INFERENCE CONDITIONS EXPLAINED FURTHER

RETURN *to Example Step Three*

*** Random Sample: A random sample was conducted to insure every member of the population was equally likely to be selected.**

Allows us to use probability theory to calculate the conditional probability that is known as the P-value.

*** Normal Sampling Distribution: The sampling distribution of all possible sample proportions has an approximately normal shape because:**

A. Normal shape is required to allow us to calculate the P-value.

B. Unlike checking conditions for mean tests, there is one simple inequality that must be explicitly checked to insure that the sampling distribution is normally distributed.

Notice that we use P_0 from the null hypothesis for these calculations. That's because we assume this population proportion is correct until we possibly reject it in Step Four (remember at this point we are only at step two.) Remember n = sample size.

$$n*\rho > 10 \qquad\qquad n*(1-\rho) > 10$$

BOTH INEQUALITIES MUST BE TRUE TO ASSUME THE SAMPLING DISTRIBUTION WILL BE NORMALLY DISTRIBUTED.

*** Independence: The lack of replacement is not a problem in this case because the number of subjects in the population is more than ten times the sample size.**

Consider the lack of replacement and its impact on the probability calculations. The Indepedence condition has many sides, but most significant is the procedural fact that we do not replace a member of the population once they have been selected in the sample. Without replacement, each selection reduces the denominator of the probability for each successive selection by one. To illustrate, examine the example below where a sample of three is drawn from a population of ten. Here the change of probability from one selection to the next is too great for us to assume independence in our calculations of P-value. In particular, it violates the Multiplication Rule.

First Selection: Every Member of Population Has Probability of $\frac{1}{10}$

Second Selection: Every Member of Population Has Probability of $\frac{1}{9}$

Third Selection: Every Member of Population Has Probability of $\frac{1}{8}$

In the example below, the differences in probability from selection to selection is too significant for us to overlook and apply the Multiplication Rule. Now consider an example where the size of the population (assumed to be 30) is ten times the sample size (assumed to be 3).

First Selection: Every Member of Population Has Probability of $\frac{1}{30}$

Second Selection: Every Member of Population Has Probability of $\frac{1}{29}$

Third Selection: Every Member of Population Has Probability of $\frac{1}{28}$

In this second example, the lack of replacement causes the probabilities for the three selections to be different but by a much smaller degree than the first example. These relatively small differences in probability are not significant, and it allows us to use the Multiplication Rule in calculating P-values. In most cases, one can determine that the population size is at least ten times the sample size to meet the Independence condition for one sample tests.