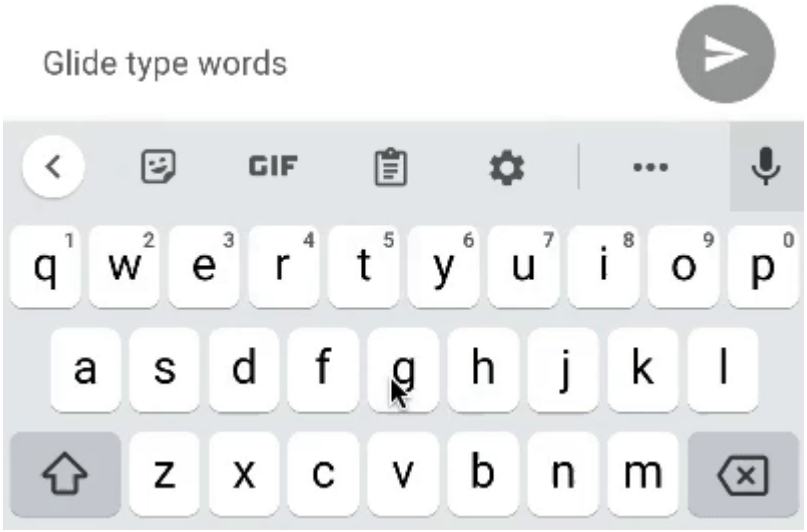
Kick Start 2022 - Round D

Touchbar Typing

Problem

Glide Typing task in Crowdsource app uses a new Google keyboard to type a word by sliding a finger across keys without lifting the finger, as shown in the animation below.



To make the Glide Typing task more challenging, instead of a normal keyboard, we have a special linear keyboard $\mathbf{K}$ that has all the keys in one row.

Imagine that you want to type a word $\mathbf{S}$ that is $\mathbf{N}$ characters long. The linear keyboard $\mathbf{K}$ has $\mathbf{M}$ keys. It is guaranteed that the keys cover all characters in $\mathbf{S}$. However, some of the keys may be duplicates. In other words, for each character in $\mathbf{S}$, there is one or more keys in $\mathbf{K}$ mapped to the character. Note that, all characters and keys are represented as integers.

You may start with your finger on any key. It takes 1 second to move your finger from a key to an adjacent key. Due to Glide Typing, there is no *pressing* a key. If the finger is currently at the key i which has character $\mathbf{K_i}$, and we want to type the character $\mathbf{K_j}$ at index j, we will glide the finger from the key i to the key j, which takes $|j - i|$ seconds. If your finger is at key x, you can type character $\mathbf{K_x}$ any number of times instantly. You need to type string $\mathbf{S}$ character by character. Formally, you need to type $\mathbf{S_i}$ before $\mathbf{S_{i+1}}$ for each $1 \leq i \leq \mathbf{N} - 1$.

For example, suppose the word $\mathbf{S}$ has characters: `1`, `2`, `2`, `3`, `4`. You can start by keeping your finger on key with character `1` on the keyboard which is at index i. Then you glide your finger to key which has character `2` which is at index j. It would take $|j - i|$ seconds. In order to type character `2` two times in string $\mathbf{S}$, you can do that in no additional time as $|j - j| = 0$ seconds. Then you can continue to glide your finger to type the other characters in the word $\mathbf{S}$ sequentially.

Can you calculate the minimal time needed to type the word?

Input

The first line of the input gives the number of test cases, $\mathbf{T}$. $\mathbf{T}$ test cases follow.

The first line of each test case contains one integer $\mathbf{N}$: the length of the word $\mathbf{S}$.
The second line of each test case contains $\mathbf{N}$ integers: each $\mathbf{S_i}$ is the character at the i-th index.
The third line of each test case contains one integer $\mathbf{M}$: the length of the keyboard $\mathbf{K}$.
The fourth line of each test case contains $\mathbf{M}$ integers: each $\mathbf{K_i}$ is the character at the i-th key.

Output

For each test case, output one line containing the minimal time needed to type the word. `Case #`x`:` y, where x is the test case number (starting from 1) and y is the minimal time needed to type $\mathbf{S}$ on the keyboard $\mathbf{K}$.

Limits

Memory limit: 1 GB.
$1 \leq \mathbf{T} \leq 100$.
All characters in $\mathbf{S}$ appears at least once in $\mathbf{K}$.
$1 \leq \mathbf{K_i} \leq 2500$.
$1 \leq \mathbf{S_i} \leq 2500$.

Test Set 1

Time limit: 20 seconds.
$1 \leq \mathbf{N} \leq 100$.
$1 \leq \mathbf{M} \leq 100$.
It is guaranteed that there are no duplicated keys in keyboard $\mathbf{K}$.

Test Set 2

Time limit: 20 seconds.
$1 \leq \mathbf{N} \leq 100$.
$1 \leq \mathbf{M} \leq 100$.

Test Set 3

Time limit: 40 seconds.
$1 \leq \mathbf{N} \leq 2500$.
$1 \leq \mathbf{M} \leq 2500$.

Sample

Note: there are additional samples that are not run on submissions down below.

Sample Input

```
2
5
1 2 3 2 1
3
1 2 3
3
1 1 1
```

Sample Output

```
Case #1: 4
Case #2: 0
```

```
2
2 1
```

In Sample Case #1, we can take the following steps to type string $\mathbf{S}$ in minimum time.

- Start by keeping your finger on key $\mathbf{K_1}$ which has character `1`. We have now typed the first character of the string $\mathbf{S}$.
- In order to type the second character `2` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_2}$. it takes $|2-1| = 1$ additional second to glide the finger from index 1 to index 2.
- In order to type the third character `3` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_3}$. it takes $|3-2| = 1$ additional second to glide the finger from index 2 to index 3.
- In order to type the fourth character `2` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_2}$. it takes $|2-3| = 1$ additional second to glide the finger from index 3 to index 2.
- In order to type the fifth character `1` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_1}$. it takes $|1-2| = 1$ additional second to glide the finger from index 2 to index 1.
- We have typed all characters of the string $\mathbf{S}$ in a total of 4 seconds.

In Sample Case #2, we can take the following steps to type string $\mathbf{S}$ in minimum time.

- Start by keeping your finger on key $\mathbf{K_2}$ which has character `1`. We have now typed the first character of the string $\mathbf{S}$.
- As our finger is on key $\mathbf{K_2}$, we can type the character `1` any number of times, without any additional time. Hence, we can type the second and third characters of the string $\mathbf{S}$.
- We have typed all characters of the string $\mathbf{S}$ in a total of 0 seconds.

Additional Sample - Test Set 2

The following additional sample fits the limits of Test Set 2. It will not be run against your submitted solutions.

Sample Input

```
2
4
2 1 4 1
8
4 1 5 2 1 3 5 4
3
1 2 3
8
2 3 5 1 4 6 7 2
```

Sample Output

```
Case #1: 4
Case #2: 4
```

In Additional Sample Case #1, we can take the following steps to type string $\mathbf{S}$ in minimum time.

- Start by keeping your finger on key $\mathbf{K_4}$ which has character `2`. We have now typed the first character of the string $\mathbf{S}$.
- In order to type the second character `1` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_2}$. it takes $|2-4| = 2$ additional seconds to glide the finger from index 4 to index 2.
- In order to type the third character `4` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_1}$. it takes $|1-2| = 1$ additional second to glide the finger from index 2 to index 1.
- In order to type the fourth character `1` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_2}$. it takes $|2-1| = 1$ additional second to glide the finger from index 1 to index 2.

- We have typed all characters of the string $\mathbf{S}$ in a total of 4 seconds.

In Additional Sample Case #2, we can take the following steps to type string $\mathbf{S}$ in minimum time.

- Start by keeping your finger on key $\mathbf{K_4}$ which has character `1`. We have now typed the first character of the string $\mathbf{S}$.
- In order to type the second character `2` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_1}$. it takes $|1 - 4| = 3$ additional seconds to glide the finger from index 4 to index 1.
- In order to type the third character `3` of the string $\mathbf{S}$, glide your finger to key $\mathbf{K_2}$. it takes $|2 - 1| = 1$ additional second to glide the finger from index 1 to index 2.
- We have typed all characters of the string $\mathbf{S}$ in a total of 4 seconds.