

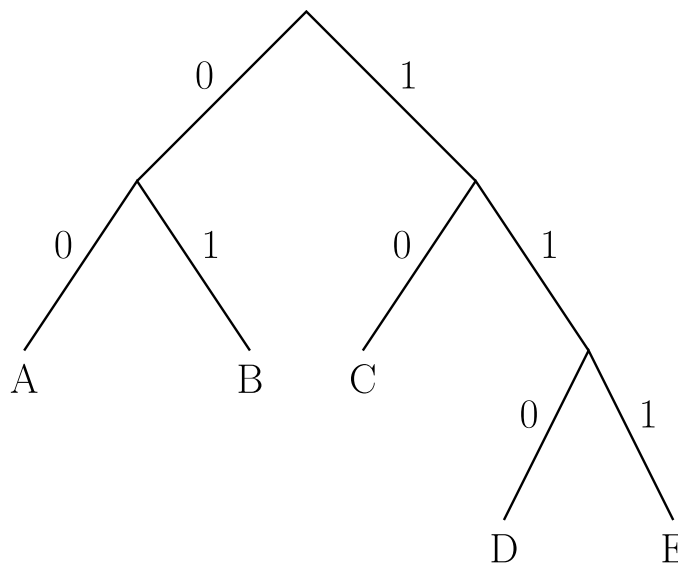
# CCC '10 S2 - Huffman Encoding

## Canadian Computing Competition: 2010 Stage 1, Senior #2

There is an ingenious text-compression algorithm called *Huffman coding*, designed by David Huffman in 1952.

The basic idea is that each character is associated with a binary sequence (i.e., a sequence of 0s and 1s). These binary sequences satisfy the *prefix-free property*: a binary sequence for one character is never a prefix of another character's binary sequence.

It is worth noting that to construct a prefix-free binary sequence, simply put the characters as the leaves of a binary tree, and label the "left" edge as 0 and the "right" edge as 1. The path from the root to a leaf node forms the code for the character at that leaf node. For example, the following binary tree constructs a prefix-free binary sequence for the characters  $\{A, B, C, D, E\}$ :



That is, A is encoded as 00, B is encoded as 01, C is encoded as 10, D is encoded as 110 and E is encoded as 111.

The benefit of a set of codes having the prefix-free property is that any sequence of these codes can be uniquely decoded into the original characters.

Your task is to read a Huffman code (i.e., a set of characters and associated binary sequences) along with a binary sequence, and decode the binary sequence to its character representation.

## Input Specification

The first line of input will be an integer  $k$  ( $1 \leq k \leq 20$ ), representing the number of characters and associated codes. The next  $k$  lines each contain a single character, followed by a space, followed by the binary sequence (of length at most 10) representing the associated code of that character. You may assume that the character is an alphabet character (i.e.,  $a \dots z$  and  $A \dots Z$ ). You may assume that the sequence of binary codes has the prefix-free property. On the  $k + 2$ nd line is the binary sequence which is to be

decoded. You may assume the binary sequence contains codes associated with the given characters, and that the  $k + 2$ nd line contains no more than 250 binary digits.

## Output Specification

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On one line, output the characters that correspond to the given binary sequence.

## Sample Input

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5
A 00
B 01
C 10
D 110
E 111
00000101111
```

## Output for Sample Input

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AABBE
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