Exercise

Confidence interval

1. In a manufacturing process, a random sample of 9 bolts has a mean length of 3 inches with a variance of .09. What is the 90 percent confidence interval for the true mean length of the bolt?   
  [± tα/2,n-1(s/√n)] = [3 ± 1.86(.3/3)] = [3 ± .186] = [2.814 3.186]

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| 2. | The internal auditing staff of a local manufacturing company performs a sample audit each quarter to estimate the proportion of accounts that are delinquent (more than 90 days overdue). For this quarter, the auditing staff randomly selected 400 customer accounts and found that 80 of these accounts were delinquent. What is the 95 percent confidence interval for the proportion of all delinquent customer accounts at this company?   = 80/400 = .2 |

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| 3. | Health insurers and the federal government are both putting pressure on hospitals to shorten the average length of stay (LOS) of their patients. In 1996, the average LOS for non-heart patients was 4.6 days. A random sample of 20 hospitals in one state had a mean LOS for non-heart patients in 2000 of 3.8 days and a standard deviation of 1.2 days. How large a sample of hospitals would we need to be 99 percent confident that the sample mean is within 0.5 days of the population mean?   n = ((tα/2 × s)/E)2 = ((2.861 × 1.2)/.5)2 = 47.15 = 48   |  |  | | --- | --- | | 4. | A researcher for a paint company is measuring the level of a certain chemical contained in a certain type of paint. If the paint contains too much of this chemical, the quality of the paint will be compromised. On average, each can of paint contains 10 percent of the chemical. How many cans of paint should the sample contain if the researcher wants to be 98 percent certain of being within 1 percent of the true proportion of this chemical?    n = p(1 - p)(z/E)2 = .1(.9)(2.326/.01)2 = (.09)(232.6)2 = 4869.2 = 4870 | |
| 5. | In a random sample of 651 computer scientists who subscribed to a web-based daily news update, it was found that the average salary was $46,816 with a population standard deviation of $12,557. Calculate a 91 percent confidence interval for the mean salary of computer scientists. |

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| 6. | A company is interested in estimating μ, the mean number of days of sick leave taken by its employees. The firm's statistician randomly selects 100 personnel files and notes the number of sick days taken by each employee. The sample mean is 12.2 days, and the sample standard deviation is 10 days. How many personnel files would the statistician have to select in order to estimate μ to within 2 days with a 99 percent confidence interval?    n = ((tα/2 × s)/E)2 = ((2.626 × 10)/2)2 = 172.4 = 173   |  |  | | --- | --- | | 7. | In a manufacturing process, we are interested in measuring the average length of a certain type of bolt. Past data indicate that the standard deviation is .25 inches. How many bolts should be sampled in order to make us 95 percent confident that the sample mean bolt length is within .02 inches of the true mean bolt length?   n = ((zα/2 × σ)/E)2 = ((1.96 × .25)/.02)2 = 600.25 = 601 | |
| 8. | Unoccupied seats on flights cause airlines to lose revenue. Suppose a large airline wants to estimate its average number of unoccupied seats per flight over the past year. 225 flight records are randomly selected and the number of unoccupied seats is noted, with a sample mean of 11.6 seats and a standard deviation of 4.1 seats. Calculate a 90 percent confidence interval for μ, the mean number of unoccupied seats per flight during the past year. |

9. An environmental group at a local college is conducting independent tests to determine the distance a particular make of automobile will travel while consuming only 1 gallon of gas. They test a sample of five cars and obtain a mean of 28.2 miles. Assuming that the standard deviation is 2.7 miles, find the 95 percent confidence interval for the mean distance traveled by all such cars using 1 gallon of gas.

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10.On a standard IQ test, the standard deviation is 15. How many random IQ scores must be obtained if we want to find the true population mean (with an allowable error of 0.5) and we want 97 percent confidence in the results?   
 n = ((zα/2 × σ)/E)2 = ((2.17 × 15)/0.5)2 = 4238.01 = 4239

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| 11. | In 1995, 13,000 WWW users were surveyed and asked about their willingness to pay fees for access to websites. Of these, 2,938 were definitely not willing to pay such fees. How large a sample is necessary to estimate the proportion of interest to within 2 percent in a 95 percent confidence interval?    = 2938/13,000 = .226 n = p(1 - p)(z/E)2 = .226(.774)(1.96/.02)2 = (.1749)(98)2 = 1679.7 = 1680 |