

**STAT 216 - Worksheet #12**      Section: \_\_\_\_\_

Historically in the United States, slightly less than half of all newborns have been girls. This worksheet illustrates the process of creating a confidence interval and investigates how sample size affects such an interval.

Names: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- To learn more about the proportion of all U.S. babies who are girls, suppose we take a random sample of 100 newborn babies in the United States and find 48% of them are girls. Define the parameter of interest, including the symbol used to denote it.
- Check that the necessary conditions and assumptions are valid for us to construct a confidence interval for  $p$ .
- For this random sample of 100 babies, what is the standard error of the sample proportion of girls? Recall that the standard error of  $\hat{p}$  is the estimated standard deviation of  $\hat{p}$ .

- Suppose for our purposes, we also take random samples of 400, 900, and 1,600 newborns, each time finding that 48% are girls. Repeat the calculation of the standard error requested in question 3 for each of these sample sizes and record them in the table to the right.

Sample Size	Standard Error of $\hat{p}$ ( $SE(\hat{p})$ )
100	
400	
900	
1,600	

- When the sample size increased by 9 times, the standard error \_\_\_\_\_ by \_\_\_\_ times.
- When the sample size increased by 16 times, the standard error \_\_\_\_\_ by \_\_\_\_ times.

- Recall that based on the Central Limit Theorem, we can construct a confidence interval for  $p$  provided the necessary assumptions and conditions have been met in question 2. Using the appropriate critical value  $z^*$  (see your notes), construct 95% confidence intervals for each of the respective sample sizes assuming that in each sample, we obtained a  $\hat{p}$  of .48. [You can verify your answer by the first interval given in the table to the right.]

Sample Size	95% Confidence Interval
100	(0.382,0.578)
400	
900	
1,600	

- How large would your sample have to be (assuming you again obtain a sample proportion of .48) to obtain a 95% confidence interval with a margin of error of .015 (or 1.5%)? Would the corresponding confidence interval provide evidence that  $p$  is less than .5? Explain why or why not.