Econ 302: Microeconomics II - Strategic Behavior

Final Exam – December 9, 2013
9:30– 11:30 in AQ 3182

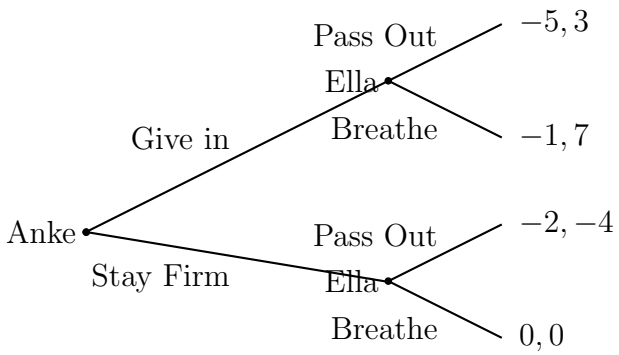
1. **(10 points)** True/False/Uncertain? Explain your answer briefly.

   a) The one-shot prisoner's dilemma game has a mixed strategy Nash equilibrium that would be a Pareto improvement compared to defection by both players.

   b) For a signal to be credible, i.e. to convey useful information in situations of informational asymmetry, the signal must be costly.

   c) In many fairytales, kings will marry off their beautiful daughters to a suitor only on the condition that the suitor first kills a dangerous dragon posing a threat to the kingdom. This demand can be explain by both adverse selection and moral hazard, i.e., the king can 'kill two birds with one stone' with this strategy.

2. **(8 points)** Anke takes her 5-year old daughter Ella to TOYS 'R US for some Christmas shopping. As soon as Ella discovers the latest Barbie doll, she threatens to hold her breath until she passes out, unless Anke buys her the doll. Seeing Ella turn red in the face, Anke has two choices, give in (buy the doll) or stay firm (don't buy the doll). Observing Anke's action, Ella has to decide whether to continue holding her breath until she passes out, or breathe and give up. The game tree is:



   a) Carefully write down all strategies for each player. Determine the unique Subgame Perfect Equilibrium of the game.

   b) Argue that there is a Nash equilibrium of the sequential game in which Sally capitulates and buys the toy, but that this equilibrium is not subgame perfect. Explain!

3. **(8 points)** Emily is a risk neutral elderly Vancouver lady, who likes going to see her doctor. When she is sick, the doctor will cure her and her utility from a weekly visit equals \$ 100. But even when she is healthy, she derives a utility of \$ 60 from a weekly visit. Of course, when Emily is healthy, she could always go to the community centre for her social needs, which would give her \$ 30 in utility, but she prefers chatting with the the doctor; besides, there're always plenty of fun magazines to read in the waiting room. The doctor's cost per visit is \$ 50, which he bills in full to the BC Medical Plan. Emily is sick 25% of the time.

   a) Emily is fully covered by the BC Medical Plan for a fixed monthly premium of \$ π. How often per month will she visit the doctor on average? And assuming the BC Medical Plan is bound by law to break even, how high does Emily's premium have to be set? Is this situation Pareto efficient?

   b) Concerned about rising medical cost and high insurance premiums, a Plan administrator proposes to charge patients a per-visit F each time they see the doctor. This would prevent unnecessary medical consultations and allow a reduction in the monthly premium, he argues. Determine the minimum fee F and the new premium π_F such that i) Emily sees the doctor only if she is sick, and ii) the BC Medical Plan continues to make zero profits. Comparing your findings in a) and b) explain why Emily is better off under the new scheme, making reference to the phenomena of adverse selection and/or moral hazard.

4. **(12 points)** Harry (H) and Sally (S) are the only people stranded on a remote island. To escape the island, they need to build a raft. The bigger the raft, the higher their chances of surviving. If they spend a total effort $e_H + e_S$ to build a raft of size G (measured in square meters), their utilities are $u_H = -\frac{36}{G} - e_H$ and $u_S = -\frac{64}{G} - e_S$. It costs 1 unit of total effort to built 1 square meter of the raft.

   a) Calculate the Pareto efficient size of the raft.

   b) Harry and Sally simultaneously decide how much effort to put into raft building. If Harry expects Sally not to contribute at all, how much effort should he contribute? If he expects her to contribute enough effort for the Pareto efficient size of G, how much should effort should he contribute?

   c) Determine and draw the best-response functions in a diagram. Find the Nash equilibrium efforts and equilibrium size of the raft. Compare your answer to a) and give a careful intuition.

5. **(12 points)** SFU professor Sam owns a house worth 1 Mill \$ and has to decide how much insurance to buy. There is a probability of p that the house will be destroyed in an earthquake. If this happens and Sam is uninsured, his wealth drops to zero. If there is no earthquake, the house remains with the same value of 1 Mill \$. Sam's utility is $\sqrt{w}$ where w is his wealth.

   a) Compare the expected value of Sam's income under no insurance to his certainty equivalent under no insurance and calculate the difference (the risk premium) as a function of p. Give an intuitive explanation why the risk premium is i) always positive and ii) maximized at $p = \frac{1}{2}$.

   b) SFU offers earthquake insurance with full coverage (equal to the loss) at actuarially fair rates through a group benefit plan. Give the insurance premium as a function of p. Show that Sam will always buy insurance, and explain why!

   c) A new startup offers each SFU employee the opportunity to test for earthquake safeness of their houses. People such as Sam could thus find out whether the probability that their house is damaged in an earthquake is high or low. In the long term, do you expect insurance premiums for the SFU earthquake insurance plan to go up, go down, or stay the same? Explain!

Bonus Question (very hard!). Reconsider the game played between Anke and Ella in TOYS 'R US from Question 3 and suppose it is repeated infinitely often. Both players discount the future with the discount factor $\delta \in (0, 1)$. Propose a strategy for Ella and a strategy for Anke that form a subgame perfect equilibrium in which Ella gets the toy every time (sigh) for sufficiently high discount factors (you don't have to show that these strategies actually form an SPE).