

J6 – Spaces, the Final Frontier

Pick-Hard, the commanding officer of the starship Venture, is also a skilled xenoarchaeologist. On his few vacations, he can generally be found on some obscure planet digging up artifacts from long dead civilizations. On his last expedition, he found a series of inscriptions in the ancient language of Zagziggian. A strange feature of Zagziggian writing is that it doesn't use spaces between words. Consequently, deciphering it is generally quite difficult, as one can never be sure when one word ends and the next word begins. This makes division of an inscription into its component words a difficult problem, because there can be a very large number of possible divisions.

Fortunately, the ever helpful Commander Theta has successfully reactivated the Zagziggian Codex, an artifact that, given an inscription, assigns a numerical value to a set of Zagziggian words. After studying these word-value pairs, Captain Pick-Hard hypothesizes that the score of a division is the sum of the values of its component words. And furthermore, inscriptions are written in such a way that the correct division is the one with the highest score. Note that the same word may occur multiple times in an inscription, and each occurrence contributes to the score. So if the word *ra* has a score of 5, and shows up 3 times, that counts as $5 \cdot 3 = 15$. The captain wants a program that will find the highest scoring division of each inscription. Helping the captain is a step towards the UCF Programming Team and all the glory that goes with it, so let's help the captain.

Input:

The first input line contains a description of an inscription and the associated Codex. The description is a single string S ($1 \leq |S| \leq 1000$), which is guaranteed to contain only lowercase letters with no spaces. The next input line contains an integer c ($1 \leq c \leq 1000$), indicating the number of word-value pairs generated by the Codex for this inscription. This is followed by c lines, each of which contains a word w (all lowercase letters and $1 \leq |w| \leq 1000$) and its value v ($1 \leq v \leq 1000$), separated by a single space.

Output:

The first output line should contain the highest possible score for dividing the given inscription. On the next line, you should print the highest scoring division by inserting spaces into the inscription string at the appropriate spots. You may assume that at least one valid division always exists. In case there are multiple possible divisions with the highest score, choose the one where the first differing space is placed earlier in the string. (A differing space is one that is not present in both divisions.)

Input and output samples:

| | |
|---|--------------------------------|
| Input: helloworld 7 he 5 hello 9 llo 2 lo 3 wo 6 wor 4 world 8 | Output: 17 hello world |
| Input: atatata 5 a 7 at 3 ta 6 t 4 att 5 | Output: 40 a t a t a t a |