



# C PROGRAMING

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# Operators Precedence and Associativity

OPERATOR	TYPE	ASSOCIIVITY
() [] . ->		left-to-right
++ -- +- ! ~ (type) * & sizeof	Unary Operator	right-to-left
* / %	Arithmetic Operator	left-to-right
+ -	Arithmetic Operator	left-to-right
<< >>	Shift Operator	left-to-right
< <= > >=	Relational Operator	left-to-right
== !=	Relational Operator	left-to-right
&	Bitwise AND Operator	left-to-right
^	Bitwise EX-OR Operator	left-to-right
	Bitwise OR Operator	left-to-right
&&	Logical AND Operator	left-to-right
	Logical OR Operator	left-to-right
? :	Ternary Conditional Operator	right-to-left
= += -= *= /= %= &= ^=  = <=> >>=	Assignment Operator	right-to-left
,	Comma	left-to-right



# Short-hand operators

- Short-hand operators will change value in variable.
- `+=`, `-=`, ...
  - `num+=2;`
  - `num=+2;`
  - `num-=2;`
  - `num=-2;`
- Pre-increment/decrement
  - `x = ++a;`
  - `y = --b;`
- Post-increment/decrement
  - `x = a++;`
  - `y = b--;`



# Comma, Relational and logical operators

- Comma operator
  - evaluate to right-most value.
  - have lowest precedence.
- Relational and logical operators result in 0 or 1.
  - 0 – indicate false condition
  - 1 – indicate true condition
- Relational operators
  - <, >, <=, >=, ==, !=
- Logical operators
  - &&, ||, !



# Logical operators

- Logical operators
  - &&, ||, !

P	Q	P && Q	P    Q	!P
T	T	T	T	F
T	F	F	T	F
F	T	F	T	T
F	F	F	F	T

- Logical operators operate according to the truth table given above
- Logical AND and Logical OR operator guarantee left to right evaluation
- Logical NOT OperatorIt is used to reverse the logical state of its operand. If a condition is true, then Logical NOT operator will make it false.



# Bit-wise operators

The C language provides six operators for bit manipulation they operate on the individual bits of the operands . The Bitwise operators available in C are

- Bitwise AND &

A	B	A&B
0	0	0
0	1	0
1	0	0
1	1	1

Bitwise AND operators on the individual bits of the operand according to the truth table shown above

Example : -      10 & 5

0000 1010   -> Binary of 10

0000 0101   -> Binary of 5

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0000 0000 → O/P is 0

|



- Bitwise OR

x	y	x   y
1	1	1
1	0	1
0	1	1
0	0	0

Bitwise OR operators on the individual bits of the operand according to the truth table shown above

Example : -     10 | 5

0000 1010 -> Binary of 10

0000 0101 -> Binary of 5

-----

0000 1111 → O/P is 15



- Bitwise XOR ^

Input		Output
A	B	A xor B
0	0	0
0	1	1
1	0	1
1	1	0

Bitwise XOR operators on the individual bits of the operand according to the truth table shown above

Example : -       $10 \wedge 5$

0000 1010 -> Binary of 10

0000 0101 -> Binary of 5

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
0000 1111 → O/P is 15





- Bitwise NOT ~

Bitwise NOT operator results in one's compliment of its operand

NOT 	
INPUT	OUTPUT
0	1
1	0



- Left shift << and Right shift >>
  - The bitshift operators take two arguments, and looks like:
    - $x \ll n$  : shifts the value of x left by n bits
    - $x \gg n$  : shifts the value of x right by n bits
- Left shift operator : -  $\text{num} \ll n = \text{num} * 2^{\text{raise to } n}$ 
  - $5 \ll 2 = 5 * 2^{\text{to the power } 2}$   
 $5 * 4 = 20$
- Right Shift operator :-  $\text{num} \gg n = \text{num} / 2^{\text{raise to } n}$ 
  - $9 \gg 1 = 9 / 2^{\text{to the power } n}$   
 $= 4$



# Twisters

- If precedence of two operators in an expression is same, their associativity is considered to decide their binding with operands.
- Data type conversions and ranges should be considered while doing arithmetic operations.
- `sizeof()` is compile time operator. Expressions within `sizeof` are not executed at runtime.
- Relational and logical operators always result in 0 or 1.
- In logical AND, if first condition is false, second condition is not evaluated. Result is false.
- In logical OR, if first condition is true, second condition is not evaluated. Result is true.
- Increment/Decrement operators in arithmetic expressions are compiler dependent.





Thank you!

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