Chapter 7 – Confidence Intervals/Sample Sizes – One Population

C.I. around mean $C.I._{1-\alpha} = \bar{x} \pm z_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$

(n > 30) - page 299

C.I. around mean $C.I._{1-\alpha} = \bar{x} \pm t_{\alpha/2,df}\left(\frac{s}{\sqrt{n}}\right)$ df = n - 1

(n ≤ 30) – page 315

C.I. around proportion – p. 304 $C.I._{1-\alpha} = p \pm z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$ **p = sample ppt**

Note: This is the standard C.I. For small sample sizes, the formula in box on page 304 may give a smaller C.I.

C.I. around single x value – p. 317 $\bar{x} \pm t_{\alpha/2,df} \bullet s\sqrt{1+\frac{1}{n}}$

Tolerance Interval – page 318 $\bar{x} \pm$ **(tolerance critical value)** $\bullet$ **s**

critical value from Table V on page 567

SAMPLE SIZES (always round up to nearest integer)

Estimate of mean (p. 300) $n = \left(\frac{z_{\alpha/2} \times \sigma}{E}\right)^2$ **E = error bound** **(use s or σ)**

w (from text) = total interval width

Estimate of proportion (p. 306) $n = p(1-p)\left(\frac{z_{\alpha/2}}{E}\right)^2$ **p = sample ppt**

NOTE: if $\hat{p}$ is unknown, use $p = 1 - p = .50$ in formula above

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COMMON Z VALUES

$1-\alpha$	α	$z_{\alpha/2}$
.90	.10	1.645
.95	.05	1.96
.98	.02	2.33
.99	.01	2.575

HINTS:

1. For "… how large a sample…" use sample size
2. For "…find …confidence interval…" use C.I.
3. Use **normal** for mean, variance
   Use **binomial** for proportion, ratio, percent

ROUNDING:

C.I. normal – 1 or 2 more decimal places than mean
C.I. binomial – usually 3 decimal places
Sample sizes – round UP to next integer

Confidence Intervals/Sample Sizes – Two Populations

CONFIDENCE INTERVALS

C.I. around difference of two means - dependent or paired samples – page 324

$$C.I._{1-\alpha} = \bar{d} \pm t_{\alpha/2,df} \frac{s_D}{\sqrt{n}}$$

$\bar{d}$ = mean of differences
s_D = st. dev. of differences
n = number of pairs
$df = n - 1$

C.I. around difference of two means – independent samples, $n_1, n_2 > 30$
page 309

$$C.I._{1-\alpha} = \left(\bar{x}_1 - \bar{x}_2\right) \pm z_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

NOTE: If n_1 or $n_2 \le 30$, use the t-value instead of z-value - pg. 322

$$C.I._{1-\alpha} = \left(\bar{x}_1 - \bar{x}_2\right) \pm t_{\alpha/2,df} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$df = \frac{\left[\left(se_1\right)^2 + \left(se_2\right)^2\right]^2}{\frac{\left(se_1\right)^4}{n_1 - 1} + \frac{\left(se_2\right)^4}{n_2 - 1}} \quad \text{where } se = \frac{s}{\sqrt{n}}$$

C.I. around difference of two proportions – not in book
$n_1 p_1 (1 - p_1) \ge 10$ and $n_2 p_2 (1 - p_2) \ge 10$

$$C.I._{1-\alpha} = \left(p_1 - p_2\right) \pm z_{\alpha/2} \sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}}$$

SAMPLE SIZES (always round up to nearest integer)

Estimate of p_1-p_2 – not in book

$$n = n_1 = n_2 = [p_1(1 - p_1) + p_2 \ (1 - p_2)] \left(\frac{z_{\alpha/2}}{E}\right)^2$$

NOTE: if p_1 and p_2 is unknown, use $p = .50$ in formula which becomes:

$$n = n_1 = n_2 = 0.5 \left(\frac{z_{\alpha/2}}{E}\right)^2$$