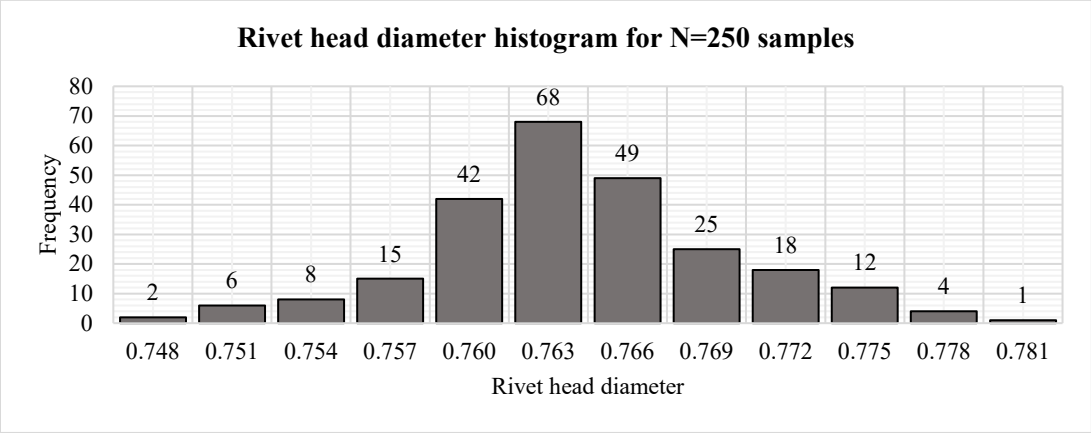
ENRE 447 Homework 3

Problems are similar to the book problems from Modarres & Groth 2023 (problem number in brackets). In some cases I have modified the problem slightly. Approved software ok, open everything. All policies of course syllabus and grading rubric apply.

1. [4.1] The following data represent times to failure (in hrs) for 20 mechanical devices.

   4 7 8 12 19 27 50 65 66 69
   71 73 75 91 107 115 142 166 184 192

   a. Find the MTTF and variance of the failure times.
   b. Develop an empirical probability distribution and histogram for the data.
2. The histogram below shows the distribution of the diameters of the heads of rivets manufactured by a company. Compute the mean and variance of the diameter.



3. [4.6] The sample mean life of ten car batteries is of 102.5 months, with the standard deviation of 9.45 months. What are the 80% confidence limits for the mean and standard deviation of a pdf that represents these batteries?
4. [4.9] The frequency distribution of time to establish the root causes of a failure by a group of experts is observed and given below. Test whether a normal distribution with known $\sigma = 10$ is an appropriate model for these data.

Time Interval (hour)	Obs. Freq.
45-55	7
55-65	18
65-75	35
75-85	28
85-95	12

5. [4.10] A sample of 50 digits using a random number generator yielded the following data. Is there any reason to doubt the digits are uniformly distributed? Use a Chi-Square test and significance level of 0.05 to test.

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	4	8	8	4	10	3	2	2	4	5

6. [4.16] Consider the following time to failure data with the ranked value of t_i. Use the K-S test to test the hypothesis that the data fit a normal distribution.

Event	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Time to Failure (hour)	10.3	12.4	13.7	13.9	14.1	14.2	14.4	15.0	15.9	16.1