

2. Broken Piano (klaver)

0.5 sec / 3 sec

30 points

MIDI (Musical Instrument Digital Interface) is a technical standard for describing musical pieces, where each note is represented by an integer from the range $0 \dots 1023$. You have a piano with 1024 keys and you want to play a piece given in the MIDI format. The leftmost key on the piano corresponds to MIDI code 0, the second key from the left to MIDI code 1, etc.

Unfortunately, the piano is very old and some keys are broken. You are familiar with the piano, and know, which keys work and which don't. You can assume that no working key will break during the playing of this one piece, and also no broken key will suddenly start working.

Write a program to find

- the number of notes in the piece that cannot be played on the piano; and
- the minimal transposition needed to play the piece on the piano.

Transposition means shifting all the notes in a piece up or down by the same amount. When transposing the piece up by a half-tone, instead of any key designated by the original piece, its right-hand neighbor will be played on the piano. Similarly, when transposing down by a half-tone, the left-hand neighbor of the original key will be played. When transposing by two half-tones, the next but one key will be played, etc. Note that when a piece is transposed up by a half-tone, the note with the MIDI code 1023 cannot be played, because there is no corresponding key on the piano.

Input. The first line contains N , the number of broken keys on the piano ($1 \leq N \leq 1024$). The second line contains N distinct integers A_i ($0 \leq A_i \leq 1023$): the MIDI codes of the broken keys. The third line contains M , the number of notes in the piece ($1 \leq M \leq 10^6$). The fourth line contains M integers B_i ($0 \leq B_i \leq 1023$): the MIDI codes of the notes in the piece.

Output. Output two lines. The first line should contain a single integer, the number of notes in the piece that cannot be played on the piano. The second line should contain the number of half-tones by which the piece must be transposed so that it can be played on the piano. If the piece could be transposed in several ways, output the transposition with the minimal absolute value. If the piece cannot be played with any transposition, the second line should contain 'X'. If your solution does not find the transposition amount, output 'E' on the second line.

Example.	Input	Output
	2	3
	7 8	-2
	6	
	4 5 6 7 8 7	

Two keys are broken on the piano. The corresponding notes appear three times in the piece. To play the piece, we need to transpose it down by two half-tones. This means that we play the second key from the left as the first note of the piece.

Example.	Input	Output
	2	4
	0 1023	X
	4	
	0 1023 1023 1023	

Grading. In this task, the first line of the output gives 1/3 and the second line gives 2/3 of the points. Additionally, tests are divided into groups. For each group, only those solutions get points that solve correctly all the tests in the group. In the test groups, the following additional conditions hold:

1. (15 points) $M \leq 1\,000$ and all pieces can be played and do not need to be transposed by more than two half-tones.
2. (15 points) No additional conditions.