

## Game Theory--The Prisoner's dilemma

A / B	hold quiet	Confess	B's Minimum penalty
Hold Quiet	-1 / / -1	-10 / / 0	
Confess	0 / / -10	-5 / / -5	
A's Minimum penalty			

Picture two partners in crime who have been picked up by the police. The penalty for robbery is 10 years in jail. If neither confesses, then the worst they can be convicted of is stealing the car they used for the getaway, which has a penalty of one year in prison. If, on the other hand, they both confess, they will be convicted of the robbery as well, and will get 5 years in prison as a reduced penalty for being cooperative with the police. The

District attorney, in order to split the team and provide incentive for confession, has offered each separately to let him off with a suspended sentence if he confesses and his partner doesn't. In the event one of the partners is convicted without being cooperative (confessing) he will get the full penalty of 10 years in prison.

The matrix shows the different payoffs in this game in which the total penalties change depending on the combination of strategies. A's outcome is in the upper left corner of each split cell, and B's outcome is shown in the lower right corners.

### ***North & South Highschools' wrestling training programs--a Zero-sum game:***

North & South Highschools' wrestling coaches are both eager to win as many matches as they can. There are three different training/preparation strategies they can employ. The first is to do healthful training. The second is to have wrestlers fast and purge themselves before weigh-in to shift some larger wrestlers into lower weight classes where they would have an advantage over smaller wrestlers. The third strategy is to not only purge, but to use steroids in training to increase strength. Assuming that the steroid and purging strategies work, the expected results of a ten match series might be represented by the following outcome table:

		North's wins			
North \ South	Healthful	Purge	Purge & Dope	South's best - Fewest losses	
Healthful	6	5	4		
Purge	7	6	5		
Purge & Dope	8	7	6		
North's best - most wins					

- A) North would like the most wins possible. For each strategy of South, show which strategy North would prefer, and vice versa. Use squares for North's choices and Circles for South's strategies. Write the results in the last row and last column.
- B) What strategies wouldn't be pursued in any case? Which combination of strategies would result in a stable outcome? Why would this outcome be stable?
- C) Is this really a zero sum game, or does the total wealth include more than just the wins and losses?