

Practice Final

The following is a list of problems I consider final-worthy. This list of problems should serve as a good place to start studying, and it should not be considered a comprehensive list of problems from the sections we've covered. YOU are responsible for studying all the sections to be covered on the final.

Note: These problems concentrate on material since the last exam. To review earlier material, use the review problems distributed for the first two exams, as well as the exams themselves.

1. Two random variables X and Y have joint density

$$f(x, y) = \begin{cases} C(2 + y - xy), & \text{if } 0 \leq x \leq 2 \text{ and } 0 \leq y \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$

- (a) Find the constant C .
 - (b) Show that the regression $\mu_{X|y}$ is linear, and find the regression coefficients α and β .
 - (c) Find the regression $\mu_{Y|x}$ and show that it is not linear.
2. (a) Write down a 3×3 table containing integers between 10 and 50.
(b) Make up a word problem for which the table from (a) represents the data, and in which it is necessary to test whether the population attribute described by the rows is independent of the attribute described by the columns. Carry out the test.
 3. In a random sample $s = 2.53$ minutes for the amount of time 30 people took to complete the written test for their driver's licenses. At the 0.05 level of significance, test the null hypothesis $\sigma = 2.85$ minutes against the alternative hypothesis $\sigma < 2.85$ minutes.
 4. Using the data in Problem 14.53, answer the following:
 - (a) Find the equation of the least squares line that will enable us to predict the selling price of a house in the metropolitan area in terms of its assessed value.
 - (b) Predict the selling price of a house that is assessed at \$205,000.
 5. The data in Example 16.5 represents the weights in pounds both before and after a diet for a group of 16 individuals. Use the sign test to test at the 0.05 level of significance whether the weight-reducing diet is effective. Repeat the test at the 0.01 level of significance using the signed-rank test.
 6. Suppose that it is known from experience that the standard deviation of the weight of 12-ounce packages of cookies is 0.25 ounces. We wish to check whether the true average weight of the packages is 12 ounces. 25 packages are selected at random and their mean is found to be 12.075. Test the null hypothesis $\mu = 12$ against the alternative $\mu \neq 12$ at the 0.01 level of significance by using a P -value, assuming the distribution of weights is normal.
 7. If $x = 7$ of $n = 20$ patients suffered serious side effects from a new medication, test the null hypothesis $\theta = 0.50$ against the alternative $\theta \neq 0.50$ at the 0.05 level of significance. Here, θ represents the true proportion of patients suffering serious side effects from the new medication.