[8 pts]

1. Formulate an LP model for the following problem. (DO NOT ATTEMPT TO SOLVE IT!!)

A furniture manufacturer makes chairs and sofas. The production process consists of three functions: carpentry, finishing, and upholstery. There are 100 labor hours available for carpentry, 32 labor hours available for finishing, and 88 labor hours available for upholstery. Each chair requires 3 hours for carpentry, 2 hour for finishing, and 2 hours for upholstery. Each sofa requires 3 hours for carpentry, 1 hour for finishing, and 3 hours for upholstery. The profit on each chair is $45, and the profit on each sofa is $65. How many of each should be produced to maximize the profit? What is the maximum profit? **AGAIN, SET UP, BUT DO NOT SOLVE!! FIRST DEFINE THE VARIABLES.**
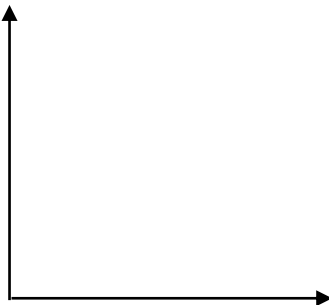
[10 pts]

2. Consider the following linear programming problem.

$$\text{Maximize} \quad P = 40x + 50y$$

$$\text{Subject to} \quad \begin{aligned} x + 2y &\leq 2 \\ 3x + y &\leq 3 \\ x, \ y &\geq 0 \end{aligned}$$
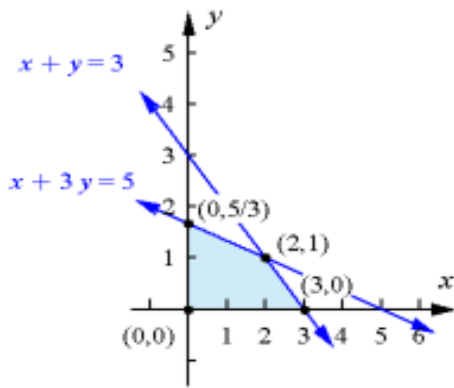
Shade the feasible region labeling ALL corner points in (x,y) form, **use algebra to verify**.
YOU DO NOT NEED TO MAXIMIZE, JUST SHADE THE FEASIBLE REGION AND LIST THE CORNER POINTS!

List the Corner Points:

3. Given the feasible region below, find the maximum and minimum values of the objective function

$P = 4x + 6y.$ Show all your work!   [8 pts]

[10 pts]

4. The following augmented matrices represent systems of linear equations in variables x, y, and z. In each case state the general solution or that no solution exists. Write answer in (x,y,z) form. Use t as the parameter if needed.

a. $\begin{bmatrix} 1 & 2 & -3 & | & 1 \\ 0 & 1 & 6 & | & -4 \\ 0 & 0 & 0 & | & 0 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 1 & | & 10 \\ 0 & 4 & 3 & | & -4 \\ 0 & 0 & 1 & | & 2 \end{bmatrix}$

[8 pts]
5. Evaluate or simplify each of the following.

a) $\frac{14!}{11!} + 0! + 1! + 5!$

b) $\frac{(n+2)!}{(n-2)!}$

[21 pts]   PLEASE WRITE ANSWERS IN NUMERICAL ORDER.

6.   If the universal set $U = \{0,1,2,3,4,5,6,7,8,9\}$, $B = \{1,2,3,4\}$; $C = \{3,4,5,6\}$ and $A = \{5,6,8\}$, find the following:

a) $A \cap B$ b) $n(A \cup B)$

c) $A \cap C$ d) A'
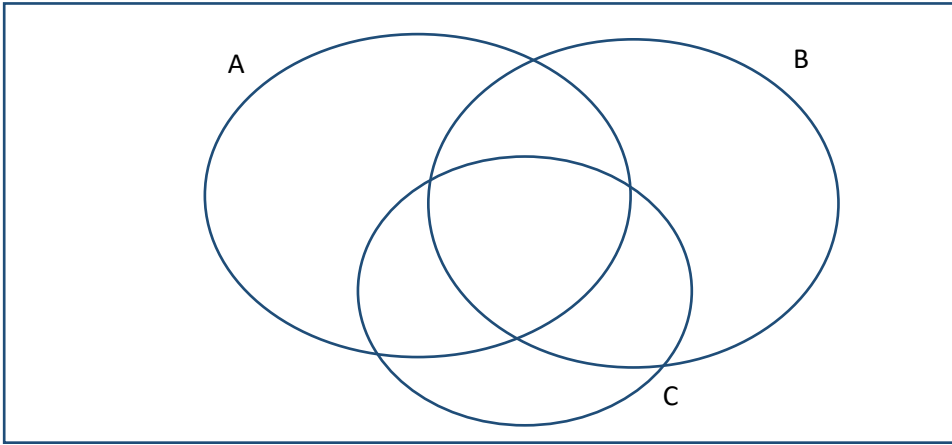
e) $(A \cup B)'$ f) $A \cap (B \cup C)$

g) Completely fill in the 3-set Venn Diagram

7.   In a survey of 500 property crimes, the following data were obtained. Give answers as reduced fractions.

Residence	Burglary	Vehicle Theft	Theft	Total
Urban	44	14	162	220
Suburban	30	10	106	146
Rural	26	4	104	134
Total	100	28	372	500

a) What is the probability that the residence is rural given there has been a vehicle theft?   [15]

b) What is the probability of being burglarized, given that the residence is suburban?

c) What is the probability that the residence is rural and it was a burglary?

d) What is the probability it was vehicle theft or an urban residence?

e) What is the probability that it was not a burglary?

3

8. A club surveyed 250 members and found that: [9 pts]
170 used an exercise bike regularly
119 use a stair stepper regularly
65 use both regularly

Draw a Venn Diagram, label completely, and answer the following:

a) How many used a stair stepper
regularly but not a bike?

b) How many used neither the bike
nor the stair stepper?

[8 pts]

9. A packet of vegetable seeds has a germination rate of 96%. *** you don't need to compute, just set up***

a) What is the probability that exactly 10 of 12 seeds planted will sprout?

b) What is the probability that at least 10 of the 12 seeds planted will sprout?

[9 pts]

10. In a somewhat non-parallel universe they have an alphabet which contains 42 letters.

a) If a business is to use 3 letters for an acronym, how many acronyms are possible?

b) How many 3 letter acronyms are possible if there is no repetition?

c) How many 3 letter or 4 letter acronyms are possible if there is no repetition?

4

[8 pts]

11. A class has 51 students. Find (unsimplified, i.e. just set up)

      a) The number of ways they can elect a president, vice-president, secretary and treasurer for their class.

      b) The number of ways they can select five students to be on the student council.

[12 pts]

12. A hospital billing department knows that the probability patients 60 or older pay the balance of their bill after one billing is 80%, while for a person under 60 the probability is 45%. Seventy percent of the hospital's patients are 60 years or older.

      a)   Construct a tree diagram for this information, labeling all probabilities and outcomes.

      b)   Given that the balance of the bill is not paid after one billing, what is the probability that the patient was less than 60? Show set up as well as the answer. Round to 2 decimal places.

13.   Suppose an urn contains 8 red balls, 5 yellow balls and 7 green balls. One ball is chosen at random, not replaced, then an other ball is chosen. Give answers as reduced fractions.   [8 pts]

a) Find the probability both are yellow   b) find the probability the first is red and the 2nd is green.

14. You can sell 90 pet chias per week if they are marked at $1 each, but only 30 each week if they are marked at $2 per chia. Your chia supplier is prepared to sell you 20 chias each week if they are marked at $1/chia, and 100 each week if they are marked at $2 per chia. Assume that the relationship between price and supply is linear and that the relationship between price and demand is linear.
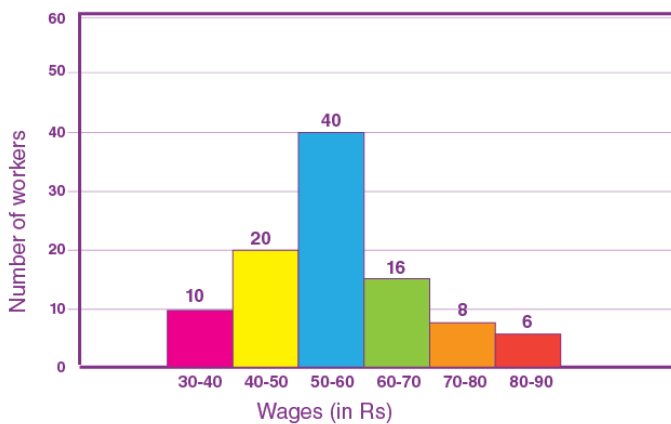
a) Find the **supply** equation of the form $q = mp + b$, where p is price per chia and q is the number of chias.

b) Suppose the **demand** equation is $q = -60p + 150$, where p if the price per chia and q is the number of chias, find the equilibrium quantity and price. You must show all your work algebraically.

Quanity:_____

Price: _____

15. [10 pts]

a) What is the mode?

b) What percent of this sample of workers earn between 70-80 Rs?

c) What is the average (mean) wage of the workers? Put units on answer. Show all work!

16.   The cost to manufacture a sofa is $600 per sofa plus a fixed setup cost of $4,500. Each sofa sells for $750.   [12 pts]

   a) Determine the revenue from selling x sofas

   b) Determine the cost of manufacturing x sofas a week.

   c) Determine the break-even point. Find the number of sofas as well as the amount of money. Show work algebraically.

[9]

17.   What is the mean, median and mode for the following?

14, 18, 13, 20, 48, 10, 12, 20, 14, 20

Mean:_____

Median: _____

Mode: _____
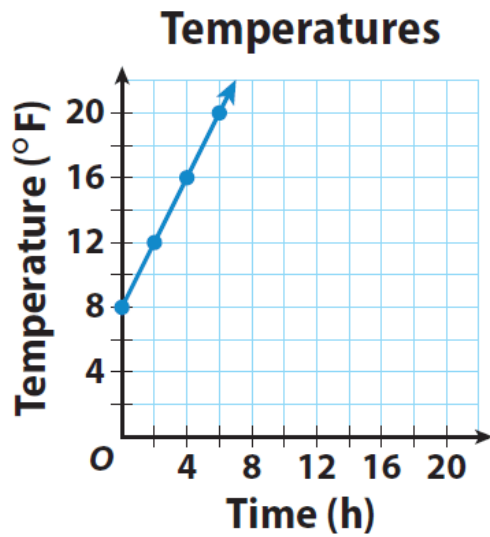
[8 pts]

18. You have $150 on a cafeteria card. If $4.50 is deducted each time your card is swiped,

a) Write a linear function that expresses the balance B after x swipes.

b) Use your equation to find out the number of swipes required until the balance reaches $78. Show your work algebraically.

[9 pts]

17. Use the graph to answer the questions.

Temperatures

a) What is the slope? Include units

b) Write the equation of this line in slope intercept form, were x is the time in hours.

c) Use your equation to estimate the temperature after 9 hours. Include units.

18.   Find the slope of the line $2x - 3y = 9$ [6 pts]