

15.075 Statistical Thinking and Data Analysis

Computer Exercises 2

Due November 10, 2011

Instructions: Please solve the following exercises using MATLAB. One simple way to present your solutions is to copy all of your code and results (plots, numerical answers, etc.) into a Word document, which you should submit in class. There is no online submission. **Do NOT share code!**

Exercise 1

In this exercise, we demonstrate the Central Limit Theorem, where each X_i is exponential.

- Generate 1000 random numbers from the exponential distribution with $\lambda = 6$, and plot them in a histogram. This should give you an idea of what the exponential distribution looks like.
- For $n = 2$, repeat the following 1000 times: Generate a random sample of n numbers from the exponential distribution with $\lambda = 6$.
- Compute the sample mean of the n numbers and standardize it using the true mean and standard deviation of the distribution.
- Make a histogram and normal plot of the 1000 sample means.
- Repeat (b)-(d) for $n = 10, 20$, and 100 . Put all four histograms and all four normal plots in the same window. Comment on their shapes.

Exercise 2

Solve Problem 6.23 from the book.

Exercise 3

Solve Problem 6.25 from the book.

Exercise 4

A thermostat used in an electrical device is to be checked for the accuracy of its design setting of 200°F . Ten thermostats were tested to determine their actual settings, resulting in the following data:

202.2	203.4	200.5	202.5	206.3	198.0	203.7	200.8	201.3	199.0
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Assume the settings come from a normal distribution. Using $\alpha = 0.05$, perform a hypothesis test to determine if the mean setting is greater than 200°F . What are the null and alternative hypotheses? Which test do you use and why? Explain your conclusion using

- An appropriate confidence interval.
- A critical value from the distribution of the test statistic.
- A p -value.

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