

2. d) Some customers believe that the variance of the weight of boxes with *Captain Crisp* cereal is more than 0.05. Use $\alpha = 0.10$ to test the customers' claim.
- e) What is the p-value of the test in part (d)? (You may give a range.)
- f) Use a computer to find the p-value of the test in part (d).

“Hint”: EXCEL =CHIDIST(x , degrees of freedom)
gives area to the right of x.

OR R > pchisq(x , degrees of freedom)
gives area to the left of x.

5. Researchers are worried that there is excess chlorine in the drinking water supply. They collected 25 independent samples of drinking water and the amount of chlorine in each was measured. The average amount of chlorine in the water samples was 4.2 mg per liter with sample standard deviation of 0.6 mg per liter. The FDA recommends a mean of at most 4.0 mg per liter of water. The researchers want to know if this limit is exceeded in the water supply. Assume the chlorine content measurements are approximately normally distributed.

- a) State the null and alternative hypothesis for this test in terms of the relevant parameter.
- b) Use $\alpha = 0.05$ to perform the appropriate test. Report the value of the test statistic, the critical value(s), and state your decision.
- c) Using the t distribution table only, what is the p-value of the test in part (b)?
(You may give a range.)

6. According to Mendelian genetics, a recessive trait will appear in 25% of the population. In order to test whether a particular recessive trait is consistent with the Mendelian model for a specific hybrid plant, the botanist produces a (random) sample of 75 offspring and counts the number of plants with this recessive trait. Indeed, she believes that this recessive trait will appear more frequently in these plants.

- a) State the null and alternative hypothesis for this test in terms of the relevant parameter.
- b) The botanist observes 27 offspring which exhibited the recessive trait of interest. Calculate the p-value for the appropriate test. What should the botanist conclude at an $\alpha = 0.05$ significant level?
- c) Use a computer to find the exact probability of observing 27 or more offspring which exhibited the recessive trait of interest in a sample of 75 if we assume the null hypothesis in part (a) is true.

“Hint”:
EXCEL =BINOM.DIST(x , n , p , 1)
 gives probability of less than or equal to x.

OR R > pbinom(x , n , p)
 gives probability of less than or equal to x.

7 – 8. In the past, the average guest check at a local restaurant was \$17.85. After the menu has been redesigned, a random sample of 20 guest checks was taken, the sample mean was \$19.35 with the sample standard deviation of \$3.88. Assume that the guest check amounts are approximately normally distributed.

7. a) Construct a 95% confidence interval for the new overall average guest check.

b) Is there enough evidence that the average guest check has changed? Find the p-value of the appropriate test.

8. c) Construct a 95% confidence interval for the overall standard deviation of guest check amounts.

d) Is there enough evidence that the overall standard deviation of guest checks is different than \$3.00 at a 5% level of significance?

That is, test $H_0 : \sigma = 3$ vs. $H_1 : \sigma \neq 3$. Report the value of the test statistic, the critical value(s), and state your decision.

9 – 10. In a random sample of 120 male customers at *Burger Queen*, 84 ordered fries with their burgers.

9. a) Construct a 95% confidence interval for the overall proportion of male customers who order fries with their burgers.

b) Find the p-value of the test $H_0 : p = 0.77$ vs. $H_1 : p \neq 0.77$, where p is the proportions of male customers who order fries with their burgers.

10. Suppose also that in a random sample of 80 female customers, 48 ordered fries with their burgers.

c) Construct a 95% confidence interval for the difference between proportions of male and female customers who order fries with their burgers.

d) Find the p-value of the test $H_0 : p_M = p_F$ vs. $H_1 : p_M > p_F$.