

# Bit Manipulation & Greedy Assignment

## Question 1:

You are given N fruits.

The weight of the fruits is represented by an array A.

All those fruits which have the same weight can be sliced in one step.

### Task:

Your task is to determine the number of steps to slice all the fruits.

Example 1:

Input: N = 4, A = [3, 6, 7, 7]

Output: 3

Example 2:

Input: N = 6, A = [20, 40, 30, 50, 40, 20]

Output: 4

## Question 2:

You are given an integer array coins representing coins of different denominations and an integer amount representing a total amount of money.

Return the fewest number of coins that you need to make up that amount. If that amount of money cannot be made up by any combination of the coins, return -1.

You may assume that you have an infinite number of each kind of coin.

Example 1:

Input: coins = [1, 2, 5], amount = 11

Output: 3

Explanation: 11 = 5 + 5 + 1

Example 2:

Input: coins = [2], amount = 3

Output: -1

## Question 3:

There are n boxes with different quantities of candies in each of them. The i-th box has  $a_i$  candies inside. You also have n friends that you want to give the candies to, so you decided to give each friend a box of candies. But, you don't want any friends to get upset so you decided to eat some (possibly none) candies from each box so that all boxes have the same quantity of candies in them.

Note that you may eat a different number of candies from different boxes and you cannot add candies to any of the boxes.

What's the minimum total number of candies you have to eat to satisfy the requirements?

Example 1:

Input: n = 5, a = [1, 2, 3, 4, 5]

Output: 10

Example 2:

Input: n = 10, a = [1, 2, 3, 5, 1, 2, 7, 9, 13, 5]

Output: 38

#### Question 4:

You have N pills of characteristic values [a1, a2.....an]

On each day i, you can take the ith pill and increase your health by ai points or Do nothing and take 1 point of damage

$H = H - 1$ , where H is a value denoting your health.

You die if your health becomes zero. Initially  $H = V$  (where V is a value given in the input).

What is the minimum number of pills you should take to survive for N days.

Example 1:

Input: N = 5, V = 1, a = [1, 1, 1, 1, 1]

Output: 3

##### Explanation

In this case, you would need to eat the 1st, 3rd and 5th pills to survive.

Example 2:

Input: N = 5, V = 2, a = [1, 3, 1, 1, 3]

Output: 1

#### Question 5:

Given an integer array input = nums of unique elements, return all possible Subsets (the power set)

The solution set must not contain duplicate subsets. Return the solution in any order.

Example 1:

Input: nums = [1, 2, 3]

Output: [[], [1], [2], [1, 2], [3], [1, 3], [2, 3], [1, 2, 3]]

Example 2:

Input: nums = [0]

Output: [[], [0]]

#### Question 6: Single Number

Given an array of integers, every element appears thrice except for one, which occurs once.

Find that element that does not appear thrice.

**NOTE:** Your algorithm should have a linear runtime complexity.

Could you implement it without using extra memory?

### Problem Constraints

$$2 \leq A \leq 5 \cdot 10^6$$

$$0 \leq A \leq \text{INTMAX}$$

### Input Format

First and only argument of input contains an integer array A.

### Output Format

Return a single integer.

### Example Input

```
Input 1:
A = [1, 2, 4, 3, 3, 2, 2, 3, 1, 1]
Input 2:
A = [0, 0, 0, 1]
```

### Example Output

```
Output 1:
4
Output 2:
1
```

### Example Explanation

Explanation 1:

```
4 occurs exactly once in Input 1.
1 occurs exactly once in Input 2.
```

### Question 7: Min XOR value

#### Problem Description

Given an integer array **A** of **N** integers, find the pair of integers in the array which have minimum **XOR** value. Report the minimum **XOR** value.

#### Problem Constraints

$$2 \leq \text{length of the array} \leq 100000$$

$$0 \leq A[i] \leq 10^9$$

#### Input Format

First and only argument of input contains an integer array A.

#### Output Format

Return a single integer denoting minimum xor value.

#### Example Input

```
Input 1:
A = [0, 2, 5, 7]
Input 2:
A = [0, 4, 7, 9]
```

### Example Output

```
Output 1:
2
Output 2:
3
```

### Example Explanation

```
Explanation 1:
0 xor 2 = 2
```

### Question 8: Single Integer II

#### Problem Description

Given an array of integers **A**, every element appears twice except for one. Find that integer that occurs once.

**NOTE:** Your algorithm should have a linear runtime complexity. Could you implement it without using extra memory?

#### Problem Constraints

$1 \leq |A| \leq 2000000$   
 $0 \leq A[i] \leq \text{INTMAX}$

#### Input Format

The first and only argument of input contains an integer array **A**.

#### Output Format

Return a single integer denoting the single element.

### Example Input

```
Input 1:
A = [1, 2, 2, 3, 1]
Input 2:
A = [1, 2, 2]
```

### Example Output

```
Output 1:
3
Output 2:
1
```

### Example Explanation

```
Explanation 1:  
3 occurs once.  
Explanation 2:  
1 occurs once.
```

### Question 9:

The Hamming distance between two integers is the number of positions at which the corresponding bits are different. Given two integers  $x$  and  $y$ , return *the Hamming distance between them*.

#### Example 1:

```
Input : x = 1, y = 4  
Output : 2  
Explanation:  
1   (0 0 0 1)  
4   (0 1 0 0)  
      ↑   ↑  
The above arrows point to positions where the corresponding bits are different.
```

#### Example 2:

```
Input : x = 3, y = 1  
Output : 1
```

### Question 10: Reverse Bits

#### Problem Description

Reverse the bits of an 32 bit unsigned integer A.

#### Problem Constraints

$0 \leq A \leq 2^{32}$

#### Input Format

First and only argument of input contains an integer A.

#### Output Format

Return a single unsigned integer denoting the decimal value of reversed bits.

#### Example Input

```
Input 1:  
0  
Input 2:  
3
```

#### Example Output

Output 1:  
0

Output 2:  
3221225472

### Example Explanation

```
Explanation 1:  
00000000000000000000000000000000  
  
=>    00000000000000000000000000000000  
  
Explanation 2:  
0000000000000000000000000000000011  
  
=>    11000000000000000000000000000000
```