PROSOLVE 7.0

TALK IS CHEAP, SHOW US THE CODE

Competitive Programming

This problem set contains 10 questions (A-J)

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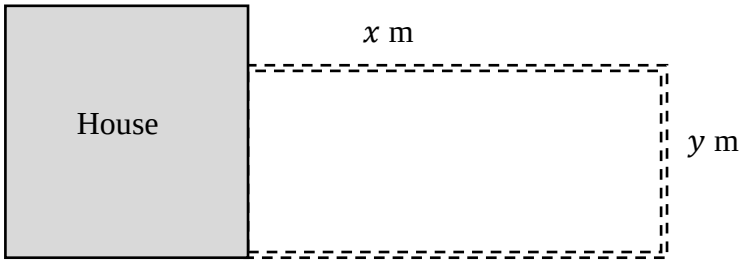
Organized by

Artificial Intelligence Society (AIS) UiTM Shah Alam

PROBLEM A	LEGEND DAIRY

Author: Syamim

Mr. Fikri is retiring from his current job at the end of the month so he was thinking about opening up a new business of selling fresh milk to the local hawkers in his town. But due to his inexperience and miscalculation, he ended up using a huge sum of his budget for the business only for the cows. He forgot to buy fences for his pasture in order to contain the cows.



He wants to put up a fence to enclose a rectangular space of a patch of grass behind his house. Your task is to find out how he can maximize the area of the pasture from the total length of the fence that he's going to get.

Example: Total length = 500m

Case 1: x = 124m, y = 252m, area = 31248m^2

Case 2: x = 125m, y = 250m, area = 31250m^2 **(Max)**

Case 3: x = 126m, y = 248m, area = 31248m^2

Note: The side with his house does not need fencing. Assume that the house is big enough to always cover that side of the fence.

Input

The first line of the input contains an integer N ($1 \le N \le 5$), the number of test cases. Following the first line are the test cases. Each line of a test case contains one non-negative integer number M ($500 \le M \le 10{,}000$) representing the total length of fence in meter.

The input must be read from standard input.

PROBLEM A	LEGEND DAIRY (CONT')

Output

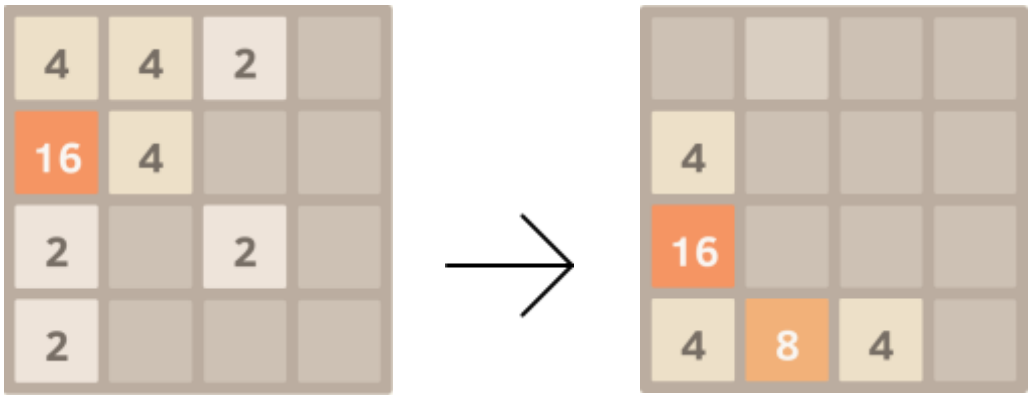
For each test case, print the maximum area, length(x) and width(y) of the fences that would maximize the area.

Sample Input	Sample Output
2 500 1230	31250.0 125.0 250.0 189112.5 307.5 615.0

PROBLEM B	2048

Author: Shahril

2048 is played on a gray 4×4 grid, with numbered tiles that slide smoothly when a player moves them using the four arrow keys. Every turn, a new tile will randomly appear in an empty spot on the board with a value of either 2 or 4. Tiles slide as far as possible in the chosen direction until they are stopped by either another tile or the edge of the grid. If two tiles of the same number collide while moving, they will merge into a tile with the total value of the two tiles that collided. The resulting tile cannot merge with another tile again in the same move.



Current 2048 state

State after being *slid down*

Figure 1 - Example of 2048 game

Your job is to imitate this game. Given a valid state of *2048* and its number, show the resultant state after it has been slid either in up, down, left, or right direction.

PROBLEM B	2048 (CONT')

Input

The input will always be a valid *2048* state. Given ***M***, 4x4 matrix in which all 16 integers are in the set of {0, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024} An integer 0 means that the cell is empty.

Next one line contains an integer, ***O***, which describes the next movement that you need to do. ***O*** will contains four possible integers, {0, 1, 2, 3}, in which it represents left, up, right, down respectively.

Output

Output a 4x4 matrix, which consists of 16 integers after ***O*** operation has been done to ***M***. Again, an integer 0 denotes that the cell is empty. You can basically ignore part of *2048* where it introduces new number in random cell consisting of 2 and 4.

Sample Input	Sample Output
64 0 2 0 16 0 0 0 8 8 0 0 2 2 4 2 0	64 2 0 0 16 0 0 0 16 0 0 0 4 4 2 0
4 8 2 0 4 8 2 0 4 2 0 0 2 0 0 0 1	8 16 4 0 4 2 0 0 2 0 0 0 0 0 0 0

PROBLEM C | ESCAPE FROM OSIRIS PYRAMID

Author: Harith

A team of explorers are trapped in Osiris Pyramid and can only escape if they can solve a question in the pyramid walls.

The question asks for an Osiris Number, a 3-digit number that are equal to the sum of permutations of sub-samples of their own digits.

An example that was given is 132 as it is equal to 12 + 21 + 13 + 31 + 23 + 32.

Write a program that can check whether a 3-digit number is an Osiris number.

Input

The first line contains the amount of test case(s).

The following line is the test case with only 3 digits.

Output

Output the answer followed by the sentence “is an Osiris number” for the correct answers and “is not an Osiris number” for the incorrect answers.

Sample Input	**Sample Output**
3 132 164 264	132 is an Osiris number 164 is not an Osiris number 264 is an Osiris number

PROBLEM D	FIND ME A PARKING SPACE, PLEASE?

Author: Syaafiq

Ahmad is late for the classes and he needs to find the nearest empty parking area for him to park his car and get to the class before it starts. He somehow managed to get the current number of parking space available on each area and he needs your help finding the nearest parking space so that he could reach his class on time.

Input

The first line contains the value of *n* nodes, *m* edges where $1 < n < 50$ and $1 < m < 1225$. The second line contains *a* number of parking area, followed by *a* number of lines denoting the parking space node, the number of available parking space and name of the parking area, and lastly followed by *m* lines of *x, y, z* where *x* represents the beginning of the edges, *y* represents the end of the edges and *r* represents the length of the link.

Output

The name of nearest parking area that Ahmad should park

Sample Input	Sample Output
10 10 3 2 10 Melati's Parking Space 6 20 Facility Administration Building 9 0 Mawar's Parking Space 0 8 5 6 0 5 1 8 8 3 1 6 6 3 7 5 8 3 2 5 2 7 3 7 4 7 6 9 7 3	Melati's Parking Space

PROBLEM E	Ġ χ ư ư 5 ° Ŝ 5 Lj ư ε

Author: Syaafiq

Oh uh… It looks like someone has hacked into our question database system and corrupted all of the files in the server. Fortunately, thanks to our computer expert who managed to recover some of the files contained inside of the server. But…. it's in a raw hexadecimal format! We need your help to convert all of the hexadecimal into something that we can understand.

Input

An unknown length of sequence of hexadecimal, terminated by 'EOF' mark.

Output

The string after converting from hexadecimal

Sample Input	Sample Output
0x48 0x65 0x6c 0x6c 0x6f 0x2c 0x20 0x57 0x6f 0x72 0x6c 0x64 0x21 EOF	Hello, World!
0x4e 0x79 0x61 0x61 0x7e 0x7e EOF	Nyaa~~

PROBLEM F	LOCATE THE VICTIM

Author: Syaafiq

The police is investigating a kidnapping case where a teenager has been kidnapped by a human trafficking criminal, waiting to be exported overseas. Fortunately, the teen has brought his/her smartphone and it haven't been confiscated by the kidnapper and the police managed to trace which cell tower that the phone are currently connected. However, the nature of the airwave and the fluctuation in the air have caused the smartphone to sometimes able to connect to a cell tower that are much further away and causing a slight noise in the data since the smartphone might be outside from the tower range of service. The police needs your help triangulating the victim so he/she can be rescued from the kidnapper before it is too late.

Figure 1: Triangulation in Work

Input

n number of circle, followed by *n* number line where $3 \leq n < 100$ containing the *x* position, *y* position and the *radius* of the circle, separated by space

Output

the *x* and *y* coordinate of the kidnapper, separated by a space

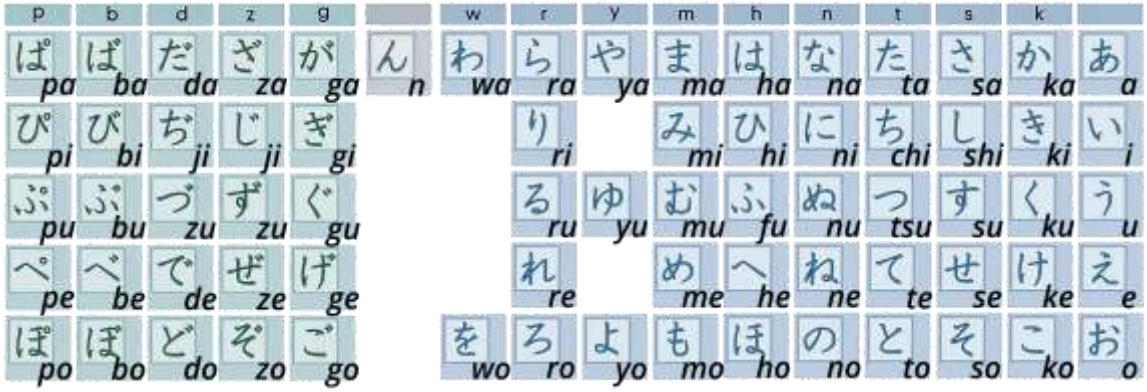
Sample Input	Sample Output
7 -66.00 100.55 11.00 -59.00 71.02 22.00 91.00 -71.86 14.00 -57.00 109.97 17.00 -74.00 63.00 18.00 -34.00 59.00 11.00 -9.00 1.00 23.00	-58 93

Circle:$(x-h)^2+(y-k)^2=r^2$ where *(h, k)* is the centre point of the circle and *r* is the radius of the circle.

PROBLEM G	NIHONGO COUNTER

Author: Harith

The Japanese alphabet does not contain letters but, instead, contains characters. All characters are either a single vowel (‘a’, ’e’, ’i’, ’o’, ’u’) or end with vowels, except for ‘n’.



Write a program that reads string of sentences and calculate the number of Japanese characters needed to write each string.

Input

First line should contain an integer indicating the number of strings to be input.

The following line is a string of sentence and each sentence should be separated by a newline.

Output

Output the answer with each result separated by a newline.

Sample Input	Sample Output
3 haro naruto nihon wa suki desuka kono anime wa wanpanman	5 9 12

PROBLEM H	SECURE-ITY

Author: Syaafiq

*Prime Factorization (or integer factorization) is a commonly used mathematical problem often used to secure public-key encryption systems. A common practice is to use very large semi-primes (that is, the result of the multiplication of two prime numbers) as the number securing the encryption. In order to break it, they would have to find the prime factorization of the large semi-prime number – that is, two or more **prime numbers** that multiplied together result in the original number*

*However, **factoring** numbers is a computationally difficult problem. It's easy for smaller numbers, but once you start dealing with very large numbers, it can take computers, days, months, years, even centuries to solve. There is no easy shortcut for factoring numbers – it's a trial and error process. You would have to try all of the primes that are….*

Blablabla… and that's one heck long of explanation, isn't? The one you need to know is, in order to break some of the encryption method on the internet is you **need** to find a prime factor sequence of a number in order to decrypt the encrypted message. So, can you *easily* and *quickly* find the prime factor of a number?

Input

n where $2 < n < 10^5$

Output

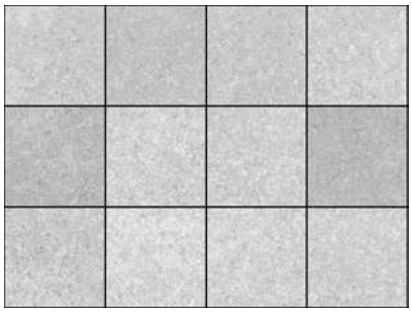
The sequences of prime factors of the input number

Sample Input	Sample Output
9	3×3
3678	$2 \times 3 \times 613$

PROBLEM I	SQUARE CALCULATOR

Author: Harith

Ahmad likes to calculate the number of squares can be created on a tile floor.



Length = 4
Width = 3
Square = [1x1] = 12
[2x2] = 6
[3x3] = 2
= 20 squares

Write a program that calculate the number of squares that can be created in a quadrilateral tiled floor given its length and width.

Input

The first line contains the amount of test case(s).

The following lines contain **the length and width** of the tiled floor separated by a space.

Output

Output the number of squares in each tiled floor.

Each output is separated with a newline.

Sample Input	**Sample Output**
4 1 1 2 2 4 3 6 5	Number of squares are 1 Number of squares are 5 Number of squares are 20 Number of squares are 70

PROBLEM J	TEALIVE

Author: Ikhwan

A new Tealive branch has open near Faculty of Computer and Mathematical Sciences, Shah Alam. Therefore, they have make an opening promotion for their customers. Customer will be given lucky draw to determine the M coupons that they get and in order to use it they required to buy N cups of drink.

A P digit is written on the coupon. $i\text{-}th$ coupon allowed the customer to choose P_i drinks and the least expensive one will be given as free!

However, only one coupon can be use per transaction. If customer use $i\text{-}th$ coupon, customer have to choose P_i drinks and buy them using the coupon, and buy all the remaining $N - Pi$ drinks without any discounts.

Help customer to decide which coupon to use in order to get minimum total amount of ringgit they have to pay if they use one of the coupons optimally.

Input
The first line contain one integer $N(2 \leq N \leq 3.10^5)$ – the number of drinks need to be bought in order to participate in the promotion.

The second line contains N integers, $A_1, A_2, \dots, A_N$ $(2 \leq A_i \leq 10^9)$ where A_i is the cost of $N\text{-}th$ cup of drinks.

The third line contains one integer M $(1 \leq M \leq N - 1)$ - the number of coupons you got from the lucky draw.

The fourth line contains M integers, $P_1, P_2, \dots, P_M$ $(2 \leq P_i \leq N)$ where P_i is the number of drinks you have to choose from N drinks using $i\text{-}th$ coupon so that the least expensive of them will be for free.

Output
Print the minimum amount of money customer have to pay customer buy P_i drinks with $i\text{-}th$ coupon, and all the remaining drinks for each coupons.

Input	Output
7 7 1 3 1 4 10 8 2 3 4	27 30