1. El Farol is bar which is at its best when busy, but not crowded. As an example consider a three player came involving Amy, Barb and Carol, who must each choose between two strategies – go to the bar, or stay at home. The payoff for a player who stays at home is 1. If a player goes to the bar alone the payoff is zero, if there are two at the bar, they enjoy each other's company and the payoff for each is two. If all three are at the bar it is too crowded, and the payoff for each is -1.

   (a) Construct the three person payoff matrix for this game.

   (b) Draw a movement diagram and hence find all pure strategy Nash equilibria, if there are any. Identify which are Pareto optimal and which are not.

   (c) Find the payoffs for all possible coalitions. Is there one coaction that is likely to form over the others?

2. Two gamblers, Slim and Harry, wish to meet up in one of two illegal gambling halls in town (the Bar and the Garage), however they need to choose independently, otherwise Policeman Pete will get word, break up the gambling and lock them up. This is a three player game, with each player deciding whether to go to the Bar or Garage. The best outcome for Pete is if he arrives at a bar and finds Slim and Harry there. This counts as a payoff of 2 for Pete and -1 each for Harry and Slim. Slim and Harry prefer to meet at the same place, and have Pete go to the other place. This give them each a payoff of 2 and Pete a payoff of -1. If Slim and Harry end up at different places they each get a payoff of 0, and Pete gets a payoff of 1, since no illegal gambling took place.

   (a) Construct the three person payoff matrix for this game.

   (b) Draw a movement diagram and hence find all pure strategy Nash equilibria, if there are any.

   (c) Find the payoffs for all possible coalitions. Is there one coalition that is likely to form over the others? If so, how would you suggest that the coalition partners correlate their strategies?