Workshop Questions

1. **Costs and Benefits**
   Consider a game where two rational players meet. Each player can choose to give a benefit b to the other player, or not. Giving incurs a cost c for the player who gives, but there is not cost for not giving. Lets call the giving strategy, cooperating, and the not giving strategy defecting.

   (a) Set up a payoff matrix for this game.

   (b) What relationship between cost and benefit will make this a prisoners dilemma.

   (c) Suppose the benefit is 3 and the cost is 1. Find the cooperation index. Now repeat the calculation for general b and c.

   (d) Assuming the payoffs in this game measure fitness, modify the game so that it shows the true payoffs for a siblings playing the game (siblings share half their genes). Is this new game still a prisoner's dilemma?

   (e) Repeat the last question for general b and c, and state a relationship on the b and c, so that the game is no longer a prisoner's dilemma

2. Consider the following Prisoner's Dilemma payoff matrix

		Colin	
		C	D
Rose	C	(3,3)	(0,4)
	D	(4,0)	(1,1)

(a) Suppose that Rose and Colin decide to repeat this game 10 times, and they choose from the following repeated play strategies: Always Defect (All-D) or Tit for Tat (T4T). T4T cooperates on the first round and then copies what the other players do. Find the payoffs after 10 rounds if both players play All-D, if both players play T4T and If one player plays T4T and the other All-D

(b) Set up a payoff matrix for the 10 round game with the All-D and T4T strategy choices and show that the game is no longer a prisoners dilemma game.

(c) Find the pure strategy Nash equilibria. Which one is Pareto optimal?

(d) How does T4T do in a 10 round game against a strategy called T4T*, which plays T4T, except cheats on the last round? Set up a payoff matrix with T4T* and T4T strategies, and show it is a prisoner's dilemmas game with one Nash equilibrium.