Bloomberg CODECON

Memory Limit: 1024 MB
Time Limit: 5 s

Chocolate Fix (100 points)

Introduction

A shop sells chocolates at a specified price per chocolate.

Each chocolate comes in 1 wrapper. You can exchange a specified number of wrappers for 1 new chocolate.

Tintimon wants to help his friends calculate how many chocolates each of them can get given how much money each has to spend on chocolates.

Wrappers cannot be transferred from one friend to another.

Help him write a program to calculate how many chocolates his friends can get.

Input Specifications

- The first line contains N, the price per chocolate in dollars ($0 < N < 1000$)
- The second line contains M, the number of wrappers that can be exchanged for a new chocolate ($N < M < 1001$)
- The third line contains P, where P is the total number of friends ($0 < P < 1000$)
- Then follows P lines of input, each containing Q, where Q is the amount of money that the friend has to spend on chocolates ($0 < Q < 1{,}000{,}000$)

Output Specifications

Based on the input, print out on **P** lines, the **number of chocolates** each friend can get. The ordering here should follow the order seen in the input.

Sample Input/Output

Input

```
1
2
1
1
```

Output

```
1
```

Explanation

Each chocolate costs $1. You can buy 1 chocolate with $1, which gives you 1 wrapper. You can exchange 2 wrappers for a new chocolate, but since you only have 1 wrapper, you cannot make an exchange. Hence, you can get 1 chocolate.

Input

1
3
2
45
15

Output

67
22

Explanation

Each chocolate costs $1. Friend 1 has $45. She can buy 45 chocolates, which will give her 45 wrappers. She can continue to exchange 3 wrappers for a new chocolate. She continues to exchange wrappers for chocolates until she gets 67 chocolates. Friend 2 does the same, starting with $15, and can get 22 chocolates.

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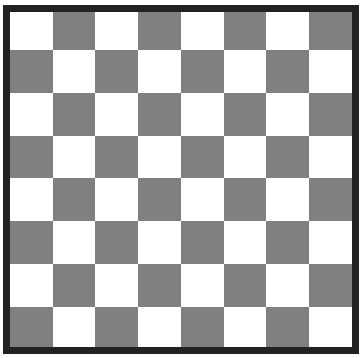
Memory Limit: 1024 MB
Time Limit: 5 s

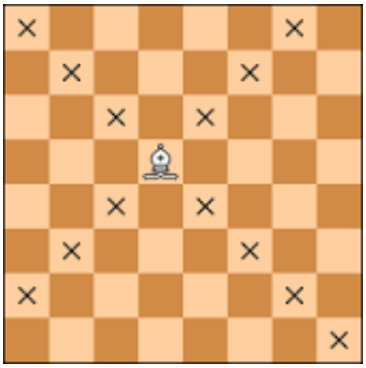
Bishop (150 points)

Introduction

Consider an 8x8 chess board.



A bishop is a chess piece that can only move diagonally.
In the image below, the bishop can only move to one of the blocks marked by an X in a single move.



Given a bishop placed at a certain block on the chess board, and a designated target block, what is the minimum number of moves it would take for the bishop to move to the target block?

Input Specifications

Each block is assigned a number as shown below.

```
1  2  3  4  5  6  7  8
9  10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40
41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 64
```

- The first line of the input will contain the block number that the bishop is on
- The second line of the input will contain the block number of the target block

Output Specifications

- Print the minimum number of moves needed by the bishop to reach the target block
- If it is not possible to reach the target block, print -1

Sample Input/Output

Input

```
1
10
```

Output

```
1
```

Explanation

A Bishop can move from Block 1 to Block 10 in 1 move.

Input

```
1
3
```

Output

```
2
```

Explanation

A Bishop can move from Block 1 to Block 10 in the 1st move, and from Block 10 to Block 3 in the 2nd move.

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Memory Limit: 256 MB
Time Limit: 2 s

Binary Ouroboros (150 points)

Introduction

Axel and Marston play a game to create regular irregularity by expanding 0 and 1 into 01 and 10 respectively.

Beginning with the original seed of 0, on each iteration they replace 0 with 01 and 1 with 10 and so on. The first few iterations look like:
Series
0 0
1 01
2 0110
3 01101001
4 0110100110010110
where # denotes the N-th iteration.

Now given this information, they would like you to return the K-th digit of the N-th iteration. Are you up to this challenge?

Input Specifications

Your program will take

- Two space-delimited numbers N and K which denote the N-th iteration and the K-th digit respectively. (0 ≤ N ≤ 16, 0 ≤ K ≤ 10^6)

Output Specifications

For each input,

- Print out 0 or 1 which indicates the K-th digit of the N-th iteration if K ≤ Length of the N-th iteration
- Print out -1 if K > Length of the N-th iteration

Sample Input/Output

Input

```
0 1
```

Output

```
0
```

Explanation

The first digit in the 0th iteration is 0. In fact that is the entire series.

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Memory Limit: 1024 MB
Time Limit: 5 s

Amazonian Languages (300 points)

Introduction

Your friend, a linguist, is studying the languages of a **newly discovered** set of indigenous Amazonian tribes. His dissertation will involve determining how each of the **languages are related** to each other, and he would like your help.

One language is considered related to another if the **prefixes** of one language **match** the prefixes of the other, above a configurable threshold. The prefix length is also configurable. Your friend needs a program that can take the dictionary of two languages, and **determine if they are related** given certain thresholds.

Example: Suppose the **prefix length** is set to 30%, and the **matching threshold** is 75%.
The base language consists of the following words:

- grasshopper
- waterfall
- prejudice
- leisure

The language to compare consists of the following words:

- grasseater
- waterballoon
- turf
- lemonjuice

In this example,

- *grasseater* and *grasshopper* match with a 50% prefix (len(*grass)* / len(*grasseater*))
- *waterballoon* and *waterfall* match with a 41.66% prefix
- *turf* has no prefix match
- *lemonjuice* and *leisure* match with a 20% prefix

Thus, since 2/4 words match with a 30% prefix or higher, the second language **is not related** to the first, since only 50% of the words are matches, not 75%.

Input Specifications

Your program will take from **STDIN**

- A number **J** representing the threshold percentage for prefix length
- A number **K** representing the threshold percentage for number of matches
- A number **N** denoting the number of words in the base language
- A number **M** denoting the number of words in the comparison language
- **N strings** comprising the base language. Strings are ascii and case-sensitive.
- **M strings** comprising the comparison language. Strings are ascii and case-sensitive.

Output Specifications

The output should be **the integer floor of the percent of words that matched** if the comparison language is related as per the specified criteria, **0 otherwise**.

Sample Input/Output

Input

```
30
75
4
4
grasshopper
waterfall
prejudice
leisure
grasseater
waterballoon
turf
lemonjuice
```

Output

```
0
```

Explanation

This is the example described in the description above.

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Memory Limit: 1024 MB
Time Limit: 5 s

Diamonds in the Rough (300 points)

Introduction

A rectangular field has diamonds buried in it uniformly in both directions; the diamonds are all buried at **integral** coordinates (ex. (1,1), (2,3)). You can assume that the field is the positive XY quadrant (where both x,y are positive) and it's infinitely large. Now, imagine that you were to dig a triangle-shaped hole to retrieve some diamonds. Given the vertices of the triangle, determine how many diamonds you'd find in that triangle. The vertices of the triangle can have any real positive coordinates.

Assumptions:

- The diamonds are all point-sized.
- Any diamond lying on the border of the triangle is considered to be part of the triangle
- The vertices of the triangle form a valid triangle lying in the positive quadrant

Input Specifications

The command line arguments shall consist of 6 real numbers, which represent the coordinates of the triangle in the format - x1 y1 x2 y2 x3 y3

Output Specifications

Your output will be the number of diamonds lying in the triangle.

Sample Input/Output

Input

```
1.0 1.0 2.0 1.0 1.5 2.0
```

Output

```
2
```

Explanation

The diamonds lie on the coordinates (1.0,1.0) and (2.0,1.0).

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Memory Limit: 64 MB
Time Limit: 5 s

Internal Fragmentation (300 points)

Introduction

Back in the 90s, early filesystems used to suffer from Internal Fragmentation http://en.wikipedia.org/wiki/Fragmentation_(computing) (http://en.wikipedia.org/wiki/Fragmentation_(computing)).

Basically, what this meant was when a disk filesystem was divided into sections of equal size, each section could only be used atmost by a single file.

Example - If a file was 200 bytes and the section size was 128, then the file would take up two sections ie 256 bytes. No other file could use the remaining 72 bytes in the section and it would get wasted.

You are given a list of files and the section size for one of these filesystems. Assuming that every section can hold only one file in it, calculate the total disk space used by the given files.

Input Specifications

Your program will take

- An input N ($1 \leq N \leq 50$) which denotes the number of files.
- This will be followed by N integers, F[1],F[2]...F[N] where F[I] denotes size of file I. ($0 \leq F[i] \leq 1{,}000{,}000{,}000$)
- Finally, you will be provided C ($1 \leq C \leq 1{,}000{,}000$), the section size of the filesystem.

Output Specifications

Print out the total diskspace used by the given files.

Sample Input/Output

Input

```
1
400

256
```

Output

```
512
```

Explanation

The file uses up two sections and as each section size is 256, it requires 512 bytes.

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Memory Limit: 1024 MB
Time Limit: 5 s

Truths of Predatation (400 points)

Introduction

On planet Dorne in galaxy Harrenhal, there exist three types of animals: Wampa, Nexu and Tribble. Wampa can eat Nexu, Nexu can eat Tribble, and Tribble can eat Wampa.
Dorne has **N** animals, numbered from 1 to N, which are each one of the 3 types.
A troll named Horda will tell you **K** clues about these animals. Each piece of information has one of the two forms below:

- 1 X Y : this tells you that x and y are of the same type
- 2 X Y : this tells you that x can eat y

Being a troll, some of the clues given are false. The clue is false if it satisfies any of the three conditions below, otherwise it's true:

- X or Y is larger than N
- The clue states X can eat X
- The clue conflicts with a true clue before

Your task is to process all clues and detect the number of false clues.

Input Specifications

The first line will contain a number **N** (1 <= N <= 1000) denoting the number of animals on Dorne and **K** (1 <= K <= 1000)
denoting the number of clues Harda will provide. This will be followed by K lines, each with three positive integers. The first number **C** (1 <= C <= 2) will tell you which type of clue this is, followed by **X** and **Y** (1 <= X,Y <= N).

Output Specifications

Your program will output a single integer denoting the number of false clues provided by the troll.

Sample Input/Output

Input

```
100 7
1 101 1
2 1 2
2 2 3
2 3 3
1 1 3
2 3 1
1 5 5
```

Output

```
3
```

Explanation

The 1st, 4th and 5th clues are false.

Bloomberg CODECON

Memory Limit: 1024 MB
Time Limit: 5 s

Grasshopper (500 points)

Introduction

Master Shifu is conducting a game between his pupils Rabbit and Grasshopper. Shifu has setup N lanes of blocks running north to south with K blocks in each lane. The blocks have varying heights and each block has a gold coin on it.

The game spans D days. The game is turn based. Rabbit makes the first move on the first day. Grasshopper makes the first move on the second day, and they continue to alternate for the rest of the days.

When it is Rabbit or Grasshopper's turn, they will pick a lane of blocks that has not yet been traversed. They will then traverse this lane by hopping from block to block. When they are traversing a lane, they can only hop to a block that has a larger height than the one they are on. They can hop to any block as their first hop onto the lane. They will pick up the coin on each block they land on.

On a given day, the game is played until all lanes have been traversed. The game is over at the end of day D. The winner is the one with the largest number of coins.

Shifu has decided to make the game a little harder. At the end of each day, Shifu will shuffle the lanes in the following manner: the first elements in each of the lanes will be shifted to the left, the second elements in each of the lanes will be shifted to the right, and so on.

If Rabbit plays optimally, can Grasshopper win and what is the largest number of coins that Grasshopper can get?

Input Specifications

The first line will be D, the number of days the game will be played for, with $1 \leq D < 10$

The second line will contain N, the number of lanes, with $1 \leq N < 10$

The third line will contain K, the number of blocks in each lane, with $1 \leq K < 10$

The next N lines will contain K integers in each line, which represent the height of the blocks. The first of which is the left most lane and the last is the right most lane. Each height will be greater than 0 and less than 50.

Output Specifications

One line with two integers. The first is 1 if Grasshopper can guarantee a victory and 0 otherwise. The second integer is the largest number of coins that Grasshopper can get.

Sample Input/Output

Input

```
2
4
```

```
4
14  4  12  6
1  8  3  10
3  13  5  11
7  2  9  4
```

Output

```
1  13
```

Explanation

On the first day, the first through fourth lanes are:

1: 14 4 12 6

2: 1 8 3 10

3: 3 13 5 11

4: 7 2 9 4

The largest number of hops for the first lane is 2 (the second block to the fourth).

For lane 2, it is 3 (first, third, then fourth block).

For lane 3 it is 3 (first, third, then fourth).

For lane 4 is it 2 (first, then third).

Rabbit will go first, picking lane 2 or 3 since he can get the largest number of

coins (3) from one them. Grasshopper will go second and traverse the other lane

with 3 coins. Rabbit will choose either the first or fourth lane since they both

have 2 coins and Grasshopper will have choose the other. At the end of day one,

they have 5 coins each.

On day two, the lanes are as follows:

1: 1 2 3 4

2: 3 4 5 6

3: 7 8 9 10

4: 14 13 12 11

The largest hops for these are 4, 4, 4, 1. Grasshopper will go first and pick

a lane with 4, Rabbit will pick a lane with 4, Grasshopper will pick the remaining lane

with 4, and Grasshopper will pick the lane with 1. Their day two totals will be

8 for Grasshopper and 5 for Rabbit.

The game was for 2 days and total coins are 10 for Rabbit and 13 for Grasshopper.

Thus Grasshopper can guarantee a victory and can gain a max of 13 coins.