CHAPTER 8 PRACTICE QUESTIONS

Directions: Complete the following open-ended problems as specified by each question stem. For extra practice after answering each question, try using an alternative method to solve the problem or check your work.

1. A school has to eliminate some of its extracurricular activities. It surveys a randomly selected group of 100 of the 2500 students in the school, providing options of four extracurricular activities and allowing each student to choose just one to nominate for elimination. The survey finds that of the 100 students surveyed, 42 think that band should be eliminated, 24 think that chorus should be eliminated, 18 think that the golf team should be eliminated, and 16 think that the cooking club should be eliminated.

(a) Given this survey, how many students in the school likely believe that the school should eliminate each of the four activities?

(b) The principal decides to eliminate three out of the four extracurricular activities mentioned on the survey. Based on the survey results, she concludes that most students in the school want to keep the cooking club. What is the flaw in her reasoning? How should she redesign the survey if she wants to choose three activities to eliminate based on the one activity the most students want to keep?

2. A bowler in a tournament bowls 8 games and gets scores of 190, 255, 210, 160, 173, 188, 206, and 224.

(a) Determine the mean, range, and interquartile range of her scores. Also calculate the variance and standard deviation for the set.

(b) Suppose that this is a representative sample of the 250 games this bowler has played this year. What is the estimated standard deviation of her scores for the year? A total of 68% of her scores are likely to fall within what range of scores? Express this as a number of games.

3. A student is conducting a survey for her Psychology class. She has heard that there is a correlation between the color of a jersey a team wears and the perceived aggressiveness of the team; for example, a team that wears black jerseys is perceived as more aggressive than one wearing white jerseys.

(a) She wants to conduct a survey in her school to see who agrees with this notion. Her first thought is to just ask everyone in all of her classes, giving a survey to each person that shares a class with her. Her second idea is to ask her teachers to give them out to all students in their classes each day. What is wrong with each of these methods, and what method could she use instead to ensure she gets survey responses from a representative sample of schoolmates?

(b) What are the problems with using a survey to study this correlation? How might a scientist design an experiment to study the correlation with less bias?

4. Describe the type of probability distribution for each of the following:

(a) the theoretical probabilities of Lillian choosing each of her seven scarves if she randomly chooses one to wear

(b) the set of possible experimental probabilities of Lillian choosing her blue scarf if randomly choosing one to wear each day

(c) the probabilities that an adult alligator chosen at random will measure any given length

(d) the probabilities that an alligator chosen at random from a group of 50 adults and 50 one-week-olds (not previously measured) will measure any given length

5. A movie theater surveys its patrons regarding its pricing for food and beverage. Of the 1200 people who visited the theater on a given day, 1056 of them said they would not pay more than $15.00 for a combo that included a large drink and a large popcorn. The theater determines that there is a margin of error of 18 patrons for a 68% confidence level for an extrapolation of these survey results to the full population of their patrons. For a 95% confidence level, what is the likely percentage range for the moviegoers who would not purchase the combo at a price more than $15.00?

6. A teacher sets her scoring curve along a normal distribution curve based on the results of a given test. On this particular test, 68% of the students scored between a 56 and an 82. In order to pass the test, the teacher requires a student to have achieved more than the mean score. In order to get an A, the student must be in the 95th percentile, and to get an A+ on the test, a student must achieve a score greater than three standard deviations above the mean. What score would be needed to pass? To get an A? To get an A+?

7. A popular television show ran for 10 seasons, with a total of 236 episodes. Now, a certain channel shows seemingly randomly chosen episodes of this show as reruns, with 2 episodes per night, 5 nights per week, for a total of 10 episodes per week. In the past 20 weeks, there has never been a repeat of the same episode within a given week. (For our purposes, define a given week as Sunday through Saturday.) Based on this information, is the selection of episodes likely to be truly random? Use statistics to support your conclusion.

8. A factory uses quality control tests for flashlights they produce. The tests correctly identify defective flashlights 80% of the time and correctly identify flashlights in perfect working condition 90% of the time. Long-term data suggests that 5% of all flashlights this factory produces are actually defective. The factory discards all flashlights labeled as defective by their quality control tests and sells the rest.

(a) Out of a batch of 10,000 flashlights, how many will the factory discard? What is the probability that a consumer purchasing a flashlight made in this factory gets a defective one?

(b) The factory makes a profit of $12 per flashlight, so they lose this amount of potential profit per properly working flashlight that they discard. The CEO is considering improving the quality control tests. For a cost of $8,000 per batch of 10,000 flashlights, the improved tests would cut the number of false positive and false negative results each in half. Is it worth it to pay for the improved quality control tests, from a cost perspective?