Tutorial 9

7.39 A computer manufacturer wants to establish that the average time to set up a new desktop computer is less than 2 hours.

(a) Formulate the null and alternative hypotheses.

(b) What error could be made if $\mu = 1.9$? Explain in the context of the problem.

(c) What error could be made if $\mu = 2.0$? Explain in the context of the problem.

7.40 A manufacturer of four-speed clutches for automobiles claims that the clutch will not fail until after 50,000 miles.

(a) Interpreting this as a statement about the mean, formulate a null and alternative hypothesis for verifying the claim.

(b) If the true mean is 55,000 miles, what error can be made? Explain your answer in the context of the problem.

(c) What error could be made if the true mean is 50,000 miles?

7.41 An airline claims that the typical flying time between two cities is 56 minutes.

(a) Formulate a test of hypotheses with the intent of establishing that the population mean flying time is different from the published time of 56 minutes.

(b) If the true mean is 50 minutes, what error can be made? Explain your answer in the context of the problem.

(c) What error could be made if the true mean is 56 minutes?

Tutorial 9

7.42 A company wants to establish that the mean life of its batteries, when used in a wireless mouse, is over 183 days. The data will consist of the life lengths of batteries in 64 different wireless mice.

(a) Formulate the null and alternative hypotheses.

(b) If the true mean is 190 days, what error can be made? Explain your answer in the context of the problem.

7.43 A statistical test of hypotheses includes the step of setting a maximum for the probability of falsely rejecting the null hypothesis. Engineers make many measurements on critical bridge components to decide if a bridge is safe or unsafe.

(a) Explain how you would formulate the null hypothesis.

(b) Would you prefer $\alpha = 0.05$ or $\alpha = 0.01$? Explain your reasoning.

7.47 If the criterion on page 222 is modified so that the paint manufacturer's claim is rejected for $\overline{X} > 20.50$ minutes, find

(a) the probability of a Type I error;

(b) the probability of a Type II error when $\mu = 21$ minutes.

7.48 Suppose that in the drying time example on page 222, n is changed from 36 to 50 while everything else remains the same. Find

(a) the probability of a Type I error;

(b) the probability of a Type II error when $\mu = 21$ minutes.

(see a copy of page 222 on the next slids)

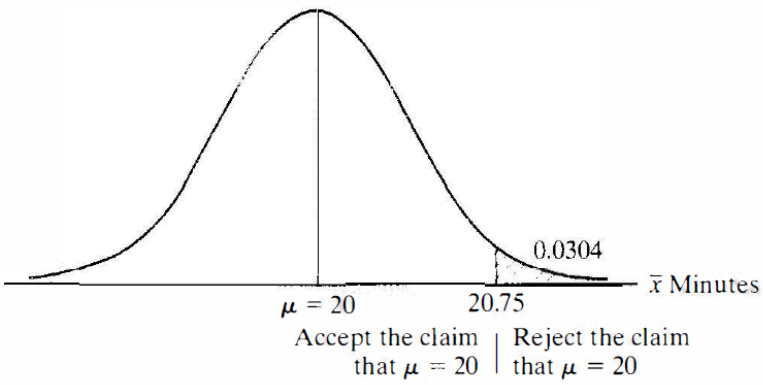
Tutorial 9

Page 222

To illustrate the general concepts involved in deciding whether or not a statement about the population is true or false, suppose that a consumer protection agency wants to test a paint manufacturer's claim that the average drying time of his new "fast-drying" paint is 20 minutes. It instructs a member of its research staff to paint each of 36 boards using a different 1-gallon can of the paint, with the intention of rejecting the claim if the mean of the drying times exceeds 20.75 minutes. Otherwise, it will accept the claim, and in either case it will take whatever action is called for in its plans.

This provides a clear-cut criterion for accepting or rejecting the claim, but unfortunately it is not infallible. Since the decision is based on a sample, there is the possibility that the sample mean may exceed 20.75 minutes even though the true mean drying time is $\mu = 20$ minutes, and there is also the possibility that the sample mean may be 20.75 minutes or less even though the true mean drying time is, say, $\mu = 21$ minutes. Thus, before adopting the criterion, it would seem wise to investigate the chances that the criterion may lead to a wrong decision.

Assuming that it is known from past experience that the standard deviation of such drying times can be expected to equal $\sigma = 2.4$ minutes, let us first investigate the possibility that the sample mean may exceed 20.75 minutes even though the true mean drying time is $\mu = 20$. The probability that this will happen purely due to chance is given by the area of the ruled region of Figure 7.5, and it can easily be determined by approximating the sampling distribution of the mean with a normal



7.49 It is desired to test the null hypothesis $\mu = 100$ pounds against the alternative hypothesis $\mu < 100$ pounds on the basis of the weights of a random sample of size $n = 40$ packages shipped by truck. The population has $\sigma = 12$ pounds. For what values of $\bar{X}$ must the null hypothesis be rejected if the probability of a Type I error is to be $\alpha = 0.01$?