2018 UTP Internal Programming Contest
Contest Information

Rules

Contestants will be disqualified if they violate any one of the following rules.

1. No machine-readable materials (e.g., source codes, templates, etc.) are allowed. However, paper-based materials, such as textbooks, dictionaries, printed notes, etc., are allowed.
2. Contestants are only allowed to contact his/her teammates during the contest. Contestants shall not discuss with his/her coach and other teams.
3. Contestants shall only access the internet for downloading the problem description, submitting source codes, requesting problem clarification and checking the scoreboard. Any other type of internet access is prohibited.
4. A team shall not simultaneously use more than one computer to write programs during the contest. Contestant shall not use any other type of electronic devices, except extra monitors and printers.
5. All malicious actions interfering the contest are prohibited.

Scoring and Ranking

1. Disqualified teams will be removed from the ranking.
2. Only C, C++, Java, Python are provided in this contest. The judge system only accepts programs which can be properly compiled and executed. A problem is solved if the submitted program terminates and outputs correctly in time. The responses of the judge system are listed as follows.
   - CE: The program cannot be properly compiled or executed.
   - TLE: The program uses too much time.
   - RE: Run-time error. The program cannot terminate normally.
   - MLE: The program uses too much memory.
   - WA: The output is incorrect.
   - AC: The program is accepted by the judge system, and the problem is solved.
3. Teams are ranked according to the most problems solved. Teams who solve the same number of problems are ranked by least total time. The total time is the sum of the time consumed for each problem solved. The time consumed for a solved problem is the time elapsed from the beginning of the contest to the submittal of the accepted run plus 20 penalty minutes for every rejected run for that problem regardless of submittal time. There is no time consumed for a problem that is not solved.
4. Breaking ties in ranking, if necessary, is according to the following order:
   (a) the less total number of submissions of the solved problems;
   (b) the shorter elapsed time of the first solved problem;
   (c) the shorter elapsed time of the second solved problem, and so on.

Problem A
Toby And Love

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby has a lot of messages from his beautiful girl, today Toby is wondering about the amount of love that each message has.

For each message Toby wants to know how many times the word "love" appears. Can you help this little pet?

Input Format

The first line contains a single integer ($1 \leq N \leq 100$) the amount of messages. The next N lines contain a single message S, the length of S does not exceed 1000 characters and only contains lowercase Latin letters.

Output Format

For every message S print a single integer.

Sample Input

```
4
iinlovewithyou
lovelovelove
mylov
tobyiloveyousomuchyouaremytruelove
```

Sample Output

```
1
3
0
2
```

Problem B
Toby And Coins

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby is going to buy a machine to send love letters to his girlfriend, the machine costs N pesos. Toby works very hard and he has a lot of money, in fact, he can pay the machine with any combination of coins!

Toby wants to know what is the **minimum** number of coins he needs to buy the machine.

In the Toby's city there are coins with the following values:

$\{1, 2, 5, 10, 20\}$

Input Format

The first line contains an integer $1 < T < 100$ denoting the number of test cases. For each one of the next T lines, there is an integer $1 < C < 10000$ denoting the cost of the machine.

Output Format

For each test case, print the minumum number of coins that Toby needs in order to buy the machine.

Sample Input

```
3
15
8
22
```

Sample Output

```
2
3
2
```

Problem C
Toby And Stars

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby is looking at the sky and he found a lot of beautiful stars, he is wondering what is the minimum distance between any pair of stars. Could you help him ?

Note: You can safetly asume that the stars are in a 2D plane.

Input Format

The input contains a number N denoting the total number of stars. Each one of the following N lines, contains a pair of integers denoting the position of one star.

$2 \leq N \leq 500$

The coordinates of each star are between 0 and 1000

Output Format

Print the minimum distance between any pair of stars. The answer is considered valid if the difference with the correct value is less than 1e-4

Sample Input

```
5
434 155
8 412
100 816
301 762
312 506
```

Sample Output

```
208.127364851
```

Problem D
Toby And Primes

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby loves prime numbers and today he has the next challenge for you. You have an integer N (N has between 1 and 4 digits), is possible to reorder the digits of the number in such a way that one of the resulting numbers is a prime number? Note: The resulting number can't have leading zeros.

Input Format

The first line contains an integer T, denoting the number of test cases, in each of the next T lines there is an integer N.

Output Format

For each test case you have to print "YES" if is possible to reorder the digits and make a prime number or print "NO" otherwise.

Sample Input

```
6
1
7
712
209
24
1798
```

Sample Output

```
NO
YES
YES
NO
NO
YES
```

Explanation:

For the fourth case 209 can be reorder like this (029, 092, 209, 290, 902, 920), 029 is prime, but is not a valid number because has leading zeros, in the valid numbers (209, 290, 902, 920). there are no primes, so the answer is "NO"

For the fith case 24 only has two possible numbers (24, 42) and there are no primes, so the answer is "NO".

Problem E
Toby And Numbers
Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby just invented a game with numbers, initially you have a list of numbers and at any moment you can do the following operation:

- Take two different numbers and replace the greater one with the absolute difference of those numbers.
- The game ends when all the numbers are equal.

It can be shown that the game always ends and no matter how you play, the result will be always the same.

Help toby to determine what is the result for several instances of the game.

Input Format

The input begins with an integer T denoting the number of test cases. For each test case, there is a number N indicating how many numbers are in the current case, followed by N positive integers.

$1 \leq N \leq 100$

Each one of the N numbers is between 1 and 10000

Output Format

Print one integer for each test case. Note that at end of each game all the numbers are equal, for this reason you only need to print it once, no matter what is the size of the input list.

Sample Input

```
2
3
3 6 9
5
2 8 10 16 36
```

Sample Output

```
3
2
```

Problem F
Toby And Sheeps

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby is now a shepherd and has a flock of sheeps all of them in a row, but alas there are wolves too, luckly our pet is pretty relaxed and will enter on panic only if when he sight a subsegment of his flock the number of wolves is greater than the number of sheeps.

Toby has few questions for you, as he is too lazy, he wants to ask you if for an given interval (defined by $[L, R]$) there are more wolves than sheeps, you have to answer Yes or No.

Note: A sheep is represented by a '1' and a wolf is represented by a '0'.

Input Format

There are several test cases. Each test case starts by a number N denoting the number animals in the flock (sheeps and wolves), next you have to read N numbers (0 or 1); followed by a number Q, the number of queries that Toby got for you, then Q lines are given and you will have to read L and R denoting the begin and the end of the subsegment that Toby wants to check.

$1 \leq N, Q \leq 100000$
$1 \leq L \leq R \leq N$

Output Format

For each query you have to output "Yes" if the numbers of wolves is greater than the numbers of sheeps, and "No" otherwise. Without quotes.

Sample Input

```
4
1 0 1 1
3
1 2
2 2
1 4
```

Sample Output

```
No
Yes
No
```

Problem G
Toby And Candies

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby has D candies and he wants to know the number of ways he can distribute those candies between K friends. Note that for a particular distribution of the candies, some people could get no candies at all.

Input Format

The input starts with a number T indicating the number of test cases. For each one of the following T lines, there are two integers D and K denoting the number of candies and the number of friends respectively.

$1 \leq T, D, K \leq 10$

Output Format

For each test case print the answer to the problem in a new line

Sample Input

```
1
3 2
```

Sample Output

```
4
```

Explanation

the four ways to distribute the candies among 2 people are:

```
3, 0
2, 1
1, 2
0, 3
```

Problem H
Toby And Sherlock

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby and his friend Sherlock are playing a game with stones, the rules are:

- Initially there are N stones.
- They play in turns.
- Toby plays first.
- Each player could take between 1 and 5 stones in one turn.
- If one player has no stones to take, he loses the game.

Help Toby to determine who will win for a several number of stones. Take into account that both players will play optimally.

Input Format

The input begins with a number T denoting the number of test cases. For each test case a positive number N is given and indicates the number of stones.

$1 \leq T \leq 1000$
$1 \leq N \leq 1000$

Output Format

For each test case print "Toby" if Toby wins the game, print "Sherlock" otherwise.

Sample Input

```
2
4
7
```

Sample Output

```
Toby
Toby
```

Problem I
Toby And Addition
Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby lives in Bitland where things are a little weird, by example 4 + 5 = 3 woow!. Definitely the addition is not like we know. Toby like a regular citizen knows very well the process for addition in Bitland. He say, "Is easy, just count the total amount of bits turn on between numbers"

Example

$4 + 5 = 3$
$4- > 100$: there is 1 bit turn on
$5- > 101$: there are 2 bits turn on

So the answer is 1 + 2 = 3

For this challenge you need to learn how Bitland's citizens add two number.

Input Format

The first line contains an integer T, ($T \leq 1000$), the number of test cases, each test case contains two integers a and b ($0 \leq a, b \leq 10^{18}$).

Note:

to store a and b you need more than 32 bits, so watch out! :P

Output Format

For each test case print a single integer with the answer.

Sample Input

```
5
1 1
8 64
4 5
66666666 33333333
576460752303423487 576460752303423487
```

Sample Output

```
2
2
3
26
118
```

Problem J
Toby And The Mall
Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby is lost in a mall and now is looking for the exit, the mall can be modeled as a matrix in 2D of N rows and M columns, Toby is located at the upper-left corner and the exit is located at the lower-right corner, Toby only has 2 kinds of moves, he can move one step right or one step down to the adjacent cells. Each cell has a price that must be payed in order to stay there. Can you help to our pet to find the exit paying the lowest possible price?.

Input Format

The input contains two numbers N, M denoting number of rows and columns respectively. Each one of the following N lines, contains M integers denoting the price that Toby must pay to stay in the $(i-th, j-th)$ cell.

$1 \leq N, M \leq 1000$

Each element in the matrix is between 1 and 1000.

Output Format

Print the minimum price that Toby has to pay to reach the exit.

Sample Input

```
4 5
1 1 1 5 6
2 2 1 8 1
2 1 8 1 2
1 1 1 1 1
```

Sample Output

```
9
```

Problem K
Toby And The Railway Stations

Time limit: 2 second
Memory limit: 512 megabytes

Problem Description

Toby is analysing the railway system of his city, and he has noticed that it can be modeled like a directed graph where the stations are the vertices and the edges are the rails that connect them.

Toby got a lot queries for you and for each query he wants to know how many stations are reachable if he is actually at the station S, by reachable he means that can go from S to an station T using one or more rails.

Input Format

The input contains two numbers N, M denoting number of stations and rails respectively. Each one of the following M lines contains two integers (X, Y) denoting that there is a connection from X to Y, then one integer Q denoting the number of queries that Toby is going to give to you, in the next Q lines an integer S is given, that is the city which toby wants to know how many stations are reachable from it.

Note:

You can assume that X and Y are different.

$1 \leq N, Q \leq 1000$
$0 \leq M \leq (N * (N - 1))/2$

Output Format

For each query print the number of stations reachable from S.

Sample Input

```
7 9
1 2
2 4
4 3
3 1
4 5
1 5
7 2
7 6
6 7
3
6
5
2
```

Sample Output

```
6
0
4
```