

# Problem 9: The MUS-OWT Problem

**(Medium-Hard)**

You've done it! After hacking into Duoprimus Inc.'s internal network, you are just one step away from hacking into the Super Unification Machine (SUM). Even better, you have the authorised personnel's private keys that are supposed to have access the SUM (your input). Unfortunately, the way to access the SUM is complex.

The SUM has a known public key of `2345`, and every authorised personnel's private key has an *internal value* ranging from  $-10000$  to  $10000$  inclusive. The SUM's private key is the product of **exactly two** of these keys' values, where the **sum of these keys' values must equal the public key of `2345`**.

Also, since you know that Duoprimus Inc. focuses heavily on security, there will only exist **one possible set of these two values**. *If there are multiple possible sets of two values, then the set which has the **largest product** will be the correct set of values.*

Look at the internal values of the private keys of the authorised personnel that are supposed to have access to the SUM. *What is the SUM's private key?*

## Input Format

The first line of the input will contain the number of authorised personnel keys,  $N$ .

The following  $N$  lines contain an integer each, representing each key's internal value.

## Constraints

- Let  $v$  be the internal value of a key. Then  $-10000 \leq v \leq 10000$ .
- $2 \leq N \leq 10^5$ .
- It is guaranteed that there is **at least one** set of values that sum to 2345.

## Output Format

The only line of output should contain the SUM's private key.

## Sample Input 1

```
4
1
2
2343
2344
```

## Sample Output 1

```
4686
```

## Explanation 1

The only two pairs of values that sum to 2345 are the pair (1, 2344) and (2, 2343). Since the first set of values has product  $1 \times 2344 = 2344$  and the second set of values has product  $2 \times 2343 = 4686$ , the correct set of values is (2, 2343) and the SUM's private key is 4686.

## Sample Input 2

```
5
100
1000
10000
-7655
1345
```

## Sample Output 2

```
1345000
```

## Explanation 2

The only two pairs of values that sum to 2345 are the pair (1000, 1345) and (10000, -7655). Since the first set of values has product  $1000 \times 1345 = 1345000$  and the second set of values has product  $10000 \times -7655 = -76550000$ , the correct set of values is (1000, 1345) and the SUM's private key is 1345000.