



- munna's academy programming contest is a timed event that brings together budding programmers and problem solvers from various educational institutions to compete, learn, and grow. This contest is designed for students who are passionate about coding and eager to test their skills in a challenging environment.

# MAPC | munna's academy programming contest

1. Do your own work—no copying or sharing answers.
2. Solve problems during the contest time only.
3. Use only allowed tools like programming language docs/Templates.
4. Be respectful to everyone and play fair.
5. Follow the rules; breaking them means disqualification.

**Good Luck!**

## Problem 1: The Golden Factory's Conveyor Riddle

### Story:

Deep within the heart of the Golden Factory lies an ancient conveyor system, rumored to be designed by the greatest mathematician of the past century. The system transports crates of gold bars, with each crate marked by a unique binary code. Every code represents the weight of the crate, calculated as the sum of the binary digits multiplied by their positional index (1-based).

However, the conveyor belt has a flaw: it occasionally skips a crate and disrupts the sequence. You are hired to fix this issue by identifying the missing crate's code from the sequence.

### Task:

You are given a list of binary strings, each representing the code of a crate in ascending order of weight. However, one crate is missing from the sequence. Find the missing binary code.

### Input:

An integer  $n$  representing the total number of crates including the missing one.

A list of  $n-1$  binary strings in ascending order.

### Output:

The missing binary string. Hint( You convert a binary string to int by: `int(b_string, 2)`)

### Constraints:

The binary strings will have lengths between 1 and 20.

There will always be exactly one missing crate.

### Example Input:

```
5
['0001', '0010', '0100', '0101']
```

### Example Output:

```
0011
```

### Example Input:

```
6
['0001', '0010', '0011', '0100', '0101']
```

### Example Output:

```
0110
```

## Problem 2: Ishtiak's Student Roster Puzzle

### Story:

Ishtiak, a dedicated instructor at the Munnas Academy Computer Learning Center, is responsible for managing a database of more than 1,000 students. The academy uses a unique ID system for students, where each student's ID is a positive integer. One day, Ishtiak encountered a problem. The student roster database got corrupted, and now he has a scrambled list of student IDs. To fix this, Ishtiak needs to identify the smallest positive integer that is missing from the list of student IDs. However, due to constraints in the system, he cannot use extra memory, making the problem even more challenging.

Your task is to help Ishtiak find the smallest positive integer that is not present in the scrambled list of student IDs.

### Task:

Given a list of  $n$  integers, find **the smallest positive integer** that does not appear in the list. You are required to solve the problem **in-place**, meaning you cannot use additional memory or data structures beyond the input list itself.

### Input:

An integer  $n$ , is the number of student IDs in the list.

A list of  $n$  integers representing the student IDs.

### Output:

A single integer: the smallest positive integer that does not appear in the list.

### Constraints:

1.  $1 \leq n \leq 10^6$
2. IDs may include negative numbers, duplicates, and numbers larger than  $n$ .
3. The solution must run in  $O(n)$  time complexity.
4. The solution must use  $O(1)$  additional space (besides the input list).

### Example Input:

5

[3, 4, -1, 1, 2]

### Example Output:

5

### Example Input:

6

[7, 8, 9, 11, 12]

**Example Output:**

1

**Example Input:**

7

[1, 2, 0, -3, 5, 6, 3]

**Example Output:**

4

**Hints:**

- Consider only numbers in the range 1 to n, as other numbers do not affect the smallest positive integer missing.
- Try finding a way to use the input list itself to mark which numbers in the range 1 to n are present.

## **Problem 1: The Chosen**

### **Statement:**

Everyone is talking about the Jatoba Teacher classes. The MEC representatives came to the UNIME of Lauro de Freitas to learn more details about this new way of teaching algorithms. In addition, they wanted to select one student to participate in the OBI-Tec (Olympiad Informatics Technical Level) and represent Kroton in the competition, because they know that they are the best. To select the best, they have available a list of the registration numbers of each student and their respective notes in the discipline. Your task is to help the Ministry of Education staff find students better able to represent the institution and who knows guarantee your place. If the highest score is not greater than or equal to 8, you should print "Minimum note not reached".

### **Task:**

You are given a list of binary strings, each representing the code of a crate in ascending order of weight. However, one crate is missing from the sequence. Find the missing binary code.

### **Input:**

The file first contains the number of students ( $3 \leq n \leq 100$ ) and then the n students bearing the registration number ( $0 < m < 1000000$ ) each, followed by the note ( $0 \leq \text{note} \leq 10.0$ , with 1 decimal place).

Obs.: the notes will not be repeated. In other words, has no chance to have two students with the same note.

**Output:**

You must print the student's registration number with the highest score or "Minimum note not reached" (without quotes) if no student has taken greater note than or equal to 8.

**Example Input:**

3

1000 5

1001 10

1002 6

**Example Output: 1001**

**Example Input:**

4

900775 5.7

201553 7.9

5032 6.2

2088 2.1

**Example Output: Minimum note not reached**

**Example Input:**

4

900775 9.4

999999 9.9

10022 9.7

441002 9.8

**Example Output: 999999**