

**Math 10 – Confidence Intervals for proportion and standard deviation ANSWERS** (gw13)

1. **Stressful Travel:** In a survey of 3224 U.S. adults, 1515 said flying is the most stressful form of travel. Construct a 95% confidence interval for the proportion of all adults who say flying is the most stressful form of travel.

$$\hat{p} = \frac{1515}{3224} = 0.470$$

$$0.470 \pm 1.96 \cdot \sqrt{\frac{(0.470)(1-0.470)}{3224}} = 0.470 \pm 0.016 = (0.454, 0.486)$$

2. **Accidents and Alcohol:** A study of 2008 traffic fatalities found that 800 of the fatalities were alcohol related. Find a 99% confidence interval for the population proportion and explain what it means.

$$\hat{p} = \frac{800}{2008} = 0.398$$

$$0.398 \pm 2.575 \cdot \sqrt{\frac{(0.398)(1-0.398)}{2008}} = 0.398 \pm 0.028 = (0.370, 0.426)$$

3. **Happy at Work?** In a survey of 1003 U.S. adults, 662 would be happy spending the rest of their career with their current employer. Construct a 90% confidence interval for the proportion who would be happy staying with their current employer. Does this result surprise you?

$$\hat{p} = \frac{662}{1003} = 0.660$$

$$0.660 \pm 21.645 \cdot \sqrt{\frac{(0.660)(1-0.660)}{1003}} = 0.660 \pm 0.025 = (0.685, 0.635)$$

**Seems like a high percentage to me.**

4. **Computer Repairs** You wish to estimate, with 95% confidence and within 3.5% of the true population, the proportion of computers that need repairs or have problems by the time the product is three years old
- a. No preliminary estimate is available. Find the minimum sample size needed.

$$n = (.5)(1-.5)\left(\frac{1.96}{.035}\right)^2 = 784$$

- b. Find the minimum sample size needed, using a prior study that found that 19% of computers needed repairs or had problems by the time the product was three years old.

$$n = (.19)(1-.19)\left(\frac{1.96}{.035}\right)^2 = 483$$

- c. Compare the results from parts (a) and (b).

**Using  $p = .5$  requires a larger sample to get the needed margin of error.**

5. Read the attached article on the CBS News poll regarding the birth control pill.

- a. What would the point estimator be for the proportion of adults who believe the pill has made women's lives better.

$$\hat{p} = 56\% = 0.56$$

- b. What is the sample size for this study?

$$n = 591$$

- c. What is the margin of error for this poll as reported in the article. Assuming a 95% level of confidence, verify this poll by calculation.

**The reported margin of error is plus or minus 4% (0.04).**

$$\text{Calculated confidence interval: } 0.56 \pm 1.96 \cdot \sqrt{\frac{(0.56)(1-0.56)}{591}} = 0.56 \pm 0.040 = (0.52, 0.60)$$

**So the reported margin of error is verified.**

6. *Lawn Mower* A lawn mower manufacturer is trying to determine the standard deviation of the life of one of its lawn mower models. To do this, it randomly selects 12 lawn mowers that were sold several years ago and finds that the sample standard deviation is 3.25 years. Use a 99% level of confidence.

$$df = 11 \quad \frac{\alpha}{2} = .005 \quad \chi_L^2 = 2.603 \quad \chi_R^2 = 26.757$$

$$99\% \text{ CI for } \sigma : \left( \sqrt{\frac{(11)(3.25^2)}{26.757}}, \sqrt{\frac{(11)(3.25^2)}{2.603}} \right) = (2.08, 6.68)$$

7. *Monthly Income* The monthly incomes of 20 randomly selected individuals who have recently graduated with a bachelor's degree in social science have a sample standard deviation of \$107. Use a 95% level of confidence.

$$df = 19 \quad \frac{\alpha}{2} = .025 \quad \chi_L^2 = 8.907 \quad \chi_R^2 = 32.852$$

$$95\% \text{ CI for } \sigma : \left( \sqrt{\frac{(19)(107^2)}{32.852}}, \sqrt{\frac{(19)(107^2)}{8.907}} \right) = (81.37, 156.28)$$