MAT1374 Probability and Games of Chance: Poker101
Midterm Examination
17.30-18.45, March 2nd, 2015
Instructor: Pieter Hofstra

LAST NAME:

First name:

Student ID:

INSTRUCTIONS

1. This exam consists of two parts: one set of multiple choice questions and one set of long answer questions. You should complete the **25 out of 30** of the multiple choice questions and **2 out of 3** long answer questions. If you answer more questions than necessary only the first 25 will be graded.
2. Write your answers to the multiple choice questions in the table below. For the long answer questions, use the space provided below the questions.
3. The exam is closed book. Notes or books are not allowed. Please make sure that all other electronic devices such as cellphones are switched off.
4. You may use a faculty-approved calculator.
5. Write your answers clearly and legibly in this booklet. Don't use red ink. Unreadable or ambiguous answers are counted as incorrect.

Multiple Choice Answers : answer 25 out of 30 questions!

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Answer to bonus question:

Part 1: Multiple Choice Questions

Complete 25 of the following multiple choice questions. Indicate your answer in the box on the first page of this booklet. Each question is worth one point.

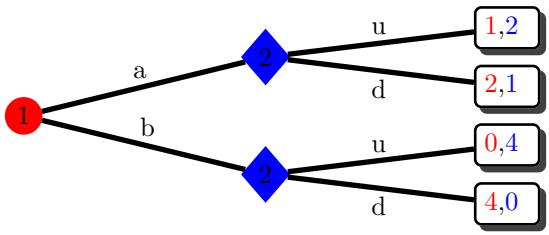
1. In a game tree, what do the nodes represent?

   A. The players
   B. The information available to the players
   C. The moves available to the players
   D. The payoffs

2. Which of the following is a good example of a simultaneous game?

   A. Chess
   B. Poker
   C. Rock-Paper-Scissors
   D. Risk

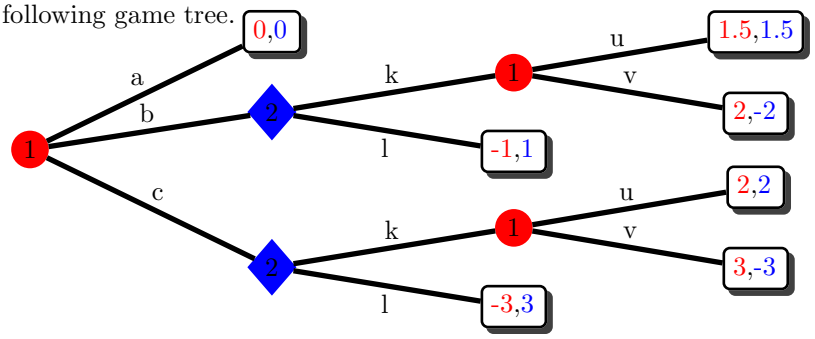
3. Consider the following game tree:



   Is (a,u) a rollback equilibrium?

   A. Yes
   B. No, because it doesn't maximize the payoff for Player 1.
   C. No, because it doesn't maximize the payoff for Player 2.
   D. No, because both players will have regrets.

4. Consider the following game tree.



   What is the rollback equilibrium in this game?

   A. (c,k,u).
   B. (b,k,v).
   C. (a).
   D. (c,k,v).
   E. (b,k,u).
   F. (c,l)

5. In the game tree from the previous question, how many strategies does Player 1 have?

   A. 5

   B. 6

   C. 7

   D. 12

6. Consider the following version of the 21 flags game, where each turn you can take 1,2,3 or 4 flags, and the player who takes the last flag wins. When there are 16 flags left, what is the winning move?

   A. Take 1 flag.

   B. Take 2 flags.

   C. Take 3 flags.

   D. Take 4 flags.

   E. This is a lost position.

7. What is the "Stealing the first move"-argument and what does it demonstrate?

   A. It is an argument to show that in certain games the first player has a winning strategy.

   B. It is an argument to show that in certain games there cannot be a predetermined move order.

   C. It is an argument to show that in certain games, we cannot have a winning strategy for either player, because such a strategy could always be stolen by the other player.

   D. It is an argument to show that in certain games your best move is to wait and see what your opponent does and then copy that.

8. In the standard Ultimatum game, what is the rollback equilibrium?

   A. Player 1 makes the smallest allowable offer, and Player 2 accepts.

   B. Player 1 offers a fair (50-50) split, and Player 2 accepts.

   C. Player 1 makes the smallest allowable offer, and Player 2 rejects.

   D. Player 1 offers a fair (50-50) split, and Player 2 rejects.

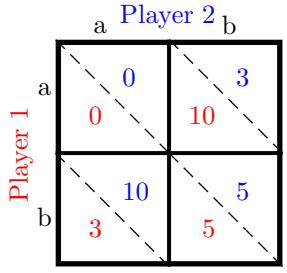
9. What kind of game is this?

   A. Chicken

   B. Battle of the Sexes

   C. Prisoner's Dilemma

   D. Coordination Game



10. Which of the following statements best describes the difference between the Pure Coordination game and Battle of the Sexes?

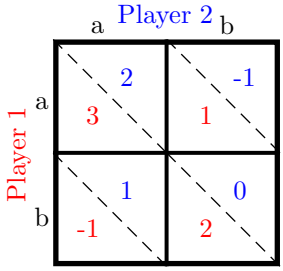
    A. In the battle of the sexes game, both players have a dominant strategy, while in the coordination game there are no dominant strategies.

    B. In the coordination game, players are indifferent between the Nash Equilibria, whereas in the battle of the sexes games each player prefers one equilibrium over the other.

    C. In the battle of the sexes game, players try to do the opposite of what their opponent does, while in the coordination game the players try to do the same thing.

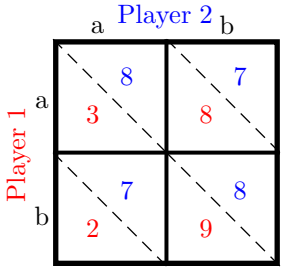
    D. In the coordination game there are no dominated strategies, while in the battle of the sexes game choosing the same move as you're opponent is dominated.

11. In this game, who has a dominant strategy?



A. No player has a dominant strategy.
B. Only Player 1.
C. Only Player 2.
D. Both players do.

12. In this game, is (a,a) and equilibrium?



A. Yes.
B. No, because neither player gets the highest possible payoff.
C. No, because Player 1 would get a higher payoff at (a,b).
D. No, because Player 1 would get a higher payoff at (b,b).

13. What is a "Tragedy of the Commons"?

A. It is a game which has the feature that using a common sense approach will lead to losses for all players.
B. It is a situation in which every player has an incentive to take a course of action which ultimately leads to bad payoffs for all players.
C. It is a situation in which a resource is owned by a private entity (e.g., a company) resulting in a negative outcome for the public as a whole.
D. It is a game in which two players have to achieve a common goal but fail due to the way the payoffs in the game are set up.

14. Suppose we throw two fair dice. What is the probability that the sum is 6?

A. 6/36
B. 1/11
C. 5/36
D. 1/2

15. In Texas Hold'em, there are 1326 different starting hands. What is the probability that you get dealt a pair of Queens? (I.e., what is the probability that if you draw two cards from a standard shuffled deck both cards are Queens?)

A. 1/1326
B. 4/1326
C. 6/1326
D. 12/1326
E. 13/1326

16. Kimberly and Mr. F are having an argument about throwing two fair dice. According to Kimberly, a total of 5 is equally likely as a total of 6: the possible outcomes are totals between 2 and 12, and hence in either case the probability is 1/11 by Cardano's Law. Mr. F, on the other hand, insists that Cardano's Law cannot be used in this way, because these outcomes can occur in different ways. Who is correct?

A. Mr. F is correct.
B. Kimberly is correct.
C. Neither is correct.
D. Kimberly's answer of 1/11 is correct, but for the wrong reasons.

17. Roulette (European). We place a $100 bet on odd, and a $500 bet on 0. Which statement is most accurate?

    A. The probability of winning is greater than the probability of losing but the EV is negative.

    B. The probability of losing is greater than the probability of winning, but the EV is positive.

    C. The probability of winning is greater than the probability of losing, and the EV is positive.

    D. The probability of losing is greater than the probability of winning, and the EV is positive.

18. Which statement about how we should think about the possible hands our opponent in a texas hold'em game might have is most accurate?

    A. At the start of the hand our opponent may have anything, but as we progress through the hand we should be able to say exactly what hand (s)he has based on the actions taken.

    B. In poker, the actions taken by our opponent do not give us any information about his/her possible holdings. Therefore, we can only gain information about this by considering psychological factors.

    C. In poker, the actions taken by our opponent do not give us any information about his/her possible holdings. Therefore, we can only gain information about this by considering our own cards and the cards on the board.

    D. At the start of the hand our opponent may have anything, but as we progress through the hand, we should narrow down his/her range of possible holdings by removing those hands which are incompatible with the actions taken.

19. Pot Limit Omaha. Player 1 holds A♥A♠4♥5♠, while Player 2 holds Q♦J♠T♠9♦. On the turn, the board is Q♣Q♥3♠2♥, giving Player 2 the current best hand. How many outs does Player 1 have?

    A. 2

    B. 6

    C. 9

    D. 11

    E. 13

20. What is the expected value (for you) of the following bet? We roll a fair die. If it comes 1 or 5, I pay you $15. Otherwise you pay me $9.

    A. $6

    B. $9

    C. $2

    D. $3

    E. None of the above.

21. What is the main use of a focal point?

    A. A focal point helps players choose which Nash equilibrium in a game to aim for.

    B. A focal point helps players find Nash equilibria in games where it is too difficult to find those by means of exact calculation.

    C. A focal point helps players determine whether their opponents are rational or not.

    D. A focal point helps players improve their level of play by moving attention to those strategies which have the highest possible payoffs.

22. It is best to measure the payoffs in games in utils, not in terms of dollars. Suppose that we just played a game. I got a payoff of 2 utils, and your payoff was 3 utils. What can we conclude from this?

    A. You played better than I did.

B. We both made a positive amount of money from the game, but you made a bit more than I did.

C. Even though I had some success in the game, I still lost.

D. None of the above.

23. What statement about the St Petersburg Paradox is correct?

A. The expected monetary payoff of the bet is small, but most people attach a high value to the bet because there is a high chance of winning.

B. The expected monetary payoff of the bet is small, but most people attach a high value to the bet because they overestimate the chances of winning.

C. The expected monetary payoff of the bet is high, but most people attach a low value to the bet because there is only a small chance of winning a lot.

D. The expected monetary payoff of the bet is high, but most people attach a low value to the bet because they underestimate the chances of winning.

24. The Public Investment game (as played twice in class) can be described as a multi-person prisoner's dilemma. Why?

A. Everyone has a dominant strategy, but when everyone plays that strategy the overall outcome is not desirable.

B. In both games, it is impossible to predict what the others will do, and hence in both games undesirable outcomes are inevitable.

C. Both games involve trying to minimize your opponents' payoffs.

D. In both games, there are strategies which seem reasonable but which turn out to be risky due to the unpredictability of your opponents.

25. What is the main difference between an English and a Dutch auction?

A. English auctions are ascending, while Dutch auctions are descending.

B. English auctions are open-outcry, while Dutch auctions are sealed bid.

C. English auctions are first prize, while Dutch auctions are second prize.

D. English auctions generally result in greater profit for the seller than Dutch auctions.

26. What does Vickrey's *Revenue equivalence theorem* say?

A. Assuming rational bidders, all auction types yield the same revenue for the seller.

B. All auction types are on average equally profitable due to the fact that there are always irrational bidders.

C. All rational bidders in any given auction type will make the same profit.

D. Over the long run, all auction houses generate the same amount of revenue.

27. In a scene of the movie "A Beautiful Mind", John Nash and his friends are in a bar and are eyeing a group of girls. The blonde is the most desirable to all of them, but Nash reasons that if they all try to woo her, none of them will succeed; moreover, they will then also fail with her friends, because none of them likes to be second choice. Therefore, he concludes, the best solution is when all of them ignore the blonde and each approaches one of her friends. Is this strategy profile a Nash Equilibrium?

A. Yes, because all players (guys) end up with a satisfactory outcome (assuming that they each manage to seduce one of the non-blondes).

B. Yes, because the alternatives don't give a better outcome; thus even though this scenario isn't optimal, it is the best one can hope for given the circumstances.

C. No, because each guy would have an incentive to cheat and go for the blonde while the others go for her friends.

D. No, because nobody achieves the best possible outcome (being with the blonde).

28. At the end of 1945, the RAND corporation was founded. What was the main motivation behind this?

    A. Military and political leaders hoped that research in general and game theory in particular could improve and guide decision-making in affairs of international strategy.

    B. During the war, many scientists felt that they ought to oppose the creation of nuclear weapons; RAND was founded in order to create an environment where scientists could work without political pressure to contribute to the war efforts.

    C. RAND was created in an effort to protect scientists who had to flee Europe because of the war.

    D. RAND was created by the United Nations in order to promote scientific research which could benefit international relations and peace-keeping efforts.

29. The ancient Greeks were avid gamblers and greatly advanced mathematics, but did not develop a mathematical theory of probability. Which of the following explains that?

    A. The philosophical and mathematical tradition emphasized absolute certainty.

    B. The Greeks believed that the study of uncertainty was not part of mathematics, but of philosophy.

    C. The Greeks believed that studying probability from a mathematical point of view would ruin the fun of gambling.

    D. The games favoured by the Greeks were relatively simple and needed no mathematical analysis.

30. What is the main difference between normative and behavioural game theory?

    A. The normative theory investigates how rational individuals assign utility values to outcomes, while the behavioural theory investigates how this leads them to play in practice.

    B. The normative theory investigates how rational individuals should play in games, while the behavioural theory investigates why individuals diverge from theoretically optimal play in practice.

    C. The normative theory investigates how rational individuals play games in practice, while the behavioural theory investigates how this affects their behaviour.

    D. The normative theory investigates why rational individuals play optimal strategies in games, while the behavioural theory investigates how they find such strategies in practice.

Bonus Question: In the Dutch fast food tradition, a popular snack with an oriental flavour is called "nasibal" (literally, "ball of nasi"). What is this?

A. A meatball with Indonesian satay sauce.

B. A deep fried ball of spicy pork with peanuts.

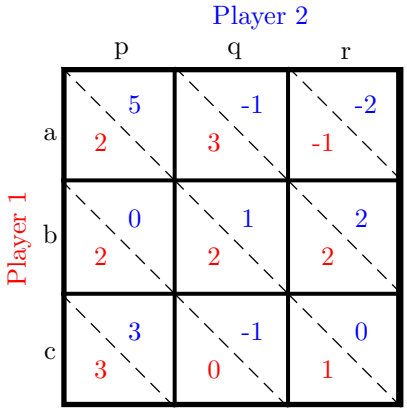
C. A deep fried ball of curried rice.

D. A variation on Scotch eggs with hot peppers.

Part 2: Long Answer Questions: choose 2 questions.

Write your answers in the space below the questions. Each question is worth 5 points. You get points for clear, structured and relevant motivation of your answers.

Question 1. Consider the following game matrix:



(a) Explain directly (i.e., without referring to your answer from the next part) why (a,p) is not a Nash Equilibrium.

(b) In the matrix, indicate all best responses for both players.

(c) Use this to find all Nash Equilibria in pure strategies.

Question 2. In class we played the "Guess the number Game", where everyone wrote down a number between 0 and 100, and where the winner was the person whose number was closest to 3/4 of the average.

- Does this game have any strictly dominated strategies? If so, which? If not, why?
- Does this game have any strictly dominant strategies? If so, which? If not, why?
- Identify all Nash Equilibria in this game. Explain your answer.

Question 3. Immediately following World War 2, game theory became increasingly popular. Explain in half a page how the historical events in that period contributed to the growth of the subject, and why the popularity of the subject declined after 1960.