Chapter 16 - Statistical Tests

31. Consider the following test of whether a coin is fair. Toss the coin three times. If the coin lands either all heads or all tails, reject H0: p=1/2. (The *p* denotes the chance for the coin to land on heads.)

- (a) What is the probability of a Type I error for this procedure?
- (b) If p=3/4, what is the probability of a Type II error for this procedure?

37. The Human Resources (HR) group gives job applicants at a firm a personality test to assess how well they will fit into the firm and get along with colleagues. Historically, test scores have been normally distributed with mean μ and standard deviation σ=25. The HR group wants to hire applicants whose true personality rating μ is greater than 200 points. (Test scores are an imperfect measure of true personality.)

- (a) Before seeing test results, should the HR group assert as the null hypothesis that μ for an applicant is greater than 200 or less than 200?
- (b) If the HR group chooses H0: μ≤200, then for what test scores (approximately) will the HR group reject H0 if α=2.5%?
- (c) What is the chance of a Type II error using the procedure in part (b) if the true score of an applicant is 225?

41. A company that stocks shelves in supermarkets is considering expanding the supply that it delivers. Items that are not sold must be discarded at the end of the day, so it only wants to schedule additional deliveries if stores regularly sell out. A break-even analysis indicates that an additional delivery cycle will be profitable if items are selling out in more than 60% of markets. A survey during the last week in 45 markets found the shelves bare in 35.

- (a) State the null and alternative hypotheses.
- (b) Describe a Type I error and a Type II error in this context.
- (c) Find the *p*-value of the test. Do the data supply enough evidence to reject the null hypothesis if the α -level is 0.05?

51. Banks frequently compete by adding special services that distinguish them from rivals. These services can be expensive to provide. The bank hopes to retain customers who keep high balances in accounts that do not pay large interest rates. Typical customers at this bank keep an average balance of $3,500 in savings accounts that pay 2% interest annually. The bank loans this money to other customers at an average rate of 6%, earning 4% profit on the balance. A sample of 65 customers was offered a special personalized account. After three months, the average balance in savings for these customers was $5,000 (s=$3,000). If the service costs the bank $50 per customer per year, is this going to be profitable to roll out on a larger scale?

- (a) State the null and alternative hypotheses. Describe the parameters.
- (b) Describe Type I and Type II errors in this context.
- (c) What is necessary for the sample size to be adequate for using a *t*-test?
- (d) Find the *p*-value of the test. Do the data supply enough evidence to reject the null hypothesis if α=0.05? (Assume that the data meet the sample size condition.)