The Problem

One method of encoding messages is known as the "expanding square code". This method encodes a message by placing the character of the message in an odd order square matrix row by row, and then retrieving them in a clockwise expanding square spiral from the center of the matrix. If the message is not exactly the right length to fill the matrix, the rest of the matrix is filled with asterisk characters (*). For example, the two square matrices below show the order in which the characters are placed in the matrix, and the order in which they are retrieved. Notice that the order of retrieval begins at the center, then proceed to the right, and then spirals clockwise.

Order In
1  2  3  4  5
6  7  8  9  10
11 12 13 14 15
16 17 18 19 20
21 22 23 24 25

Order Out
21 22 23 24 25
20  7  8  9 10
19  6  1  2 11
18  5  4  3 12
17 16 15 14 13

Message In: "This is a test message!!"
Message Out: "stssees a a*!egmtiThis "

Your program must be able both to encode and to decode messages by this method.

Input

The input will consist of pairs of lines. The first line in each pair will contain either the word ENCODE or the word DECODE in upper case characters beginning in column 1. The second line in each pair will consist of a message to be encoded or decoded, containing a maximum of 72 characters. From the length of the message, you should determine the minimum odd order required for the matrix, and perform the specified operation. You may assume the no actual message ends with an asterisk. Your program should continue reading input lines and performing operations until an operation other than ENCODE or DECODE is encountered.
Output

The output for each operation will consist of one blank line, the given message on a line, and the resultant message on a line. Each message should be on a separate line, and each should be appropriately labeled. A decoded message may not contain the asterisk characters used to fill the matrix in the encoded process.

Sample input

ENCODE
This is a test message!!
DECODE
besal  is ss*!revceming tett *******e hamProgram
END

Corresponding output

DECODED: This is a test message!!
ENCODED: stsseses a  a*!!egmitiThis

DECODED: Programming team is the best class ever!
ENCODED: besal  is ss*!revceming tett *******e hamProgram