

6214 The Perks of Planning Ahead

Having just downloaded the latest multi-player RPG, “*SkyFall ExThe Creed of the Guild*,” a group of gamers are trying to plan how to maximize their character development over the course of the game.

Game characters advance by acquiring “perks.” One perk is earned for every three levels the character earns, and the maximum number of levels is capped, so only a limited number of perks can be acquired. By reading the manual and early reviews of the game, the players have come up with a score for how desirable they believe each perk will be in the final stages of the game.

However, players can’t simply grab the most valuable perks. The more advanced perks can only be taken if a game character qualifies by way of having earlier chosen certain prerequisite perks. For example, the perk “Sharpshooter 2” can only be taken after having selected “Sharpshooter 1,” and the perk “Master Trader” can only be selected if the character already has “Merchant 2” and “Diplomat 1.” Your team is to write a program to select the most valuable set of perks that can be acquired in the game world.

Input

Input will contain multiple data sets. Each data set begins with a line containing a positive integer P , the maximum number of perks that a player can acquire. A zero value for this indicates the end of the input.

The second line of the data set contains from one to twenty-six integers in the range 1..100 separated by one or more spaces, giving the estimated value of the perks. Perks are identified by single upper-case alphabetic characters. The first integer in this line is the value of perk A, the second is the value of perk B, and so on.

This is followed by zero to twenty-six lines identifying the requirements for taking a perk. Each line will contain two or more uppercase alphabetic characters, separated by one or more spaces. The first character indicates the perk being described. The remaining characters indicate perks that must already belong to the character before this perk can be taken. For example, the line

```
B A C
```

would specify that perk B can be taken only if a character already has both perk A and perk C. Perks will not have mutual prerequisites: in this example, neither perk A nor perk C will require perk B. The end of the series of requirements, and of the data set, is indicated by a line containing only a period.

Output

For each data set, your program is to print a single line containing the identifiers of the perks making up the most valuable attainable set. These are to be printed in ascending alphabetical order with no leading, intervening, or trailing whitespace.

If there is a tie among multiple sets for most value, print the one whose output line would come earliest in an alphabetical ordering.

Sample Input

```
3
10 10 90 30 75 30
B A
```

```
C B
E D A
F D E
.
2
100 45 60 50 5
A C D
D C
B E
.
0
```

Sample Output

```
ADE
CD
```