Cheatography

# Bit Hacks Cheat Sheet

by JSondhof via cheatography.com/30576/cs/9135/

## C/C++ bitwise operations

| | |
|---|---|
| & | AND |
| \| | OR |
| ^ | XOR |
| ~ | NOT |
| << | SHIFT (left) |
| >> | SHIFT (right) |

## Useful snippets

Counting (c) bits set in x

```
for (c = 0; x; c++) { x &= vx- 1; }
```

Computing parity in parallel (32 Bit)

```
x ^= x >> 16; x ^= x >> 8; x ^= x >> 4; x &= 0xf; return (0x6996 >> x) & 1;
```

## Integer arithmetics

| | |
|---|---|
| `x = y << n` | Multiply by n times 2 |
| `x = y >> n` | Divide by n times 2 |
| `return (x & 1) == 0` | Is x even? |
| `return (x && !(x & (x - 1)))` | Is x power of 2? |
| `return (x ^ y) < 0` | Has x opposite sign than y? |
| `y ^ ((x ^ y) & -(x < y))` | min(x,y) |
| `x ^ ((x ^ y) & -(x < y))` | max(x,y) |

## Single bit operations

| | |
|---|---|
| `y = x \| (1<<n)` | Set the $n^{th}$ bit |
| `y = x & ~(1<<n)` | Unset the $n^{th}$ bit |
| `y = x ^ (1<<n)` | Toggle the $n^{th}$ bit |
| `return x & (1<<n)` | Test if the $n^{th}$ bit is set |
| `y = x & (x-1)` | Turn off rightmost 1bit |
| `y = x & (-x)` | Isolate rightmost 1bit |
| `y = x \| (x-1)` | Right propagate rightmost 1bit (fill in ones) |
| `y = x \| (x+1)` | Turn on rightmost 0bit |
| `y = ~x & (x+1)` | Isolate rightmost 0bit |

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