

Exam #3

Math 112-H

Monday, November 18, 2002

For full credit show all work. When in doubt, explain your reasoning. When giving answers in percentages, give at least one digit after the decimal point. Otherwise show two digits after the decimal point when rounding your answers.

1. Explain why the standard deviation for a sample mean is smaller than the standard deviation for a single measurement.
2. Explain the connection between confidence level and the width of a confidence interval. Refer to critical values in your answer.
3. In a random sample of 5200 American physicians, 1200 lived in cities of over a million people. Find a 99% confidence interval for the proportion of all American physicians living in cities of over a million people.
4. Sketch a normal distribution with mean 5 and standard deviation 2, labeling the axis underneath it appropriately. Shade the area between 2 and 7, and find the proportion of values for the distribution that lie between 2 and 7.
5. In a random sample of 3500 American dry-cleaning stores, the average number of orders per week is 74 with standard deviation 23. Find a 90% confidence interval for the average number of orders per week for all American dry-cleaning stores.
6. Explain why we replace θ with \hat{p} in the formula $\sigma_{\hat{p}} = \sqrt{\theta(1-\theta)/n}$ when we are constructing a confidence interval for θ .
7. Assume that 40% of the population has type O blood. Suppose that you take a random sample of 150 people. What is the probability that the sample proportion of people with type O blood is over 35%?
8. Explain the connection between sample size and the width of a confidence interval. Refer to standard deviations in your answer.
9. Find the critical value, z^* , for a confidence level of 94%.
10. Explain why we estimate population parameters with intervals instead of single numbers.