MA 2080: Worksheet 5

1 Simplex Methods

(C) Use the simplex method to solve the problem.

9. Maximize $P = 15x_1 + 10x_2$ subject to $2x_1 + x_2 \le 10$ $x_1 + 3x_2 \le 10$ $x_1, x_2 \ge 0$ 10. Maximize $P = 3x_1 + 2x_2$ subject to $5x_1 + 2x_2 \le 20$ $3x_1 + 2x_2 \le 16$ $x_1, x_2 \ge 0$

- 11. Repeat Problem 9 with the objective function changed to $P = 30x_1 + x_2$.
- 12. Repeat Problem 10 with the objective function changed to $P = x_1 + 3x_2$.

Solve the linear programming problems in Problems 13–28 using the simplex method.

13. Maximize $P = 30x_1 + 40x_2$ subject to $2x_1 + x_2 \le 10$ $x_1 + x_2 \le 7$ $x_1 + 2x_2 \le 12$ $x_1, x_2 \ge 0$ **14.** Maximize $P = 15x_1 + 20x_2$ subject to $2x_1 + x_2 \le 9$ $x_1 + x_2 \le 6$ $x_1 + 2x_2 \le 10$ $x_1, x_2 \ge 0$ $P = 2x_1 + 3x_2$ 15. Maximize subject to $-2x_1 + x_2 \le 2$ $-x_1 + x_2 \le 5$ $x_2 \leq 6$ $x_1, x_2 \ge 0$ 16. Repeat Problem 15 with $P = -x_1 + 3x_2$. **17.** Maximize $P = -x_1 + 2x_2$ subject to $-x_1 + x_2 \le 2$ $-x_1 + 3x_2 \le 12$ $x_1 - 4x_2 \le 4$ $x_1, x_2 \ge 0$

2 Some Probability Questions

- 1. Experiment, flip coin three times. Record heads or tails.
 - (a) Write down sample space. What is n(S)?
 - (b) Let A be getting a head on the first flip. What are n(A) and P(A)?
 - (c) Let B be getting at least two heads. What are n(B) and P(B)?
 - (d) Compute P(A|B) and P(B|A).
 - (e) Are A and B independent?
- 2. Roll a fair four-sided die twice. Record the numbers on the rolls.
 - (a) Write down sample space. What is n(S)?
 - (b) Let A be getting a two on the first roll. What are n(A) and P(A)?
 - (c) Let B be getting a sum of 5. What are n(B) and P(B)?
 - (d) Let C be getting a sum of 6. What are n(C) and P(C)?
 - (e) Compute P(A|B) and P(B|A).
 - (f) Compute P(A|C) and P(C|A).
 - (g) Are A and B independent?
 - (h) Are A and C independent?
 - (i) Can you explain why A and B are independent, but A and C are not?
- 3. There are four games left in a sports teams season. The team is quite an average team and is equally likely to win or lose any given game.
 - (a) Write down sample space. What is n(S)?

I get
$$S = \{WWWW, WWWL, \ldots\}$$

- (b) Let A be the event of winning for the first two games. What are n(A) and P(A)?
- (c) Let B be the event of winning exactly two games. What are n(B) and P(B)?
- (d) Let C be the event of winning at least two games. What are n(C) and P(C)?
- (e) Compute P(A|B) and P(B|A).
- (f) Compute P(A|C) and P(C|A).
- (g) Are A and B independent?
- (h) Are A and C independent?
- (i) If our team needs to win at least one game to be in the playoffs, what is the probability the team is in the playoofs?
- 4. There are three games left in a hockey season. The team is quite an average team and is equally likely to win, lose or tie any given game.

(a) Write down sample space. What is n(S)?

I get $S = \{WWW, WWL, WWT, \ldots\}$

- (b) Let A be the event of winning for the first two games. What are n(A) and P(A)?
- (c) Let B be the event of winning exactly two games. What are n(B) and P(B)?
- (d) Let C be the event of winning at least two games. What are n(C) and P(C)?
- (e) Compute P(A|B) and P(B|A).
- (f) Compute P(A|C) and P(C|A).
- (g) Are A and B independent?
- (h) Are A and C independent?
- 5. Joe asked 100 people whether they like cheese pizza or pepperoni pizza.
 - 54 people like cheese pizza.
 - 24 people like both.
 - 10 people like neither.
 - (a) Draw the Venn diagram for this problem.
 - (b) What is the probability if we pick a person at random that they will like cheese pizza?
 - (c) What is the probability if we pick a person at random that they will like cheese pizza and pepperoni pizza?
 - (d) What is the probability if we pick a person at random that they will like cheese pizza and pepperoni pizza?
 - (e) What is the probability if we pick a person at random that they will like cheese pizza given that they like pepperoni pizza?
 - (f) Is liking cheese pizza independent of liking pepperoni pizza?