or equal to, greater than, greater than or equal to, equal to and not equal to. It is also known as equality operator. These operators return Boolean values either true or false.

Operator	Name	Description
<	Less Than	If the value of the first operand is lesser than the value of the second operand, the Less Than operator returns true, otherwise false.
>	Greater Than	If the value of the first operand is greater than the value of the second operand, the Greater Than

		operator returns true, otherwise false.
<=	Less Than or Equal to	When the value of the first operand is lesser than or equal to the value of the second operand, the Less Than or Equal to operator returns true, otherwise false.
>=	Greater Than or Equal to	When the value of the first operand is greater than or equal to the value of the second operand, the Greater Than or Equal to operator returns true, otherwise false.
==	Equal to	Equal to operator checks whether the given operands are equal or not. If they are equal, they return true otherwise false.
!=	Not Equal to	Not Equal to operator works just opposite to Equal to operator. It returns false if the operands are equal in value, otherwise true.

Java Relational Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a=10;
int b=20;
System.out.println("(a < b) : " + (a<b));
System.out.println("(a > b) : " + (a>b));
System.out.println("(a <= b) : " + (a<=b));
System.out.println("(a >= b) : " + (a>=b));
System.out.println("(a == b) : " + (a==b));
System.out.println("(a != b) : " + (a!=b));
}
}
```

Output:

```
(a < b) : true
(a > b) : false
(a <= b) : true
(a >= b) : false
(a == b) : false
(a != b) : true
```

To read more: Relational Operators in Java

Java Bitwise Operators

Java bitwise operators are used to perform the manipulation of individual bits of a number and with any of the integer types. They are used when performing update and query operations of the Binary indexed trees.

Operator	Operator Name	Description

|	Bitwise OR	It is a binary operator which gives OR of the input values bit by bit.
&	Bitwise AND	It is a binary operator which gives AND of the input values bit by bit.
^	Bitwise XOR	It is a binary operator which gives XOR of the input values bit by bit.
~	Bitwise Complement	The Bitwise Complement operator is also a unary operator. It makes every bit 0 to 1, and 1 to 0.

Java Bitwise OR (|) Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a = 10;   // binary representation 1010
int b = 5;    // binary representation 0101
// a | b = 1010 | 0101 = 1111
// the value of 1111 in decimal representation is 15
System.out.println("The value of a | b is: " + (a | b));
}
}
```

Output:

```
The value of a | b is: 15
```

Java Bitwise AND (&) Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a = 11;  // binary representation 1011
int b = 5;    // binary representation 0101
// a & b = 1011 & 0101 = 0001
// the value of 0001 in decimal representation is 1
System.out.println("The value of a & b is: " + (a & b));
}
}
```

Output:

```
The value of a & b is: 1
```

Java Bitwise XOR (^) Operator Example

Example

```
public class Main {
public static void main(String args[]){
int a = 11;  // binary representation 1011
int b = 5;    // binary representation 0101
// a ^ b = 1011 ^ 0101 = 1110
// the value of 1110 in decimal representation is 14
System.out.println("The value of a ^ b is: " + (a ^ b));
}
}
```

Output:

```
The value of a ^ b is: 14
```

Java Bitwise Complement Operator Example

Example

```
public class Main {
public static void main(String args[]){
int a = 5;  // binary representation 0101
// ~a = 1010 which will be represented as 10 in decimal format
// The compiler will give 2's complement of this number which is -6
System.out.println("The value of ~a is: " + (~a));
```

```
    }
    }
```

Output:

```
The value of ~a is: -6
```

To read more: Bitwise Operators in Java

Java Logical Operators

Logical operators are used extensively in various programming languages to perform Logical NOT, OR and AND operations whose functionality is similar to OR gate and AND gate in the world of digital electronics.

Operator	Name	Description
&&	Conditional AND Operator	The logical && operator does not check the second condition if the first condition is false. It checks the second condition only if the first one is true.
||	Conditional OR Operator	The logical || operator does not check the second condition if the first condition is true. It checks the second condition only if the first one is false.

!	Bitwise Complement	The NOT operator is used to reverse the value of a Boolean expression.

Java Logical AND (&&) Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a = 10;
int b = 5;
int c = 20;
// (a < b) evaluates to false. Therefore, (a < c) condition will not executed.
// Hence, the value of a will remain 10
if((a < b) && (++a < c))
System.out.println("if block is executed.");
else
System.out.println("else block is executed.");
System.out.println("The value of a is: " + a);
}
}
```

Output:

```
else block is executed.
The value of a is: 10
```

Java Logical OR (||) Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a = 10;
int b = 5;
int c = 20;
// the first condition (a > b) evaluates to true. Therefore, (a++ < c) will not be executed.
// Hence, the value of a will remain 10.
System.out.println(a > b || a++ < c);
```

```
System.out.println("The value of a is: " + a);
// the first condition (a < b) evaluates to false. Therefore, (a++ < c) will be executed.
// Hence, the value of a will be 11.
System.out.println(a < b || a++ < c);
System.out.println("The value of a is: " + a);
}
}
```

Output:

```
true
The value of a is: 10
true
The value of a is: 11
```

Java Logical NOT or Bitwise Complement (!)Operator Example

Example

```
public class Main {
public static void main(String args[]) {
int a = 10;
int b = 5;
// the condition (a > b) evaluates to true. After applying NOT operator, the true value
// changes to false.
System.out.println(!(a > b));
// the condition (a < b) evaluates to false. After applying NOT operator, the false value
// changes to true.
System.out.println(!(a < b));
}
}
```

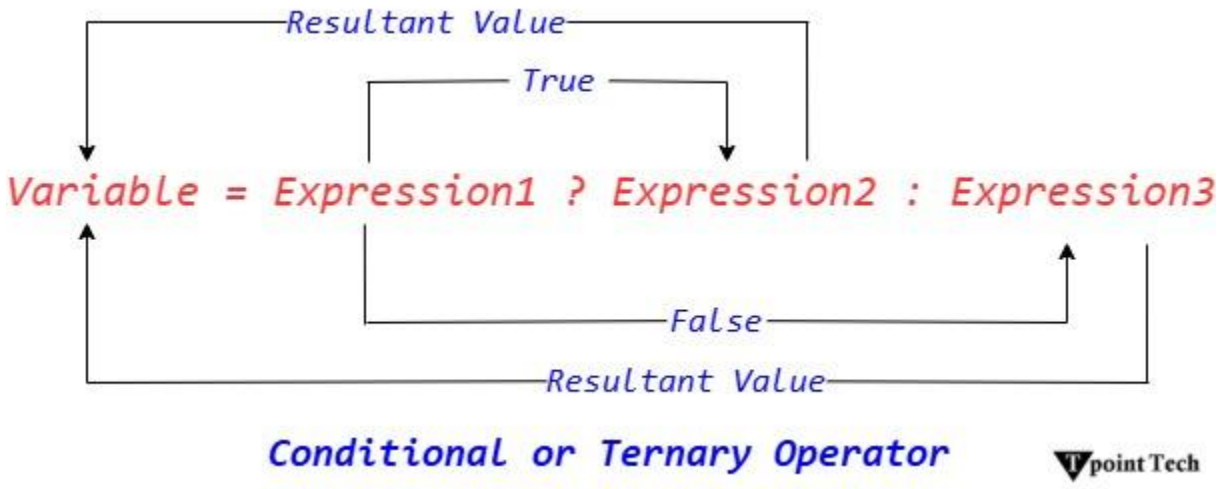
Output:

```
false
true
```

To read more: Logical Operators in Java

Java Ternary Operator

Java Ternary operator is used as one line replacement for if-then-else statement and used a lot in Java programming. It is the only conditional operator which takes three operands.



Java Ternary Operator Example

The following example checks the maximum between two numbers.

Example

```
public class Main {
public static void main(String args[]){
int a=2;
int b=5;
int min=(a<b)?a:b;
System.out.println(min);
}}
```

Output:

```
2
```

Let's see another example.

The following example illustrates to find the maximum between three numbers using ternary operator. Note that it uses the nesting of ternary operators.

Example

```
public class Main {
public static void main(String args[]) {
int a = 10;
int b = 15;
int c = 13;
int max = (a > b) ?  (a > c ? a : c) : (b > c ? b : c);
System.out.println("The maximum between the three numbers " + a + ", " + b + ", "
+ c + " " + "is: " + max );
}
}
```

Output:

```
The maximum between the three numbers 10, 15, 13 is: 15
```

Note: Though writing code using ternary operator takes less amount of code as compared to if-else statements, it is not always a good way to write code using ternary operator. Usually in complex logic or conditions, if-else statements take precedence over the ternary operator. Using ternary operator in complex logic makes the code difficult to understand.

To read more: Ternary Operators in Java

Java Assignment Operator

Java assignment operator is one of the most common operators. It is used to assign the value on its right to the operand on its left. The left operand has to be a variable and right operand contains value. Note that the data type of both the operands has to be of the same type. If not, an error will be raised by the compiler. The associativity of the assignment operators is form right to left, which means values on the right side of the operator is assigned to the left side.

Types of Assignment Operator

There are two types of assignment operators. They are:

- Simple Assignment operator: The simple assignment operator where only (=) is used.
- Compound Assignment operator: The compound assignment operator is used where -,+,/,* are used along with (=) operator.

The following table illustrates the working of the different assignment operators.

Types	Operator	Description
Single Assignment Operator	=	It is the simplest assignment operator that assigns the value of the right side to the variable of the left side.
Compound Assignment Operator	+=	It is a compound assignment operator which consists of + and =. It first adds the current value of the variable present on the left side to the value on the right side and then assign the result to the variable on the left side.
	*=	It is a compound assignment operator which consists of * and =. It first multiplies the current value of the variable present on the left side to the value on the right side and then assign the result to the variable on the left side.

	/=	It is a compound assignment operator which consists of / and =. It first divides the current value of the variable present on the left side to the value on the right side and then assign the quotient to the variable on the left side.
	%=	It is a compound assignment operator which consists of % and =. It first divides the current value of the variable present on the left side to the value on the right side and then assign the remainder to the variable on the left side.

Java Assignment Operator Example

Example

```
public class Main {
public static void main(String[] args) {
int a=10;
a+=3;//10+3
System.out.println(a);
a-=4;//13-4
System.out.println(a);
a*=2;//9*2
System.out.println(a);
a/=2;//18/2
System.out.println(a);
a %= 3; // 9 % 3 = 0
System.out.println(a);
}}
```

Output:

```
13
9
18
9
0
```

Note: In Java, the compound assignment operator performs implicit typecasting. The following program illustrates the same.

Java Assignment Operator Example: Adding Short

In this example, we have used the compound operator +=. Similarly, we can do for the other compound operators.

Example

```
public class Main {
public static void main(String args[]){
short a=10;
short b=10;
//a+=b;//a=a+b internally so fine. It is because implicit typecasting has occurred.
a=a+b; // Compile time error because 10+10=20 now int, and int can't be assigned to a shot without typecast
System.out.println(a);
}}
```

Output:

```
Compile time error
```

After Type Cast:

Example

```
public class Main {
public static void main(String args[]){
short a=10;
short b=10;
a=(short)(a+b);//20 which is int now converted to short
System.out.println(a);
}}
```

Output:

```
20
```

To read more: Assignment Operators in Java

Java Operator Precedence

Operator Type	Precedence
Unary	expr++ expr--
prefix	++expr --expr +expr -expr ~ !
Arithmetic	* / %
additive	+ -
Shift	<< >> >>>
Relational	< > <= >= instanceof
equality	== !=
Bitwise AND	&
Bitwise exclusive OR	^
Bitwise inclusive OR	I

Logical AND	&&
Logical OR	||
Ternary	? :
Assignment	= += -= *= /= %= &= ^= |= <<= >>= >>>=

Conclusion

Operators are a fundamental part of Java programming, enabling developers to perform various tasks ranging from simple arithmetic to complex bitwise operations. Understanding the different types of operators and their precedence is crucial for writing efficient and effective Java code. The section provides a comprehensive overview and practical examples to help you get started with using operators in Java