D2 Game Theory Challenge

Challenge 1

Alma and Brian play a zero-sum game. The game is represented by the following pay-off matrix for Alma.

		Brian			
		I	II	III	IV
Alma	I	3	−1	7	−7
	II	3	−6	0	8
	III	8	12	8	11
	IV	8	13	8	10

(a) Write down the pay-off for **Brian** if Alma plays I and Brian plays IV. *(1 mark)*

(b) Show that this game has a stable solution. *(3 marks)*

(c) Find all the saddle points for the game. *(2 marks)*

Challenge 2

Two people, A and B, play a zero sum game. The game is represented by the following pay-off matrix for A.

		B		
	Strategy	I	II	III
	I	5	1	3
A	II	2	5	4
	III	4	–1	2

(a) Show that there is no stable solution. *(2 marks)*

(b) Explain why it will never be optimal for A to adopt strategy III. *(1 mark)*

(c) By considering mixed strategies, and giving your answers as exact fractions,

(i) find the optimal mixed strategy for A, *(7 marks)*

(ii) find the value of the game. *(1 mark)*

Final Challenge

Alan and Tracy play squash against each other every week. They each have three shots that they can play to try to win a point: a boast (B), a drop shot (D) and a lob (L). The pay-off matrix for Alan is given below.

Tracy

Alan		B	D	L
	B	12	5	2
	D	5	−2	−3
	L	8	10	13

(a) State which shot Alan should **not** play, giving a reason for your answer. *(2 marks)*

(b) By considering mixed strategies, find the ratio of the number of times Alan should play each of the other two shots. *(8 marks)*

(c) Find the value of the game. *(1 mark)*