통계분석
Statistical Analysis

Assignment 04

Confidence Intervals (CI)

Problem 1.

Assume that the helium porosity (in percentage) of coal samples taken from any particular seam is normally distributed with true standard deviation .75.

A. Compute a 95% confidence interval (CI) for the true average porosity of a certain seam if the average porosity for 20 specimens from the seam was 4.85.

B. Compute a 98% CI for true average porosity of another seam based on 16 specimens with a sample average porosity of 4.56.

C. How large a sample size is necessary if the width of the 95% interval is to be .40?

D. What sample size is necessary to estimate true average porosity to within .2 with 99% confidence?

Problem 2.

A study of the ability of individuals to walk in a straight line ("Can We Really Walk Straight?" Amer. J. of Physical Anthro., 1992: 19–27) reported the accompanying data on cadence (strides per second) for a sample of n = 20 randomly selected healthy men.

0.95	0.79	0.91	0.95	0.92	0.86	1.00	0.94	0.85	0.89
0.78	0.98	0.93	1.05	0.93	1.06	1.10	0.97	0.81	0.96

A normal probability plot gives substantial support to the assumption that the population distribution of cadence is approximately normal.

A. Plot a normal probability plot in order to confirm that the population distribution is approximately normal.

B. Calculate and interpret a 95% confidence interval for population mean cadence.

Problem 3.

The alternating current (AC) breakdown voltage of an insulating liquid indicates its dielectric strength. The article "Testing Practices for the AC Breakdown Voltage Testing of Insulation Liquids" (IEEE Electrical Insulation Magazine, 1995: 21–26) gave the accompanying sample observations on breakdown voltage (kV) of a particular circuit under certain conditions.

62 50 53 57 40 53 55 61 59 64 50 53 64 62 50 68
52 55 57 50 55 50 56 57 46 55 53 54 52 49 47 55
57 48 63 54 55 51 53 57 53 51 50 55 63 50 56 59

A. Construct a boxplot of the data to find out possible outliers. Use the Tukey's fence criterion for outliers.

B. Calculate and interpret a 95% confidence interval (CI) for true average breakdown voltage m.

C. Suppose the investigator believes that virtually all values of breakdown voltage are between 40 and 70. What sample size would be appropriate for the 95% CI to have a width of 2 kV?

Problem 4.

The article “Concrete Pressure on Formwork” (Mag. of Concrete Res., 2009: 407–417) gave the following observations on maximum concrete pressure (kN/m2):

33.2 41.8 37.3 40.2 36.7 39.1 36.2
36.0 35.2 36.7 38.9 35.8 35.2 40.1 41.8

A. Is it plausible that this sample was selected from a normal population distribution?

B. Calculate the confidence interval with confidence level 95% for the population standard deviation of maximum pressure.