Directions

You should not consider this packet to be anything other than practice for the Midterm. There may be questions on the Midterm that do not resemble these questions entirely. Review all your notes, previous quizzes, and homework. In doing so there should be no surprises. This may not be an exhaustive study list, but I thought I'd include one to get you started.

1. Chapter 1: Voting Methods

   - What is a preference ballot? What is a preference schedule?
   - Plurality method – how to apply, pros and cons
   - Borda count method – how to apply, pros and cons
   - Plurality-with-elimination method – how to apply, pros and cons
   - Pairwise comparison method – how to apply, pros and cons
   - What is a Condorcet candidate? How do search for a Condorcet candidate?
   - What are the four major fairness criteria?
   - What is Arrow's Impossibility Theorem?

2. Chapter 3: Mathematics of Sharing

   - Fair Value Systems: What is the concept of fair share? Know how to calculate prices of fair shares.
   - Divider-chooser – How to tell who divides? Is it better to be divider or chooser?
   - Lone-divider – Process of assigning shares.
   - Sealed Bids – How to calculate fair shares? What is a surplus? How is the surplus calculated/distributed?
   - Method of markers – What are fair shares to the players? Know the process to distribute items.

3. Chapter 9: Population Growth Models

   - Arithmetic (linear) Sequences: What is the common difference? How do you find terms? How do you find which term a specific number is in the sequence? How do you sum the first N terms?
   - Geometric (exponential) Sequences: What is the common ratio? How do you find terms? How do you sum the first N terms?
   - Word problems: Recognize when to use arithmetic or geometric sequences. Be able to figure out common ratio or difference.
   - How to tell a sequence is linear or exponential.

Chapter 1: Voting Methods

Consider the following preference schedule:

Number of Voters	29	21	18	10	1
1st Choice	D	A	B	C	C
2st Choice	C	C	A	B	B
3st Choice	A	B	C	A	D
4st Choice	B	D	D	D	A

1. Find the winner using the plurality method.

2. Find the winner using the Borda count method.

3. Find the winner using the plurality-with-elimination method.

4. Find the winner using the pairwise comparisons method.

5. Use this election to show why the plurality-with-elimination violates the Condorcet criterion.

Chapter 3: Mathematics of Sharing

Fair Value and Lone-Divider

Alice, Bob, and Carlos are dividing among themselves the family farm equally owned by the three of them. The farm was divided into three shares, namely s_1, s_2, and s_3. Consider the table below illustrating how each of them values the three shares:

	s_1	s_2	s_3
Alice	38%	28%	34%
Bob	$33\frac{1}{3}\%$	$33\frac{1}{3}\%$	$33\frac{1}{3}\%$
Carlos	34%	40%	26%

1. Who was the divider? How do you know?

2. Write down the bid lists for each player. (What each player considers to be a fair share.)

3. Find all possible fair **divisions** (so, assingments) of the assets.

4. Of the fair divisions found, which one is the best?

Sealed Bids

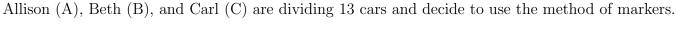Ana, Belle, and Chloe are dividing four pieces of furniture using the method of sealed bids.

Steps:	Ana	Belle	Chloe
Bids (made in private, sealed envelope)			
Dresser	$150	$300	$275
Desk	$180	$150	$165
Vanity	$170	$200	$260
Tapestry	$400	$250	$500
Total of Bids			
Fair Share			
Initial Allocation of Items			
Value of Items Won			
Estate Payment/Receipt			
Estate Surplus Share			
Final Allocation (Items and Net Payment/Receipt)			

Estate Work Sheet

This Work sheet is used with the Sealed Bids Estate Settlement work sheet to calculate the amount of surplus each player received from the Estate.

A. Sum of all monies paid into the Estate   A. _____

B. Sum of monies paid out of the Estate   B. _____

C. The difference of A and B = total surplus   C. _____

D. Each player's share if total surplus   D. _____

The Method Of Markers

Allison (A), Beth (B), and Carl (C) are dividing 13 cars and decide to use the method of markers.

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

A: immediately to the right of cars 4 and 9

B: immediately to the right of cars 3 and 8

C: immediately to the right of cars 4 and 7

1. Which segments does each player consider a fair share? (List for each player.)

2. Describe the allocation of items to each player.

3. Which items are left over?

Chapter 9: Population Growth Models

1. Consider the sequence $5, 9, 13, 17, \ldots$.

    (a) Is the sequence linear or exponential? Find the common difference or common ratio.

    (b) Find T_4.

    (c) Find T_{17}.

    (d) What is the 38th term of this sequence?

    (e) The number 185 is what term of the sequence?

(f) The number 233 is what term of the sequence?

(g) What is $\displaystyle\sum_{i=0}^{15} T_i$?

2. Consider the sequence $34, 28, 22, 16, \ldots$.

(a) Is the sequence linear or exponential? Find the common difference or common ratio.

(b) Find T_4.

(c) Find T_{19}.

(d) What is the 33rd term of this sequence?

(e) The number -92 is what term of the sequence?

(f) The number -128 is what term of the sequence?

(g) What is $\displaystyle\sum_{i=0}^{15} T_i$?

3. Consider the sequence $2200, 1760, 1408, 1126.4 \ldots$

   (a) Is the sequence linear or exponential? Find the common difference or common ratio.

   (b) Find T_4.

   (c) Find T_{11}.

   (d) What is the 7th term of this sequence?

   (e) What is $\displaystyle\sum_{i=0}^{13} T_i$?

4. Consider the sequence $20, 28, 39.2, 54.88 \ldots$.

    (a) Is the sequence linear or exponential? Find the common difference or common ratio.

    (b) Find T_4.

    (c) Find T_9.

    (d) What is the 7th term of this sequence?

    (e) What is the sum of the first 15 terms of the sequence? Use sigma notation and the appropriate sum formula.

5. Some conceptual stuff.

   (a) A population **increases** exponentially by 12%. What is the common ratio r?

   (b) A population **increases** exponentially by 13.5%. What is the common ratio r?

   (c) A population **decreases** exponentially by 19%. What is the common ratio r?

   (d) A population **decreases** exponentially by 9.5%. What is the common ratio r?

   (e) Why can't a linear sequence be an exponential sequence, or vice versa?