1. (2 points) In a random sample of 150 adults over the age of 45, 30 say they have played in a band at least one time in their lives.

    (a) Construct a 99% confidence interval for the proportion of all adults over the age of 45 who have played in a band at least one time in their lives.

    (b) Suppose all adults over the age of 45 who have played in a band at least one time in their lives each send a donation of $10 to the musicians as social activists. Assuming there are 125 000 000 adults over the age of 45 in the U.S. what is a 99% confidence interval for what these donations would total for this worthwhile charity?

2. (2 points) There are 12 500 high school students in a large city district. Administrators and teachers want to determine the extent to which parents do homework for their children. In an anonymous survey, 150 of the 500 students say that someone else has done their homework at least once. Of those 150 students, 90 say that a parent has done their homework for the at least once.

   (a) What is wrong with using 0.6 to calculate a confidence interval for the proportion of all high school students in the city for whom a parent has done their homework for them at least once¿

   (b) Given the above sample, what is an estimate of the number of high school students in the city for whom a parent has done their homework for them at least once?

3. (2 points) A D1 university recruiter claims that 10 percent of its baseball players go on to play professionally after graduation. A reporter contacts a simple random sample (SRS) of baseball players who graduated during the past 20 years and finds that only 32 of 450 went on to play professionally. Is there sufficient evidence to write an article disputing the university's claim? Give statistical justification for your conclusion.

4. (2 points) A high school coach claims that the average pulse rate of those trying out for sports is 62.4 beats per minute. The AP statistics instructor suspects this is a made-up number and runs a hypothesis test on a simple random sample (SRS) of 32 students trying out for sports, calculating a mean of 65.0 bpm with a standard deviation of 10.3 bpm. What is the p-value?

5. (2 points) The claim is made that the students at Lake Wobegon High School are smarter than the other high school students. To test this, the principal gathers a simple random sample of 30 students and finds their mean IQ is 104 with a standard deviation of 7.5. Conduct the appropriate hypothesis test.

6. (2 points) It is claimed that 54 percent of lost remote controls are stuck between sofa cushions. A reporter tests this claim by checking a simple random sample (SRS) of 500 people who lost remote controls, and 280 of them reported finding the remote controls between sofa cushions. Conduct an appropriate hypothesis test.

7. (2 points) In a well known baseball study, it was reported that Larry Bird hit a second free throw in 48 out of 53 attempts after the first free throw was missed and hit a second free throw 251 of 285 attempts after the first free throw was made. Suppose an appropriate test is performed to determine whether there is sufficient evidence to say that the probability that Bird will make a second free throw is depending on whether or not he made the first free throw., Conduct an appropriate hypothesis test.

8. (2 points) At schools using an innovative math program, a simple random sample (SRS) of 100 students results in an average score of 178 with a standard deviation of 27 on a state test. At schools using a traditional approach, an SRS of 150 students results in an average score of 171 with a standard deviation of 31 on the same state test.

   (a) Is there evidence that the students using the innovative approach have a higher average score than students using the traditional approach? Give statistical justification for your answer.

   (b) Suppose a study using this design resulted in a p-value less than 0.01 Would it be reasonable for all of the school boards to push for the adoption of the innovative approach? Explain.

   (c) Assuming standard deviations of 27 and 31 as listed above, how large a sample (same number for both) should be used to be 95 percent sure of knowing the difference of scores to within 5 points.

9. (2 points) A dietician claims that the new weight loss program will result in an average loss of 9 pounds in the first month. The program developer believes that the average weight loss in the first month will be greater than this. The program developer runs a test on a simple random sample of 64 overweight volunteers. What conclusion is reached if the sample mean loss is 9.55 pounds with a standard deviation of 3.00 pounds?

10. (2 points) Construct a $100(1 - \alpha)\%$ confidence interval for μ given a SRS with mean $\bar{x}$ and standard deviation S. (You may assume conditions for inference are met).

11. (2 points (bonus)) Construct a $100(1 - \alpha)\%$ confidence interval for σ the population standard deviation given a SRS with mean $\overline{x}$ and standard deviation S. (You may assume conditions for inference are met).