

Name:

- Please sign your name after the following statement.
I understand that this is a take home test and, while I may consult my own notes, worksheets, homework and textbook, I will not discuss my work with other students or seek assistance from any other sources.

- Male frogs who wish to find a mate can either call to attract a mate, or sit, hoping that a mate will pass by. If few frogs are calling it is a good idea to call, but if there are lots of frogs calling the females get confused and a frog who is sitting will likely come across a mate without having to waste the effort to call. The following game gives the payoffs when Kermit, Jeremiah and Flip play this game.

		Flip			
		Call		Sit	
		Jeremiah		Jeremiah	
		Call	Sit	Call	Sit
Kermit	Call	5,5,5	4,6,4	4,4,6	7,2,2
	Sit	6,4,4	2,2,7	2,7,2	1,1,1

- Find all the Nash equilibria. Find the Pareto optimal outcomes.
- Frogs don't usually form coalitions, but let's assume they do. Find out the payoffs and strategies for two frog and three frog coalitions.

3. Consider the following coalitions involving three players with non-transferable utility. The payoffs are listed in the orders given in the coalition structures

Coalition Structure	Payoff
ABC	(8,8,8)
AB,C	(8,7),(0)
AC,B	(7,10),(2)
BC,A	(8,9),(4)
A,B,C	(4),(2),(0)

- (a) Which coalition structures are in the solution set?
- (b) What are the stable coalitions?
- (c) What is the Core of the game?
4. Explain what the "independence of irrelevant alternatives fairness criteria" means, in the context of voting systems. Give a numerical example of how plurality with run off of the top two candidates can violate the independence of irrelevant alternatives.
5. Explain what the "Pareto optimal fairness criteria" means, in the context of voting systems. Explain why the Borda count method always satisfies this criteria. What voting system does not always satisfy this criteria, and support your answer with a numerical example.

6. A community wants to build a park and has the funds to build either a tennis court, a basketball court or a baseball field. The community is polled and the preference rankings for each option are listed below:

	Percentage of Voters					
	12	20	24	11	23	10
Tennis Courts	1	1	2	3	2	3
Basketball court	2	3	1	1	3	2
Baseball field	3	2	3	2	1	1

- (a) Which choice would win a plurality election?
- (b) Which choice would win a plurality election with runoff between the top two candidates?
- (c) Which choice has the top Borda count?
- (d) Is there a Condorcet winner?
- (e) Can the 23 people who put baseball as their first choice, tennis as their second choice and basket ball as their third choice vote strategically so that Baseball wins the Borda count? Explain.

7. Consider the following game with five players. Each player can choose to press button A or button B . A player who presses A gets \$8, a player who presses B gives \$3 to each of the other players.
- Write down an N -player game matrix showing the payoffs for a player who choose A or B , depending how many other other players press B .
 - What is the Nash Equilibrium of this game? What type of game is this?
 - If players are allowed to form coalitions and the members of the coalition vote whether to push A or B as a group. What is the smallest stable coalition where members do better than they would do in a singleton coalition?
 - A researcher decides to change the game by applying a fine to players who chose A . If one player choose A the fine is x if two choose A they each pay a fine of $2x$, if three choose A they each pay a fine of $3x$ and so on. Suppose x is \$2. Write down the new payoff table and find the new Nash equilibrium.
8. The disciplinary board of Walington High School has five members. The principal has 3 votes (P), the vice principal (VP) has 2 votes and three teachers (T_1, T_2, T_3) each have one vote.
- List all the winning coalitions and underline all the critical voters in these coalitions.
 - Write down the Banzhaf power index of the disciplinary committee.