

### **Task3**

Being in charge of the computer department of the Agency of International Espionage, you are asked to write a program that will allow a spy to encode and decode their messages.

You can assume a spy's message is at most 80 characters long, and it includes all the upper and lowercase letters of the alphabet plus the space, and any of the following characters:

! , . : ; ?

The following is an ASCII table of the valid characters in a message:

"A"	65	"a"	97	" "	32
"B"	66	"b"	98	"!"	33
.		.		","	44
.		.		":"	46
.		.		":"	58
"Y"	89	"y"	121	;"	59
"Z"	90	"z"	122	"?"	63

The algorithm that you should use to encode messages is to take the ASCII value of each character in the message, starting with the last character in the message and ending with the first character in the message. You should then add on to the coded message this ASCII value written in reverse order. For example, if the ASCII value is 123, the encoded message should contain the string "321". There should be no spaces separating the numbers in the encoded message.

The input file consists of one or more lines with a normal (not encoded) or encoded message each.

Output file must have the same number of lines with the corresponding encoded message or the decoded one, respectively.

### **Sample Input**

abc  
798999  
Have a Nice Day !

### **Sample Output**

998979  
cba  
332312179862310199501872379231018117927

### **Task4**

The rotating cipher is a secret that goes as follows:

(A)

The message is written using capital letters only, and spaces, all other characters are removed.

Replace all spaces by the period (.)

Replace all double letters with the single letter and the @ character, for example, HELLO would become: HEL@O



☼ Java

- Use of electronic devices or any other unfair means is strictly prohibited and will result in disqualification.
- Communication can only be done with the competition organizers.
- Stationery will be provided.
- Participants cannot leave the room before the competition round ends.
- Tasks once given cannot be exchange either with the invigilator or the students aside.

## Task1

A boolean matrix has the *parity property* when each row and each column has an even sum, i.e. contains an even number of bits which are set. Here's a 4 x 4 matrix which has the parity property:

1 0 1 0  
0 0 0 0  
1 1 1 1  
0 1 0 1

1 0 1 0  
0 0 0 0

The sums of the rows are 2, 0, 4 and 2. The sums of the columns are 2, 2, 2 and 2.

Your job is to write a program that reads in a matrix and checks if it has the parity property. If not, your program should check if the parity property can be established by changing only one bit. If this is not possible either, the matrix should be classified as corrupt.

## Input:

The input file will contain one or more test cases. The first line of each test case contains one integer  $n$  ( $n < 100$ ), representing the size of the matrix. On the next  $n$  lines, there will be  $n$  integers per line. No other integers than 0 and 1 will occur in the matrix. Input will be terminated by a value of 0 for  $n$ .

## Output:

For each matrix in the input file, print one line. If the matrix already has the parity property, print "OK". If the parity property can be established by changing one bit, print "Change bit (i,j)" where  $i$  is the row and  $j$  the column of the bit to be changed. Otherwise, print "Corrupt".

## Sample Input

4  
1 0 1 0  
0 0 0 0  
1 1 1 1





**(B)**

Perform the three instructions from (A) with the keyword or key phrase also.  
 Fill the 4x7 char (see example) with the characters, in order, of the keyword, taking care to ignore all duplicates occurrences of the characters.  
 Fill the rest of the chart with the remaining characters, in order of occurrence in the string:  
 “@ABCDEFGHIJKLMNOPQRSTUVWXYZ.”

**(C)**

Substitute the first letter with the letter you find above the one in the chart. If the letter is in the top row, use the letter in the same column from the bottom row.  
 Substitute the second letter with you find to the left of the chart. If the letter is in the leftmost column, use the letter in the right most column that is in the same row instead.  
 Substitute the third letter with the letter you find below the one in the chart. If the letter is in the bottom row, use the letter in the same column from the top row.  
 Substitute the fourth letter with the letter you find to the right one in the chart. If the letter is in the rightmost column, use the letter in the leftmost column that is in the same row instead.  
 Repeat instructions 1, 2, 3, 4 for each of the next sets of four characters.

**Example:**

The chart below is constructed using the key phrase: MARY HAD A LITTLE LAMB. Notice that the key phrase used up the first 13 letters of the chart; note the double T of LITTLE; and note that repeating letters are dropped, as the letters are entered in the chart:

Let's encode the short message: “Hello John”

Instructions A will prepare the message to say: HEL@O.JOHN

the H is replaced by the X “above” the H in the chart

the E is replaced by the @ “left”

the L is replaced by the F “below”

the @ is replaced by the E “right”

the O is replaced by the B “above”

the . is replaced by the Y “left”

M	A	R	Y	.	H	D
L	I	T	@	E	B	C
F	G	J	K	N	O	P
Q	S	U	V	W	X	Z

the J is replaced by the U “below”

the O is replaced by the P “right”

the H is replaced by the X “above”

the N is replaced by the K “left”

“Hello John” will therefore be in code “X@FEYUPXK”

**Note:**

If one line does not contain a multiple of 4 letters, the rotation carries through to the next line, as in the 3<sup>rd</sup> sample's output.

The above instructions tell you how to **ENCODE** a message. It is your job to **DECODE** a message, given the encoded message and the keyword or key phrase. Note that the keyword or

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key phrase may be in lower case, and may contain spaces and double letters. Print each decoded message separately on a cleared screen or window, and let the user press any key to see the next result.

The sample input contains 3 sets of data. The first line of each set contains the key phrase or word, possibly in lower case. The last line contains three stars (\*\*\*). The lines in between contains the encoded message using the 28 characters of the chart. There are never more than 10 lines in the message, and each line contains 100 characters or less.

## Sample Input:

```
Canada
GZFNWCIN
G.YUNMUCTCH@TAGMDULUECH@
***
thy sons
QQYFVMIHIGEHVKEWOYRTV@WAVNA.V.ETWYKNEFITS
***
true north
KGH@XPXTKGDIXFBBSORNKUCVWHCRTUINSGR.X
OTFPXDJUX@DFXVSFWE
***
```

## Sample Output:

```
O CANADA
OUR HOME AND NATIVE LAND
```

Press any key to continue...

```
TRUE PATRIOT LOVE IN ALL THY SONS COMMAND
```

Press nay key to continue...

```
WITH GLOWING HEARTS WE SEE THEE RISE
FROM FAR AND WIDE
```

## Task5

Administration of GCU has decided to cut charges from its employee's salaries. The VC of GCU orders a Software House to make software which should keep records of phone calls. And in the end of every month employees will receive their telephone bill at the rate of Rs.5 after every 5 minute call. The Software House bought a device to attach with the main telephone exchange. The device keeps record of incoming and outgoing calls for every extension. There are only 10 extensions in GCU from 0 to 9. 0 is extension of receptionist. Device saves data in following format;

