

# Student Review Problems for Final Exam

NOTE: The following problems are to serve merely as practice for your final exam. The problems cover the chapters discussed this semester except for the material of 8.4-8.6, and Chapter 5. The final exam for MATH 141 is NOT a common exam; each instructor makes up his/her own final exam as they did for the other tests of the semester. It is advised that you work your old exams, quizzes, and assignments as well as any old week-in-review problems which you feel might be beneficial to you.

## CHAPTER 1

- Find the equation of the circle that has a radius of 8 and a center at (3,-8).
- Find the distance between the x and y intercepts of the given lines.
  - $18x + 3y = 9$
  - $-2x + 3y = 18$
  - $-6x + 12y = 24$
- What is the distance between the points (2,3) and (3,1)?
- A:(0,0), B:(200,100), C:(50,300), D:(300,200)  
If you start at A and travel to B, then to C, then to D, back to B, then home to A, what is the total distance traveled?
- What is the slope and x-intercept for the line  $4y+36+18x = 0$ ?
- Give the equation of the line passing through the points (2,3) and (1,-2).
- Find the equation of the line parallel to the line  $6x - 3y = 12$  and through the origin.
- Given  $3x - 4y = 14$ , find the following.
  - The equation of a line with a negative y-intercept and perpendicular to the given line.
  - The equation of a line parallel to the given line.
  - The equation of a line with a negative x-intercept and perpendicular to the given line.
- Given  $3x - 2y = 7$ , find the following.
  - The equation of a line with a negative y-intercept and parallel to the given line.
  - The equation of a line with a positive x-intercept and perpendicular to the given line.
- Find the equation of the line through (2,5) and perpendicular to  $y = 5x + 4$ .
- Find the equation of a line that passes through (1,2) and (3,4) and is perpendicular to  $y = -0.5x + 3$ .
- The Hertz Car Rental Company rents out a Honda Civic for \$50/day and 20 cents/mile, while the Sun Valley Car Rental Company rents out the same model for \$40/day and 25 cents/mile.
  - Find the functions that describe the WEEKLY cost of rental from each company.
  - Sketch the graphs of the two functions on the same set of axes.
  - If a customer plans to drive at most 3000 miles, which company should he rent from for 1 week?
- In 1980 Paul buys a new fishing boat for \$15,000. In the year 1995 he sells the boat for \$2500. Assuming that the depreciation of the boat is linear, find an equation that expresses the value of the boat as a function of time, where time is the number of years since 1980.

14. A student buys a computer for \$5000 and after 1 month it will be worth \$4900.
- Find an expression for the value of the computer as a function of time, where time is measured in months since the computer was purchased.
  - What's the rate of depreciation?
  - What's the computer worth after 2 years?
15. A company buys a car, to be used by all employees, for \$20,000. After 5 years it's worth \$15,000.
- Find an expression for the value of the car as a function of time.
  - What's the rate of depreciation?
  - What's the car worth after 8 years?
16. A company buys a chicken rotisserie machine for \$13,500 and after 7 years it will be worth \$5,200.
- Find an expression for the value of the chicken rotisserie machine as a function of time.
  - What is the rate of depreciation of the machine?
  - How much is the machine worth in 3 years?
17. A boat is worth \$37,750 in 1998 and is being depreciated linearly over 15 years.
- What is the rate of depreciation of the boat?
  - What is the value of the boat in 2008?
18. A company that makes rotisserie machines has a cost of \$1500 to make 7 machines and a cost of \$2800 to make 17 machines.
- Find the company's cost equation.
  - What is the revenue equation if each machine sells for \$13,500?
  - What is the profit the company would make from selling 15 machines?
19. C.C. Creations makes A&M Maroon Out T-shirts. The cost to make 300 shirts is \$750 and the cost to make 1000 shirts is \$1500. (Pretty cheap!) If each shirt sells for \$5, what is
- the cost equation?
  - the revenue equation?
  - the profit if 50,000 shirts are made and sold?
20. A company makes candy canes. It costs \$12 to make 400 candy canes and \$32 to make 1200 candy canes. Find the cost equation.
21. A company that produces shirts has a monthly fixed cost of \$50,000, a production cost of \$10 a shirt, and each shirt sells for \$30.
- Sketch the graphs of the cost and revenue functions.
  - Find the break-even point.
  - Sketch the graph of the profit function.

22. A company making radios finds that the total cost of producing 100 radios is \$9,000 and that the total cost of producing 150 radios is \$13,000. Each radio sells for \$110. Let  $x$  be the number of radios made and sold. Find the
- cost function.
  - revenue function.
  - profit function.
  - break-even point and explain its meaning.
23. A person owns a business which has a fixed cost of \$80,000 and a production cost of \$10 for each item it manufactures. An item sells for \$20. Find the
- cost function.
  - revenue function.
  - profit function.
  - break-even point.
  - profit corresponding to production levels of 4000, 8000, and 12000 items, respectively.
24. It costs a company \$500 to make 100 lamps and \$1,200 to make 300.
- Find the cost equation.
  - What is the revenue of selling lamps if each lamp sells for \$75?
  - What is the profit from selling 'x' lamps?
  - Find the break-even point.
25. A store can sell 10 bikes when the price is \$120 each and can sell 50 bikes when they are \$75 each. Find the demand equation.
26. The quantity demanded for a car is 12000 units when the invoice is \$15,000. If the price drops by \$1,500, 14000 cars are demanded. The car will not be marketed if the dealer's invoice is below \$13,000. For each \$1,000 increase, the dealer will supply 50 additional cars.
- What is the demand function?
  - What is the supply function?
27. When pencils cost 10 cents each, 1000 are demanded. When they cost 6 cents each, 1875 are demanded. If the pencil company wants to sell 2200 pencils, what should they charge per pencil?
28. The quantity demanded of TI-83 calculators is 950 units when the price is \$90. The demand increases to 1000 units when the price drops to \$85. Determine the demand function.
29. The quantity demanded for model Corvettes is 8000 if the price is \$20. If the price goes up to \$25, the quantity demanded goes down to 6000. A manufacturer will not market the models if the price drops below \$10. For every \$5 increase, he will produce 2000 more models.
- Find the demand function.
  - Find the supply function.
  - Find the equilibrium point.
30. Given data: (0,0), (1,2), (3,5), (4,6), and (6,9).
- Find the best-fitting line for the data.
  - Is the line you found a good fit for the data? Why or why not?

## CHAPTER 2

31. Given  $A = \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$ ,  $B = \begin{bmatrix} 5 & 1 \\ 2 & 0 \\ 3 & 4 \end{bmatrix}$  and  $C = \begin{bmatrix} 6 & 1 & 3 & 4 \\ 7 & 5 & 1 & 0 \\ 2 & 1 & 8 & 1 \end{bmatrix}$

find:

- (a)  $AB$   
 (b)  $BC$

32. Find the following, if  $A = \begin{bmatrix} 1 & 4 \\ 5 & 6 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$  and  $C = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

- (a)  $A^T$   
 (b)  $2B$   
 (c)  $B + C$

33. Transpose the following matrices:

(a)  $\begin{bmatrix} A & B & C & D \\ E & F & G & H \\ I & J & K & L \\ M & N & O & P \end{bmatrix}$

(b)  $\begin{bmatrix} 1 & -2 & 3 \\ 3 & 4 & -2 \\ 2 & 3 & 7 \end{bmatrix}$

34. Is there an inverse for a 3 x 6 matrix?

35. Solve the following for a, b, and c:  $\begin{bmatrix} a & 4 \\ 1 & -2 \end{bmatrix} - 2 \begin{bmatrix} 4 & 3 \\ (b+3) & 0 \end{bmatrix} = \begin{bmatrix} 3 & -2 \\ 4 & c \end{bmatrix}$

36. Solve the following for a, b, c, and d.

(a)  $\begin{bmatrix} 2 & 4 \\ -3 & 1 \end{bmatrix}^T \begin{bmatrix} 0 & -4 \\ 1 & 2 \end{bmatrix} - 3 \begin{bmatrix} 4 & b \\ (a+1) & -2 \end{bmatrix} = \begin{bmatrix} (d+3) & 2 \\ -4 & c \end{bmatrix}$

(b)  $3 \begin{bmatrix} -1 & (3+a) \\ b & 7 \end{bmatrix} + \begin{bmatrix} 2 & -3 \\ 8 & 4 \end{bmatrix} \begin{bmatrix} 7 & 0 \\ -3 & 9 \end{bmatrix}^T = \begin{bmatrix} (20-d) & -18 \\ 62 & c \end{bmatrix}$

(c)  $4 \begin{bmatrix} -3 & 0 \\ 7 & 2 \end{bmatrix}^{-1} \begin{bmatrix} 2 & -4 \\ 5 & 2 \end{bmatrix} + 3 \begin{bmatrix} 1 & (c-2) \\ b & 4 \end{bmatrix}^T = \begin{bmatrix} (d+4) & -2 \\ 5 & a \end{bmatrix}$

37. Are the following matrices in row-reduced echelon form?

(a)  $\left[ \begin{array}{ccc|c} 1 & -2 & 0 & t \\ 0 & 1 & 3 & u \\ 0 & 0 & 1 & v \end{array} \right]$

(b)  $\left[ \begin{array}{cccc|c} 0 & 0 & 1 & 0 & x \\ 1 & 0 & 0 & 0 & w \\ 0 & 0 & 0 & 0 & t \\ 0 & 0 & 1 & 0 & r \end{array} \right]$

38. Solve the following systems of equations.

$$\begin{aligned} \text{(a)} \quad & 3x - 5y = 6 \\ & -2x + 4y = -7 \\ & 2x - 4y = 6 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & 3x + y + z = -3 \\ & -4x - z = 3y + 2 \\ & 3x = -5 - 6y - 3z \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & -3x + 2y + 5z = 10 \\ & 5x + 10y + 7z = 1 \\ & x + y + z = 27 \\ & -10x + 7y + 7z = 4 \\ & -9x + 41y + 69z = 43 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad & 3x - 2y = 40 \\ & 5x - 6y + 4z = 30 \\ & x - 4y + z = 10 \end{aligned}$$

$$\begin{aligned} \text{(e)} \quad & x - 2y + 3z + 4w = 17 \\ & 2x + y - 2z - 3w = -9 \\ & 3x - y + 2z - 4w = 0 \\ & 4x + 2y - 3z + w = -2 \end{aligned}$$

$$\begin{aligned} \text{(f)} \quad & x - 3y + 7z = 9 \\ & 2x + 4y - 5z = 4 \\ & 3x - 5y + 3z = -1 \end{aligned}$$

$$\begin{aligned} \text{(g)} \quad & x + y + z = 30 \\ & 2y + 4z = 15 \\ & 2x - y + 2z = 15 \end{aligned}$$

$$\begin{aligned} \text{(h)} \quad & 2x - y - 3z = 3 \\ & 2x + 2y - z = 7 \\ & 3y + 2z = 4 \end{aligned}$$

$$\begin{aligned} \text{(i)} \quad & x + 2y = 20 \\ & 3x + 4z = 25 \\ & 2y + 7z = 16 \end{aligned}$$

$$\begin{aligned} \text{(j)} \quad & x + 3y + 2z = 60 \\ & 4x + z = 30 \\ & x + y = 10 \end{aligned}$$

$$\begin{aligned} \text{(k)} \quad & 2x + 3y + z = 9 \\ & 4x - y + 3z = -1 \\ & 6x + 2y - 4z = 8 \end{aligned}$$

39. Jamal has 3 stocks, HND, JBC, and LMC with 300, 600, and 900 shares, respectively. HND's price is \$128/share, JBC's is \$13/share, and LMC's is \$57/share on one particular day. Use a matrix equation to show Jamal's stock's worth for the day.
40. Alex bought 3 pairs of shoes, 4 shirts, and 2 hats. The hats cost \$18 each, the shoes cost \$68 a pair, and the shirts cost \$19 each. Using matrices, find out how much Alex spent on school clothes.
41. Joe has a total of 20 different kinds of livestock. He knows that he has an equal number of heifers and bulls, but two less calves than heifers. Determine how many heifers, bulls, and calves that Joe has by setting up a system of equations and solving. Then, find matrices A, B, and X so that the system can be written in the form  $AX = B$ .
42. A child wants to build a block city. Each house requires 50 square blocks, 100 rectangular blocks, and 4 windows. Each store requires 50 square blocks, 125 rectangular blocks, and 8 windows. Each school requires 100 square blocks, 75 rectangular blocks, and 20 windows. If there are 5250 square blocks, 7375 rectangular blocks, and 880 windows, how many houses, stores, and schools can the child build if all of the materials are to be used?
43. A company makes two types of toys: zappers and wompers. Each zapper takes 6 oz. of plastic and 4 minutes to manufacture. Each womper takes 3 oz. of plastic and 2 minutes to manufacture. There is available 1000 oz. of plastic and 40 hours of manufacturing time. Determine how many of each toy the company can make, if all resources are to be used.
44. 4000 students and faculty went to Reed Arena to listen to a motivational speaker. Student tickets cost \$3 and faculty tickets cost \$2. The total revenue for the event was \$11,780. How many faculty members and students attended this event?
45. Hart Hall has three groups (Hart Hall Surgeons, Hart Hall Hellraisers, and Hart Burn) producing three types of shirts: A,B, and C. The Surgeons can make 1 shirt A in an hour, 1 shirt B in 1.5 hours, and 1 shirt C in  $3/4$  of an hour. The Hellraisers can make 1 shirt A in 2 hours, 1 shirt B in  $1/2$  an hour, and 1 shirt C in an hour. The Hart Burners can make all three types of shirts in an hour. We assume that when the groups are not in class they are making shirts. (They never sleep!) If the Surgeons and Hart Burners are in class for 13 hours a day each and the Hellraisers are in class for 9 hours a day, how many of each kind of shirt will be produced in a day?
46. A bakery purchased a set of 24 pans with a combined capacity of 2500 lbs of dough. There are three sizes of pans which have capacities of 80 lbs, 60 lbs, and 180 lbs, respectively. How many of each pan is purchased?

### CHAPTER 3

47. Graph  $x - 2y > 0$
48. Graph  $5x - 3y \geq 15$
49. Is the following bounded?  
 $2x + 8y \leq 24$   
 $x - y < 4$
50. Find the feasible region and label the corner points of the following system.  
 $5x - 2y \leq 10$   
 $6x + 8y \leq 10$   
 $x \geq 0, y \geq 0$

51. Graphically determine the solution set for the following system.

$$x + y \leq 7$$

$$0 \leq x \leq 5$$

$$y \geq 0$$

52. Determine the solution set of the following system and whether or not the solution set is bounded.

$$-x + 2y \leq 12$$

$$3x \geq 2y + 16$$

$$x \geq 0, y \geq 0$$

**Use the method of corners to solve the linear programming problems in 53-62.**

53. OBJ: Min  $C = 6x + 3y$

$$\text{SUBJ TO: } 4x + y \geq 40$$

$$2x + y \geq 30$$

$$x + 3y \geq 30$$

$$x \geq 0, y \geq 0$$

54. OBJ: Min  $C = 4x + 2y$

$$\text{SUBJ TO: } 2x + 2y \geq 6$$

$$x + y \geq 4$$

$$3x + 2y \geq 10$$

$$x \geq 0, y \geq 0$$

55. OBJ: Min  $C = 2x + 5y$

$$\text{SUBJ TO: } 4x + y \geq 40$$

$$2x + y \geq 30$$

$$x + 3y \geq 30$$

$$x \geq 0, y \geq 0$$

56. OBJ: Max  $P = 2x + 5y$

$$\text{SUBJ TO: } x + y \leq 10$$

$$3x + y \geq 12$$

$$-2x + 3y \geq 3$$

$$x \geq 0, y \geq 0$$

57. OBJ: Max  $P = 5x + 3y$

$$\text{SUBJ TO: } 30y + 40x \leq 1200$$

$$10x + 15y \leq 540$$

$$x + y \geq 30$$

$$x \geq 0, y \geq 0$$

58. OBJ: Max  $P = 3x + 4y$

$$\text{SUBJ TO: } x + y \leq 48$$

$$x + 3y \geq 70$$

$$3x + 5y \leq 320$$

$$x \geq 10, y \geq 10$$

59. OBJ: Max  $P = 4x - 3y$   
 SUBJ TO:  $x + 2y \leq 50$   
 $5x + 4y \leq 145$   
 $2x + y \geq 25$   
 $x \geq 0, y \geq 5$

60. OBJ: Max  $P = 3x + 6y$   
 SUBJ TO:  $x + 2y \leq 11$   
 $5x + 3y \leq 30$   
 $x \geq 0, y \geq 0$

61. OBJ: Max  $P = 8x + 3y$   
 SUBJ TO:  $x + 2y \geq 4$   
 $x + 3y \geq 6$   
 $x \geq 0, y \geq 0$

62. OBJ: Min  $C = 5x + 9y$   
 SUBJ TO:  $-2x + 5y \geq 13$   
 $x + y \geq 18$   
 $x \geq 0, y \geq 0$

63. Find where the objective function  $P = 9x + 2y$  is maximized and what the maximum value is, given that the corner points of the bounded feasible region are (0,6), (8,3), (6,2), and (4,0).

64. Find where the objective function  $P = 2x + 3y$  is both maximized and minimized and what the maximum and minimum values are, given that the corner points of the bounded feasible region are (3,6), (3,9), (6,7), and (6,4).

**SET UP the following TWO linear programming problems, but do not solve.**

65. A farmer has 220 acres of land that he uses to grow cotton and lima beans. It takes 1.5 days to pick an acre of cotton and 2 days to process it. It takes 2 days to pick an acre of lima beans and 1 day to process them. If there are 175 days per year available for picking and 50 days per year available for processing, and each acre of cotton brings \$250 and each acre of lima beans brings \$150, how many acres of each crop should be planted in order to maximize profits?

66. A company produces two types of saddles, one english and one western. The english sells for \$350 and the western for \$600. The english saddle requires 5 units of leather, 12 hours assembly time, and 2 units of stitching. The western saddle requires 12 units of leather, 16 hours of assembly, and 4 units of stitching. The company only has 1100 units of leather, 32 eight-hour days for assembly, and 42 units of stitching. How many of each model should be produced in order for the company to maximize its revenue?

67. **SET UP AND SOLVE the following three linear programming problems using the METHOD OF CORNERS.**

(a) Suppose a company produces two products A and B that sell for \$200 and \$100, respectively. Product A takes \$100 to produce; B takes \$75 to produce. The company has \$250,000 available for production and 1600 hours of labor available. If product A takes 10 minutes to produce and product B takes 15 minutes to produce, what is the maximum revenue that the company can make?

- (b) A coat factory makes two sizes of coats. The large coat requires 10 units of cotton and 5 buttons and sells for \$75. The small coat requires 5 units of cotton and 3 buttons and sells for \$55. The factory has 60 units of cotton and 30 buttons. How many of each coat should the company produce in order to maximize its revenue?
- (c) A shoelace maker makes \$4 for every shipment of variety A shoelace and \$3 for each shipment of variety B shoelace. There are 10 hours available for constructing the actual laces; each shipment of variety A takes 1 hour to make and each shipment of B takes 2 hours to make. It takes 3 hours to attach the little plastic thing to the ends of a shipment of variety A and 1/2 an hour to attach them to the ends of a shipment of B; there are 8 hours available for adding the plastic things. It takes 2 of a total of 12 people to produce a shipment of either variety. (Assume a person can only work on one shipment of laces.) In order to maximize the amount of money he makes, how many shipments of each variety of shoelace should the shoelace maker produce?

## CHAPTER 4

68. Use the simplex tableau below.

- (a) What are the basic variables at this point in the process?
- (b) What are the non-basic variables at this point in the process?
- (c) Is the tableau in final simplex form?  
If so, what is the final solution? If not, indicate the pivot element.

$$\left[ \begin{array}{ccccccc|c} x & y & t & u & v & w & P & \\ \hline 4 & 0 & 0 & 2 & 0 & 1 & 0 & 40 \\ 3 & 0 & 0 & -3 & 1 & 0 & 0 & 20 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 18 \\ -3/4 & 0 & 1 & 1 & 0 & 0 & 0 & 10 \\ \hline 3 & 0 & 0 & -5 & 0 & 0 & 1 & 50 \end{array} \right]$$

69. Solve the following linear programming problems by using the **SIMPLEX METHOD**.

- (a) OBJ: Max  $P = 3x + 7y + 2z$   
SUBJ TO:  $3x + 5y + 3z \leq 15$   
 $4x + 5y + 2z \leq 20$   
 $x \geq 0, y \geq 0, z \geq 0$
- (b) OBJ: Max  $P = 4x + 6y$   
SUBJ TO:  $3x + y \leq 24$   
 $2x + y \leq 18$   
 $x + 3y \leq 24$   
 $x \geq 0, y \geq 0$
- (c) OBJ: Max  $P = 3x + 9y$   
SUBJ TO:  $2x + 6y \leq 12$   
 $3x + y \leq 18$   
 $x + 2y \leq 12$   
 $x \geq 0, y \geq 0$

- (d) OBJ: Max  $P = 16x + 14y$   
 SUBJ TO:  $x + y \leq 13$   
 $2x + y \leq 30$   
 $8x + 5y \leq 90$   
 $x \geq 0, y \geq 0$
- (e) OBJ: Max  $P = 2x + 10y - z$   
 SUBJ TO:  $5x + 3y + z \leq 13$   
 $9x + 2y + 3z \leq 28$   
 $4x + y + 6z \leq 15$   
 $x \geq 0, y \geq 0, z \geq 0$
- (f) OBJ: Max  $P = 4x + 3y$   
 SUBJ TO:  $2x + y \leq 10$   
 $2x + 3y \leq 18$   
 $x \geq 0, y \geq 0$
- (g) OBJ: Max  $P = 3x + 4y + 8z$   
 SUBJ TO:  $3x + y + 4z \leq 10$   
 $4x + 2y + 3z \leq 45$   
 $2x + 3y + 4z \leq 126$   
 $x \geq 0, y \geq 0, z \geq 0$

70. **SET UP AND SOLVE** the six following linear programming problems using the **SIMPLEX METHOD**.

- (a) A company manufactures two products, A and B, on two machines, I and II. It has been determined that the company will realize a profit of \$3/unit on product A and a profit of \$4/unit on product B. To manufacture a unit of A requires 6 minutes on machine I and 5 minutes on machine II. To manufacture a unit of B requires 9 minutes on machine I and 4 minutes on machine II. There are 5 hours of machine I time available and 3 hours of machine II time available in each work shift. How many units of each product should be produced in each shift to maximize the company's profit?
- (b) Nissan Motor Co. makes two cars, the Maxima and the I-30. They are essentially the same car except that the I-30 has a few more "extras". A Maxima costs \$15,000 to make and an I-30 costs \$17,500 to make. The profit made from a Maxima sold is \$8,000 and the profit made from an I-30 sold is \$17,500. Due to the "prestige" factor that keeps the price of an I-30 so high, I-30 production is limited to no more than 75 a month while no more than 250 Maximas are produced a month. If Nissan desires to spend no more than \$250,000 on monthly production, how many Maximas and I-30s should it produce to maximize profits?
- (c) A company manufactures teddy bears. Each large bear uses 5 buttons, 3 yds of fabric, and 20 g of fluff. Each small bear uses 7 buttons, 2 yds of fabric, and 15 g of fluff. The profit on the large bear is \$20/bear and the profit on the small bear is \$17/bear. If there are 67 buttons, 23 yds of fabric, and 500 g of fluff, how many bears of each size should the company manufacture to maximize profits? How many buttons, yds of fabric, and g of fluff will be left over?
- (d) Jenkins Industry produces two types of lamps, floor lamps and table lamps. To produce each floor lamp requires 1.5 hours of labor and 8 lbs of materials. To produce each table lamp requires 2 hours of labor and 6 lbs of materials. The profit for each floor lamp is \$25, and the profit for each table lamp is \$30. If 40 hours of labor and 1000 lbs of materials are available for the production of the lamps per day, how many lamps of each type should the Jenkins Industry produce each day in order to maximize profits?

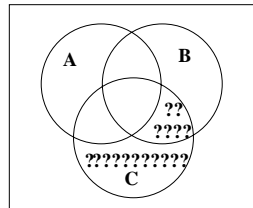
- (e) A company makes calculators. Standard calculators sell for \$26 each and require 25 buttons, 3 wires, and 2 batteries. Scientific calculators sell for \$86 each and require 49 buttons, 5 wires, and 3 batteries. If the company only has 500 buttons, 30 wires, and 50 batteries, how many of each type of calculator should the company make and sell in order to maximize revenue under these constraints?
- (f) A firm manufactures three types of tool sheds; small, medium, and large. Each small shed takes 2 hours to cut and 2 hours to assemble. Each medium shed takes 1 hour to cut and 3 hours to assemble. Each large shed takes 3 hours to cut and 4 hours to assemble. There is a total of 320 hours available to cut and 640 hours available to assemble sheds. No more than 200 sheds are to be produced. How many of each shed should be made to maximize profit if there is \$90 profit on each small shed, \$60 on each medium shed, and \$30 on each large shed?

## CHAPTER 6

71. Shade the portion of a Venn diagram that represents the given set notation.

- (a)  $(A \cap B) \cup (B \cap C)$   
 (b)  $(A^C \cap B)^C \cap C^C$   
 (c)  $(A \cap B)^C \cup (C \cap B)$   
 (d)  $(A \cup B) \cap C$   
 (e)  $A \cap (B \cup C^C)$

72. Describe the portion of the Venn diagram containing question marks using set notation.



73. A, B, and C are disjoint sets and  $n(A) = 65$ ,  $n(B) = 39$ , and  $n(C) = 42$ . Find  $n(A \cap B)$ ,  $n(A \cap C)$ ,  $n(A \cup B)$ , and  $n(A \cup C)$ .
74. Draw a Venn diagram representing the following:  
 U = all freshmen enrolled at A&M  
 A = all freshmen girls enrolled at A&M  
 B = all freshmen boys enrolled at A&M  
 C = all freshmen taking chemistry at A&M

Use the information given in problems 75-81 to fill in an appropriate Venn diagram.

75. 100 people are surveyed concerning the sports they prefer.
- 50 like football or baseball, but not basketball
  - 11 like baseball and basketball
  - 13 like basketball and football, but not baseball
  - 16 don't like any of these sports
  - 47 like football
  - 34 like at least two of these sports
  - 3 like all three of these sports
76. 150 Dallas residents are surveyed concerning their restaurant preferences.
- 65 like The Hardrock Cafe or Snuffers, but do not like Chili's
  - 41 like Chili's and Snuffers
  - 26 like none of these restaurants
  - 10 like Chili's and The Hard Rock Cafe, but do not like Snuffers
  - 77 like The Hard Rock Cafe
  - 67 like at least two of these restaurants
  - 30 like all three of these restaurants
77. A survey of students at Mischief High School is conducted to find out their pizza topping preferences.
- 190 like pepperoni
  - 40 like sausage and olives
  - 130 like olives
  - 150 like pepperoni and sausage
  - 20 like olives and pepperoni
  - 200 like sausage
  - 5 like none of these toppings
  - 5 like all three of these toppings
78. 300 Texans are surveyed concerning their previous travels to Oklahoma, Wyoming and foreign countries.
- 60 have been to Oklahoma and Wyoming only
  - 27 have been to all three places
  - 70 have never left Texas
  - 57 have been to a foreign country and Wyoming
  - 150 have been to Wyoming
  - 115 have been to only two of these places
  - 97 have been to a foreign country
79. 100 students are surveyed concerning their participation in football and baseball.
- 50 play football
  - 15 play both sports
  - 75 play at least one of these sports

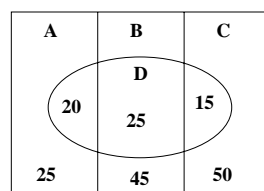
80. 100 Aggies are surveyed concerning where they prefer to go on Friday nights.
- 35 like Harry's and Shadow Canyon
  - 69 like The Chicken
  - 59 like more than one of the three places
  - 30 like Harry's or Shadow Canyon, but not The Chicken
  - 15 like Harry's and The Chicken, but not Shadow Canyon
  - 30 like all three places
  - 15 like Harry's, but not The Chicken
  - 1 likes to stay home and study for math!
- (a) Fill in a Venn diagram.
- (b) Express "the Aggies who like only Shadow Canyon" with set notation.
81. 350 people are surveyed concerning the Texas football teams they like to watch play.
- 130 watch Texas Tech and A&M, but not t.u.
  - 82 watch A&M and t.u.
  - 52 watch none of these three teams
  - 20 watch t.u. and Texas Tech, but not A&M
  - 215 watch Texas Tech
  - 60 watch all three of these teams
  - 250 watch A&M
- (a) Fill in a Venn diagram.
- (b) Shade the part of the diagram that shows the people that watch exactly 2 of the teams.
- (c) Express "the people who only watch A&M" with set notation.
82. In a survey of 200 people at a movie theater, 100 people said that they have seen movie A, 60 have seen movie B, and 40 have seen both movies. How many people surveyed have seen:
- (a) at least one of the movies?
- (b) exactly one of the movies?
- (c) neither movie?
- (d) both movies?
- (e) just movie A?
83. Of 2004 students surveyed, 1200 read the Battalion, 1000 read the Aggie Review, and 540 read the Chronicle. 5 read all three, 400 read the Aggie Review and the Battalion, 200 read the Aggie Review and the Chronicle, and 195 read the Chronicle and the Battalion. How many students surveyed read:
- (a) at least one of these?
- (b) at least two of these?
- (c) none of these?

84. In how many ways can four couples be seated in a row of eight seats at a theater if each couple is seated together?
85. Determine the amount of 7 digit telephone numbers that can be derived from the set  $S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$  with the only restriction being that the first digit cannot be zero.
86. A poll is being conducted among readers of USA Today. Eight multiple choice questions are asked, each with 5 possible answers. In how many different ways can a reader complete the poll if exactly one response is given to each question?
87. You are looking for 3-digit area codes. How many different ones are possible
- (a) if there are no restrictions?
  - (b) if the number 9 is not allowed to be used at all?
88. In how many ways can 10 different boxes of cereal be arranged on a shelf if:
- (a) there are no restrictions?
  - (b) one of the boxes, Frosted Flakes, must be displayed on the left end?
  - (c) Cocoa Pebbles must be displayed on the right end and Frosted Flakes must be on the left end?
89. How many distinct ways can the letters in the word HULLABALOO be arranged?
90. In how many ways can a supermarket chain select 3 out of 12 possible sites for the construction of new supermarkets?
91. A company makes 100 CDs with 10 of them being defective. You buy 8 from the factory directly. In how many ways can you get at least 1 defective CD?
92. There are 472 people; 263 are girls and 209 are boys.
- (a) How many 11 member soccer teams can be formed from those people?
  - (b) How many 11 member soccer teams can be formed if 6 members must be girls and 5 members must be boys?
93. If you have a box containing 4 red, 6 blue, 2 green, and 3 yellow marbles, in how many ways can you choose 4 marbles if you want exactly 2 green and 1 red marble?
94. How many five card hands can be drawn from a standard 52 card deck that contain exactly 2 red cards and 3 black cards?

## CHAPTER 7

95. A fair die is cast. What is the probability that a 2 is rolled?
96. From a standard deck of cards, what is the probability that you will select a red 5 if you draw one card?
97. Select a card at random from a standard 52 card deck. Find the probability of drawing
- (a) a king and a heart.
  - (b) a queen or a heart.
  - (c) a heart or a diamond.
  - (d) not a king.

98. Let A and B be two events with  $P(A) = 0.5$ ,  $P(B) = 0.7$ , and  $P(A \cup B) = 0.8$ . Find the following:
- $P(A^C)$
  - $P(A \cap B)$
  - $P(A^C \cap B^C)$
99. All probabilities are between \_\_\_\_\_ and \_\_\_\_\_ .
100. If you have a box with 4 purple, 3 red, 2 green, and 1 blue marble, and you select 3 at random, what is the probability you draw:
- one blue and 2 purple marbles?
  - at least 2 red marbles?
  - 2 green and one blue marble?
101. You go to a pet store to pick out a new kitten. There are 26 kittens to choose from, of which 6 are extremely sick (not a communicable disease). One kitten is selected randomly. What is the probability that the kitten chosen is
- healthy?
  - extremely sick?
102. A feed store has 50 sacks of corn of which 2 are bad. A deer hunter buys all 50 sacks of which he will put 7 in his feeder. What is the probability that he
- puts one bad sack in his feeder?
  - puts no bad sacks in his feeder?
103. There is a fruit market that has 120 oranges, 500 cherries, and 200 apples. Of these, there are 4 rotten oranges, 100 rotten cherries, and 10 rotten apples. What's the probability that a customer will select 2 rotten oranges of 2 oranges he/she picked, 1 rotten apple of 1 apple he/she picked, and 30 rotten cherries of 40 cherries he/she picked?
104. Roll two fair 8-sided dice. What is the probability that
- the sum is 9?
  - the second die rolled shows a smaller number than the first die rolled?
  - the sum of the dice is even, given that the second die rolled shows a 4?
105. A pair of fair 6-sided dice are rolled. If the sum of the numbers which lands uppermost on the dice is 6 or 7, what is the probability that the number which lands uppermost on the second die is a 4 or 5?
106. A mommy has two sets of twins (not necessarily identical). Draw a tree diagram showing all the possibilities.
107. Draw a tree diagram illustrating the properties of the given Venn diagram.

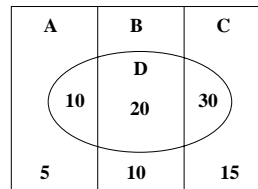


108. At a given time there are 2 green and 3 red lights on University Drive. Given that the first light is red, what is the probability you will encounter 2 green lights at the next two lights?

109. Suppose a box contains 20 Christmas tree lights of which 3 are defective. If the lights are selected at random one at a time without replacement and tested until all three defective lights are found, what is the probability that they will all be found after 4 trials?
110. In a group of 200 people in Florida,  $\frac{3}{4}$  are Republicans and  $\frac{1}{4}$  are Democrats. In the most recent presidential election, 95% of the Republicans voted for Bush, 4% voted for Gore, and the rest had unreadable ballots. On the other hand, 60% of the Democrats voted for Gore, 10% voted for Bush, and the rest had unreadable ballots. If an unreadable ballot is selected at random, what is the probability it was cast by
- a Democrat?
  - a Republican?
111. A farmer has 65 acres of corn and 35 acres of wheat. The probability of an acre of corn making more than market price is 0.02 and for wheat the probability is 0.16. If one of the farmer's acres is selected at random, what is the probability it is
- an acre of corn that makes above market price?
  - an acre of wheat that makes above market price?
112. In a CHEM 101 class, 53% are male and the rest are female. 25% of the females passed the class with a "D" or above and 33% of the males passed with a "D" or above.
- Draw a tree diagram representing this situation, labeling the probabilities of each branch.
  - What is the probability that a randomly selected student will be female and passing?
  - What is the probability that a student is male, given that the student is passing?

113. Using the given Venn diagram, find the following:

- $P(D)$
- $P(B \mid D)$
- $P(D^C)$
- $P(B \mid D^C)$



114. There are 1000 people who daily drive drunk in Houston, of which 60% are minors and 40% are legal adults. The probability that a drunk minor will be pulled over is 0.8, whereas that of a drunk adult is only 0.6. If a drunk driver is pulled over, what is the probability he/she is a legal adult?
115. A pouch contains 5 yellow and 7 blue marbles and a box contains 4 yellow and 6 blue marbles. A marble is chosen from the pouch and transferred into the box. A marble is then drawn from the box. What is the probability that the transferred ball was blue given that the second ball drawn was yellow?
116. There are three buckets, labeled 1, 2, and 3. Bucket 1 has 4 white candles and 3 pink ones. Bucket 2 has 5 white candles and 4 pink ones. Bucket 3 has 1 white candle and 5 pink ones.
- If a white candle is picked at random, what is the probability it is drawn from bucket 1?
  - What is the probability that a candle picked at random is drawn from Bucket 2 and is pink?

### CHAPTER 8 - (The first 3 sections)

117. Let  $X$  denote the random variable that gives the sum of the faces that fall uppermost when 2 fair six-sided dice are cast. Find  $P(X=9)$ .

118. At Christmas time every year the Salvation Army sends “ringers” out to stand in front of grocery stores to collect money for their programs. At the end of a busy shopping day the ringers totaled their results:

Ringer	1	2	3	4	5	6	7	8	9	10
Money (in \$)	100	50	300	100	40	250	125	80	100	50

- (a) Describe a random variable  $X$  that is associated with this data.  
 (b) Find the probability distribution for the random variable  $X$ .  
 (c) Compute the mean, variance, and standard deviation of  $X$ .
119. The grade distribution for a certain class is shown in the table. Find the probability distribution associated with this data.

Grade	A	B	C	D	F
Freq.	3	9	10	5	2

120. Find the expected value of  $X$  having the following frequency distribution:

X	-4	-3	-1	0	1	2
Freq.	35	6	2	1	10	11

121. If 3 of a child's toys are selected from his toy chest of 30 toys (7 of the 30 toys do not work any longer), what is the expected number of toys he picks that do not work?
122. You pay \$5.00 to play the following game. You have 2 chances to draw a ball from a bag. If you draw a white ball, you win nothing. If you draw a green ball, you win a dollar. If you draw a blue ball you win six dollars, and if you draw a red ball you win fifteen dollars. In the bag there are 30 balls total - 15 are white, 6 are green, 6 are blue, and 3 are red. After a ball is drawn, it is replaced before the next ball is drawn.
- (a) Find the expected net winnings of this game.  
 (b) Is this game fair? Why or why not?
123. In a lottery there are 6300 tickets to be sold for \$1 each. The first place prize is \$2,200, the second place prize is \$700, the third place prize is \$500, and the fourth place prize is \$100. Assuming all tickets are bought, what are the expected net earnings for someone who buys one ticket?
124. You pay \$8.00 to play in a game where you roll 2 fair six-sided dice. If you roll doubles you win 8 times the sum shown, unless you roll double ones where you win nothing. If there are no doubles and the sum of the dice is even then you win twice the amount shown; if the sum is odd you win the amount shown.
- (a) Draw a probability distribution describing your net winnings.  
 (b) What are your expected net winnings?
125. If the odds of something happening are 2 to 3, what is the probability of it happening?
126. If the odds are 5 to 8 against an event occurring, what is the probability of
- (a) the event occurring?  
 (b) the event not occurring?
127. A person has a \$15,000 life insurance policy from his employer for the year. The probability that he will live another year is 0.9872. If he purchases the same amount for himself, what is the minimum premium he can expect to pay?

128. JoeBob Burns wants to buy his wonderful wife a \$500,000 life insurance policy in the event that she will live 50 more years. (What marital bliss!) The probability she will live 50 more years is 0.1.

- (a) What is the minimum premium he can expect to pay?
- (b) Is this a very smart decision on JoeBob's part?

129. The probability distribution of a random variable  $X$  is given. Compute the mean, variance, and standard deviation of  $X$ .

$X$	1	2	3	4
$P(X=x)$	0.4	0.3	0.2	0.1

130. A probability distribution has a mean of 30 and a standard deviation of 4. Estimate the probability that an outcome of the experiment lies between 24 and 36.

131. The mean annual shrimp collection of a fisherman is 92000 lbs with a standard deviation of 600 lbs. What is the probability that the fisherman will take in between 90000 and 94000 lbs of shrimp?