

Exam 2 - An Overview of what you need to know...**Chapter 3 – Linear Programming**

- Graph systems of linear inequalities to find the solution (feasible region)
- Determine if a feasible region is bounded or unbounded
- Find the exact value of the corners of the feasible region
- Set up a linear programming problem which includes
 - Defining all the variables
 - Finding the objective function and stating if it is minimized or maximized
 - Stating “Subject to”
 - Listing the constraints, including non-negativity when appropriate
- Know the theorems
- Solve linear programming problems using the method of corners, including parametric solutions, word problems and parametric word problems
- After finding the optimal solution, determine if any resources are leftover

Chapter 6 – Sets and Counting

- Be able to use roster notation, set notation, and set builder notation
- Find subsets of a set and know the number of subsets and proper subsets
- Know the meaning of the symbols used such as $\emptyset, \in, \notin, \subset, \subseteq, \cup, \cap$, and c
- Know how to shade Venn diagrams and express shaded regions in set notation
- DeMorgan’s Laws
- Union rule: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
- Fill in two and three-circle Venn diagrams with numbers when given information
- Use the multiplication principle to find the number of ways to complete a series of tasks
- Determine the number of ways to arrange a set of items, some of which are identical
- Determine the number of ways to choose groups when order does not matter (combinations)

Chapter 7.1 – Experiments, Sample Spaces, and Events

- A sample point is the outcome of an experiment and a sample space is the set of all possible sample points
- Use a tree diagram to find the sample space
- An event is a subset of the sample space
- Mutually exclusive events can’t occur at the same time

Part I – Linear Programming

1. A linear programming problem has an objective function $f = 3x - 4y$ on the region
- $$\begin{aligned} 4x + 5y &\leq 20 \\ x - 3y &\leq 0 \\ x &\geq 1 \end{aligned}$$

What are the maximum and minimum values of f and where are they located?

2. A linear programming problem has an objective function $f = 2x + 8y$ on the region
- $$\begin{aligned} 5x + 2y &\geq 15 \\ 2x + 3y &\geq 12 \\ x + 4y &\geq 10 \\ x &\geq 0, y \geq 0 \end{aligned}$$

What are the maximum and minimum values of f and where are they located?

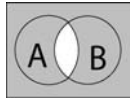
3. Set up the following Linear Programming problem

Farmer Blue has 175 plots available to plant short- and long-stemmed strawberries. Each plot of long-stemmed strawberries will yield 40 baskets of strawberries and each plot of short-stemmed will yield 60 baskets of strawberries. He wants to have at least three times as many baskets of long-stemmed strawberries than he does of short-stemmed strawberries. The long-stemmed will sell for \$4.00 per basket and the short-stemmed will sell for \$3.00 per basket. How many plots of each type of strawberry should Farmer Blue plant to maximize his revenue?

4. A manufacturer makes two types of products: widgets and gadgets. Each widget and gadget needs to be fabricated, polished and wrapped as shown in the table below:

	fabrication minutes	polishing minutes	wrapping minutes	Profit
widget	9	12	11	\$3
gadgets	9	10	6	\$5
available time	288 minutes	338 minutes	275 minutes	

How many of each type of product should be produced to realize a maximum profit? What is the maximum profit? What, if anything is leftover?

Part II – Sets

1. Express the shaded regions in set notation:

2. A class of math students can be grouped in the following sets:

$$A = \{x \mid x \text{ is a woman}\}$$

$$B = \{x \mid x \text{ has taken Economics}\}$$

Find the set of women who have not taken Economics in set builder notation

3. A store has sold 100 microwaves. 80 of the microwaves have turntables and 40 of them have programs. If 90 of them have programs or turntables, how many have only turntables?

4. A survey of two hundred students is done at a school cafeteria. Use the information given to fill in a Venn diagram:

55 students like pizza and burritos.

130 students did not like chicken.

30 students like all three items.

35 students like burritos but did not like chicken.

55 students like only pizza.

60 students like exactly 2 of these dishes.

15 students like chicken and pizza but not burritos.

5. Shade the region corresponding to

(a) $\{x \mid x \notin A \text{ or } x \in B\}$ (b) $(A \cup B)^c$ (c) $(A \cap B^c) \cup C$ (d) $(B \cup C) \cap A^c$

(e) $(A \cap B^c \cap C^c) \cup (A^c \cap B \cap C)$

6. Define the following sets. Note that U is the universal set. Decide if each statement is true or false.

$$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\} \quad A = \{1, 2, 3\} \quad B = \{2, 4, 6\} \quad C = \{3, 5, 7\}$$

(a) B and C are disjoint

(b) $1 \subseteq A$

(c) $B \subset B$

(d) $\{3, 5\} \in C$

(e) $A \cap B = 2$

(f) $A \cup C = \{1, 2, 3, 3, 5, 7\}$

(g) A has 8 proper subsets

Part III – Counting

1. There are three letters in an airport's abbreviation.
 - (a) How many different airport call letters are possible?
 - (b) How many are possible if no repeats are allowed?
 - (c) How many if three of the same letter is not allowed?
 - (d) How many are possible if no repeats are allowed and a vowel must be in the middle?
2. A pizza place has 12 different toppings available for pizza. How many different 2 item pizzas are possible?
3. How many different "words" can be made from the letters in *HALLOWEEN*?
4. You are dealt 2 cards. How many ways can you be dealt a blackjack? (that is, a sum of 21 where an ace is worth 11 and a 10 and face cards are worth 10).
5. From a class of 18 students a committee of 5 is chosen. One person on the committee is the chair and the others are the members. How many different committees can be chosen?
6. You have 4 different yellow books and 4 different green books. How many ways can the books be arranged on the shelf if the colors must alternate?
7. You have a bag of jelly beans. There are 4 blue, 5 green and 2 pink jelly beans. A sample of 3 is chosen. How many ways to have exactly one blue or exactly two green?
8. How many ways can a hand of 4 cards be dealt if exactly 3 of them are queens?
9. You have advertisement to layout for a full page newspaper ad. The ad features 3 different departments and each department has 4 items for sale. If items from the same department must appear all on the same row, how many different ads are possible?

Part IV – Language of Probability

1. An experiment consists of choosing a card from a standard deck of cards and noting the suit and then flipping a coin.
 - (a) What is the sample space for this experiment?
 - (b) How many events are possible in this experiment?
 - (c) Are the events E, a heart is picked and F, a head is tossed mutually exclusive events?