1. At a university, 13% of students smoke.

   a. Calculate the expected number of smokers in a random sample of 100 students from this university.

   b. The university gym opens at 9 am on Saturday mornings. One Saturday morning at 8:55 am there are 27 students outside the gym waiting for it to open. Should you use the same approach from part a. to calculate the expected number of smokers among these 27 students?

2. Consider the following card game with a well-shuffled deck of cards. If you draw a red card, you win nothing. If you get a spade, you win $5. For any club, you win $10 plus an extra $20 for the ace of clubs.

   a. Create a table (sometimes called a probability model) that expresses the amount you win at this game in terms of a random variable; i.e. a column for the possible values and another column for their respective probabilities. Also, find the expected winnings for a single game and the standard deviation of the winnings.

   b. What is the maximum amount you would be willing to pay to play this game? Explain your reasoning.

3. An airline charges the following baggage fees: $25 for the first bag and $35 for the second. Suppose 54% of passengers have no checked luggage, 34% have one piece of checked luggage and 12% have two pieces. We suppose a negligible portion of people check more than two bags.

   a. Build a probability model, compute the expected revenue per passenger, and compute the corresponding standard deviation.

   b. About how much revenue should the airline expect for a flight of 120 passengers? With what standard deviation? Note any assumptions you make and if you think they are justified.

4. The manufacturer of a low-calorie dairy drink wishes to compare the taste appeal of a new formula (formula B) with that of the standard formula (formula A). Each of four judges is given three glasses in random order, two containing formula A and the other containing formula B. Between each tasting, all judges' palates are completely cleansed with milk. Each judge is asked to state which glass he or she most enjoyed. Suppose that the two formulas are equally tasty. Let Y be the number of judges stating a preference for the new formula.

   a. Which named random variable (Bernoulli, Binomial, Poisson) is Y? Why?

   b. Find the probability mass function for Y: $\mathbb{P}(Y = y)$.

   c. What is the probability that at least three of the four judges state a preference for the new formula?

   d. Calculate the expected value of Y using the definition of expected value of a random variable.

   e. Calculate the variance of Y using the definition of variance of a random variable.

   f. Calculate and interpret the standard deviation of Y.

5. The number of power surges in an electric grid has a Poisson distribution with a mean of one power surge every twelve hours. What is the probability that there will be no more than one power surge in a 24-hour period?