UTD Programming Contest for High School Students
July 9/10 2012

- **Time Allowed: two hours.**
- **Each team must use only one computer - one of UTD's in the main lab.**
- **Answer the questions in any order.**
- **Use only Java.**
- **Your program source code must be contained in one source file.**
- **Do not use the "package" construct in your Java code.**
- **Your programs must read from the named file specified in the problem header, and must output to System.out.**
- **Do not access the web except to access Java documentation.**
- **Do not use any recording device containing code, other than UTD's computer.**
- **Your solutions must be entirely yours, typed by you during the time allowed for the contest.**
- **As soon as you have solved a problem, submit ONLY the source file via your `PC^2` client.**

Scoring

Equal points will be awarded to each question, even though they may not be equally difficult.

In order to break ties, we will use penalty points. The penalty points for a question will be zero if the question is not answered correctly. If a correct submission occurs for a question at time T minutes, then T penalty points will be added, plus 20 penalty points for each incorrect submission for that question.

A Too many shoes

Input File: A.txt
Runtime limit: 2 seconds

A certain rich woman has lots of pairs of shoes. To simplify keeping track of the shoes, each pair has a unique ID number written on the bottom of each shoe. The shoes are arraigned in pairs on huge shoe-racks in her extensive closet. Each pair is carefully arranged, left first, then right, but not necessarily in numerical order. When she goes to bed at night, a gremlin, who has two right feet, takes down some of the right shoes and dances silently through the night. Before dawn each day the gremlin places the shoes back on the racks in arbitrary order in the slots left vacant by the right shoes that she has danced in.

The maid knows about the gremlin and, before her mistress wakes, she goes to the closet and puts all the right shoes back in their correct places, each one to the right of its numerical twin. She does this by swapping pairs of right shoes until all the shoes are correctly placed. Fortunately she never has to move any left shoes. She would like some help and asks you to write a program to minimize the number of swaps necessary to correct the positions of all the right shoes. Your job is simply to calculate the minimum number of swaps necessary to rearrange the right shoes.

Remember, the shoes will initially be in $LRLRLR\cdots$ order, but the numbers on the bottoms of the shoes may not match:

$$L_7R_{11}, L_{10}R_4, L_{11}R_1, \cdots$$

The maid swaps two right shoes on each iteration to solve the problem:

$$L_7R_7, L_{10}R_{10}, L_{11}R_{11}, \cdots$$

Input format:
The first line contains the number of test cases. Each test case consists of a single line starting with total number of pairs of shoes n. The following $2n$ numbers describe the initial arrangement of shoes on the rack. Each shoe is labeled by a positive integer in [1,10000] where two shoes share the same label if and only if they are part of the same pair. Both the left and right shoes of a given pair will be present (remember that left and right shoes alternate before the swapping begins).

Output:
For each test case, output one line containing a single number - the minimum number of swaps needed to pair up all shoes.

Sample Input	Sample Output
2	1
2 2 1 1 2	3
4 1 2 3 4 4 1 2 3	

B Tour Europe

Input File: B.txt
Runtime limit: 3 seconds

You are planning a vacation and you ask your parents for help. Your mother says “You MUST visit Paris, Madrid, Lisbon and London. But it’s only fun if you visit them in this order.” Your father says: “Go first to Paris, then to Lisbon, then to London and then go to Madrid” You’re afraid that you’ll hurt your mother if you follow your father’s suggestion, and vice-versa. But it would be worse, if you ignored both of their suggestions!

“Paris - Lisbon - London” is the sequence that best satisfies both parents. You decided to write a program to help with this task in the future. You’ll represent each city by one uppercase letter, lowercase letter, or a digit. Thus, you can represent at most 62 different cities. It’s possible that you’ll visit some city more than once.

If you represent Paris with ’a’, Madrid with ’b’, Lisbon with ’c’ and London with ’d’, then your mother’s suggestion would be “abcd” and you father’s suggestion would be “acdb”.

The program will read two travel sequences, one from each of your parents, and calculate the maximum number of cities that you can visit such that you best satisfy both of your parent’s suggestions.

The Input

The input will consist of an arbitrary number of city sequence pairs. The end of input occurs when the first sequence starts with a ’#’ character (without the quotes). Your program should not process this case. Each travel sequence will be on a line alone and will be formed by legal characters (as defined above). A travel sequence will appear on a single line and will have at most 100 cities.

The Output

For each sequence pair, you must print the following message in a line alone:

Case #d: you can visit at most K cities.

Where d stands for the test case number (starting from 1) and K is the maximum number of cities you can visit such that you satisfy both parent’s suggestions.

Sample Input	Sample Output
abcd acdb abcd dacb abacda bcbada #	Case #1: you can visit at most 3 cities. Case #2: you can visit at most 2 cities. Case #3: you can visit at most 4 cities.

C Base -2

Input File: C.txt
Runtime limit: 3 seconds

Everyone knows about integers in base 2 (binary), and integers in base 10 (decimal), but what about base -2? An integer n written in base -2 is a sequence of digits $d_{k-1}d_{k-2}\cdots d_2d_1d_0$. Each of which is either 0 or 1. The value of a base -2 number is given by:

$$d_{k-1}(-2)^{k-1} + \cdots + d_3(-2)^3 + d_2(-2)^2 + d_1(-2)^1 + d_0(-2)^0$$

The cool thing is that every integer (including the negative ones) has a unique base -2 representation, with no minus sign required. Your task is to find this representation.

Input

The first line of input gives the number of cases, N (at most 10000). N test cases follow. Each one is a line containing a decimal integer in the range [-1,000,000,000, 1,000,000,000].

Output

For each test case, output one line containing "Case #x:" followed by the same integer, written in base -2 with no leading zeros.

Sample Input	Sample Output
5	Case #1: 1
1	Case #2: 11011
7	Case #3: 10
-2	Case #4: 11100
12	Case #5: 0
0	

D Triplet Sums

Input File: D.txt
Runtime limit: 12 seconds

Given S, a set of integers, find the largest d such that $a + b + c = d$, where a, b, c, and d are distinct elements of S.

Input

Several sets S, each consisting of a line containing an integer $4 \leq n \leq 1000$ indicating the number of elements in S, followed by the elements of S, one per line. Each element of S is a distinct integer in [-536870912, +536870911]. The last line of input contains a 0.

Output

For each S, a single line containing d, or a single line containing "no solution".

Sample Input	Sample Output
5 2 3 5 7 12 5 2 16 64 256 1024 0	12 no solution

E Jumbled Strings

Input File: E.txt
Runtime limit: 3 seconds

You are given two strings of lower-case characters a and b. Both strings have been transmitted over a poor link from Alpha Centarui. The second string is supposed to be a copy of the first string.

The order of the characters in both strings may have been changed and some characters may have been deleted. NASA needs to discover the similarity between the strings. They need your help!

For each pair of strings, a and b, you have to discover the longest string x of lowercase letters such that x is a subsequence of some permutation of a and x is a subsequence of some permutation of b. For example, if a = "tasrs" and b = "rats", the longest string x would be "rats", or "star" or "tasr", or some other arrangement of those 4 characters. You would print the result "arst", the string x with the characters arranged into alphabetical order.

Input

The input file contains several pairs lines of input. Consecutive pairs of lines make a set of inputs, a and b respectively.

Output

For each set of inputs, output a line containing x. The characters in x should be arranged in alphabetical order.

Formally, x is the longest string of lowercase letters such that there is a permutation of x that is a subsequence of a and there is a permutation of x that is a subsequence of b.

Sample Input	Sample Output
pretty	e
women	nw
walking	et
down	pqqrt
the	
street	
qptsrwq	
qtprqv	