Introduction

Consider the following problem about tennis. (The rules of tennis are below). Player A has a probability p of winning a point against player B if she is serving. Hence if $p=70$, A will win 70 of the points she serves. Player B will have a probability q of winning a point against A when she serves. One question that arises is what percentage of the time will A win a match against B? Although it is possible to work out mathematical formulas for this problem, the formulas are very long and messy. Instead we propose to simulate matches between A and B. If we simulate enough matches, we can get a very good estimate of A's probability of winning.

The Problem

Simulate a tennis match between two players. The probabilities p and q will be input by the user of the program. The output will give a detailed accounting of the match. For example

Set	Player A	Player B
1	6	3
2	6	7 (tie breaker 7-9)
3	3	6
4	4	6

Player B wins the match 3 sets to 1.

The rules of tennis

A *match* is won by the first player to win 3 *sets*.

A *set* is won by the first player to win 6 *games* if ahead by two games. If the set reaches a score of 6-5, another game is played. If the player ahead wins that game, the set is over, won by a score of 7-5. Otherwise, the score is 6-6 and a *tie-breaker* is played. The winner of the tie-breaker is the winner of the set 7-6.

The Server Players alternate who *serves* a game. The server is the player who first hits the ball. Player also alternate who serves the first game of a set.

A *game* is won by the first player to get at least 4 points and be ahead by two points. Tennis uses a strange way of counting points. We can simply count points by 0,1,2,...

Points are the basic unit of play. A point consists of a player putting the ball into play (serving) followed by the two players hitting it back and forth until something goes wrong such as the ball is hit out of bounds.

A *tie-breaker* is a game in which the first player to score at least seven and be ahead by two wins. The service in a tie breaker alternates. The player whose turn it would be to serve in a normal game serves once. Thereafter the players alternate serving twice until the tie breaker is over.