Bit-Manipulation

video-7

Leetcode
-191
Easy

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Number Of 1 Bits

Company :- Microsoft amazon

4 ways

191. Number of 1 Bits

191. Number of 1 Bits

Set bits.

Easy 6K 1.2K

Companies

Write a function that takes the binary representation of an unsigned integer and returns the number of '1' bits it has (also known as the Hamming weight).

Example :- n = 00000000.....1011

output = 3

Some Facts ...

① How to find ith bit of a number ?

(num >> i) & 1 = 1

Example :- 0 1 0 1 0 ← i = 3

0 0 0 0 1

& 1 ←

0 0 0 0 1

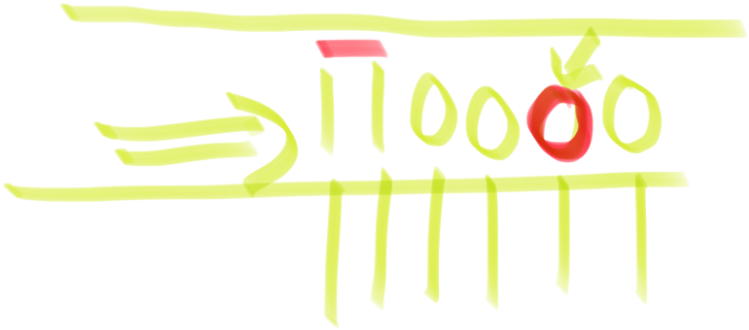
---

② How to unset the right-most set bit of an integer ???

$n = (n \ \& \ (n-1))$;

Example :- n = 1 1 0 0 1 0 → 50

$(n-1)$ = 1 1 0 0 0 1 → 49



Approach-1 :-

31 30 29 28 27 ... 3 2 1 0

n = 0 0 0 0 0 ..... 1 0 1 1

↑

O(32) ⇒ for (i = 31 ; i >= 0 ; i--) {

```
if ((n >> i) & 1 == 1) {
    count++;
}
}
```

O(1).

Approach-2 ...

n = 0 1 1 0 1 → 13 ≠ 0

1 set bit unset ⇒ n = n & (n-1) = 0 1 1 0 0 → 12 ≠ 0

Next ⇒ n = n & (n-1) = 0 1 0 0 0 → 8 ≠ 0

Next bit ⇒ n = n & (n-1) = 0 0 0 0 0 → 0 = 0

3 set bits थी

Time Complexity:- `while (n > 0) {` ⇐

O(K)

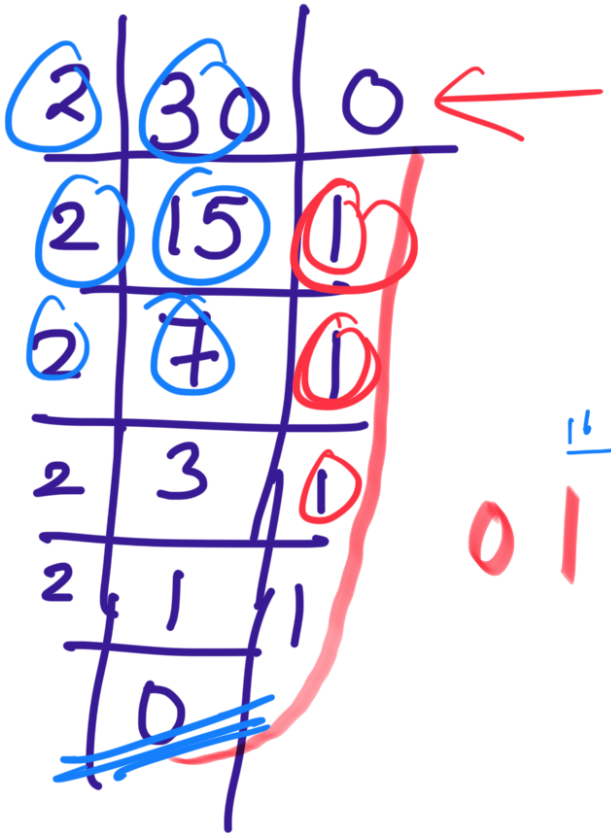
K = no of 1 bits

n = (n & (n-1)); → 1 set is unset

count ++;

}

Approach-3



1 & 4 & 2 & 1

01110 = 30

while (n != 0) {

count += (n % 2);

n = (n/2);

}

T.C :- $\log_2(n)$

$n = 64 \longrightarrow 64/2 = 32/2 = 16/2 = 8/4/2$

$n/2/2/2.$

Appr = 4 :-

↑ O(no of bits)

C++ : __builtin_popcount(n) → count of set bits.

Java : Integer.bitCount(n);