

335 Processing MX Records

Mapping symbolic machine names, like `bigone.stateu.edu`, to the corresponding Internet network address (like `24.99.100.33`) is a major function of the Domain Naming System, or DNS. The pieces of a machine's symbolic name, separated by periods, correspond to nodes in a tree when the name is read right to left. The pieces corresponding to internal nodes in the tree correspond to domains. The `edu` domain, for example, is the node under which we find all college and university machines in the United States. All machines in Canada are found under the `ca` domain.

By providing one or more MX records (lines of text in a particular file), a system manager can arrange for DNS to route mail bound for one machine to another instead. Rerouting is appropriate in many cases, but one frequent use is to create addresses for fictitious machines with meaningful names. For example, it might be nice to allow mail to be addressed to `info.stateu.edu`, but not have a specific machine named `info` on the `stateu` campus. The mail could be redirected to `bigone.stateu.edu` by using an appropriate MX record. In this problem we'll deal with processing a simplified form of MX records.

An MX record has three fields, or sequences of non-blank characters. These fields are separated by one or more blanks. The first field, if present, always begins in the first column on a line. If the first field is not present, then it is assumed to be the same as the first field from the preceding line (or the one assumed for that line if it didn't have one). The first and third fields are symbolic machine names, and will contain no more than 36 characters. The second field is a non-negative integer specifying a preference. Let's look at an example.

```
info.stateu.edu      0      bigone.stateu.edu
                    10     tiny.stateu.edu
```

The first line says that all mail destined for `info.stateu.edu` should be delivered to `bigone.stateu.edu`. The preference in this MX record is 0, versus 10 for the second MX record. If `bigone.stateu.edu` is down, then mail for `info` would instead be redirected to `tiny`. Smaller numbers indicate higher preference, and MX records need not be given in order of increasing preference.

Wildcard MX records allow redirection of mail to many machines with a single MX record. For example,

```
*.citycc.midville.edu  0      tiny.stateu.edu
```

would redirect mail to any machine whose name has the symbolic suffix `.citycc.midville.edu` to the machine `tiny` on the `stateu` campus. For simplicity, we will assume that the asterisk (*) representing a wildcard record will appear only in the first part of a wildcarded symbolic name, and that no more than three periods will occur in any symbolic name.

Input and Output

What you will do in this problem is record MX records, process commands that indicate when machines go up or down, and process requests to determine how to redirect mail based on the recorded MX records. The input begins with a line containing an integer N , following by N lines, each of which contain an MX record that is to be read and recorded. (There is no explicit limit on the value of N .) The remaining lines of input (after the N MX records) will each begin with the letter `U`, `D`, `A`, or `X` in column 1. Following a `U` or `D` will be one or more blanks and a machine name. `D` means the machine is now down (not operational), while `U` means it is now up. All machines are initially assumed to be up at the beginning

of the input. An **A** in column 1 will be followed by one or more spaces and a symbolic machine name. That machine name is to be processed (at the time the line is read) using the recorded MX records and the up/down status of machines to determine how mail to that machine should be directed. Of course some machines may not have their mail redirected, so be prepared to handle these cases.

Output for these **A** lines is as shown in the samples. Note the output style for machines which have no redirection indicated (that is, there are no applicable MX records). The end of input is indicated by a line containing **X** in column 1.

Notes

1. No input line will contain more than 80 characters.
2. MX records are not to be processed recursively. Thus if mail to **first.com** is being redirected to **second.com** by one MX record, any additional MX records that might redirect mail from **second.com** to another machine are not examined during the processing of **first.com**.

Sample Input

```
5
service.stateu.edu    10  tiny.stateu.edu
info.stateu.edu 0      bigone.stateu.edu
                        10      tiny.stateu.edu
service.stateu.edu    5      bigone.stateu.edu
*.smallu.edu    10      service.stateu.edu
A    alpha.cs.smallu.edu
A    info.stateu.edu
D    bigone.stateu.edu
A    info.stateu.edu
A    nowhere.com
X
```

Sample Output

```
alpha.cs.smallu.edu => service.stateu.edu
info.stateu.edu => bigone.stateu.edu
info.stateu.edu => tiny.stateu.edu
nowhere.com =>
```