Problem 1.

"La gusga" dispensers

(Author: Luis Arturo De La Garza Navel)

"La gusga" is a company dedicated to the manufacture of snack dispensers for different brands, and is about to release a new model of dispenser, which keeps them cold to enjoy them better, but does not allow you to see inside to see if there are products available, so they want to add a function so that the customer before entering their money can press the button and display how many products are left in the dispenser or indicate that there is no product available. Your task will be to help the programmers of "La gusga" to implement this function.

Input:
You will receive a number ***n***¸ indicating the quantity of products in the dispenser, in the next line there will be ***n*** products, which are identified by capital letters, separated by blank spaces.
In the next line there will be a number ***q***, indicating the number of queries that will be tested in the dispensers, then in the following ***q*** lines will come a letter indicating the product for which you are asking.

Output:
As output, it should show ***q*** lines, with the message corresponding to the product in the same position. If the product exists, the message must be shown: There are k products of ***i***, otherwise, it must show the message: The product ***i*** is sold out. ***K*** indicates the quantity of existing product, and ***i*** indicates the product in position ***i***.

Input	Output
10 A B C A A E E C D D 2 A F	There are 3 products of A Product F is sold out

Input	Output
15 F F G G A A E A F F J J B K E 5 F G J C I	There are 4 products of F There are 2 products of G There are 2 products of J Product C is sold out Product I is sold out

Problem 2.

The search for toys

(Author: Luis Arturo De La Garza Navel)

Mateo is a child who loves to play all day with his toys, it is always possible to find him in some corner of his house playing with one of his many toys, this is something that his mother does not like very much, because being a very neglected child, has lost several toys, so, his mother has asked him to pick up his toys after playing, or else he will be punished. To remember which toys he has been using during the day, Mateo writes on a sheet of paper in his room the toys he has been playing with, and when he finishes playing he takes all the toys he has found, but he realizes that some are missing, he helps Mateo to know which are the toys he needs.

Input:
In the first line, you will receive a number ***n*** which indicates the number of toys that Matthew took out of his room, in the next line will come the name of the ***n*** toys separated by a ***blank space***. In the next line, you will receive a number ***k*** that indicates the toys that Matthew found, in the next line will come the ***k*** toys found, it is guaranteed that ***k*** is less than ***n***.

Output:
As a way out you must show the missing toys in the same line, the order doesn't matter.

Input	Output
5 ball car aeroplane marble cubes 3 ball cubes car	aeroplane marble

Input	Output
6 car cowboy horse spinner cow tractor 4 car cowboy cow tractor	horse spinner

Problem 3.

Happy numbers

(Author: Luis Arturo De La Garza Navel)

Happy numbers are a very curious group of numbers, which can be obtained in a very simple way:

1. Take any integer
2. Add the squares of your digits
3. If the sum is equal to one, we have a happy number, otherwise step 2 is repeated.

After repeating these steps several times, we can have 2 types of results:

A) Let's get to one, and therefore we have a happy number
B) A number of the sum is repeated and therefore the number is happy.

An example of a happy number is 19:

$$1^2 + 9^2 = 82$$
$$8^2 + 2^2 = 68$$
$$6^2 + 8^2 = 100$$
$$1^2 + 0^2 + 0^2 = 1$$

If you wonder what these numbers are for, then actually, for nothing special, but they are very fun to calculate, so your task will be to determine if a number is happy or not.

Input:
You will receive a unique number to determine if it is a happy number or not.

Output:
You must enter the message "Yes" if the number is happy, otherwise you will print "No".

Input	Output
19	Yes

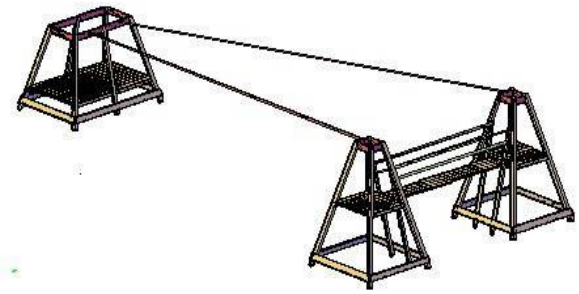
Input	Output
4	No

Problem 4.

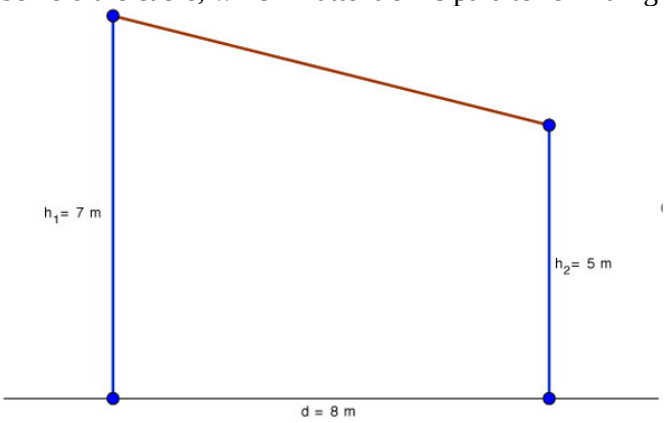
The Tyrolese

(Author: Luis Arturo De La Garza Navel)

An amusement park in the city has decided to install a new attraction in its facilities, it is a zip line, consisting of a cable suspended between supports forming an inclination as in the following image:



The park already knows where it will place the arrival points of its zipline, now it lacks to know the length between the points that will be held the cable, which if attention is paid to form a right triangle.



The park has the difference in height between the posts and the distance between them, now just calculate the distance between the posts (the red line), help them to get that distance to finish the installation as soon as possible.

Input:

As an entry you will receive an n number that will indicate the number of pairs of posts to use in the zip line, followed by n lines, where in each line will come 2 numbers with the difference between the posts and the distance between them.

Output:

As an output you must show the n rope lengths required for the zip line.

Input	Output
4 4.0 4.0 2.0 5.0 5.0 1.0 9.0 2.0	5.657 5.385 5.099 9.22

Problem 5.

Combined cards

(Author: Iván Ramírez Aguayo)

Rex is a very smart kid who loves to play cards and math. When he comes home from school in the afternoon, the first thing he does is to play with his cards. One afternoon, bored of having played all the games he knew deicide create his own card game using the math he loves so much.
He wants to play with his school friends, but they still have a hard time understanding how to play it. The game consists of choosing a random N number of cards, and each participant must say how many different ways the N cards can be placed, the first one to answer correctly wins. Rex discovered that the total number of combinations could be calculated by applying the factorial. Your task is to create a program that allows Rex to do this automatically. For example, if there are 3 cards, the ways to arrange them would be as follows:

1,2,3
1,3,2
2,1,3
2,3,1
3,1,2
3,2,1

In total there are 6 ways to accommodate the three cards.

Input:
The entry consists of several cases, each case contains a line with a single positive integer N. The end of the entry will be when N = 0, in this case the entry should not be processed.

- $1 \leq N \leq 10^6$

Output:
For each test case, print on one line the total number of combinations that can be made with N cards.

Input	Output
3 5 0	6 120

Problem 6.

IPv4 protocol

(Author: Iván Ramírez Aguayo)

IP addresses (IP is an acronym for Internet Protocol) are a unique and unrepeatable number by which a computer connected to a network running the IP protocol is identified.
Internet Protocol version 4 (IPv4) defines an IP address as a 32-bit number, and they are normally written and displayed as annotations that a person can read, consisting of four decimal numbers, each in a range of values from 0 to 255, separated by dots, e.g. 192.168.1.254. Each part represents a group of 8 bits (an octet) of the address. The binary representation of the IP address is the concatenation of each of these bytes. To obtain the binary representation of the IP address 192.168.1.254 you first obtain the binary representation of each byte:

- 192 = 11000000
- 168 = 10101000
- 1 = 00000001
- 254 = 11111110

So the binary representation of 192.168.1.254 is 11000000101010000000000111111110, in this problem your task is to get the binary representation of each byte of the IP address and concatenate them.

Input:
The entry consists of a single line of a string representing the IP address to be converted.

Output:
The output is a single line with a string that is the binary representation of the IP address you were given at the input.

Input	Salida
192.168.1.254	11000000101010000000000111111110
0.0.0.0	00000000000000000000000000000000
255.255.255.0	11111111111111111111111100000000