

Additional Sample Midterm 1 Exam Problems

Q1. Boys of a certain age are known to have a mean weight of $\mu = 85$ pounds. A complaint is made that the boys living in a municipal children's home are underfed. As one bit of evidence, $n = 25$ boys (of the same age) are weighed and found to have a mean weight of $\bar{x} = 80.94$ pounds. It is known that the population standard deviation σ is 11.6 pounds. Based on this evidence, can we conclude that mean weight of boys in municipal children's home is less than the norm?

Q2. How do students of New York University measure up on the GRE verbal score? The population average on GRE verbal score was 554 with a standard deviation of 99. Our sample of 90 NYU had an average of 568. Is there enough evidence to say that NYU students perform better than the general population? Use 1% significance level.

Q3. A bottling company uses a machine to fill the bottles with olive oil. The amount of oil in the bottle vary according to a normal distribution with a mean of 473 ml and standard deviation of 3 ml.

- Sketch a sampling distribution for six randomly selected bottles. Label properly.
- What is the probability that the mean of six bottles is more than 475 ml?
- What is the probability that the mean of six bottles is less than 470 ml?

Q4. Suppose a researcher, interested in obtaining an estimate of the average level of some enzyme in a certain human population, takes a sample of 10 individuals, and finds the sample mean is 22. Suppose further it is known that population variance is 45. Estimate the population mean value with 90% confidence.

Q5. The average lifetime of a light bulb is 3000 hours with a standard deviation of 696 hours. A simple random sample of 36 bulbs is taken.

- What are the expected value, standard deviation, and shape of the sampling distribution of \bar{x} ?
- What is the probability that the average life time in the sample will be between 2670.56 and 2809.76 hours?
- What is the probability that the average life time in the sample will be equal to or greater than 3219.24 hours?
- What is the probability that the average life time in the sample will be equal to or less than 3180.96 hours?

Q6. The mayor of a large city claims that the average net worth of families living in this city is at least \$300,000. A random sample of 25 families selected from this city produced a mean net worth of \$288,000. Assume that the net worths of all families in this city have a normal distribution with the population standard deviation of \$80,000. Using the 2.5% significance level, can you conclude that the mayor's claim is false?

Q7. The TIV Telephone Company provides long-distance telephone service in an area. According to the company's records, the average length of all long-distance calls placed through this company in 2009 was 12.44 minutes. The company's management wanted to check if the mean length of the current long-distance calls is different from 12.44 minutes. A sample of 150 such calls placed through this company produced a mean length of 13.71 minutes. The population standard deviation is 2.65 minutes.

Using the 2% significance level, can you conclude that the mean length of all current long-distance calls is different from 12.44 minutes?

Q8. The equatorial radius of the planet Jupiter is measured 40 times independently by a process that is practically free of bias. These measurements average $\bar{x} = 71492$ kilometers with a population standard deviation of $s = 28$ kilometers. Find a 90% confidence interval for the equatorial radius of Jupiter.

Q9. How much credit card debt do students typically have when they graduate from Penn State University? A sample of 15 recent Penn State graduates is obtained. Each of these recent graduates is asked to indicate the amount of credit card debt they had at the time of graduation. It turns out that the sample mean was $\bar{x} = \$2430$ with a sample standard deviation of $\sigma = \$2300$. Construct a 99% confidence interval estimating the mean credit card debt.