

Problem set 1  
 Due March 21st

1) Extensive and normal form. Represent the following game in extensive form, determine the strategies, and transform it in normal form.

There are two players. Initially player 1 moves and decides whether to play action A, action B or action C. Next, Player 2 responds. However player 2 imperfectly observes the move of her predecessor. Namely, she detects action A if taken. Otherwise she cannot tell whether player 1 played B or C. Player 2 adopts either action U or action D. The payoffs associated to each outcome

	U	D
are described in the following matrix	A	1,1    2,1
	B	0,2    3,2
	C	1,-1   0,3

2) Suppose that a player has four information sets, A,B,C and D. At the information sets A and B, she can play either U or D while at the information sets C and D she can play either L or R. Give an example of strategy. How many such strategies can be determined?

3) Strictly and Weakly Dominated Strategies. What is the definition of a strictly dominated strategy? What is the definition of a weakly dominated strategy? Give an example of a two-player game in normal form where one player has three strategies, one of which is strictly dominated; and the other player has three strategies, one of which is weakly (but not strictly) dominated. Indicate the dominated strategies.

4) Iterative Deletion of (weakly) Dominated Strategies Consider the following two-player game in normal form

	l	c	r
T	1,1	0,1	3,1
M	1,0	2,2	1,3
D	1,3	3,1	2,2

(a) Are there any strictly dominated strategies? Are there any weakly dominated strategies? If so, explain what dominates what and how.

(b) After deleting any strictly or weakly dominated strategies, are there any strictly or weakly dominated strategies in the ‘reduced’ game? If so, explain what dominates what and how. What is left?

(c) Go back to your argument for deleting in the first ‘round’ and recall what dominated what and how. Compare this with what was deleted in the ‘second’ round. Comment on how this might make you a bit cautious when iteratively deleting weakly dominated strategies?

5) There are two candidates, each of whom chooses a position from the set  $S_i = \{1, 2, \dots, 10\}$ . The voters are equally distributed across these ten positions.

Voters vote for the candidate whose position is closest to theirs. If the two candidates are equidistant from a given position, the voters at that position split their votes equally. The aim of the candidates is to maximize their percentage of the total vote.

(a) Show that strategy 2 strictly dominates strategy 1. What other strategies do strictly dominate strategy 1?

(b) Suppose now that there are three candidates. Thus, for example,  $u_1(8; 8; 8) = 33.3$

and  $u_1(7; 9; 9) = 73.3$ . Is strategy 1 dominated, strictly or weakly, by strategy 2? How about by strategy 3? Explain. Suppose we delete strategies 1 and 10. That is, we rule out the possibility of any candidate choosing either 1 or 10, although there are still voters at those positions. Is strategy 2 dominated, strictly or weakly, by any other strategy  $s_i$  in the reduced game? Explain.