Do you like music? Let's play a game. I wrote down some notes on a piece of staff paper, then erase every other thing and leave only the notes. Can you guess what I wrote?
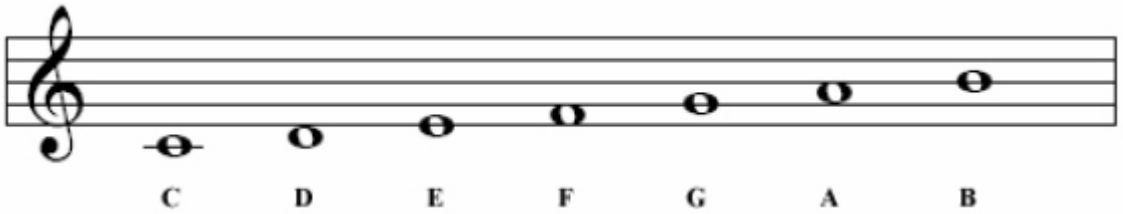

Fig 1. Names of Notes

If you're not familiar with music, take a look at the picture above. The vertical position of a note determines its name, which is one of C, D, E, F, G, A and B, in this problem (yes, you don't have to consider notes in other octaves). Consecutive lines in the staff have the same vertical distances. We call it one standard distance (sd), which is always between 1.0 and 5.0. For example, C and E are 1sd apart, and D and B are 2.5sd. The horizontal order of the notes determines how the sequence is played (or sung). The exact horizontal positions do not matter, as long as the relative order is preserved. But since I never write down ugly scores, you can safely assume that the horizontal distance of an arbitrary pair of neighboring notes is at least 1sd and at most 5sd.

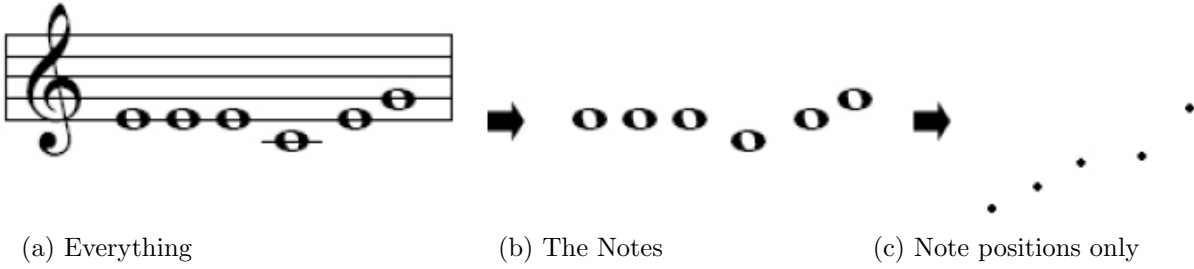(a) Everything   (b) The Notes   (c) Note positions only

Fig 2. Transforming the original score into a hidden form

Figure 2(a) corresponds to the sequence EEECEG. Figure 2(b) shows the notes when other stuffs have been erased. Then, I rotate the paper and tell you the positions of the notes, shown in figure 2(c).

Write a program to find my original music score, given the rotated positions of the notes. To make your life a little bit easier, I can tell you the name of the first and last note, and I promise that the answer could be uniquely determined. The rotation angle is an integer between -60 and 60 degrees (inclusive).

Input

The input consists of several test cases. The first line of each case contains one integer n ($3 \leq n \leq 20$) and two different capital letters from 'A' to 'G', in the order of "first note, last note". This is followed by n lines each containing two real numbers to eight decimal places, the rotated positions of each note. The notes can appear in any order. All the real numbers have absolute values not greater than 1000. The last test case is followed by a single zero, which should not be processed.

Output

For each test case, print the case number and recognized hidden score. The test cases are carefully designed such that floating error does not cause any problem.

Sample Input

```
6 E G
0.00000000  1.00000000
1.00000000  1.00000000
2.00000000  1.00000000
4.00000000  0.00000000
5.00000000  1.00000000
8.00000000  2.00000000
4 A C
0.00000000  15.62499286
11.28111236  5.80618831
20.63744497  6.54957842
37.94846083  0.00000000
7 B F
0.00000000  0.00000000
15.14798698  18.22443643
25.04608611  30.65582149
19.58478851  24.56084570
23.09216832  27.86533768
11.29672536  9.31513384
8.65999632  3.84492903
0
```

Sample Output

```
Case 1: EEECEG
Case 2: ADEC
Case 3: BDEGGFF
```