

## AGENDA

- Basics - Bitwise AND, OR, XOR, NOT, Left/Right Shift
- How to set / unset / toggle the n-th bit in a number?
- Check if a number is a power of 2.
- Count set bits in a number.
- Count set bits in all numbers from 1 to N.
- Single Number
- Single Number: follow-up

## Check if a number is a Power of 2

Given a non-negative integer **n**. You have to check if it is a power of **2** or not.

### Examples

**Input:** n = 8

**Output:** true

**Explanation:** 8 is equal to 2 raised to 3 ( $2^3 = 8$ ).

**Input:** n = 98

**Output:** false

**Explanation:** 98 cannot be obtained by any power of 2.

**Input:** n = 1

**Output:** true

**Explanation:** ( $2^0 = 1$ ).

### Constraints:

$0 \leq n < 10^9$

## Count Set Bits in a Number

Given a positive integer **n**. Your task is to return the **count** of set bits.

### Examples:

**Input:** n = 6

**Output:** 2

**Explanation:** Binary representation is '110', so the count of the set bit is 2.

**Input:** n = 8

**Output:** 1

**Explanation:** Binary representation is '1000', so the count of the set bit is 1.

**Input:** n = 3

**Output:** 2

### Constraints:

$1 \leq n \leq 10^9$

## Count set bits in all numbers from 1 to N

You are given a number **n**. Find the total count of set bits for all numbers from 1 to n (both inclusive).

**Examples :**

**Input:** n = 4

**Output:** 5

**Explanation:** For numbers from 1 to 4. for 1: 0 0 1 => 1 set bit, for 2: 0 1 0 => 1 set bit, for 3: 0 1 1 => 2 set bits, for 4: 1 0 0 => 1 set bit. Therefore, the total set bits are 5.

**Input:** n = 17

**Output:** 35

**Explanation:** From numbers 1 to 17(both inclusive), the total number of set bits are 35.

**Constraints:**

$$1 \leq n \leq 10^8$$

## Single Number

Given a **unsorted** array **arr[]** of positive integers having all the numbers occurring exactly **twice**, except for one number which will occur only **once**. Find the number occurring only once.

**Examples :**

**Input:** arr[] = [1, 2, 1, 5, 5]

**Output:** 2

**Explanation:** Since 2 occurs once, while other numbers occur twice, 2 is the answer.

**Input:** arr[] = [2, 30, 2, 15, 20, 30, 15]

**Output:** 20

**Explanation:** Since 20 occurs once, while other numbers occur twice, 20 is the answer.

### Constraints

$$1 \leq \text{arr.size()} \leq 10^6$$

$$0 \leq \text{arr}[i] \leq 10^9$$

## Single Number - Follow-up

Given an array of integers **arr[]** where, every element **appears thrice** except for one which **occurs once**.

Find that element which **occurs once**.

### Examples:

**Input:** arr[] = [1, 10, 1, 1]

**Output:** 10

**Explanation:** 10 occurs once in the array while the other element 1 occurs thrice.

**Input:** arr[] = [3, 2, 1, 34, 34, 1, 2, 34, 2, 1]

**Output:** 3

**Explanation:** All elements except 3 occurs thrice in the array.

### Constraints:

$1 \leq \text{arr.size()} \leq 10^5$

$\text{arr.size()} \% 3 = 1$

$-10^9 \leq \text{arr}[i] \leq 10^9$