Problem K
Knockout Phase

The *UEFA Champions League* is one of the most prestigous football tournaments all over the world. This event is hosted annually, involving top-division European football clubs. The final match of UEFA Champions League usually attracts over 400 million viewers.

According to the current format of the UEFA Champions League, a tournament consists of 3 periods: qualification round, group stage and knockout phase. 32 best European football clubs compete in the group stage, which are divided into 8 groups of four. Winners and runner-ups from these groups advance to the knockout phase. The knockout phase is a single elimination bracket starting with the Round of 16. 16 teams are drawn into 8 matches satisfying the following rules:

- In every match, a group winner plays against a group runner-up.
- Teams from the same group can not be drawn against each other.
- Teams from the same association can not be drawn against each other.

Since several teams can not play against some other teams; for some teams A, B and C, the probability that A play against B may not be equal to the probability that A play against C. As football fans want to predict the opponents of their beloved teams, you are asked to write a program to calculate the probability of a match to occur.

In this problem, we are working on a generalized version of the UEFA Champions League. The group stage consists of n groups instead of 8. Groups are numbered from 1 to n. During the first round of the knockout phase, n group winners and n group runner-ups form n matches. All matches have to satisfy all three above rules. Therefore, a *valid draw* of n matches can be represented by a permutation $x_1, x_2, \ldots, x_n$ of integers from 1 to n, meaning that for every i, the winner from the i-th group plays against the runner-up from the x_i-th group. Each valid draw has the same probability to be chosen.

Given the association of all $2 \cdot n$ teams, your task is to calculate, for every pair of teams, the probability for them to play against the other.

Input

The input consists of multiple test cases. Each test case is presented as below:

- The first line contains an integer n ($1 \leq n \leq 20$) — the number of groups.
- In the last n lines, the i-th one contains two strings, which denote the associations of the winner and the runner-up from the i-th group, respectively. Each string contains from 1 to 3 uppercase English characters.

The input is terminated by a line containing a single 0 which does not represent a test case.
It is guaranteed that valid draws always exist.
The sum of n over all test cases does not exceed 300.

Output

For each test case, print n lines, each line contains n numbers. The j-th number on the i-th line is the probability that the winner from the i-th group plays against the runner-up from the j-th group.

Your answer will be considered correct if its relative or absolute error doesn't exceed 10^{-6}.

More formally: let's assume that your answer is C, and the answer of the jury is J. The checker program will consider your answer correct, if $\frac{|C-J|}{max(1,J)} \leq 10^{-6}$.

Sample explanation

In the first test case, the winner from the first group can play against the runner-ups from neither the first group (as they are from the same group) nor the second group (as they are from the same association HN). Hence, they must play against the runner-up from the third group. Consequently, the winner from the second group must play against the runner-up from the first group, and the winner from the third group must play against the runner-up from the second group. This is the only valid draw.

In the second test case, there are 6 valid draws:

- $(2, 3, 5, 1, 4)$
- $(2, 4, 5, 1, 3)$
- $(2, 5, 4, 1, 3)$
- $(4, 1, 5, 2, 3)$
- $(4, 5, 1, 2, 3)$
- $(4, 5, 2, 1, 3)$

For the winner from the first group, the probability to play against the runner-ups from the second and the forth group are both 0.5.

For the winner from the second group, the probability to play against the runner-ups are $\frac{1}{6}$, 0, $\frac{1}{6}$, $\frac{1}{6}$, $\frac{1}{2}$, respectively.

In the third test case, every group winner can play against every group runner-up (except the one from the same group). Therefore, it can be seen that the probability to play against these runner-ups are equal.

Sample Input 1

```
3
HN LA
QT HN
SG PY
5
LCK LPL
LEC LPL
LCS LCK
LCK VCS
LPL LCK
4
GBR FRA
GER ESP
SUI POR
ITA HUN
0
```

Sample Output 1

```
0.00000000 0.00000000 1.00000000
1.00000000 0.00000000 0.00000000
0.00000000 1.00000000 0.00000000
0.00000000 0.50000000 0.00000000 0.50000000 0.00000000
0.16666667 0.00000000 0.16666667 0.16666667 0.50000000
0.16666667 0.16666667 0.00000000 0.16666667 0.50000000
0.66666667 0.33333333 0.00000000 0.00000000 0.00000000
0.00000000 0.00000000 0.83333333 0.16666667 0.00000000
0.00000000 0.33333333 0.33333333 0.33333333
0.33333333 0.00000000 0.33333333 0.33333333
0.33333333 0.33333333 0.00000000 0.33333333
0.33333333 0.33333333 0.33333333 0.00000000
```