

Bit Hacks Cheat Sheet

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

C/C++ bitwise operationsSingle bit operations& AND $y = x \mid (1 < n)$ Set the n^{th} bit OR $y = x \land (1 < n)$ Toggle the n^{th} bit^ NOT $y = x \land (1 < n)$ Toggle the n^{th} bit<SHIFT (left) $y = x \land (1 < n)$ Toggle the n^{th} bit>> SHIFT (right) $y = x \land (1 < n)$ Toggle the n^{th} bitUseful snippetsCounting (c) bits set in x $y = x \land (-x)$ Isolate rightmost 1bit (fill in ones)Computing parity in parallel (32 Bit) $y = x \land (x-1)$ Right propagate rightmost 1bit (fill in ones) $x = y < x \land (x \land x) \Rightarrow (x \land x \land x) $		_			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	C/C++ bitwise operations		Single bit of	perations	
A XOR NOT SHIFT (left) SHIFT (right) Useful snippets Counting (c) bits set in X	& AND		y = x	(1< <n)< td=""><td>Set the nth bit</td></n)<>	Set the n th bit
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	OR		y = x &	~(1< <n)< td=""><td>Unset the nth bit</td></n)<>	Unset the n th bit
$ \begin{array}{c} << \text{SHIFT (left)} \\ >> \text{SHIFT (right)} \\ \\ >> \text{SHIFT (right)} \\ \\ \hline \\ \text{Useful snippets} \\ \hline \\ \text{Counting (c) bits set in x} \\ \hline \\ \text{for } (c=0; x; c++) \ \{ \ x \ \&= vx-1; \\ \text{for } (c=0; x; c++) \ \{ \ x \ \&= vx-1; \\ \text{for } (x=0; x; c++) \ \{ \ x \ \&= vx-1; \\ for $	^ XOR		y = x ^	(1< <n)< td=""><td>Toggle the nth bit</td></n)<>	Toggle the n th bit
				& (1< <n< td=""><td></td></n<>	
Counting (c) bits set in x $ for (c = 0; x; c++) \{ x &= vx- 1; y = x \mid (x-1) \} $ Right propagate rightmost 1bit (fill in ones) $ x ^= x >> 16; x ^= x >> 8; x ^= x >> 4; x &= 0xf; return (0x6996 >> x) $ Integer arithmetics $ x = y << n \} $ Multiply by n times 2 $ x = y >> n \} $ Divide by n times 2 $ x = y >> n \} $ Divide by n times 2 $ x = y >> n \} $ Divide by n times 2 $ x = y >> n \} $ Feturn $(x & 1) == 0$ $ x = y >> n \} $ Divide by n times 2 $ x = y >> n \} $ Feturn $(x & 2 \mid (x \mid x \mid (x \mid x \mid x \mid x \mid x \mid x \mid x \mid$	>> SHIFT (right)		у = х &	(x-1)	
for (c = 0; x; c++) { $x \&= vx- 1$; $y = x \mid (x-1)$ Right propagate rightmost 1bit (fill in ones) $x \triangleq x >> 16$; $x \triangleq x >> 8$; $x \triangleq x >> 4$; $x \&= 0xf$; return $(0x6996 >> x)$ Turn on rightmost 0bit $y = x \mid (x+1)$ Isolate rightmost 0bit $y = x \mid (x+1$	**		у = х &	(-x)	Ü
Integer arithmetics $x = y << n$ Multiply by n times 2 $x = y >> n$ Divide by n times 2 return $(x \& 1) == 0$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ $x = y >> n$ $x = y >> n$ Divide by n times 2 $x = y >> n$ Divide by n times 2 $x = y >> n$ $y = x (x+1)$ Itrn on rightmost Obit y and the point of times 2 $y = x $	for (c = 0; x; c++) { x &= x Computing parity in parallel (32 Bit)				rightmost 1bit (fill in ones)
<pre>multiply by n times 2 x = y >> n Divide by n times 2 return (x & 1) == 0</pre>	1		y = x	(x+1)	Turn on
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)		by n	y = ~x 8	(x+1)	Ü
<pre>even? return (x && ! (x & (x - 1)))</pre>	x = y >> n	by n			
power of 2? return (x ^ y) < 0	return (x & 1) == 0				
opposite sign than y? $y ^ ((x ^ y) & & -(x < y)) \\ min(x,y)$	return (x && !(x & (x - 1)))	power o	f		
	return (x ^ y) < 0	opposite sign	9		
$x ^ ((x ^ y) & -(x < y)) $ $\max(x,y)$	y ^ ((x ^ y) & -(x < y))	min(x,y)			
	x ^ ((x ^ y) & -(x < y))	max(x,y)		



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