
Theoretical Exercises**Exercise 9.1: (Theoretical) Confidence intervals**

- a) How does the length of the confidence interval for the expected value μ of a normally distributed random variable change when σ doubles?
- b) A sample of size 1000 from a normally distributed population with $\sigma = 0.1$ resulted in $\bar{x} = 5.3$. In which interval does the expected value lie with certainty?
- c) How does the length of the confidence interval change if you
 - i) increase the sample size
 - ii) increase the confidence level
- d) If the sample size is small, which distribution is used to calculate the confidence interval for the expected value μ of a normally distributed random variable with unknown variance?

Exercise 9.2: (Theoretical) Confidence intervals 2

A manufacturer investigates the probability of failure of components under increased load. A test with 50 components resulted in 6 failures. Determine an approximate confidence interval at the 0.95 level for the probability of failure.