

Homework #4

1. (10 points) A sample of size 100 which has the sample mean $\bar{X} = 500$ was drawn from a population with an unknown mean μ and the standard deviation $\sigma = 80$.
 - a) What is the probability that the population mean will be in the interval (480, 510)?
 - b) Give the 95% confidence interval for the population mean.
2. (10 points) Find the maximum likelihood estimator for λ in a sample of size n drawn the Poisson distribution

$$f(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

3. (10 points) (10 points) The elasticity of a polymer is affected by the concentration of a reactant. When low concentration is used, the true mean elasticity is 55, and when high concentration is used the mean elasticity is 60. The standard deviation of elasticity is 4 in the first case and 5 in the second case. Random samples of sizes 16 and 9 correspondingly are taken, find the probability that $\bar{X}_{high} - \bar{X}_{low} \geq 4$.
4. (20 points) To estimate the copy number of a specific protein, a laboratory has done multiple measurements: 2310, 2320, 2010, 10800, 2190, 3360, 5640, 2540, 3360, 11800, 2010, 3430, 10600, 7370, 2160, 3200, 2020, 2850, 3500, 10200, 8550, 9500, 2260, 7730, 2250

- a) Find a point estimate of the mean protein copy number.
 - b) Find a point estimate of the standard deviation of the protein copy number
 - c) What is approximately the standard error of the estimate of the mean protein copy number obtained in part a)
 - d) Find a point estimate for the proportion of readings that are less than 5000.
 - e) Find 95% confidence intervals for the point estimate in part d)
 - f) Use the computer to plot the histogram and the box-and-whisker diagram for the sample
5. (10 points) The college bookstore tells prospective students that the average cost of its textbooks is \$52 with a standard deviation of \$4.50. A group of statistics students think that the average cost is actually higher. In order to test bookstore's claim against this alternative hypothesis, the students bought a random sample of 100 books. The mean price of this sample was \$52.80. Perform the hypothesis test at the 5% level of significance and state your decision.