Hypotheses Testing Problems

Exercise 8.25 The desired percentage of SiO_2 in a certain type of aluminous cement is 5.5. To test whether the true average percentage is 5.5 for a particular production facility, 16 independently obtained samples are analyzed. Suppose that the percentage of SiO_2 in a sample is normally distributed with $\sigma = .3$ and that $\bar{x} = 5.25$.

a. Does this indicate conclusively that the true average percentage differs from 5.5?

b. If the true average percentage $\mu = 5.6$ and a level $\alpha = .01$ test based on $n = 16$ is used, what is the probability of detecting this departure from H_a?

c. What value of n is required to satisfy $\alpha = .01$ and $\beta(5.6) = .01$?

Exercise 8.26 To obtain information on the corrosion-resistance properties of a certain type of steel conduit, 45 specimens are buried in soil for a 2-year period. The maximum penetration (in mils) for each specimen is then measured, yielding an average penetration of 52.7 and a standard deviation 4.8. The conduits were manufactured with the specification that true average penetration be at most 50 mils. They will be used unless it can be demonstrated conclusively that the specification has not been met. What would you conclude?

Exercise 8.27 The Charpy V-notch impact test is the basis for studying many material toughness criteria. This test was applied to 42 specimens of a particular alloy at 110^oF. The average amount of transverse lateral expansion was computed to be 73.1 mils, and the standard deviation was 5.9 mils. To be suitable for a particular application, the true average amount of expansion should be less than 75 mils. The alloy will not be used unless the sample provides strong evidence that this criterion has been met. Test the relevant hypotheses using $\alpha = .01$ to decide whether the alloy is suitable.

Exercise 8.32 A sample of 12 radon detectors of a certain type was selected, and each was exposed to 100 pCi/L of radon. The resulting readings were as follows:

$$105.6, 90.9, 91.2, 96.9, 96.5, 91.3, 100.1, 105.0, 99.6, 107.7, 103.3, 92.4$$

a. Does this data suggest that the population mean readings under these conditions differs from 100? State and test the appropriate hypotheses using $\alpha = .05$.

b. Give a 95% CI for the population mean readings. Does the 95% CI include 100?

c. What assumptions are you making? How to check these assumptions?

Exercise 8.36 A manufacture of nickel-hydrogen batteries randomly selects 100 nickel plates for test cells, cycles them a specified number of times, and determines that 14 of the plates have blistered.

a. Does this provide compelling evidence for concluding that more than 10% of all plates blister under such circumstances? State and test the appropriate hypotheses using $\alpha = .05$. In reaching your conclusion, what type of error might you have committed?

b. Give a 95% CI for the true proportion of all plates blister under such circumstances.

Exercise 8.51 An aspirin manufacturer fills bottles by weight rather than by count. Since each bottle should contain 100 tablets, the average weight per tablet should be 5 grains. Each of 100 tablets taken from a very large lot is weighed, resulting in an average weight per tablet of 4.87 grains and a standard deviation of .35 grains. Does this information provide strong evidence for concluding that the company is not filling its bottles as advertised? Compute the P-value and perform a level .01 test.

Exercise 8.53 Many consumers are turning to generics as a way of reducing the cost of prescription medications. A survey of 102 doctors showed that only 47 of those surveyed knew the generic name for the drug methadone. Does this provide strong evidence for concluding that fewer than half of all physicians know the generic name for methadone? Compute the P-value and perform a level .01 test.