Homework 2

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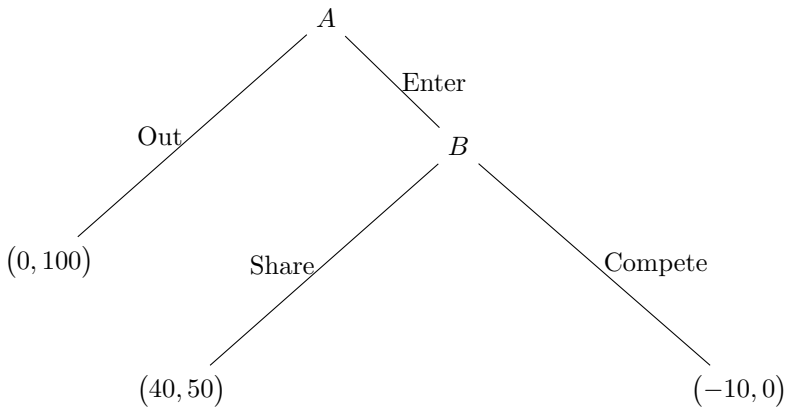
Solution 1. (1) The extensive form (tree):



Where (Payoff A, Payoff B) denoted by (X, Y).

The induced normal-form game payoff matrix (row player A, column player B):

$$\begin{array}{r c} & \begin{array}{cc} \text{Share} & \text{Compete} \end{array} \\ \begin{array}{r} \text{Out} \\ \text{Enter} \end{array} & \begin{bmatrix} (0,100) & (0,100) \\ (40,50) & (-10,0) \end{bmatrix} \end{array}$$

(2) - If B plays Share, A compares 0 (Out) and 40 (Enter), so best response is Enter. - If B plays Compete, A compares 0 (Out) and -10 (Enter), so best response is Out. - If A plays Out, B gets 100 regardless of Share/Compete (both best responses). - If A plays Enter, B compares 50 (Share) and 0 (Compete), so best response is Share.

Thus the pure Nash equilibria are

$$(\text{Enter}, \text{Share}) \quad \text{and} \quad (\text{Out}, \text{Compete}).$$

The action Compete is a noncredible threat: at the subgame after A enters, B always prefers Share to Compete. So $(\text{Out}, \text{Compete})$ would not actually carry out.

(3) At B's decision node (after Enter), B chooses Share, since $50 > 0$. In this case, A compares Out (payoff 0) to Enter (payoff 40 if B shares), so A chooses Enter.

So the unique subgame-perfect equilibrium strategy profile is

$$(\text{Enter}, \text{Share}).$$

Solution 2. (1) Information sets: Player 1: $\{1_a\}$ and $\{1_b, 1_c\}$. Player 2: $\{2_a\}$ and $\{2_b\}$.

(2) Yes, it respects the definition. The two nodes of player 1 1_b and 1_c, offer the same action set $\{L, R\}$.

(3) Strategies: Player 1: choose high/low at 1_a and L/R at $\{1_b, 1_c\}$:

$$(high, L),\ (high, R),\ (low, L),\ (low, R).$$

Player 2: choose yes/no at 2_a and at 2_b:

$$(\text{no}, \text{no}),\ (\text{no}, \text{yes}),\ (\text{yes}, \text{no}),\ (\text{yes}, \text{yes}).$$

(4) Normal-form payoff matrix (rows: player 1, columns: player 2):

	(no, no)	(no, yes)	(yes, no)	(yes, yes)
$(high, L)$	$(5,5)$	$(5,5)$	$(9,1)$	$(9,1)$
$(high, R)$	$(5,5)$	$(5,5)$	$(1,9)$	$(1,9)$
(low, L)	$(5,5)$	$(4,6)$	$(5,5)$	$(4,6)$
(low, R)	$(5,5)$	$(6,4)$	$(5,5)$	$(6,4)$

(5) Nash equilibria:

$$((high, L),\ (\text{no}, \text{no})) \quad \text{and} \quad ((low, R),\ (\text{no}, \text{no})).$$