

Workshop Questions

1. Determine the pure-strategy Nash equilibria in the following nonzero-sum game. Which outcomes are Pareto optimal.

	A	B	C
A	(4,3)	(5,1)	(6,2)
B	(2,1)	(8,4)	(3,6)
C	(3,0)	(9,6)	(2,8)

2. **Welfare Game**

The government only likes to offer welfare to paupers if they are actively seeking work. The pauper prefers to get aid without looking for work, but if he is looking for work he'd rather get aid than not. The following pay off matrix represents the utils the government and pauper give to the various outcomes.

		Pauper	
		Seek Work	Idle
Government	Aid	(3,2)	(-1,3)
	No Aid	(-1,1)	0,0)

- (a) Show that this game has no pure strategy Nash equilibrium.
- (b) Find the mixed strategy Nash equilibrium.
- (c) Find the expected payoffs for each player if the other player plays their mixed strategy.

3. Shared Resources

Littleton and Hamlet have to get their water by digging wells. They have a choice of digging down to one of two aquifers. One aquifer is shallow, and one is deep. The shallow aquifer is cheap to reach, but can only supply one town. If they both dig there they will deplete the well and will have no water. The deep aquifer is expensive to drill down to, but it provides enough for both towns, and they can consequently share the costs. The payoff matrix for the two towns is shown below.

		Littleton	
		deep	shallow
Hamlet	deep	(10,10)	(3,15)
	shallow	(15,3)	(0,0)

- (a) This game is similar to one of the social dilemma games we discussed in class. Which one is it.
- (b) Find the pure strategy equilibria for this game. Find all the Pareto optimal outcomes. Which one of these is the most cooperative? Is it a Nash equilibrium?
- (c) If both players play the strategy corresponding to their best equilibrium outcome what outcome results?
- (d) This game also has a mixed strategy Nash equilibrium. Find the equalizing strategy for each player, and the corresponding payoff for the other player if they choose this mixed strategy.
- (e) Show that in this case the mixed strategy Nash equilibrium is better than the payoff for being the only one to dig in the deep well, but worse than the strategy of being the only one to dig in the shallow well.