Problem Set #2

1. There are four blue balls, three red balls, three yellow balls, and two green balls in a basket.
   a. With your eyes closed, you reach into the basket and choose a single ball. What is the probability
      that it is blue?
   b. Now instead you choose balls and replace them until a red ball appears. What is the probability
      a red ball appears for the first time on the 10\textsuperscript{th} draw?
   c. Now you choose balls and replace them until a red or yellow ball is chosen. What is the probability
      that neither a red nor a yellow ball will be chosen in 25 draws?

2. You play a game of cards with a friend. From a well-shuffled standard pack of 52 cards, he deals
   each of you five cards.
   a. What is the probability that all your five cards are of the same suit? (There are 4 suits with 13
      cards in each suit).
   b. You pick up two of your cards and find that they are both spades. What is the conditional
      probability that all your five cards are of the same suit?

3. Suppose the PP soccer team plays 19 games in a season. In each game they have a \( \frac{1}{2} \) probability
   of winning, a \( \frac{1}{3} \) probability of losing, and a \( \frac{1}{6} \) probability of tying. Games are independent.
   What is the probability that the team will end the season with a 7-11-1 record (7 wins, 11 losses, and
   1 tie)?

4. A bundle of 40 Pitzer t-shirts are delivered to Huntley Bookstore. They randomly select 4 t-shirts for
   inspection. If none or one is defective, the bundle is accepted. If two or more are defective, the bundle
   is rejected. What is the probability that the bundle will be rejected if only 4 of the 40 t-shirts are
   defective?

5. A Perris Valley sky-diving instructor can take 3 students at a time for a single jump. Students
   are only allowed one jump per day. One morning, 15 students show up at her office for sky-diving
   lessons.
   a. In how many ways can the instructor choose her 3 students for the first jump of the day?
   b. In how many ways can the instructor choose her 3 students for the third jump of the day?
   c. Among the 15 students, there is a couple and 13 singles. Given that the couple insists on being
      selected together (if not they would rather not jump), in how many ways can the instructor choose
      her 3 students for the first jump?

6. In Punxsutawney, Pennsylvania there are 162 sunny days per year. February 2 is Groundhog
   Day. If Punxsutawney Phil, the groundhog, sees its shadow due to sunny weather, we forecast six
   more weeks of winter. If the groundhog does not see its shadow, we forecast spring will arrive
   early. Punxsutawney Phil accurately forecasts six more weeks of winter 37\% of the time. Punxsutawney
   Phil accurately forecasts an early spring 47\% of the time. What is the probability
   of six more weeks of winter?
7. Susan, Mary, and Liz like to make hot tamales. Susan makes the best tamales. 90% of her tamales taste great. 80% of Mary’s tamales taste great. And 70% of Liz’s tamales taste great. However, Liz makes 50% of the tamales, Mary makes 30% of the tamales, and Susan only makes 20% of the tamales. If you have just eaten a bad tamale, what is the probability it was prepared by Mary?

8. Suppose that Roeper gives movies a “thumbs up” 65% of the time, and Ebert and Roeper give movies “two thumbs up” 40% of the time. If Roeper gives a movie a “thumbs up”, what is the probability that Ebert gave the movie a “thumbs up”?

9. Suppose that 71% of Pitzer student graduate in four years, and 81% graduate in six years. If you randomly select 10 first year Pitzer students, what is the probability that all 10 will graduate in four years? in six years?

10. Suppose Huntley Bookstore has a stock of 30 Lenovo ThinkPad X1 Carbon laptop computers of which 8 are defective because the battery can overheat. You and your roommate just purchased two of these laptop computers. What is the probability that both of your computers are defective?

11. You want to fly from LAX to Denver for an important meeting. There is a 20% chance that the direct flight from LAX to Denver will be canceled. There is a 25% chance that the flight from LAX to Phoenix will be canceled. And there is a 30% chance that the flight from Phoenix to Denver will be canceled. What is the probability that you will be able to get to Denver?

12. In the lottery game FANTASY 5 you have to select 5 numbers from the numbers \{1,2,3,...,38,39\}. The jackpot today is $76,000. Each ticket costs $1. In this lottery each number must be different and the order of the numbers does not matter.
   a. What is the probability of having a winning ticket?
   b. What is the expected value of this game?
   c. A fair game has an expected value of 0. How large does the jackpot have to be for Fantasy Five to be a fair game?

Due Wednesday 20 February

Extra credit: What is the expected value of KENO (Power Play Twenty)? See the details of the game on the course web page. You may want to do this in Excel.