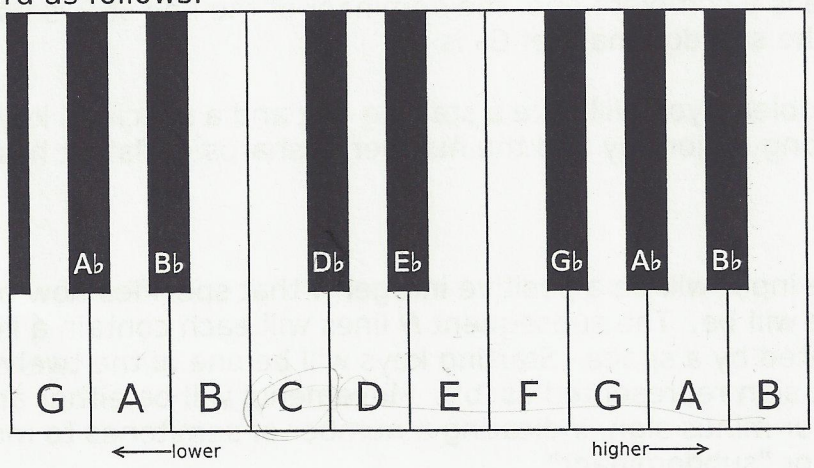
Longwood Invitational (Fall 2011)

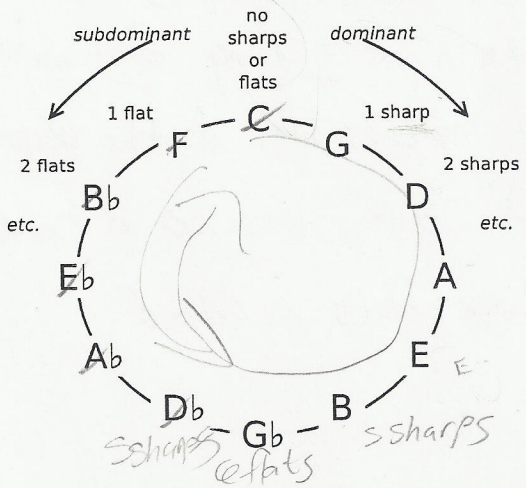
Problem 6: Circular Music (Contributed by Don Blaheta, Longwood University)

In western music theory, all musical notes are associated with a label. Some of the labels are just a single letter between A and G, while others are labeled with a letter and a flat sign ♭. Note that there is no C♭ or F♭; as a result, although there are seven letters used, there are only twelve notes in the scale. The twelve notes are laid out in order on a keyboard as follows:



The scale repeats after every twelve notes as shown in the diagram. Pairs of adjacent notes are always considered one semitone apart, so that C is one semitone above B, and E♭ is one semitone below E; but A is two semitones above G (because A♭ is between them).

Each of the twelve notes is associated with a major "key" or "key signature" that is based on that note. The key signature has some number of sharps or flats (never both), and the keys can be arranged in a circle according to how many sharps or flats each has:



Keys that are adjacent on the circle are named after notes that are seven semitones apart. The key of C, at the top of the circle, has no sharps or flats, and seven semitones above C is G, whose key has one sharp. Up another seven semitones is D with two sharps, and so on up to the key of B, with five sharps. In the other direction, seven semitones down from C is F with one flat, then B♭ with two flats, and so on to G♭, with six flats.

A composer that wishes to change from one major key to another will generally try one of three things:

- move the key note up or down some number of semitones
- change to the current key's dominant, one element clockwise in the circle
- change to the current key's sub-dominant, one element counterclockwise

The circle is a complete one: the dominant of the key of B is its clockwise neighbor G♭, and the sub-dominant of G♭ is B.

In this problem, you will take a starting key and a specified key change type and give the resulting major key and the number of sharps or flats it has.

Input

The first line of the input will be a positive integer *N* that specifies how many further lines of input there will be. The subsequent *N* lines will each contain a key and a movement, separated by a space. Starting keys will be one of the twelve note names given, with the flat sign represented as 'b'). Movements will be either an integer prefixed by a plus or minus sign, indicating a number of semitones to move, or else the words "dominant" or "subdominant".

Output

Each line of output will contain the name of the key resulting from the key change, followed by a colon, a space, and the number of sharps or flats. See the sample output for exact formatting details.

Example

Input:

```
4
D -2
Eb +1
C dominant
F subdominant
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Output:

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C: no sharps or flats
E: 4 sharps
G: 1 sharp
Bb: 2 flats
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