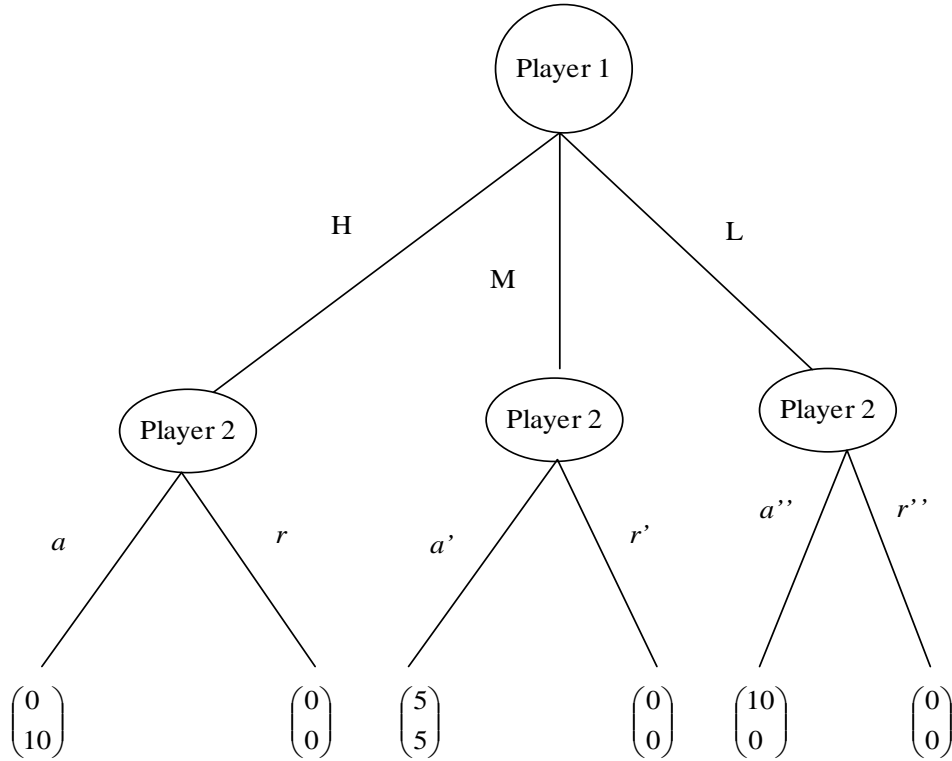


**ECONS 424 -STRATEGY AND GAME THEORY**  
**HOMEWORK #1 – DUE DATE: FRIDAY, JANUARY 18<sup>TH</sup>, IN CLASS**

**Exercise 1 –From extensive form to normal form representation**

Consider the following extensive form game



- Which are the strategies for player 1?
- What are the strategies for player 2?
- Take your results from parts a) and b) and construct a matrix representing its normal form game representation.

**Exercise 2 – A variation of the Prisoner's Dilemma game.**

Consider the following Prisoner's Dilemma game. The game coincides with that we discussed in class, except for the fact that every player sees his payoff decrease by  $m > 0$  when he chooses to confess. For instance, prisoner 1's payoff decreases by  $m$  in the top row (where he confesses) but is unaffected when he is at the bottom row (where he does not confess). A similar argument applies to prisoner 2, who sees his payoff decrease in the left column (where he confesses) but not in the right-hand column (where he remains silent). Intuitively,  $m$  represents the punishment that the confessing prisoner suffers from other criminals, either in jail (when he serves some time) or on the streets (when he does not serve any time in jail).

		Prisoner 2	
		Confess	Not confess
Prisoner 1	Confess	$-5-m, -5-m$	$0-m, -15$
	Not confess	$-15, 0-m$	$-1, -1$

- a) Find if either player has a strictly dominated strategy. Does your result depend on the value of the punishment,  $m$ ?
- b) Using your results from part (a), which is the strategy profile (or profiles) surviving Iterative Deletion of Strictly Dominated Strategies (IDSDS)?
- c) Find if either player has a strictly dominant strategy? Does your result depend on the value of the punishment,  $m$ ?

**Exercise 3 – Unemployment benefits.**

Consider the following simultaneous-move game between the government (row player), which decides whether to offer unemployment benefits, and an unemployed worker (column player), who chooses whether to search for a job. As you interpret from the payoff matrix below, the unemployed worker only finds it optimal to search for a job when he receives no unemployment benefit; while the government only finds it optimal to help the worker when he searches for a job.

		Worker	
Government		<i>Search</i>	<i>Don't search</i>
	<i>Benefit</i>	3,2	-1,3
	<i>No benefit</i>	-1,1	0,0

- a) Represent this game in its extensive form (game tree), where the government acts first and the worker responds without observing whether the government offered unemployment benefits.
- b) Does player 1 has strictly dominant strategies? What about player 2?
- c) Find which strategy profile (or profiles) survive the application of IDSDS.

**Exercise 4 – Pure strategies that are only strictly dominated by a mixed strategy**

Consider the following normal form game

		Player 2	
Player 1		<i>Left</i>	<i>Right</i>
	<i>Up</i>	4,1	0,2
	<i>Middle</i>	0,0	4,1
	<i>Down</i>	1,3	1,2

- a) Is there some strictly dominated strategy for player 1 involving only the use of pure strategies?
- b) Is there some strictly dominated strategy for player 1 when mixed strategies are allowed? [*Hint: you may assign probabilities to two of her strategies, similarly as we did in class*].
- c) Delete the strictly dominated strategies for player 2 that you found in the previous question. Then, represent the remaining (undeleted) strategies.
- d) Proceed with IDSDS. What is the strategy pair surviving IDSDS?

**Exercise 5 (Bonus exercises):** Exercise 10 from Chapter 3 in Harrington. If you have the first edition of the book, please note that this exercise should start with “Two students are to take an exam, and the professor has...”