error. How can the power of an experimental methodology be increased for a given type I error rate? Two approaches were suggested in Section 1.3. One approach is to increase the size of the sample. A second approach is to use an experimental design that provides for a more precise estimate of treatment effects and a smaller error variance.

If information concerning the true parameter is available, the probability of committing a type II error can be determined. Generally, however, the value of the parameter is unknown. In practice, an experimenter can specify various possible values of the parameter of interest to him and then compute the probability of committing a type II error and $1 - \beta$, given that the specified value of μ is true. Let us assume that the obtained sample statistic is equal to 102.5 and that an experimenter is interested in determining the probability of correctly rejecting H_0 if the population mean is really equal to 103. The probabilities β and $1 - \beta$ can be determined from

$$z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{102.5 - 103.0}{15/\sqrt{100}} = -.33.$$

According to the normal distribution table in Appendix D.3, the probabilities β and $1 - \beta$ are .37 and .63, respectively. The location of the regions corresponding to β and $1 - \beta$ are shown in Figure 1.5-3. In this example the probability of making a correct decision if $\mu = 103$ is only .63, whereas the corresponding probability if $\mu = 100$ is .95. The probabilities associated with the possible outcomes of our decision rule are summarized in Table 1.5-2.

TABLE 1.5-2 Probabilities Associated with the Decision Process

		True Situation	
		$\mu = 100$	$\mu = 103$
Decision	$\mu = 100$	$1 - \alpha = .95$	type II error $\beta = .37$
	$\mu = 103$	type I error $\alpha = .05$	$1 - \beta = .63$

SELECTION OF A LEVEL FOR α

In the preceding hypothetical example, the probability of a type I error (α) is much lower than the corresponding type II error (β). Experimenters in the behavioral sciences frequently set the type I error rate at .05 or .01. This convention is based primarily on the notion that a type I