The rules of MTGDAF are as given in the notes, with the following additions. We now have two players. Each plays in turn. On each turn, each player plays a land if there is one in hand. On each turn, each player plays spells until they have run out of lands to tap. Each player always plays their cheapest spells first (i.e. all cost 1 spells, then if there are remaining lands all cost 2 spells, etc.), and each player always plays as many spells as possible on every turn. There are two ways to win: First, a player who plays a cost 6 spell wins immediately, and the game is over. Second, on player 2's 10'th turn, the game ends; if this occurs, you sum the cost of all spells each player played in all turns, and the player with the largest sum wins.

There are three players. Player A has a deck of 24 lands, 10 cost 1 spells, 10 cost 2 spells, 10 cost 3 spells and 6 cost 6 spells. Player B has a deck of 15 lands, 40 cost 1 spells, and 5 cost 6 spells. Player C has a deck of 28 lands, 8 cost 1 spells, 8 cost 2 spells, 8 cost 3 spells and 8 cost 4 spells.

These questions should be answered by simulation. You may do this homework in groups of one or of two. The answers are due by email, to daf@cs.uiuc.edu, with CS 498 in the title, by **October 8**. I strongly advise you to use simulation methods, though I don't discount the (extremely remote) possibility that these questions could be attacked by analysis.

Question 1: For each matchup (A first, B second; B first, A second; B-C; C-B; A-C; C-A) what is the expected length of a game? With what probability does each player win the game? How reliable are your predictions?

Question 2: Now assume that two copies of player A play one another. Does the first player or the second player win more often? What is the expected length of the game? How reliable are your predictions?

Question 3: Now assume that two copies of player B play one another. Does the first player or the second player win more often? What is the expected length of the game? How reliable are your predictions?

Question 4: Now assume that two copies of player C play one another. Does the first player or the second player win more often? What is the expected length of the game? How reliable are your predictions?

Question 5: Can you come up with a deck that has a high probability of beating all three players?