

Day 6 - Bitwise Operators

28 June 2022 08:23



EQ

//

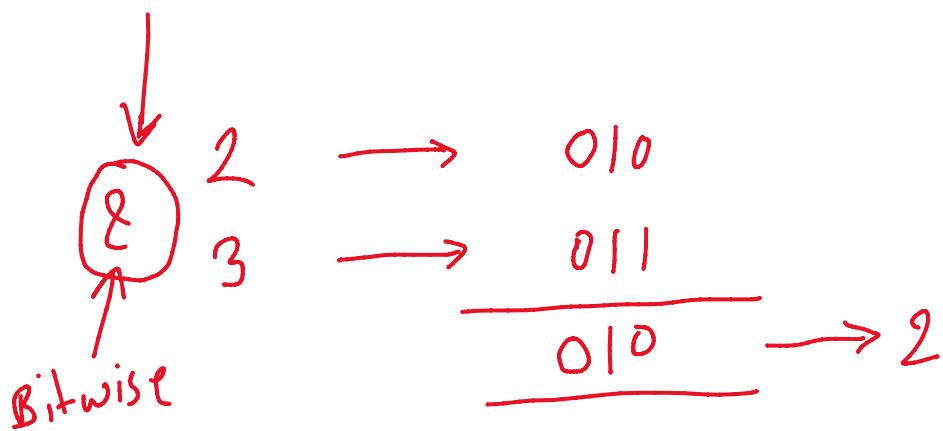
&

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^

~

1	1	=	1
1	0	=	0
0	1	=	0
0	0	=	0



$$\text{num} = \textcircled{10110} \Rightarrow 22$$

0

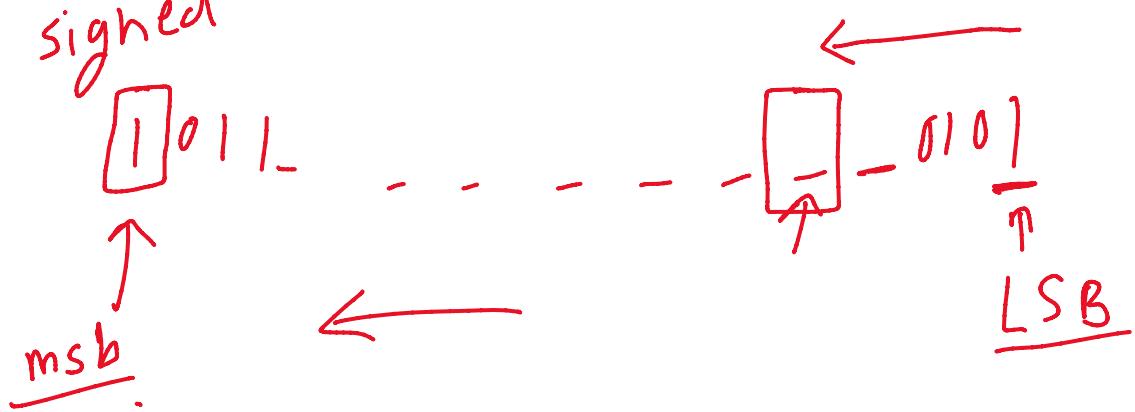
$$\text{mask} = \textcircled{01111}$$

$$\underline{00110} = 6$$

ℓ = ① Bit Disable
② Read a bit

32 int

signed

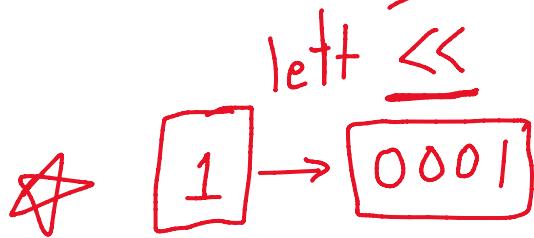


1298

7th bit

14
3 2 1
~~2~~

shift Operators



Right

num \ll ith

$$\boxed{000\ 1} \ll 2$$

$$\boxed{010\ 0}$$

$$5 \rightarrow \begin{array}{c} \downarrow \\ 00101 \\ \cancel{0}\cancel{1}010 \\ \hline 10100 \end{array} \ll 1$$

① = $0000\ 1$

* $1 \ll 6^{th}$

0000000001000000
32 bits

num = ~~10~~ → 1

min bits req

num = 5 ← 101
3

1 → 1

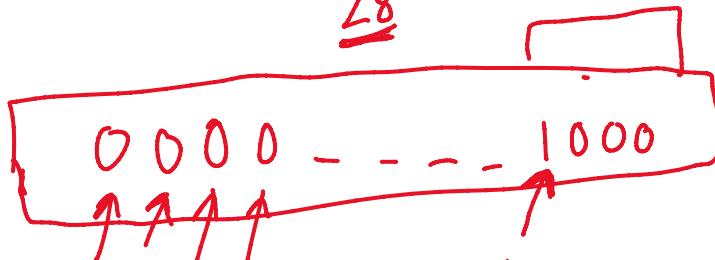
8 → 4
1000

32 bit
input → 8, 10, 3, 2, 2567923
store in ? bits

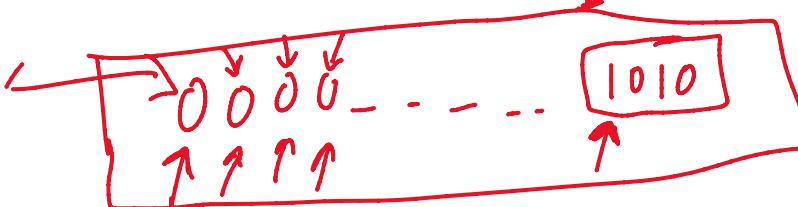
4, 4, 2, 2, 15
n = -1, 16

32

$$\begin{array}{r} \overset{1}{\cancel{1}} \quad \overset{1}{\cancel{1}} \quad \overset{1}{\cancel{1}} \quad \overset{1}{\cancel{1}} \\ \underline{32 - 28 = 4} \\ \overset{1}{\cancel{2}} \end{array}$$



$$32 - 28 = 4$$



$$1 \rightarrow \underline{1000000 - \dots 0}$$

$$2 \rightarrow \checkmark \quad \underline{010000 - \dots \dots 0}$$

$$3 \rightarrow \quad \underline{001 - \dots \dots \dots 0}$$

L $\xrightarrow{\hspace{1cm}}$ R

$$\underline{0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0}$$

$$\begin{matrix} 2^3 \\ 2^2 \\ 2^1 \end{matrix} = 8$$

$$\begin{matrix} 2^3 \\ 2^2 \\ 2^1 \end{matrix} + 1 = 9$$

$$1 \ll 31$$

$$\underbrace{0 \ 0 \ 0 \ 1}_{31}$$

31

5 ←

$$1 \rightarrow \begin{array}{c} 00101 \\ 10000 \\ \dots \dots \end{array}$$

$$\begin{array}{r}
 1 \rightarrow 10000 \\
 2 \rightarrow 01000 \\
 3 \rightarrow 00100 \\
 \hline
 \underline{\underline{2}}
 \end{array}$$

1
 =
 =

255

in → 11111111

out → 11101111

E

mask = 11101111

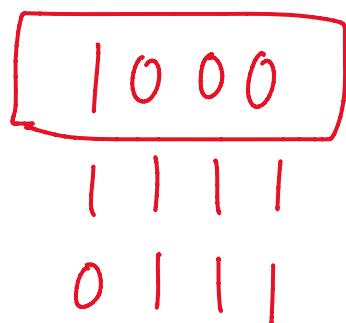
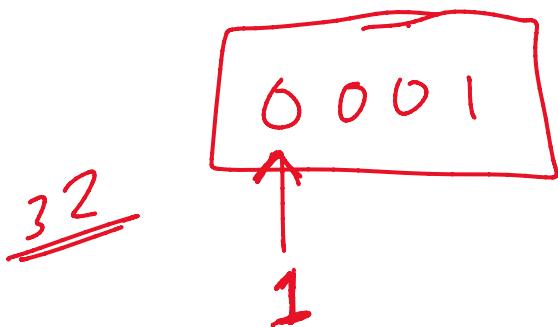
00010000 ↘ 1<<4

≈ (11101111)

$$\begin{array}{r} 10 \\ \hline 1010 \\ = 2 \end{array}$$

$$\begin{array}{r} 5 \\ \hline 0101 \\ - 2 \end{array}$$

$$\begin{array}{r} 255 \\ \hline = 7 \end{array}$$



8

|

$$\begin{array}{r} \checkmark 10 = 1 \\ \checkmark 01 = 1 \\ \checkmark 11 = 1 \\ \hline 00 = 0 \end{array}$$

$$10 \rightarrow \begin{array}{c} 0 \\ + \end{array} 1010$$

$$\underline{\underline{2's}} \rightarrow \begin{array}{c} 1 \\ - \end{array} 1010$$

$$\begin{array}{r} 0101 \\ + 1 \\ \hline \end{array}$$

✓

$$\begin{array}{r}
 1 \\
 2's \\
 \end{array}
 \quad
 \begin{array}{r}
 +1 \\
 \hline
 0110 \\
 \hline
 = -6
 \end{array}$$

$$\begin{array}{r}
 + 0001 \\
 \textcircled{1} 001 \\
 1's \quad \quad \quad |10 \\
 2's \quad \quad \quad +1 \\
 \hline
 -111 \\
 \textcircled{-7} \checkmark
 \end{array}$$

$$\begin{array}{r}
 \textcircled{11111} \checkmark \\
 00000 \\
 +1 \\
 \hline
 00001 \\
 \boxed{-1}
 \end{array}$$

1's
 2's

1

$$\cancel{2's} \quad \boxed{-1 + 1 = 0}$$

$$\begin{array}{r} \cancel{1} \cancel{1} \cancel{1} \cancel{1} \cancel{1} \\ + \quad \quad \quad \cancel{0} \cancel{0} \cancel{0} \cancel{0} \cancel{1} \\ \hline 0 \quad 0 \quad 0 \quad 0 \quad 0 \end{array}$$

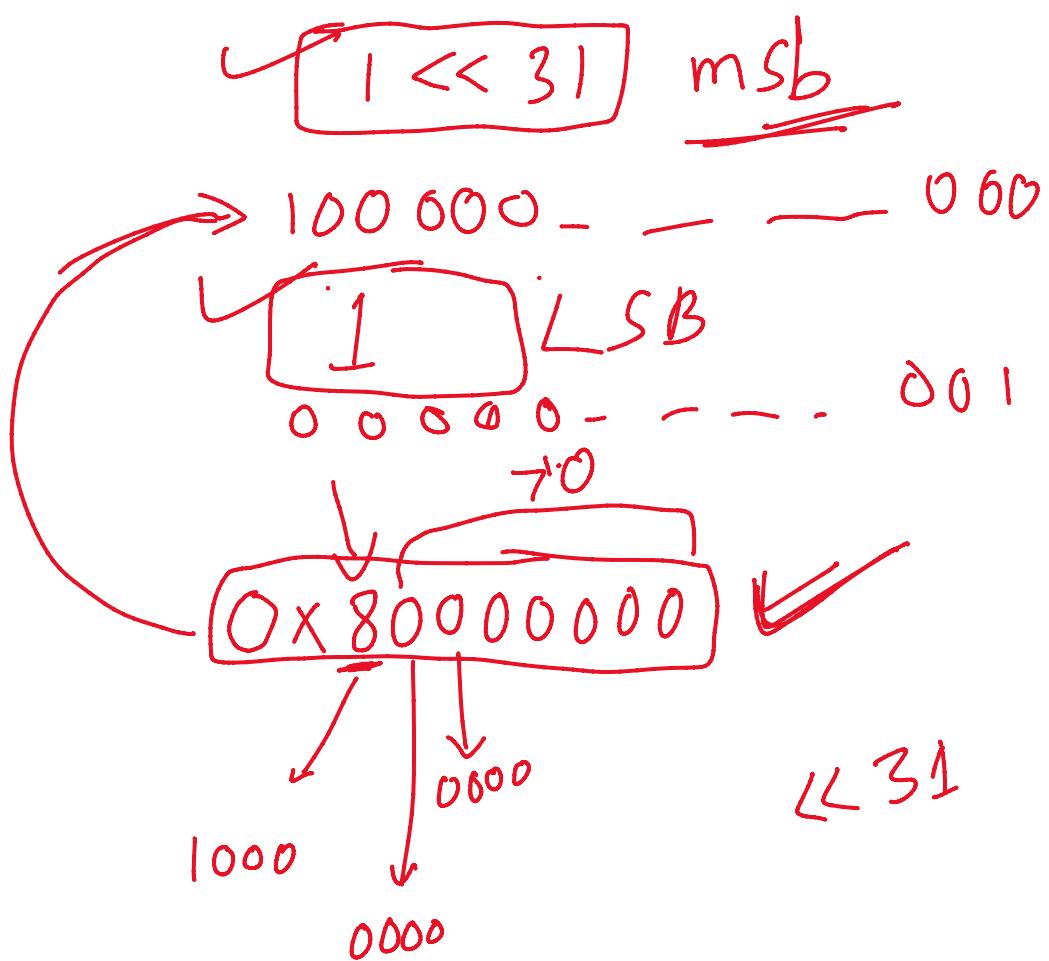
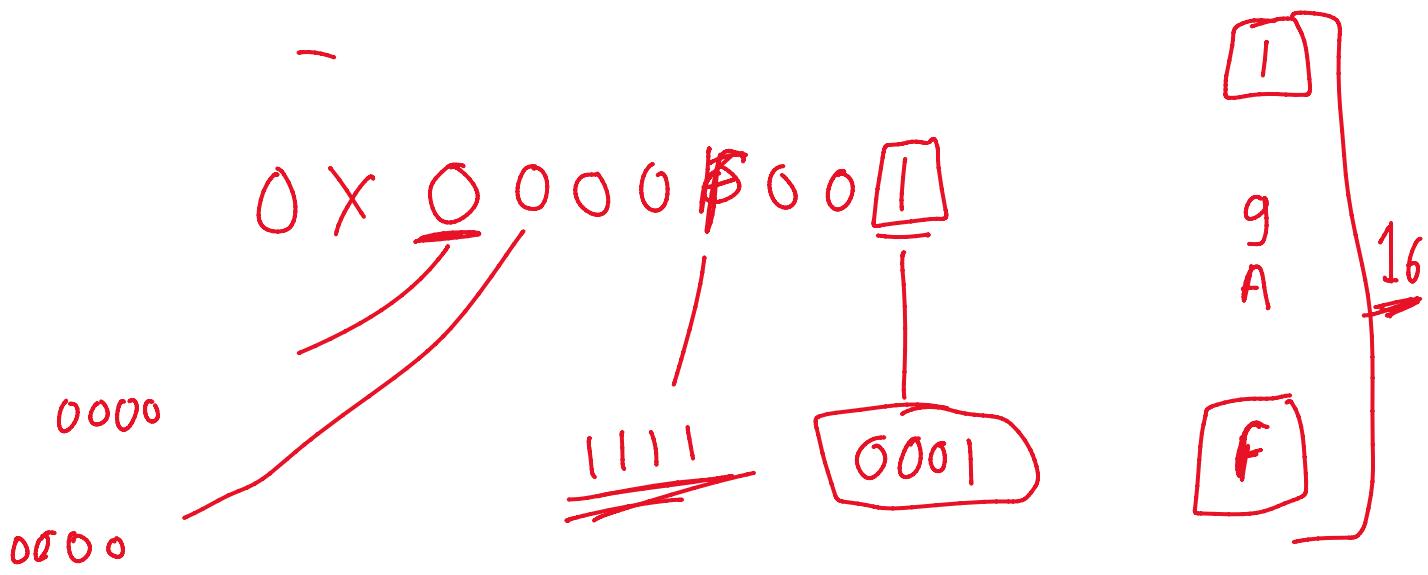
$1 \downarrow$
 $-1 \rightarrow 0 \rightarrow 1$

~~$\infty \infty \infty 0$~~
 $0 - + \infty - \infty - \dots - 1$

$\leftarrow -ve$
 \rightarrow
Int_min $\dots -1, 0, +1 \dots - Int_{max}$

$0x$

$0 \dots \dots \dots$



~~1000 0 - --- 0000~~

MSB

$i = .0 \rightarrow 32$

~~32 bit~~ ~~0x80000000 >> i~~ 32

$i \rightarrow \rightarrow \rightarrow$

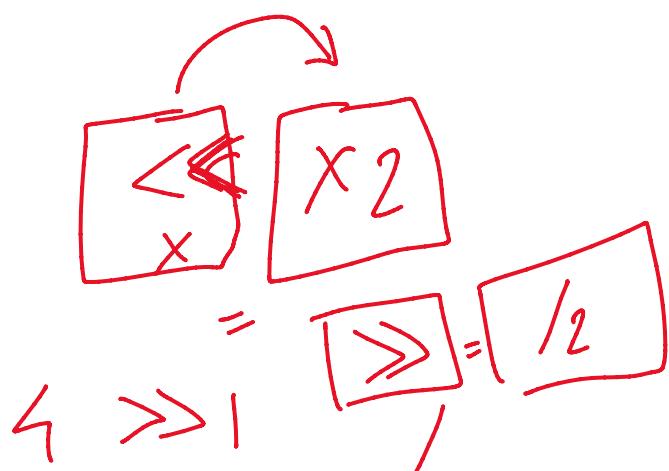
16 bit $\underline{0x8000} = 16$

~~001
010
100~~

$i \ll 1$

$2 \ll 1$

✓ $4 \ll$



$4 \gg 1$ /
2

$2^0, 2^1, 2^2, 2^3$
1 2 4 8 , 16, 32, 64 ---

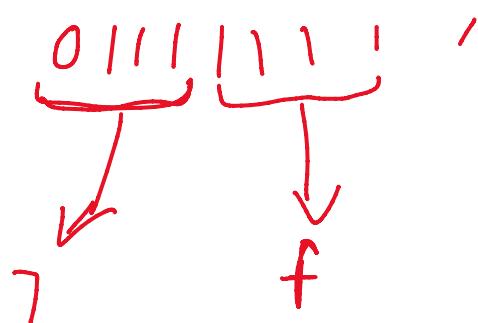


0X80000000

1's complement
+1 0 0 a 0 0 0 0 a 0 c .

$$- \underline{2^{31}}$$

$$\boxed{1000} = 8$$
$$2^3$$



$$\begin{array}{r} 1000 \\ 1111 \\ \hline 15 \end{array}$$