**A. Problem Description**

In this problem, you are given a list of characters with their frequencies (at most 100007). You have to find all the Huffman codes for the given characters. In case of having more than one characters with same length of codes, lower ASCII valued character should be assigned the lexicographically lower binary string.

**Input**

The first line of input contains one integer N (2 <= N <= 62) indicating the number of alphanumeric characters. Each of the next lines will contain a character as well the frequency of the character.

**Output**

Print the corresponding Huffman codes for each of the characters in different line as sample output. Characters should be sorted in ascending order.

|  |  |
| --- | --- |
| Sample Input | Sample Output |
| 4  A 5  B 1  C 6  D 3 | A 11  B 100  C 0  D 101 |

**B. Problem Description**

In this problem, you are given a paragraph of alphanumeric characters. The paragraph can contain spaces too. You need to find the minimum number of bits to compress the paragraph using Huffman codes.

**Input**

Input file will contain a paragraph with the maximum size of 10000009 characters.

**Output**

Print the number of bits needed to compress the paragraph using Huffman codes.

|  |  |
| --- | --- |
| Sample Input | Sample Output |
| 14  I should do it | 45 |
| 70  This is csedu where we cant answer all the questions and get A easily | 272 |

**C. Problem Description**

In this problem, you will be given some information of the relationship among some people. You need to answer some queries about their direct/indirect relationship considering the given information.

There will be two types of queries:

* JOIN X Y: It means X and Y are directly related with some relations. You have to update their relation.
* FIND X Y: It means you have to find any direct/indirect relationship between X and Y.

**Input**

First line will consist two integers N (1 <= N <= 100003) and M (1 <= M <= 100003) indicating number of persons and the number of the queries.

Each of the next M lines will consists one of the queries as described above.

Note that the person index starts with 0.

**Output**

Print a single line for each “FIND” queries either Yes or No.

|  |  |
| --- | --- |
| Sample Input | Sample Output |
| 5 5  JOIN 0 2  JOIN 4 2  FIND 0 4  JOIN 3 1  FIND 1 0 | Yes  No |