These four steps and the conventions they summarize require some amplification. First, the selection of an appropriate sample statistic is determined by the experimenter's interest in a particular parameter or characteristic of a population. If only one population is involved, an experimenter in the behavioral sciences is generally interested in testing a hypothesis with respect to the central tendency of the population. If, as is frequently the case, more than one population is involved, hypotheses concerning differences among the populations in terms either of central tendency or of dispersion may be of interest. The measures most often adopted to describe central tendency and dispersion are the mean and standard deviation, respectively.

Test statistics are similar to sample statistics in that both have sampling distributions; however, unlike sample statistics, test statistics are not used to estimate population parameters. Instead, test statistics provide information in the form of a probability statement, which is used by an experimenter in deciding whether or not to reject a null hypothesis. Conventionally, an experimenter specifies a region of the sampling distribution of the test statistic based on α and H_1 that will lead to rejection of the null hypothesis *prior* to computation of the test statistic. This region is specified in such a way as to contain those values of the test statistic that have a small probability of occurring if the null hypothesis is true but a high probability of occurring if the alternative hypothesis is true. If the test statistic falls in the region for rejection, either an improbable event has occurred or the null hypothesis is false and should be rejected.

Two commonly used test statistics are z and t ratios. For testing a hypothesis concerning a single population mean, z and t ratios have the following form:

$$z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}} \quad \text{and} \quad t = \frac{\bar{X} - \mu_0}{\hat{\sigma}/\sqrt{n}},$$

where $\bar{X}$ = sample mean used to estimate the population mean μ, μ_0 = value of population mean specified by null hypothesis, σ = population standard deviation, $\hat{\sigma}$ = unbiased estimate of population standard deviation calculated from a sample, and n = number of observations in the sample. If it can be assumed that the population sampled has a normal distribution, z and t are distributed as the normal curve and t distribution, respectively. That is, a z or t ratio can be computed for each conceivable sample of n independent observations drawn from a normal population with mean = μ. The value of z or t will vary over the different samples from the population. If a plot of the probability-density of each z or t value is made, the resulting distributions will be distributed as the normal distribution and t distribution, respectively. The t distribution, unlike the z distribution, actually is a family of distributions. The exact shape of the t distribution varies, depending on the number of observations in the sample. Probabilities associated with obtaining various values of z or t are given in Tables D.3 and D.4, respectively. It should be noted that the denominator