Operators in C

$=$ 😑   if(a $==$ b)

$==$ a $=$ b

1) Arithmetic $(-, ++, --, *, /, \%, +, -)$

2) Relational $[<, <=, >, >=, ==, !=]$

3) Logical $[!, \&\&, ||]$

4) Bitwise $[\&, |, \wedge, \sim, <<, >>]$

5) Assignment $[=, +=, -=, *=, /=, \%=, <<=, >>=$
$\&=, \wedge=, !=]$

6) Misc $[sizeof(), \&, *, ?:]$

Properties of the operators

1) Arity of operators $\rightarrow$ $++$ 1 operand

                              $+$ 2 operand

2) Precedence

     $1 > 2 + 3 \&\& 4$ $1 > 5 \&\& 4$

     ②   ①   ③ $0 \&\& 4 = 0$

       $((1 > (2+3)) \&\& 4)$

3) Associativity
→ left
→ right

$3+2 \rightarrow 5 \checkmark$

eg: $7 - 4 + 2$

$\nearrow$

$(7-4)+2$

$\downarrow$

$7 - 6$ ... 1

2^2

2^2

2^2

$2 \wedge 3 \wedge 2 \rightarrow 2^{\wedge 9}$

$\downarrow$

2^{3^2}

8^{n^2}

2^{3^2}

$2^{3^2} \quad 2^9$

2

logical OP   Bitwise OP

&&   ~
|| &
                      |
                      ^
                      <<
                      >>

| 0 | 0 | . | . |

1) NOT (~)

$5 - 0000\ 0101$ 128 64 32 16 8 4 2 1

$\sim 5 - \boxed{1111\ 1010}$ $\boxed{250}$

2) AND (&)

$5 \& 4$ $0000\ 0101$ | 0 | 0 | 0 |
                 $0000\ 0100$ | 0 | 1 | 0 |
                 ───────── | 1 | 0 | 0 |
                 $0000\ 0100$ | 1 | 1 | 1 |
                 ─────────
                      4

3) OR $0000\ 0101$ | 0 | 0 | 0 |
$5 | 4$ $0000\ 0100$ | 1 | 0 | 1 |
              ───────── | 0 | 1 | 1 |
               $0000\ 0101$ | 1 | 1 | 1 |
              ─────────
                   5

4) XOR   ^

XOR
i/p		o/p
0	0	0
0	1	1
1	0	1
1	1	0

5 ^ 4

```
0000 0101
0000 0100
0000 0001    (1)
```

5) <<   5 << 2 ⇒ left shift by 2 bits

5 → 0000 0101
0001 0100

6) >>   5 >> 2

Unsigned ⇒   0000 0101 ⇒
              0000 0001

Signed ⇒   MSB ⇒⇒ >> 2
            (11100100)   00100001
                         (11110100)

Some important Concepts

AND	OR	XOR
$0 \& x = 0$	$0 \mid x = x$	$0 \wedge x = x$
$-1 \& x = x$	$-1 \mid x = -1$	$-1 \wedge x = \bar{x}$
$x \& x = x$	$x \mid x = x$	$x \wedge x = 0$
$\bar{x} \& x = 0$	$\bar{x} \mid x = 1$	$\bar{x} \wedge x = -1$

Swapping → one extra variable → overflow
x, y

temp $= x$	$x = x + y$	$x = x \times y$
$x = y$	$y = x + y$	$y = x / y$
$y = $ temp	$x = x - y$	$x = x / y$

$$x = x \wedge y$$
$$y = x \wedge y$$
$$x = x \wedge y$$

→ Swap

$$x = 5$$
$$y = 10$$