Alice and Bob Play Sheldon's Favorite Game

Problem Statement

Rock, Paper, Scissors, Lizard, Spock is a game, invented by Sam Kass and Karen Bryla, that extends the Rock, Paper, Scissors game. It is a favorite of the character Sheldon from the TV Show, *The Big Bang Theory*.

The rules of the game are as follows. Each player chooses a shape from the set {*Rock*, *Paper*, *Scissors*, *Lizard*, *Spock*}. If the two players choose the same shape, they tie. Otherwise, the winner is the one with the shape listed first in the following set of rules:

```
Scissors cuts Paper
Paper covers Rock
Rock crushes Lizard
Lizard poisons Spock
Spock smashes Scissors
Scissors decapitates Lizard
Lizard eats Paper
Paper disproves Spock
Spock vaporizes Rock
(and as it always has) Rock crushes scissors
```

Below is a graphical representation from *The Big Bang Theory's* wiki:

Alice and Bob also enjoy this game, and they have decided to play a series of them. Each has a very specific strategy that they follow.

Alice's strategy is as follows:

1) If she wins a game, she keeps the same shape.

2) If she ties, she chooses a shape from one of the two that would beat her current shape. Of these two, she chooses the one that beats the other. For example, if she has tied when choosing *Rock*, her options are *Paper* and *Spock*. Since *Paper* beats *Spock*, she chooses *Paper*.

3) If she loses, she chooses a shape from one of the two that would beat her opponent's current shape. Of these two, she chooses the one that beats the other. For example, let's say she has lost by choosing *Rock*, when her opponent chose *Paper*. She will then choose from *Scissors* or *Lizard*. Since *Scissors* beats *Lizard*, she chooses *Scissors*.

Bob's strategy is as follows:

1) Every other turn, he chooses *Spock*.

2) If he won the previous turn when playing *Spock*, he chooses *Rock*.

3) If he tied the previous turn when playing *Spock*, he chooses *Lizard*.

4) If he lost the previous turn when playing *Spock*, he chooses *Paper*.

Your task is to write a program that evaluates a series of games between Alice and Bob.

Input Format

The first line of input contains a single integer *t*, 1 <= *t* <= 50, containing the number of test cases in the input.

Then come *t* lines each describing a test case, made up of a series of games for you to evaluate. These lines have the following format:

```
[AliceShape] [BobShape] [n]
```

Where

- [AliceShape] is the shape that Alice will choose in the first game of the series.
- [BobShape] is the shape that Bob will choose in the first game of the series.
- [n] is an integer, 1 <= n <= 10^{18}, indicating how many games Alice and Bob will play in the series.

Output Format

Output will consist of a single line in the appropriate one of the following forms:

```
[Player] wins, by winning [WinGames] game(s) and tying [TieGames] game(s)

Alice and Bob tie, each winning [WinGames] game(s) and tying [TieGames] game(s)
```

where

- [Player] is the name of the player with more wins (either "Alice" or "Bob")
- [WinGames] is the number of games won either by the winner or, in the case of a tie, by each player
- [TieGames] is the number of games in which the players tied

Notes:

- The output is case sensitive. The player names, for example, must be either "Alice" or "Bob". Neither "alice" nor "BOB" will be acceptable.
- The words are separated by a single space, and there are no spaces before the first word in the line, nor after the last word in the line.

Sample Input

```
2
Rock Spock 4
Paper Paper 1
```

Sample Output

```
Bob wins, by winning 2 game(s) and tying 1 game(s)
Alice and Bob tie, each winning 0 game(s) and tying 1 game(s)
```

Explanation

There are two test cases in this input:

Test Case 1

In the first game, Bob wins, since *Spock* vaporizes *Rock*.

Bob won when choosing *Spock* so he chooses *Rock*. Alice lost, so she chooses from *Paper* and *Lizard*, both of which beat Bob's last choice of *Spock*. Since *Lizard* beats *Paper*, she chooses *Lizard*.

In the second game, then, Bob wins again, because *Rock* crushes *Lizard*.

Bob did not play *Spock* last turn, so he chooses *Spock* next. Alice lost, so she chooses from *Paper* and *Spock*, both of which beat Bob's last choice of *Rock*. Since *Paper* beats *Spock*, she chooses *Paper*.

In the third game, Alice wins, since *Paper* disproves *Spock*.

Bob lost when choosing *Spock* so he chooses *Paper*. Alice won, so she continues playing *Paper*.

In the fourth game, they tie by both choosing *Paper*.

Test Case 2

This test case consists of a single game in which both players play *Paper*.