

Math 10 MPS - Homework 5 Answers

1. A researcher wanted to estimate the MPG for municipal busses in a large city. 100 busses were samples and the sample mean price was 9.8 MPG. For the following questions, assume the population standard deviation is 1.2 MPG.

- a. Find a 95% confidence interval for the population mean. Explain what this interval means in the context of the problem.

$$9.8 \pm 1.96(1.2) / \sqrt{100} \rightarrow 9.8 \pm .235 \rightarrow (9.565, 10.035)$$

We are 95% confident that mean MPG for busses is between 9.565 and 10.035 MPG

- b. Find a 99% confidence interval for the population mean. Why does the confidence interval have a larger margin of error?

$$9.8 \pm 2.576(1.2) / \sqrt{100} \rightarrow 9.8 \pm .31 \rightarrow (9.50, 10.11)$$

To be more confident, we need a bigger target, more margin of error.

- c. Suppose you wanted to redo the sampling or the 95% confidence interval in order to get a margin of error of plus or minus 0.1 MPG. Determine the necessary sample size.

$$n = \left[\frac{(1.96)(1.2)}{0.1} \right]^2 = 554$$

2. The department of education conducted a survey of 1100 undergraduate college students and determined that 761 have received some form of financial aid.

- a. Determine the point estimate for the proportion of undergraduate college students who have received some form of financial aid.

$$\hat{p} = \frac{761}{1100} = .692$$

- b. Find a 95% confidence interval for the proportion of the undergraduate students who have received some form of financial aid. Explain what this interval means in the context of the problem.

$$0.692 \pm 1.96\sqrt{(0.692)(0.308) / 1000} \rightarrow 0.692 \pm 0.027 \rightarrow (0.665, 0.719)$$

We are 95% confident that the percentage of undergraduate students who have received some form of financial aid is between 66.5% and 71.9%

- c. Suppose you wanted to redo the sampling in order to get a margin of error of plus or minus 0.02. Determine the necessary sample size assuming you know nothing about the actual proportion.

$$n = (0.5)(0.5) \left[\frac{(1.96)}{0.02} \right]^2 = 2401$$

3. The mean number of years of post secondary education of employees in an industry is 1.5. A company claims that this *mean* is higher for its employees. A random sample of 16 of its employees has an *mean* of 2.1 years of post secondary education with a *sample standard deviation* of 0.6 years.

- a. Find a 95% confidence interval for the mean number years of post secondary education for the company's employees. How does this compare with the industry value?

$$2.1 \pm 2.131(0.6) / \sqrt{16} \rightarrow 2.1 \pm .32 \rightarrow (1.78, 2.42) \text{ The company is well above the industry average.}$$

- b. Find a 95% confidence interval for the *standard deviation* of number years of post secondary education for the company's employees.

$$\left(\sqrt{\frac{(15)(0.6^2)}{27.488}}, \sqrt{\frac{(15)(0.6^2)}{6.262}} \right) = (0.443, 0.929) \text{ (Chi-square with 15 df)}$$

4. When polling companies report a margin of error, they are referring to a 95% confidence interval. Go to the website www.pollingreport.com and **verify** the stated margins of error for 2 polls.

Many answers possible