

## Suggested Supervisions 1

1. (Games equivalent to the Prisoner's Dilemma) Determine whether each of the following games differs from the Prisoner's Dilemma only in the names of the players' actions, or whether it differs also in one or both of the players preferences.

|   |     |     |   |      |      |
|---|-----|-----|---|------|------|
|   | X   | Y   |   | X    | Y    |
| X | 3,3 | 1,5 | X | 2,1  | 0,5  |
| Y | 5,1 | 0,0 | Y | 3,-2 | 1,-1 |

2. (Hermaphroditic fish) Members of some species of hermaphroditic fish choose, in each mating encounter, whether to play the role of a male or a female. Each fish has a preferred role, which uses up fewer resources and hence allows more future mating. A fish obtains a payoff of  $H$  if it mates in its preferred role and  $L$  if it mates in the other role, where  $H > L$ . (Payoffs are measured in terms of number of offspring, which fish are evolved to maximise.) Consider an encounter between two fish whose preferred roles are the same. Each fish has two possible actions: mate in either role or insist on its preferred role. If both fish offer to mate in either role, the roles are assigned randomly, and each fish's payoff is  $\frac{1}{2}(H + L)$ . If each fish insists on its preferred role, the fish do not mate; each goes off in search of another partner, and obtains the payoff  $S$ . The higher the chance of meeting another partner, the larger is  $S$ . Formulate this situation as a strategic game and determine the range of values of  $S$ , for any given values of  $H$  and  $L$ , for which the game differs from the Prisoner's Dilemma only in the names of the actions.

3. (Strict dominance) Consider the following game (where only player 1's payoffs are given):

|   |   |   |
|---|---|---|
|   | L | R |
| T | 1 | 1 |
| M | 4 | 0 |
| B | 0 | 3 |

Which strategies dominate strategy  $T$ ?

4. (Weak and strict dominance) Consider the following games :

|   |     |     |   |     |     |     |
|---|-----|-----|---|-----|-----|-----|
|   | L   | R   |   | L   | C   | R   |
| T | 1,1 | 0,0 | T | 0,0 | 1,0 | 1,1 |
| M | 2,2 | 0,0 | M | 1,1 | 1,1 | 3,0 |
| B | 2,2 | 1,1 | B | 1,1 | 2,1 | 2,2 |

Determine, for each player and for each game, whether any action is strictly dominated or weakly dominated.