**Section 8.2 – Estimating a Population Proportion**

**Warmup**

The U.S. Forest Service is considering additional restrictions on the number of vehicles allowed to enter Yellowstone National Park. To assess public reaction, the service asks a random sample of 150 visitors if they favor the proposal. Of these, 89 say “Yes.”

Are the conditions met for calculating a confidence interval?

**Activity: Paper Clips**

Your teacher has a bucket full of different colored paper clips. Your goal is to estimate the actual proportion of red paper clips in the bucket.

* Form teams of students.
* Determine how to get a simple random sample of paper clips from the bucket
* Each team is to collect one SRS of paper clips.
* Determine a point estimate for the unknown population proportion.
* Find a 90% confidence interval for the parameter p. Consider any conditions that are required for the methods you use.
* Compare your results with other students in the class

Point estimate:

Conditions:

Construct a 90% Confidence Interval:





**Finding a Critical Value**



For example, to find a 95% confidence interval, we use a critical value of 2 based on the 68-95-99.7 rule. Using Table A or a calculator (menu 5-5-3), we can get a more accurate critical value.

Note, the critical value z\* is actually 1.96 for a 95% confidence level.

For 90%, z\*=

The 90% confidence interval is:

Other students’ results:

**One-Sample z Interval for a Population Proportion**

Our confidence interval for the population proportion p is:



**Example #1**

After two games of the regular season, Lebron had made 17 of 45 shots attempted. Construct a 95% confidence interval for the proportion of shots that you would expect him to make for the season.

**The Four-Step Process**

**State**: What parameter do you want to estimate, and at what confidence level?

**Plan**: Identify the appropriate inference method. Check conditions.

**Do**: If the conditions are met, perform calculations.

**Conclude**: Interpret your interval in the context of the problem.

**Example #2**

Gallup asked a random sample of 439 U.S. teens whether they thought young people should wait to have sex until marriage. Of the sample, 246 said “Yes”. Construct a 90% confidence interval for the proportion of all teens who would say “Yes” to this question using the 4-step process.

**Choosing the Sample Size**

In planning a study, we may want to choose a sample size that allows us to estimate a population proportion within a given margin of error. The margin of error (ME) in the confidence interval for p is







Rearranging the equation from above, the required sample size is:

 

**Example #1**

A customer service manager wants to know the proportion of customers who are satisfied with their dealings with her company. Determine the sample size needed to estimate p within 0.03 with 95% confidence.

**Example #2**

The U. S. Crime Commission wants to estimate p = the proportion of crimes in which firearms are used to within .02 with 90% confidence. Data from previous years shows that p is about .6. Find the sample size required to get this margin of error.