Stat414; **Fall** 2024; **Worksheet 05**; 20 Points;

1. Study Example 5.1 (204-205) from Chapter 5 of M&N. Suppose $x_1, x_2, \cdots, x_m$ denote data obtained from a normally distributed population. Write down the formulas for the method of moments estimators (mme) of the parameters μ(mean), σ^2 (variance), and σ (standard deviation).

   (a) In `EnvStats`, find the tccb data set `attach(EPA.94b.tccb.df)` and subset the data corresponding to the Reference area. Plot the histogram of the logtransformed TcCB, and overlay a normal curve. Obtain a q-q plot. Comment on the normality assumption for the log-transformed data. (Please be aware that `log` in R is the natural log.)

   (b) Obtain MME, MLE and MVUE for μ and σ^2 of the population of log-measurements from the Reference area.

2. Study the R code given on pages 22-23 of the lecture material **Point Estimation.pdf**. This code conducts a simulation study (also called Monte Carlo study) for comparing four differ-ent estimators proposed for a population parameter.

   (a) What is the population and what is the target population parameter? What are the nuisance parameters, if any?

   (b) What are the different estimators proposed? Comment on the intuitive appropriateness of each estimator.

   (c) The simulation assumes a specific value for the population parameters. Can we extend the conclusion of this simulation study for other values of the parameters?

   (d) Modify the code to compare the MME to MVUE for estimating the variance σ^2 of a normal distribution.