# Practice Set 11 Sampling and the Sampling Distribution of the Means

I. Darin's new company, Future Horizons Corporation, manufactures a component for computer chips. Darin wants to know the average weight of 1,000 recently produced components. A sample of 36 had a mean weight of 30.025 milligrams and a standard deviation of .065 milligrams. Calculate the 98% confidence interval for the population mean weight of these components.

| Given: | n = 36 | 98% CI | $\bar{X} = 30.025$ | $S = .065$ |
|---|---|---|---|---|

98% CI→ $z = 2.33$

$$\bar{x} \pm Z\frac{S}{\sqrt{n}}$$

$$30.025 \pm 2.33\frac{.065}{\sqrt{36}}$$

$$30.025 \pm .0252$$

$$29.999 \leftrightarrow 30.050$$

I did not round the lower limit up because I wanted to show the population mean could be under 30 milligrams.

II. Calculate the 95% confidence interval using problem I information.

95% CI→ $z = 1.96$

$$\bar{x} \pm Z\frac{S}{\sqrt{n}}$$

$$30.025 \pm 1.96\frac{.065}{\sqrt{36}}$$

$$30.025 \pm .0212$$

$$30.004 \leftrightarrow 30.046$$

III. What can Darin do to make this interval smaller?

Increase the sample size. This will lower $\frac{S}{\sqrt{n}}$, which is the point estimate of the standard error of the mean.

# Practice Set 12 Sampling Distributions Part II

I. Darin wants to know the proportion of page 68 parts passing inspection. Fifty parts were randomly selected from a recent production run of 1,000 parts and 45 passed inspection.

A. Calculate the proportion of parts passing inspection.

$$\bar{p} = \frac{x}{n} = \frac{45}{50} = .90 \rightarrow 90\%$$

B. Darin would like to use last week's data to predict a range for the proportion of future production runs passing inspection. Calculate the 95% confidence interval for the proportion of parts produced by this production process passing inspection.

$\frac{n}{N} = \frac{50}{1{,}000} = .05 \geq .05$
Finite correction factor applies.

$n = 50 \geq 30$
$np = 50 \times .9 = 45 \geq 5$
$nq = 50 \times .1 = 5 \geq 5$
Normal approximation of the binomial applies.

Note: $\bar{p}$ has been used as an estimate of p.

$$\sigma_{\bar{p}} = \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}\sqrt{\frac{N-n}{N-1}}$$

$$= \sqrt{\frac{.9(1-.9)}{50}}\sqrt{\frac{1{,}000-50}{1{,}000-1}}$$

$$= .042(.975) = .041$$

$$\bar{p} \pm z\sigma_{\bar{p}}$$

$$.90 \pm 1.96(.041)$$

$$.90 \pm .080$$

$$.82 \leftrightarrow .98$$

C. What assumption is Darin making when using last week's data to predict future manufacturing quality?

Darin is assuming the factors affecting the weight of parts are stable. If tests soon to be explored in this part of **Quick Notes** indicate the proportion passing inspection is dropping, Darin will investigate these factors.