HOMEWORK 5

STA 321, Basic Statistical Theory I

Spring Semester, 2015

Due: April 2nd, 2015

1. For the following statements, decide whether they are a null hypothesis, or an alternative hypothesis. Next, introduce appropriate notation for a parameter and state these hypotheses in terms of the parameter values.

(a) In Kentucky, the proportion of adults who favor legalized gambling is less than 50%.

(b) The proportion of all college students in Kentucky who are regular smokers is 0.2.

(c) The mean annual household income in Kentucky is larger than $40,000.

2. You want to know whether females in your country think the ideal number of children is equal to 2, or higher or lower than that. Define notation and state the null and alternative hypotheses for studying this. A national survey of 497 females was asked the following question. "What do you think is the ideal number of children for a family to have?" The mean response was 3.02 with a standard deviation of 1.81. Is it plausible that the population mean equals 2.0? Justify your answer by calculating a 95% confidence interval and a p-value for an appropriate hypothesis. Finally, assuming that the standard deviation stays the same, how large a sample would we need to achieve a margin of error of ± 0.1?

3. How large a sample size is needed to estimated the mean annual income of Native Americans correct to within $1000 with probability 0.99? Suppose that there is no prior information about the standard deviation of Native Americans, but we guess that about 95% of their incomes are between $6,000 and $50,000, and that this distribution is approximately normal.

4. In a survey (posted on October 26, 2009), 55% of Americans interviewed had a favorable opinion of Barack Obama. Assuming that results were based on telephone interviews with 1521 randomly selected national adults, aged 18 and older, can we say with 95% confidence that more than half of adult Americans have a favorable opinion of their president? Justify your answer by constructing a confidence interval. Next, justify your answer by testing whether 50% is a reasonable population approval proportion. Finally, how large a sample size would we need to achieve a margin of error of ± 1 percentage point?

5. If a result is significant at the 1% level, is it also always significant at the 5% level? If a result is significant at the 5% level, what can you say about its significance at the 1% level? Justify your answers.