Institute of Engineering & Technology, DAVV Indore
Programming Contest August 2020 [06/08/2020]

PROBLEM STATEMENTS

Problem – A

Maximum Digit Sum

For an non-negative integer N, define Even(N) as the sum of all even digits of N plus twice the sum of all odd digits of N and Odd(N) as the sum of all odd digits of N plus twice the sum of all even digits of N.

You need to find max(Odd(N) , Even(N)).

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.
The first line of each test case contain an integer N .

Output Format :-

For each test case, print a single integer - max(Odd(N) , Even(N)).

Constraints:-

- **1 ≤ T ≤ 1000.**
- **1 ≤ N ≤ 10^18.**

  Time Limit.   : 2 secs
  Source Limit :   256 megabytes

Example:-

Input:

```
2
1
111
```

Output:

2
6

Explanation :

In Test case 1 :

Odd(1) = 1+ 2*(0) = 1
Even(1)= 0 + 2*(1)= 2

max(Odd(1) , Even(1)) =max(1,2) =2.

In Test case 2 :

Odd(111) = 1+1+1 + 2*(0) = 3
Even(111)= 0 + 2*(1+1+1) = 6

max(Odd(111) , Even(111)) = max(3,6) = 6.

Problem – B

Welcome to India

Victor and Sara are best friends. They both decide to go to India and buy some property of N x N unit size. In this property Victor and Sara want to build their houses but to make the construction more interesting they set the following rules in order to build their houses:

1) Width of both houses will be same.
2) Length of both houses will be same.
3) Height of both houses will same.
4) Both houses will share exactly one wall.

Now They reach to the King of India and ask to purchase desired property there. The King tells them that they can choose any property but he wants P coins / Unit Area.

Now you need to help Victor and Sara in order to minimize the total number of coins that they will spend to purchase the property and build their houses.

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.
The first line of each test case contain Four integer P , X ,Y ,Z .
Where ,
P – Per unit area coins
X – Common length of both houses
Y – Common width of both houses
Z – Common height of both houses

Output Format :-

For each test case, print a single integer - minimal coins that Victor and Sara will give to the king in order to purchase the property and build their houses .

Constraints:-

- $1 \leq T \leq 100$
- $1 \leq P \leq 100$
- $1 \leq X \leq 100$
- $1 \leq Y \leq 100$
- $1 \leq Z \leq 100$

Time Limit. : 2 secs
Source Limit :   256 megabytes

Example:-

Input:

```
3
1 3 2 10
8 10 4 9
1 3 5 9
```

Output:

```
16
800
36
```

Explanation :

In the test case one, Victor and Sara decide to purchase 4 x 4 unit size property which will cost them 4 x 4 x 1 = 16 x 1= 16 coins that is minimal where they can build both houses of size 3 x 2 x 10.

Problem – C

Barbeque Nation

David has opened a new restaurant called **Barbeque Nation** !

We all know that to make everything go well , David needs employees like chef , manager , workers etc. Because David is a perfectionist, he planned to employ only those employees who are good at competitive programming And he described the following criteria in order to judge someone's competitive programming skills:

1) At least 4 Star In Code Chef and Expert in Code Forces.
2) Have Solved 1000+ Competitive problem in any available online judges.

Hence, David asked for help from his friends Anjali and Vishal. Knowing that many people (such as Usha , Yash , Shivani and Shreya) will apply for the job, they decided to choose only the best appliers.

As the day of the employment came, people lined up in front of the restaurant applying for the job. Before accepting any appliers, Anjali and Vishal decided to make them answer a simple question, in order to determine which of them better deserves the job.

Given an array of **N** elements $A_1, A_2, ..., A_N$, each applier was asked to insert any **M** integers from the range [1,2,3…..1000] to this array. Eventually, each applier will be asked to write down the median among all the elements in his resulting array. Now appliers asked you to help them in order to determine what is the greatest median they can get after inserting any **M** elements they want ?

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.

The first line of each test case contains two space separated integers N and M denoting the array length, and the number of elements to be inserted.

The second line of each test case contains N space separated integers A1, A2, ..., AN denoting the elements of the array.

Output Format :-

For each test case output a single line, containing a single integer, indicating the greatest median the applier can obtain after inserting exactly **M** new elements into the given array.

Constraints:-

- $1 \le T \le 100.$
- $0 \le M < N \le 100.$
- $0 \le A_i \le 1000.$
- N + M is guaranteed to be odd.

    Time Limit.   :   2 secs
    Source Limit :   256 megabytes

Example:-

Input:

```
3
2 1
4 7
4 3
9 2 8 6
5 2
6 1 1 1 1
```

Output:

```
7
9
1
```

Explanation :

In case 1:
One of the possible solutions is to add 9 making the array [4, 7, 9], whose median is 7

In case 3:
No matter what elements you add to this array, the median will always be 1.

Problem – D

Optimal Game

Anjali and Vishal are playing a game. Anjali moves first .They start with an integer n and move alternatively . In each turn, a player can make **any one** of the following moves:

- Subtract 1 from n , when n > 1.
- Divide n by any of its odd divisors greater than 1.

The player who is **unable to make a move** loses the game. Determine the winner of the game if both of them play optimally.

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.
The first line of each test case contain an integer N .

Output Format :-

For each test case, print "Anjali " if she wins, or "Vishal " otherwise (without quotes).

Constraints:-

- **1 ≤ T ≤ 100.**
- **1 ≤ N ≤ 10^6.**

    Time Limit.   : 2 secs
    Source Limit. :   256 megabytes

Example:-

Input:

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

12

Output:

Vishal
Anjali
Anjali
Vishal
Anjali
Vishal
Anjali

Problem – E

Number Game

The number 13 is considered an ugly number in some countries and beautiful number in few other countries. In-fact any number that contain 13 will considered an ugly.

Example :- 13 , 1130 , 2013 , 19137898 , 72638646221113 are all ugly numbers and all the other numbers which does not contain 13 are beautiful by default.

Write a program to find how many beautiful number can be formed with upto n digits.

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.
The first line of each test case contain an integer N .

Output Format :-

Print single integer :— x % 19 .
where x= total beautiful number can be formed from n digits.

Constraints:-

- $1 \leq T \leq 1000$
- $1 \leq N \leq 1000$
- Valid Integer Digits : 0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9
- A number of N digits can include any N Valid digits in any order.

    Time Limit.   : 2 secs
    Source Limit. : 256 megabytes

Example:-

Input:

```
5
1
2
3
4
```

422

Output:

```
10
4
11
11
0
```

Problem – F

PUBG Battleground

You are given a strength of n players who are playing PUBG mobile solo match with each other. Once the match started every player try to kill the other player. Fighting can take place between any random players.

When two players with strength x and y fights together and if x attacking to y then strength of y will reduce by x and vice versa. One player can attack to other player only if he has lesser or equal strength with respect to his opponent.

Now you need to find the strength of the last player alive.
Note:
1) Here any player can win the particular match but the beauty of the PUBG battleground is that the man who will stand alive at the end have the constant strength for that particular match.
2) Whenever the strength of any player goes zero or some negative then he/she will immediately die.

Input Format :-

The first line of the input contains an integer T denoting the number of matches.
The first line of each test case contain an integer N – denoting total number of player in a match.
The second line of each test case contains N space separated integers A1, A2, ..., AN denoting the initial strength of each player.

Output Format :-

Print single integer — strength of the last player alive.

Constraints:-

- $1 \le T \le 1000$.
- $0 \le N \le 100$.
- $0 \le A_i \le 1000$.

  Time Limit.   : 2 secs
  Source Limit. : 256 megabytes

Example:-

Input:

```
3
3
4 2 10
4
2 2 2 2
3
10 4 22
```

Output:

```
2
2
2
```

Explanation :

In the 1st match :

One of the possible scenario is:

Before Fighting we have : 4 2 10
2nd player attacks 1st player then after the fight we have : 2 2 10
1st player attacks 3rd player then after the fight we have : 2 2 8
1st player attacks 3rd player then after the fight we have : 2 2 6
1st player attacks 3rd player then after the fight we have : 2 2 4
1st player attacks 3rd player then after the fight we have : 2 2 2
1st player attacks 3rd player then after the fight we have : 2 2 0
1st player attacks 2nd player then after the fight we have: 2 0 0

So 1st player won the match here with the strength 2. There could be multiple ways to perform fighting but answer will always 2 for this match. Lets see some other way too :

Before Fighting we have : 4 2 10
1st player attacks 3rd player then after the fight we have : 4 2 6
1st player attacks 3rd player then after the fight we have : 4 2 2
2nd player attacks 3rd player then after the fight we have : 4 2 0
2nd player attacks 1st player then after the fight we have : 2 2 0
2nd player attacks 1st player then after the fight we have : 0 2 0

So 2nd player won the match here with the strength 2.

Problem – G

Petrol Pumps In India

There are N petrol pumps along a circular route in India , where the amount of fuel at petrol pump i is fuel[i] . You have a car with an unlimited fuel tank and it costs cost[i] fuel to travel from petrol pump i to petrol pump (i+1). You need to begin the journey with an empty tank at one of the petrol pumps.

Return the starting petrol pumps index if you can travel around the circuit once , otherwise return -1.

Note : If multiple solutions possible then print the minimal one.

Input Format :-

The first line of the input contains an integer T denoting the number of test cases.

The first line of each test case contain an integer N denoting the total number of petrol pumps.

The second line of each test case contains N space separated integers fuel1, fuel2, ..., fuelN denoting the amount of the fuel in petrol pumps.
The second line of each test case contains N space separated integers cost1, cost2, ..., costN denoting the to travel from petrol pump i to petrol pump (i+1) .

Note : When car reaches to Nth Petrol Pump still want to move then it will continue with the 1st Petrol Pump.

Output Format :-

For each test case output a single line, containing a single integer , the starting petrol pumps index if you can travel around the circuit once , otherwise return -1.

Constraints:-

- **$1 \leq T \leq 10$.**
- **$1 \leq N \leq 10000$.**
- **$1 \leq fuel[i] , cost[i] \leq 10\char`^6$ where $1 <= i <= n$.**

  Time Limit.   : 2 secs
  Source Limit. : 256 megabytes

Example:-

Input:

```
2
3
1 4 4
2 1 1
8
15 8 2 6 18 9 21 30
8 6 30 9 15 21 26 30
```

Output:

```
2
-1
```