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**Operators in C**

Operators are the foundation of any programming language. Thus the functionality of C language is incomplete without the use of operators. Operators allow us to perform different kinds of operations on operands.



An operator is a symbol that tells the compiler to perform specific mathematical or logical functions. C language is rich in built-in operators and provides the following types of operators

* Arithmetic Operators
* Relational Operators
* Logical Operators
* Bitwise Operators
* Assignment Operators
* Conditional Operators
* Special Operators

**Arithmetic Operators**

The following table shows all the arithmetic operators supported by the C language. Assume variable **A** holds 10 and variable **B** holds 20 then −

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| + | Adds two operands. | A + B = 30 |
| − | Subtracts second operand from the first. | A − B = -10 |
| \* | Multiplies both operands. | A \* B = 200 |
| / | Divides numerator by de-numerator. | B / A = 2 |
| % | Modulus Operator and remainder of after an integer division. | B % A = 0 |
| ++ | Increment operator increases the integer value by one. | A++ = 11 |
| -- | Decrement operator decreases the integer value by one. | A-- = 9 |

**Relational Operators**

The following table shows all the relational operators supported by C. Assume variable **A** holds 10 and variable **B** holds 20 then −

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| == | Checks if the values of two operands are equal or not. If yes, then the condition becomes true. | (A == B) is not true. |
| != | Checks if the values of two operands are equal or not. If the values are not equal, then the condition becomes true. | (A != B) is true. |
| > | Checks if the value of left operand is greater than the value of right operand. If yes, then the condition becomes true. | (A > B) is not true. |
| < | Checks if the value of left operand is less than the value of right operand. If yes, then the condition becomes true. | (A < B) is true. |
| >= | Checks if the value of left operand is greater than or equal to the value of right operand. If yes, then the condition becomes true. | (A >= B) is not true. |
| <= | Checks if the value of left operand is less than or equal to the value of right operand. If yes, then the condition becomes true. | (A <= B) is true. |

**Logical Operators**

Following table shows all the logical operators supported by C language. Assume variable **A** holds 1 and variable **B** holds 0, then −

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| && | Called Logical AND operator. If both the operands are non-zero, then the condition becomes true. | (A && B) is false. |
| || | Called Logical OR Operator. If any of the two operands is non-zero, then the condition becomes true. | (A || B) is true. |
| ! | Called Logical NOT Operator. It is used to reverse the logical state of its operand. If a condition is true, then Logical NOT operator will make it false. | !(A && B) is true. |

**Bitwise Operators**

Bitwise operator works on bits and perform bit-by-bit operation. The truth tables for &, |, and ^ is as follows −

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **p & q** | **p | q** | **p ^ q** |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 |

Assume A = 60 and B = 13 in binary format, they will be as follows −

A = 0011 1100

B = 0000 1101

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A&B = 0000 1100

A|B = 0011 1101

A^B = 0011 0001

~A = 1100 0011

The following table lists the bitwise operators supported by C. Assume variable 'A' holds 60 and variable 'B' holds 13, then –

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| & | Binary AND Operator copies a bit to the result if it exists in both operands. | (A & B) = 12, i.e., 0000 1100 |
| | | Binary OR Operator copies a bit if it exists in either operand. | (A | B) = 61, i.e., 0011 1101 |
| ^ | Binary XOR Operator copies the bit if it is set in one operand but not both. | (A ^ B) = 49, i.e., 0011 0001 |
| ~ | Binary One's Complement Operator is unary and has the effect of 'flipping' bits. | (~A ) = ~(60), i.e,. -0111101 |
| << | Binary Left Shift Operator. The left operands value is moved left by the number of bits specified by the right operand. | A << 2 = 240 i.e., 1111 0000 |
| >> | Binary Right Shift Operator. The left operands value is moved right by the number of bits specified by the right operand. | A >> 2 = 15 i.e., 0000 1111 |

**Assignment Operators**

The following table lists the assignment operators supported by the C language −

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| = | Simple assignment operator. Assigns values from right side operands to left side operand | C = A + B will assign the value of A + B to C |
| += | Add AND assignment operator. It adds the right operand to the left operand and assign the result to the left operand. | C += A is equivalent to C = C + A |
| -= | Subtract AND assignment operator. It subtracts the right operand from the left operand and assigns the result to the left operand. | C -= A is equivalent to C = C - A |
| \*= | Multiply AND assignment operator. It multiplies the right operand with the left operand and assigns the result to the left operand. | C \*= A is equivalent to C = C \* A |
| /= | Divide AND assignment operator. It divides the left operand with the right operand and assigns the result to the left operand. | C /= A is equivalent to C = C / A |
| %= | Modulus AND assignment operator. It takes modulus using two operands and assigns the result to the left operand. | C %= A is equivalent to C = C % A |
| <<= | Left shift AND assignment operator. | C <<= 2 is same as C = C << 2 |
| >>= | Right shift AND assignment operator. | C >>= 2 is same as C = C >> 2 |
| &= | Bitwise AND assignment operator. | C &= 2 is same as C = C & 2 |
| ^= | Bitwise exclusive OR and assignment operator. | C ^= 2 is same as C = C ^ 2 |
| |= | Bitwise inclusive OR and assignment operator. | C |= 2 is same as C = C | 2 |

### Conditional operator

The conditional operators in C language are known by two more names

1. **Ternary Operator**
2. **? : Operator**

It is actually the if condition that we use in C language decision making, but using conditional operator, we turn the if condition statement into a short and simple operator.

The syntax of a conditional operator is :

expression 1 ? expression 2: expression 3

**Explanation:**

* The question mark **"?"** in the syntax represents the **if** part.
* The first expression (expression 1) generally returns either true or false, based on which it is decided whether (expression 2) will be executed or (expression 3)
* If (expression 1) returns true then the expression on the left side of **" : "** i.e (expression 2) is executed.
* If (expression 1) returns false then the expression on the right side of **" : "** i.e (expression 3) is executed

### Special operator

|  |  |  |
| --- | --- | --- |
| **Operator** | **Description** | **Example** |
| sizeof | Returns the size of an variable | **sizeof(x)** return size of the variable **x** |
| & | Returns the address of an variable | **&x ;** return address of the variable **x** |
| \* | Pointer to a variable | **\*x ;** will be pointer to a variable **x** |