Code Jam 2020 - Round 1A

Pattern Matching

Problem

Many terminals use asterisks (`*`) to signify "any string", including the empty string. For example, when listing files matching `BASH*`, a terminal may list `BASH`, `BASHER` and `BASHFUL`. For `*FUL`, it may list `BEAUTIFUL`, `AWFUL` and `BASHFUL`. When listing `B*L`, `BASHFUL`, `BEAUTIFUL` and `BULL` may be listed.

In this problem, formally, a *pattern* is a string consisting of only uppercase English letters and asterisks (`*`), and a *name* is a string consisting of only uppercase English letters. A pattern *p* matches a name *m* if there is a way of replacing every asterisk in *p* with a (possibly empty) string to obtain *m*. Notice that each asterisk may be replaced by a different string.

Given **N** patterns, can you find a single name of at most 10^4 letters that matches all those patterns at once, or report that it cannot be done?

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case starts with a line with a single integer **N**: the number of patterns to simultaneously match. Then, **N** lines follow, each one containing a single string $\mathbf{P_i}$ representing the i-th pattern.

Output

For each test case, output one line containing `Case #x: y`, where `x` is the test case number (starting from 1) and `y` is any name containing at most 10^4 letters such that each $\mathbf{P_i}$ matches `y` according to the definition above, or `*` (i.e., just an asterisk) if there is no such name.

Limits

Time limit: 20 seconds per test set.
Memory limit: 1GB.
$1 \le \mathbf{T} \le 100$.
$2 \le \mathbf{N} \le 50$.
$2 \le$ length of $\mathbf{P_i} \le 100$, for all i.
Each character of $\mathbf{P_i}$ is either an uppercase English letter or an asterisk (`*`), for all i.
At least one character of $\mathbf{P_i}$ is an uppercase English letter, for all i.

Test set 1 (Visible Verdict)

Exactly one character of $\mathbf{P_i}$ is an asterisk (`*`), for all i.
The leftmost character of $\mathbf{P_i}$ is the only asterisk (`*`), for all i.

Test set 2 (Visible Verdict)

Exactly one character of $\mathbf{P_i}$ is an asterisk (`*`), for all i.

Test set 3 (Visible Verdict)

At least one character of $\mathbf{P_i}$ is an asterisk (`*`), for all i.

Sample

Sample Input	Sample Output
2 5 *CONUTS *COCONUTS *OCONUTS *CONUTS *S 2 *XZ *XYZ	Case #1: COCONUTS Case #2: *

In Sample Case #1, there are other possible answers, including `COCOCONUTS` and `ILIKECOCONUTS`. Neither `COCONUTSAREGREAT` nor `COCOANUTS` would be acceptable. Notice that the same pattern may appear more than once within a test case.

In Sample Case #2, there is no acceptable name, so the answer is `*`.

The following cases could not appear in Test Set 1, but could appear in Test Set 2 or Test Set 3:

```
4
H*O
HELLO*
*HELLO
HE*
```

`HELLO` and `HELLOGOODBYEHELLO` are examples of acceptable answers. `OTHELLO` and `HELLOO` would not be acceptable.

```
2
CO*DE
J*AM
```

There is no name that matches both patterns, so the answer would be `*`.

```
2
CODE*
*JAM
```

`CODEJAM` is one example of an acceptable answer.

The following cases could not appear in Test Set 1 or Test Set 2, but could appear in Test Set 3:

```
2
A*C*E
*B*D*
```

`ABCDE` and `ABUNDANCE` are among the possible acceptable answers, but `BOLDFACE` is not.

```
2
A*C*E
*B*D
```

There is no name that matches both patterns, so the answer would be `*`.

```
2
**Q**
*A*
```

`QUAIL` and `AQ` are among the possible acceptable answers here.