

Introduction to Probability and Statistics - 18.05

Problem set 8

Due Friday, May 2nd, 2008

1. The weights of chocolate bars produced in a chocolate factory are normally distributed with unknown mean and unknown variance. A random sample of chocolate bars was taken from the production line. Each bar was weighed on a very accurate scale. The results in grams were:
3.087 3.131 3.241 3.241 3.270 3.553 3.440 3.411 3.437 3.477
Please construct a 90% confidence interval for the mean weight.
2. In the context of the previous problem. Suppose that you know that the variance is 0.14. What sample size would be necessary to estimate the true weight to within ± 0.03 grams with 90% confidence?
3. Still in the context of problem 1. Suppose that you know that the variance is 0.14. Based on the same data set as in problem 1, what is now the 90% confidence interval for the mean weight.
4. Finally (in the context of problem 1). Suppose you know that the variance is 0.14, but you **do not know** that the weights are normally distributed. Again construct a 90% confidence interval for the mean (from the same dataset).
5. (a) Determine the least squares estimate $\hat{\alpha}, \hat{\beta}$ for the regression line $y = \alpha + \beta x$ based on the dataset $(1, 2), (3, 1.8), (5, 1)$.
(b) Suppose we add to the dataset the point $(0, 0)$. Determine the new least squares estimate, and compare it to the previous estimate.