MAT 201 Quiz

October 29, 2010

Problem 1 (5 Points each) Please circle True or False

A. 6.5% of all people have A-Negative blood type. If 45 people are surveyed and you want to find the probability that at least 3 of them have blood type A-Negative, then it is appropriate to use the normal distribution to approximate the binomial distribution since 45 > 30.   **True**   **False**
   False, to use the normal distribution we need np > 5 and nq > 5.

B. Suppose that 24% of all LTCC math students use the math center. If the normal distribution is to be used to find an approximate probability that the number of MSC users out of 100 randomly selected math students is greater than 20, then the continuity correction requires finding P(x > 20.5).   **True**   **False**
   True, the continuity correction boosts > up by 0.5

C. A 95% confidence interval for a population proportion was computed to be (0.42, 0.47). If instead the researcher had used a 90% confidence level, then the new confidence interval could not have been (0.42, 0.45).   **True**   **False**
   True, the lower limit would be lower than 0.42.

D. A 95% confidence interval for the proportion of students in the US who pass elementary statistics was computed to be (0.72,0.78). Then a randomly selected US statistics student has a 95% chance of passing his or her statistics class.
        True   **False**
   False, the confidence interval describes a mean not an individual.

E. A 90% confidence interval for the mean age when people get their first full time job is (15,22). Then if many studies are done with the same sample size, 90% of them will have confidence intervals (15, 22).   **True**   **False**
   True, this is what it means to be 90% confident.

F. Based on a random sample weights of 42 marmots, a 95% confidence interval was computed as (6.5,7.2). Then we can be 95% confident that the mean weight of all marmots is between 6.5 pounds and 7.2 pounds.   **True**   **False**
   True, this is what it means to have a confidence interval.

G. If the sample mean and the sample standard deviation are known, then one can always use the Student's T distribution to calculate a confidence interval for the population mean.   **True**   **False**
   False, you must have np and nq greater than 5.

H. If you want to have a smaller margin of error for a confidence interval, then two strategies are to increase the sample size and to decrease the confidence level.
        True   **False**
   True, the sample size is in the denominator and the confidence level z or t is in the numerator of the margin of error equation.

Problem 2 (20 Points) Suppose that 60 percent of all registered voters will vote on election day.

    A. Use the normal approximation to the binomial distribution to approximate the probability that out of 30 registered voters, at least 20 of them will vote on Election Day. (Sketch the picture and show what you put into your calculator)
Use normalcdf(19.5,99999,18,2.68) = 0.288075
Sketch not shown here

    B. Explain why it was appropriate or inappropriate to use the normal distribution for this approximation.
  Since np = 18 and nq = 12 are both greater than 5, we can use the normal distribution.

Problem 3 (10 Points) Suppose you want to construct a 95% confidence interval for the proportion of all likely California voters who plan on voting for Brown for Governor. If you want a margin or error of no more than plus or minus 3%, at least how many voters must you survey? (Show what you put into your calculator)

Use the formula: $n = \dfrac{z^2 \cdot 0.25}{E^2} = \dfrac{1.96^2 \cdot 0.25}{0.03^2}$ and round up to get that you need 1068 voters

Problem 4 (20 Points) Of the 72 LTCC students who were surveyed, 30 of them were taking a PE class.

    A. Calculate the appropriate 90% confidence interval. (Show what you put into your calculator)

        Use 1-PropZint with n = 72, x = 30, and C-Level = 0.90 to get (0.321,0.512)

    B. Use a complete sentence to interpret this confidence interval in the context of the study.

        We can be 90% confident that the proportion of all LTCC students that are taking a PE class is between 0.312 and 0.512.

    C. Use a complete sentence or two to interpret what the 90% means in the context of the study.

        If many such surveys are conducted, each with 72 LTCC students, then the would each result in a different confidence interval. 90% of all of these intervals will contain the true population proportion of students taking PE. 10% will not.

Problem 5 **(20 Points)** A psychologist studied 38 autistic children to see how many single digit numbers they could recall from memory. Their mean was 23 and their standard deviation was 7.

    A. Calculate the appropriate 95% confidence interval. (Show what you put into your calculator)

        First notice that we use the T-distribution since only the sample standard deviation is known (s = 7), the population standard deviation is unknown. Now use your calculator T-interval to get (20.699,25.301)

    B. Use a complete sentence to interpret this confidence interval in the context of the study.

        We can be 95% confident that the mean number of single digit numbers that can be memorized for all autistic children is between 20.7 and 25.3.

    C. Use a complete sentence or two to interpret what the 95% means in the context of the study

        If many studies are done each including 38 autistic children, they will each produce a different confidence interval. 95% of these confidence intervals will contain the true population mean number of single digit numbers that all autistic children can recall. 5% will not contain this mean.

    D. Do you need to assume that the population distribution is approximately normal? Explain.

        No, by the Central Limit Theorem, when n > 30, we do not need to assume the underlying population distribution is normal. The sampling distribution is guaranteed to always be normal with a large sample size.