

Purpose : STL, Learn Proper Documentation and Commenting

Due : Parts due Jan 18<sup>th</sup>, Jan 25<sup>th</sup> and Feb 1<sup>st</sup>

The BCS committee is in trouble. Since the Associated Press dropped their participation and the coaches' poll has been shown to be biased, they are looking for a new type of poll. To guarantee they are unbiased, they are asking the people whose livelihood depends on knowing which team is better; the bookies. They are planning having the nations bookies rank the top six teams. The problem is that if different people rank the teams differently they do not know which ranking to use. So they have asked you the Unbiased Mathematical Decision, Inc. (UMD) to help them out by writing a computer program to find the "best" ranking.

You plan to publish the median ranking from among all possible rankings. The median ranking is computed as follows: Given any two rankings, for instance **ACDBEF** and **ABCDEF**, the distance between the two rankings is defined as the total number of pairs of teams that are given different relative orderings. In our example, the pair **B, C** is given a different ordering by the two rankings. (The first ranking has **C** above **B** while the second ranking has the opposite.)

The only other pair that the two rankings disagree on is **B, D**; thus, the distance between these two rankings is 2. The median ranking of a set of rankings is that ranking whose sum of distances to all the given rankings is minimal. (Note we could have more than one median ranking.) The median ranking may or may not be one of the given rankings.

Suppose there are 4 bookies that have given the rankings: **ABDCEF**, **BACDEF**, **ABCEDF** and **ACBDEF**.

Consider two candidate median rankings **ABCDEF** and **CDEABF**. The sum of distances from the ranking **ABCDEF** to the four voted rankings is  $1 + 1 + 1 + 1 = 4$ . We'll call this sum the value of the ranking **ABCDEF**. The value of the ranking **CDEABF** is  $7 + 7 + 7 + 5 = 26$ .

It turns out that **ABCDEF** is in fact the median ranking with a value of 4.

### Input

There will be multiple input sets. Input for each set is a positive integer  $n$  on a line by itself, followed by  $n$  lines ( $n$  no more than 10,000), each containing a permutation of the letters **A, B, C, D, E**, and **F** left-justified with no spaces. The final input set is followed by a line containing a 0, indicating end of input.

### Output

Output for each input set should be one line of the form:

**ranking** is the median ranking with value **value**.

Of course **ranking** should be replaced by the correct ranking and **value** with the correct value. If there is more than one median ranking, you should output the one which comes first alphabetically.

### Sample Input

4

ABDCE

BACDE  
 ABCED  
 ACBDE  
 0

**Sample Output**

ABCDE is the median ranking with value 4.

## Grading (what to turn in)

What ■ indicates program/other is memo	Points	Due Tuesday Jan 18	Due Tuesday Jan 25	Due Tuesday Feb 1
<b>External Documentation</b>	<b>8</b>			
Your Name	1	X		
Description of the problem	2	X		
Input Specification	1	X		
Output Specification	1	X		
Algorithm Description Chart (structure or UML)	3		X	
<b>Data Structure</b>	<b>10</b>			
main data structure "structure"	3		X	
member functions pre/post conditions for each	3		X	
Implementation and discussion.	3		X	
<b>Analysis</b>	<b>17</b>			
How many rankings are possible? If the computer did 1/sec how long? Given a 1 gig machine what is the largest problem you can solve in "reasonable time"?	3	X		
Worst and/or average case space analysis for each function	4		X	
Worst and/or average case space analysis for each function	4		X	
Test Plan	3		X	
Sample Runs	3			X
<b>Program Listing Style</b>	<b>15</b>			
Your Name	1	X		
Description of the problem	2	X		
Variable Names	3			X
Data Dictionary	2			X
Pre/post conditions	3		X	
Length of functions	2			X
Use of white space	2			X
<b>Functionality</b>	<b>50</b>			
Main	10	X		
Inputs Correctly	5		X	
Outputs Correctly	5		X	
Gives the correct Output	20			X
Uses STL (meaningfully)	10			X