

## Review of Mathematical Statistics

1. A corporation has 272 accounts receivable in a particular category. A random sample of 50 of them was taken. The sample mean was \$492.36, and the sample standard deviation was \$149.92.
  - a. Find a 99% confidence interval for the population mean value of these accounts receivable.
  - b. Find a 95% confidence interval for the total value of these accounts receivable.
  - c. Without doing the calculations, state whether a 90% confidence interval for the population total would be wider or narrower than the interval found in part (b).
2. A corporation employs many sales representatives. A random sample of 60 of them was taken, and it was found that, for 36 of the sample members, the volume of orders taken this month was higher than for the same month last year.
  - a. Find a 95% confidence interval for the population proportion of sales representatives with a higher volume of orders. Use both methods and compare the results.
  - b. Use R to define a function that produces the more accurate confidence interval.
3. A machine being used for packaging seedless raisins has been set so that on the average 15 ounces of raisins will be packaged per box. The quality control engineer wishes to test the machine settings and selects a sample of 30 consecutive raisin packages filled during the production process. Their weights are recorded below:  
15.2 15.3 15.1 15.7 15.3 15.0 15.1 14.3 14.6 14.5  
15.0 15.2 15.4 15.6 15.7 15.4 15.3 14.9 14.8 14.6  
14.3 14.4 15.5 15.4 15.2 15.5 15.6 15.1 15.3 15.1  
Assume that the weight per box is normally distributed.
  - a. Is there evidence that the mean weight per box is different from 15 ounces? (use  $\alpha = 0.05$ ).
  - b. Is there evidence that the standard deviation of weight per box is different from 0.25 ounces? (use  $\alpha = 0.05$ ).
4. Stocks on the National Association of Security Dealers (NASD) system were analyzed in *Financial Analysts Journal* (Jan/Feb 1993). The annualized monthly returns (%) for a sample of 13 large-firm NASD stocks were computed and are summarized as follows:  $\bar{x} = 13.5\%$ ,  $s = 23.84$ . Conduct a test of hypothesis to determine whether the mean annualized monthly return for large-firm NASD stocks exceeds 10%. Use  $\alpha = 0.05$ .
5. The management of the Tiger baseball team decided to sell only low alcohol beer in their ballpark to help combat rowdy fan conduct. They claimed that more than 40% of the fans would approve of this decision. Let  $p$  equal the proportion of Tiger fans on opening day that approved of this decision. Knowing that 550

fans out of a sample of 1278 said that they approved of this new policy what can you conclude?

6. A sample of 45 sales receipts from the university bookstore has  $\bar{x} = 73.5$  and  $s = 12.4$ . Assume that sales receipts follow a normal distribution
  - a. Use these values to perform a test of  $H_0 : \mu = 80$  against  $H_1 : \mu < 80$  with  $\alpha = 0.05$ . Calculate the p-value.
  - b. Test  $H_0 : \mu = 80$  against  $H_1 : \mu \neq 80$  with  $\alpha = 0.05$ . Calculate the p-value. Why does the p-value change from the previous one.
  - c. Define a 95% confidence interval for  $\mu$ .

### Answers

- 1- a) (440.9; 543.8)    b) (123432.8; 144411.1)    c) narrower
- 2- a) Usual: (0.476; 0.724)    Alternative: (0.474; 0.714)    b) ...
- 3- a) p-value=0.1369 do not reject H0 or  $T_{obs} = 1.5298$ ,  $c = \pm 2.045$   
b) p-value=0.0000 reject H0 or  $Q_{obs} = 76.395$ ,  $q_1 = 16.047$ ,  $q_2 = 45.722$
- 4- p-value=0.3031 do not reject H0 or  $T_{obs} = 0.5293$ ,  $c = 1.7823$  (one side test)
- 5- p-value=0.01336 Reject H0 and then more than 40% of the fans approve the decision
- 6- a) p-value=0.00051    b) p-value=0.001028    c) (69.7746; 77.2254)