

cmput 355 2025 practice questions 6

Rose is the row player, Colin is the column player. RPS is rock-paper-scissors. Read handout <https://webdocs.cs.ualberta.ca/~hayward/355/rps.pdf> and answer these questions.

1. Give Rose's expected RPS payoff matrix.
2. This is modified RPS (MRPS): if Rose plays rock and Colin plays scissors, Rose wins 2, otherwise the game is the same as RPS. Give Rose's expected MRPS payoff matrix.
3. In MRPS, Colin follows strategy C_X : play R,P,S with resp. probabilities .5,.1,.4.
 - a) Against C_X , how many possible strategies can Rose play?
 - b) Give a strategy R_Y for Rose that is best against C_X .
 - c) How can you answer b), given your answer to a)?
4. Assume that Rose follows a strategy R_t with R,P,S resp. prob's a, b, c . If Colin plays column 1 against R_t , what is Rose's expected payoff? Repeat for columns 2 and 3.
5. Continuing from the previous question, how will Rose pick a, b, c to maximize her expected payoff?
6. Continuing from the previous question, how many choices does Rose need to consider in order to find a strategy with best payoff?
7. Formulate Rose's problem as a linear program.
8. If you were working at home and had access to a computer and the internet, explain how you could find the solution to the previous question.
9. Formulate Colin's problem (find a best MRPS strategy) as a linear program.
10. Someone tells you that a Von Neumann equilibrium for MRPS is (3/12, 5/12, 4/12) for Rose, (4/12, 5/12, 3/12) for Colin, expected Rose payoff 1/12. Prove or disprove this.
11. Someone tells you that a Von Neumann equilibrium for MRPS is (3/12, 5/12, 4/12) for Rose, (1/3, 1/3, 1/3) for Colin, expected Rose payoff 1/12. Prove or disprove this.

12. Rose and Colin play this game.

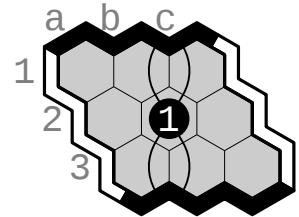
1	0	-2
3	5	-4
-6	7	8

What is Rose's expected payoff if she plays $S = (.7, .1, .2)$ and Colin plays $T = (.4, 0, .6)$?
(Express your answer as an arithmetic expression: you do not need to simplify.)

Read handout <https://webdocs.cs.ualberta.ca/~hayward/355/andor.pdf> and answer these questions.

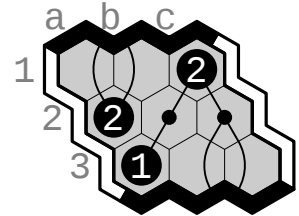
13. In each case, give this hex strategy in and-or form and draw the corresponding and-or tree:

- from the diagram, the 1st-player Black win-strat
- after 1.B[b2], the remaining 2nd-player Black win-strat
- after 1.B[b2] 2.W[b3], the remaining 1st-player Black win-strat



14. In each case, give this hex strategy in and-or form and draw the corresponding and-or tree:

- from the diagram, the 1st-player Black win-strat
- after 1.B[a3], the remaining 2nd-player Black win-strat
- after 1.B[a3] 2.W[b1], the remaining 1st-player Black win-strat



15. In each case, give this hex strategy in and-or form and draw the corresponding and-or tree:

- from the diagram, the 1st-player Black win-strat
- after 1.B[a2], the remaining 2nd-player Black win-strat
- after 1.B[a2] 2.W[a3], the remaining 1st-player Black win-strat

