PROBLEM SET FOUR - -ECON 3010

1. In Table 1, is there a DS e in the game? If not, are there any Nash e? If there are more than one Nash e, how can the game have a solution?

2. In Table 2, is there a DS e?

3. Find the optimal mixing probabilities for Carmine (probability = p of choosing *top*) & Miranda (probability = q of choosing *left*) in Table 3.

4. Find the sub-game perfect Nash equilibrium in Figure 1.

5 There are two types of workers, *good* & *bad*. Absent signaling, employers know only that ½ of workers are good (with the work force size = 1). There are two types of jobs, *skilled* and *unskilled*. The productivity of the two types in the two jobs is given in the table below.

	Good	Bad
Skilled	5	0
Unskilled	2	2

The signal is education, *y*, & *y* does not affect productivity. The cost of the signal = *y*/3 for good workers & *y* for bad workers.
a) Ignoring pooling for now, explain what is necessary for a signaling equilibrium. What is the Riley outcome?
b) With pooling, where will workers be employed, will good workers wish to deviate from a pooling equilibrium, & is wealth increased when they do so?

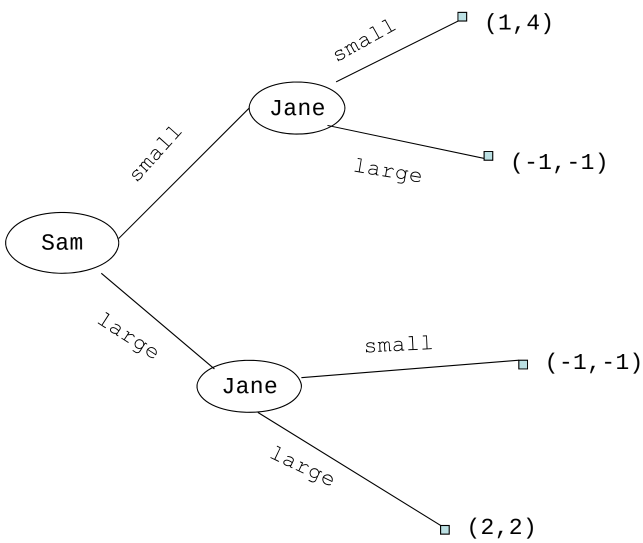
Table 1		Betty	
		Left	Right
Abe	Top	6, 3	3, 2
	Bottom	4, 7	5, 8

Table 2		Zeke	
		Deny	Confess
Babe	Deny	-1,-1	-10, 0
	Confess	0,-10	-8,-8

Table 3		Miranda	
		Left	Right
Carmine	Top	100,-100	150,-150
	Bottom	200,-200	50,-50

Fig.1

The 1st # in parentheses is Sam's payoff.



Answers

1. No DS for either player. 2 Nash e: {top, left} & {bottom, right}. Abe prefers {top, left} & Betty prefers {bottom, right}, so she tries to commit to right, & he tries to commit to top. If one succeeds, that tells us which Nash e we will see.

2. Both have DS: confess, so DS e is {confess, confess}.

3. $\pi^{Carmine}_{Miranda\ left}$ = 100p + 200(1-p) = 200 - 100p.

$\pi^{Carmine}_{Miranda\ right}$ = 150p + 50(1-p) = 50 + 100p.

Set the payoffs = for Carmine or Miranda won't randomize: p = .75.

$\pi^{Miranda}_{Carmine\ top}$ = -100q - 150(1-q) = 50q - 150.

$\pi^{Miranda}_{Carmine\ bottom}$ = -200q - 50(1-q) = -150q - 50.

Set the payoffs = for Miranda or Carmine won't randomize: q = .5.

4. {large, large} is SGP Nash e. If Jane announces a strategy of always going small, & he believes this, the Nash e is {small, small}. However, he should not believe this <u>unless</u> a) she has committed to small; or b) this is part of a repeated game, so it pays her to develop a reputation for going small.

5. a) Good workers prefer signaling & revealing they are good to being viewed as a bad worker (& earning 2) if:

$5 – y/3 \geq 2$, or $y \leq 9$.

Bad workers prefer <u>not</u> to signal & (mimic good workers), thus revealing bad workers (& earning 1) if:

$5 – y < 2$, or $y > 3$.

Thus, signaling occurs if $3 < y \leq 9$. The Riley outcome is y slightly larger than 3, and occurs as employers compete to drive y as low as possible (because any y such that $3 < y \leq 9$ works in that good workers will get that level of education & bad workers will set $y = 0$).

b) Average productivity in good jobs = .5(5) = 2.5 if all are placed there, so all will be placed in good jobs (versus all in bad jobs at productivity = 1) with pooling. With signaling, a good worker's payoff = $5 – y/3 = 4$ with $y = 3$. Thus, a good worker prefers to signal & deviate from a pooling equilibrium since 3 > 2.5.

Wealth with signaling equals:

{productivity of a good worker in a skilled job minus signaling cost}{# of good workers}
+ {productivity of a bad worker in an unskilled job}{# of bad workers}
= (4).5 + (2).5 = 3.

Thus, signaling increases wealth (since wealth with pooling = 2.5: the average productivity of those in the good job (2.5) times the # in the good job (1).