Free-Response Questions

Directions: You must show all work and indicate the methods you use. You will be graded on the correctness of your methods and on the accuracy of your final answers.

Eleven Open-Ended Questions

1. An SRS of 1000 voters finds that 57% believe that competence is more important than character in voting for President of the United States.
   (a) Determine a 95% confidence interval estimate for the percentage of voters who believe competence is more important than character.
   (b) If your parents know nothing about statistics, how would you explain to them why you can't simply say that 57% of voters believe that competence is more important.
   (c) Also explain to your parents what is meant by 95% confidence level.

2. During the H1N1 pandemic, one published study concluded that if someone in your family had H1N1, you had a 1 in 8 chance of also coming down with the disease. A state health officer tracks a random sample of new H1N1 cases in her state and notes that 129 out of a potential 876 family members later come down with the disease.
   (a) Calculate a 90% confidence interval for the proportion of family members who come down with H1N1 after an initial family member does in this state.
   (b) Based on this confidence interval, is there evidence that the proportion of family members who come down with H1N1 after an initial family member does in this state is different from the 1 in 8 chance concluded in the published study? Explain.
   (c) Would the conclusion in (b) be any different with a 99% confidence interval? Explain.

3. In a random sample of 500 new births in the United States, 41.2% were to unmarried women, while in a random sample of 400 new births in the United Kingdom, 46.5% were to unmarried women.
   (a) Calculate a 95% confidence interval for the difference in the proportions of new births to unmarried women in the United States and United Kingdom.
   (b) Does the confidence interval support the belief by a UN health care statistician that the proportions of new births to unmarried women is different in the United States and United Kingdom? Explain.

4. An SRS of 40 inner city gas stations shows a mean price for regular unleaded gasoline to be \$3.45 with a standard deviation of \$0.05, while an SRS of 120 suburban stations shows a mean of \$3.38 with a standard deviation of \$0.08.

   (a) Construct 95% confidence interval estimates for the mean price of regular gas in inner city and in suburban stations.

   (b) The confidence interval for the inner city stations is wider than the interval for the suburban stations even though the standard deviation for inner city stations is less than that for suburban stations. Explain why this happened.

   (c) Based on your answer in part (a), are you confident that the mean price of inner city gasoline is less than \$3.50? Explain.

5. In a simple random sample of 30 subway cars during rush hour, the average number of riders per car was 83.5 with a standard deviation of 5.9. Assume the sample data are unimodal and reasonably symmetric with no extreme values and little, if any, skewness.

   (a) Establish a 90% confidence interval estimate for the average number of riders per car during rush hour. Show your work.

   (b) Assuming the same standard deviation of 5.9, how large a sample of cars would be necessary to determine the average number of riders to within ±1 at the 90% confidence level? Show your work.

6. In a sample of ten basketball players the mean income was \$196,000 with a standard deviation of \$315,000.

   (a) Assuming all necessary assumptions are met, find a 95% confidence interval estimate of the mean salary of basketball players.

   (b) What assumptions are necessary for the above estimate? Do they seem reasonable here?

7. An SRS of ten brands of breakfast cereals is tested for the number of calories per serving. The following data result: 185, 190, 195, 200, 205, 205, 210, 210, 225, 230.

   Establish a 95% confidence interval estimate for the mean number of calories for servings of breakfast cereals. Be sure to check assumptions.