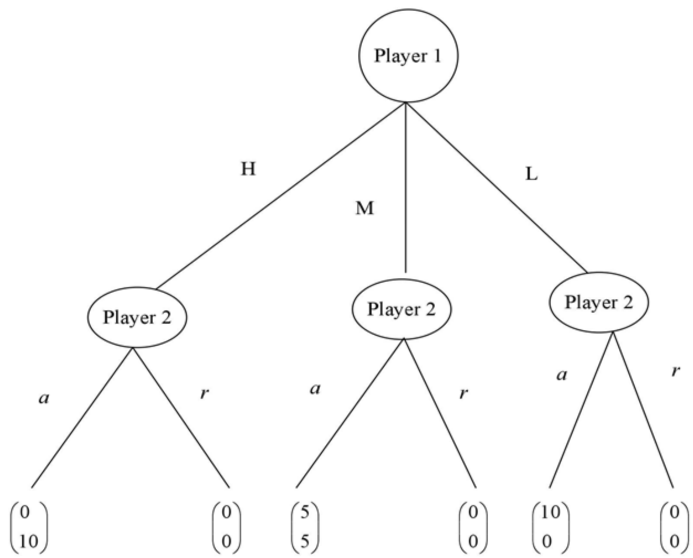
Homework # 1 [Due on February 5th, 2021]

1. Find a story that can be represented by an extensive form game. Identify the: (i) set of players, (ii) set of actions, (iii) time structure of the game and (iv) payoffs.

Follow the example of "Antz vs A Bug's life"

2. Consider the following extensive form game.



(a) What are the strategies for player 1?

The strategies for player 1 are H, M, and L.

(b) What are the strategies for player 2?

The strategies for player 2 are: $\{aaa, aar, arr, rrr, rra, raa, ara, rar\}$

(c) Take your results from a) and b) and construct a matrix representing its normal form game representation.

		Player 2							
		aaa	*aar*	*arr*	*rrr*	*rra*	*raa*	*ara*	*rar*
Player 1	H	0, 10	0, 10	0, 10	0,0	0,0	0,0	0,10	0,0
	M	5, 5	5, 5	5, 5	0,0	0,0	5,5	0,0	5,5
	L	10, 0	10, 0	10, 0	0,0	10,0	10,0	10,0	0,0

3. Consider the following normal form game

		Player 2	
		L	R
Player 1	U	-10, 10	0, 12
	C	-12, 0	2, 2
	D	-9, 0	1, 0

(a) Find strictly dominant strategies (if any) for player 1 and for player 2.

There are no strictly dominant strategies for both players 1 and 2.

(b) Find strictly dominated strategies (if any) for player 1 and for player 2.

For player 1, strategy U is strictly dominated because when player 2 chooses strategy L, he could maximize his payoff by choosing strategy D, and similarly, by choosing strategy C when player 2 chooses strategy R.

For player 2, neither strategy L nor R is strictly dominated because when player 1 chooses strategy D, player 2 obtains the same payoff by either choosing strategy L or R, both of which give him exactly the same payoff of 0.

(c) If you apply iterative deletion of strictly dominated strategies (IDSDS), what is the surviving strategy pair (or pairs)? Explain the steps you use in IDSDS, and why you use them.

Since strategy U is strictly dominated, we can remove this strategy for player 1, resulting in a reduced-form matrix as follows:

		Player 2	
		L	R
Player 1	C	-12, 0	2, 2
	D	-9, 0	1, 0

At this stage of the game, none of the strategies are strictly dominated by one another, and therefore, the strategy profile that survives IDSDS becomes

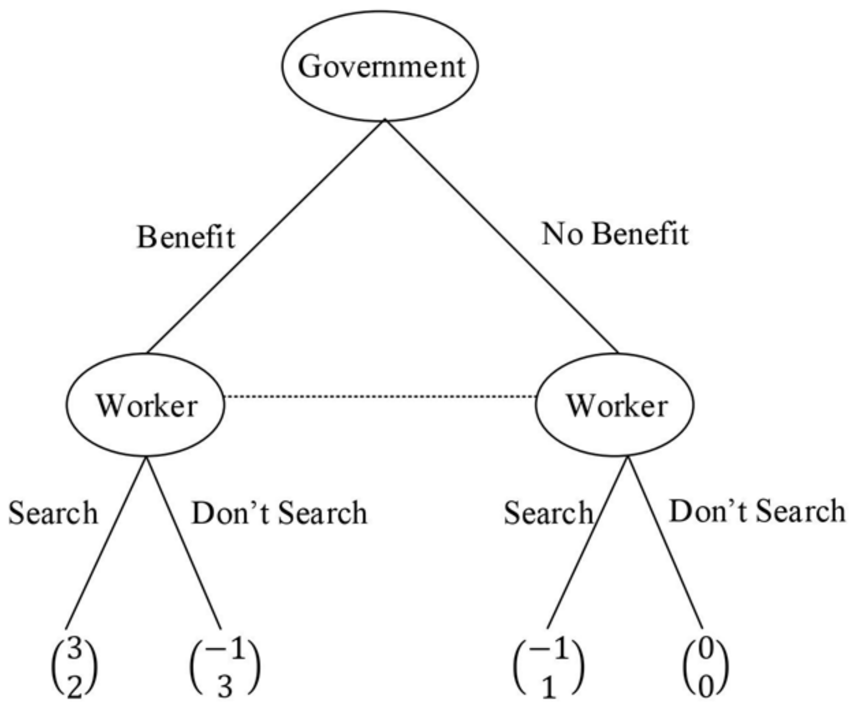
$$\{(C, L), (C, R), (D, L), (D, R)\}$$

4. 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	
		Search	*Don't Search*
Government	*Benefit*	3, 2	-1, 3
	No benefit	-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 government has strictly dominant strategies? How about the worker?

There are no strictly dominant strategies for both government and worker. Specifically, when the worker chooses (not) to search for a job, the government will be better off (not) offering unemployment benefits. Whereas, when the government chooses (not) to offer unemployment benefits, the worker will be better off (not) searching for a job.

(c) Find which strategy profile (or profiles) survive the application of IDSDS.

In this context, every strategy survives IDSDS, which contribute to a strategy profile of

$$\{(Benefit, Search), (Benefit, Don'tSearch), (NoBenefit, Search), (NoBenefit, Don'tSearch)\}$$