

Assignment 1

Rules¹:

1. There are 5 problems to complete.
2. All questions require you to read the test data from a input file ("input.txt") and write the output in an output file ("output.txt"). Follow the input/output format for each problem.
3. The allowed programming languages are C, C++, Java and Python.
4. Non-standard libraries cannot be used in your solutions. The Standard Template Library (STL) and C++ string libraries are allowed. The standard Java API is available.
5. Each problem should be finished in less than 10 seconds (If you come up with a good algorithm it should not take even more than 5 sec. Anyways you can try your code on machines in D242).
6. The input to all problems will consist of multiple test cases. (Try your code with as many test cases as you can).
7. For each problem submit just one file with the name of the problem (for example for problem A, your file should be A.cpp or A.py ,...)
8. Put all your source codes in a folder, compress it then submit it to the blackboard.

¹ The header is just added for fun and the sake of copyright (the problems are chosen form previous ICPC contests). Of course this is not a contest! ;)

Problem A

You are helping a political party canvass their members. The party has a list of candidates they wish to support, and they also have a list of members, each of which supports one candidate.

The party wants for you to sort the list of members, according to some rules. You will be given the list of candidates, in the desired order. Then, you'll have access to a list of supporters; each supporter will have one candidate that they support.

The party wants you to put the list of supporters in order, sorted by their preferred candidate. There may be some supporters who support the same candidate. If so, order them in the order that they appear on the original list. Some supporters may have a 'write-in' candidate, thereby mentioning a candidate who was not on the original preferred candidate list. Put these supporters at the end, grouped by candidate, in the order that their *candidates* appear in the list of supporters. There also may be candidates who have no supporters. They will probably be taken off the list later, but that's just the politics of the situation.

Input

There will be several test cases in the input file ("input.txt"). Each test case will begin with a line with two integers, n ($1 \leq n \leq 1,000$) and m ($1 \leq m \leq 100,000$), where n is the number of candidates, and m is the number of supporters. On the following n lines will be the names of the candidates, one per line. These names will each be a single word consisting of from 1 to 30 capital letters. All n listed candidate names in any test case will be unique. After the candidates, the next m lines will describe the supporters, one per line. Each of these lines will contain two words separated with a single space. Each word contains from 1 to 30 capital letters. The first word is the name of the supporter, and the second is the name of the candidate that they support. The input will end with a line with two **0s**

Output

Write the output in a file ("output.txt"). For each test case, print out the names of the supporters, one name per line, in the requested order. Do not output any spaces. Do not separate answers with a blank line.



Sample Input

```
3 5
STEVENS
MICHAELS
JORDAN
BOB JORDAN
JACK STEVENS
MACK MICHAELS
BILL JORDAN
CHRIS MATTHEWS
1 5
FRED
SAM FRED
ARTHUR GEORGE
DANIEL HERBERT
MARK GEORGE
MIKE HERBERT
0 0
```

Sample Output

```
JACK
MACK
BOB
BILL
CHRIS
SAM
ARTHUR
MARK
DANIEL
MIKE
```

Problem B

On the first day of Christmas, my true love gave to me, a partridge in a pear tree.

Great. I wanted an iPad!

On the second day of Christmas, my true love gave to me, two turtle doves, and a partridge in a pear tree.

OK, now I have 4 birds: two turtle doves and a partridge today, and a partridge from yesterday. My cats are going crazy.

On the third day of Christmas, my true love gave to me, three french hens, two turtle doves, and a partridge in a pear tree.

What's with the birds? I now have ten of them, and no place to put them (except inside the cats).

How long can my true love keep this up? Given a number of days of Christmas, figure out the total number of gifts I'm going to receive.

Input

There will be several test cases in the input file ("input.txt"). Each test case will consist of a single integer n ($1 \leq n \leq 1,000,000$), on its own line. The input will end with a line with a single **0**.

Output

Write the output in a file ("output.txt"). For each test case, output a single integer, indicating the number of gifts I'm going to receive, in total. Output no spaces, and do not separate answers with blank lines.

Sample Input	Sample Output
1	1
2	4
3	10
0	

Problem C

Suppose you are tracking some satellites. Each satellite broadcasts a 'Ping' at a regular interval, and the intervals are unique (that is, no two satellites ping at the same interval). You need to know which satellites you can hear from your current position. The problem is that the pings cancel each other out. If an even number of satellites ping at a given time, you won't hear anything, and if an odd number ping at a given time, it sounds like a single ping. All of the satellites ping at time 0, and then each pings regularly at its unique interval.

Given a sequence of pings and non-pings, starting at time 0, which satellites can you determine that you can hear from where you are? The sequence you're given may, or may not, be long enough to include all of the satellites' ping intervals. There may be satellites that ping at time 0, but the sequence isn't long enough for you to hear their next ping. You don't have enough information to report about these satellites. Just report about the ones with an interval short enough to be in the sequence of pings.

Input

There will be several test cases in the input file ("input.txt"). Each test case will consist of a single string on its own line, with from 2 to 1,000 characters. The first character represents time 0, the next represents time 1, and so on. Each character will either be a 0 or a 1, indicating whether or not a ping can be heard at that time (0=No, 1=Yes). Each input is guaranteed to have at least one satellite that can be heard. The input will end with a line with a single 0.

Output

Write the output in a file ("output.txt"). For each test case, output a list of integers on a single line, indicating the intervals of the satellites that you know you can hear. Output the intervals in order from smallest to largest, with a single space between them. Output no extra spaces, and do not separate answers with blank lines.

Sample Input

01000101101000

1001000101001000

0

Sample Output

1 2 3 6 8 10 11 13

3 6 7 12 14 15

Problem D

Tandem Repeats occur in DNA when a pattern of one or more nucleotides is repeated, and the repetitions are directly adjacent to each other. For example, consider the sequence:

ATTCGATTTCGATTTCG

This contains 9 *Tandem Repeats*:

```

ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG
ATTCGATTTCGATTTCG

```

Given a nucleotide sequence, how many Tandem Repeats occur in it?

Input

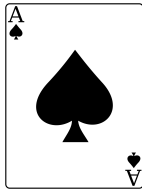
There will be several test cases in the input file ("input.txt"). Each test case will consist of a single string on its own line, with from 1 to 100,000 capital letters, consisting only of A, G, T and C. This represents a nucleotide sequence. The input will end with a line with a single 0.

Output

Write the output in a file ("output.txt"). For each test case, output a single integer on its own line, indicating the number Tandem Repeats in the nucleotide sequence. Output no spaces, and do not separate answers with blank lines.

Sample Input	Sample Output
AGGA	1
AGAG	1
ATTCGATTTCGATTTCG	9
0	

Problem E



The magician shuffles a small pack of cards, holds it face down and performs the following procedure:

1. The top card is moved to the bottom of the pack. The new top card is dealt face up onto the table. It is the Ace of Spades.
2. Two cards are moved one at a time from the top to the bottom. The next card is dealt face up onto the table. It is the Two of Spades.
3. Three cards are moved one at a time . . .
4. This goes on until the n th and last card turns out to be the n of Spades.

This impressive trick works if the magician knows how to arrange the cards beforehand (and knows how to give a false shuffle). Your program has to determine the initial order of the cards for a given number of cards, $1 \leq n \leq 13$.

Input

There will be several test cases in the input file ("input.txt"). Each test case will consist of a single integer on its own line. The input will end with a line with a single 0.

Output

Write the output in a file ("output.txt"). For each test case, output a line with the correct permutation of the values 1 to n , space separated. The first number showing the top card of the pack, etc . . .

Sample Input	Sample Output
4	2 1 4 3
5	3 1 4 5 2
0	