1. A bag of 10 marbles contains 5 red marbles, 2 blue marbles, 2 yellow marbles, and 1 white marble.

   (a) Suppose you draw one marble from the bag at random. What is the probability that you drew a blue marble given that you did not draw a red marble?

   (b) Suppose you draw three marbles from the bag at random without replacement. What is the probability you draw at least 2 red marbles?

   (c) If you randomly draw 3 marbles from the bag simultaneously, what is the probability you drew 1 red, 1 yellow, and 1 white marble?

   (d) Suppose you randomly draw marbles from the bag, one at a time with replacement, until you draw a yellow marble. How many red marbles would you expect to draw (on average) before you draw a yellow marble?

2. 350 people live in an apartment building. Of those, 143 own a VCR and 94 own a PlayStation. 60 people own a DVD player and a PlayStation, 71 people own a VCR and a PlayStation, and 183 people own a VCR or a DVD player. Only 3 people own a DVD and PlayStation but not a VCR. How many people do not own a VCR, DVD player, or PlayStation?

3. For this problem the universal set is the set of months of the year: $U = \{$January, ..., December$\}$. Let T be the set of months that have 31 days. Let $S = \{$June, July, August$\}$.

   (a) Find $(T' \bigcup \emptyset) \bigcap S$.

   (b) Find $(T' \bigcup S') \bigcap \emptyset$.

4. Suppose you put \$3000 every year into an account that makes 8% interest annually. How much money will you have in 35 years? Round your answer to the nearest cent.

5. Suppose the payoff matrix for some game is $\begin{pmatrix} 4 & 8 & -3 \\ 2 & -1 & 1 \\ 7 & 9 & 0 \end{pmatrix}$.

   (a) Find any dominated strategies.

   (b) Find the optimum strategy for both players.

   (c) If the players play the game 250 times and both use optimum strategy, how much money will each player win or lose?

6. Suppose the payoff matrix for some game is $\begin{pmatrix} 3 & 5 \\ -4 & 3 \\ 1 & -2 \end{pmatrix}$.

(a) If player A chooses row 1 with probability .3 and chooses row 2 with probability .5, and if player B chooses both columns equally often, what is the expected value of the game?

(b) Without calculating optimum strategies, would you say the players in part (a) are using good strategy? Why or why not?

7. Find the maximum and minimum values (if they exist) of $z = 3y - 2x$ subject to the constraints $-x + 2y \leq 14, 3x + 2y \leq 24, x \geq 0, y \geq 0$. If the maximum and/or minimum values do not exist, explain why not.

8. Find all solutions to the following systems. If no solutions exist, say so.

(a) $$\begin{cases} w + 2x + y - z = -1 \\ 2w - x + 3y = -7 \\ 3x + 5y + z = 4 \\ -2w - x - 2y + 2z = 8 \end{cases}$$

(b) $$\begin{cases} 4x + 3y + 2z = -3 \\ -x - 2y - 2z = 2 \\ 2x - y - 2z = 3 \end{cases}$$

9. (a) Construct a histogram for the following list of data. Use eight intervals, starting with the interval 0-100.

$$77, 145, 182, 205, 236, 254, 275, 280, 315, 375, 475, 524, 608, 624, 638, 659, 771$$

(b) Would you say the data is close to normally distributed? Why or why not?

10. Suppose an assembly line produces a defective item 1/25 of the time.

(a) If the assembly line produces 100 items, what is the probability that exactly 3 of those items are defective?

(b) Use normal approximation to estimate the probability that between 960 and 1000 items are defective out of a total of 25000 items produced.

11. The Jones Candy Company finds that 315 out of 500 candy eaters surveyed like Jones' new Chocolate Walnut Bar.

(a) What are the *population*, *parameter*, *statistic*, and *sample* in this situation?

(b) Construct a 95% confidence interval for this survey. Interpret your interval in words.