Quick Questions 12 Sampling Distributions Part II

1.	$\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$
2.	$\sqrt{\frac{N-n}{N-1}}$
3.	$\frac{n}{N} \geq .05$
4.	$\bar{p} \pm z\sigma_{\bar{p}}$
5.	$\frac{x}{n}$
6.	$\bar{p}(1-\bar{p})\left(\frac{z}{E}\right)^2$
7.	$\left(\frac{zS}{E}\right)^2$

I. Place the number of the appropriate formula next to the item it describes.

A. Population proportion __5__
B. Standard error of the proportion __1__
C. Confidence interval for the population proportion __4__
D. Finite correction factor __2__
E. When to use the finite correction factor __3__
F. Sample size when predicting the population mean __7__
G. Sample size when predicting the population proportion __6__

II. A survey of 80 New York City voters revealed 60 planned to vote in the next election. Calculate both the 99% and 95% confidence interval for the population proportion.

$n = 80 \geq 30$

$np = 80(.75) = 60 \geq 5$

$nq = 80(1.00 - .75) = 20 \geq 5$

A. 99% confidence interval

$\bar{p} = \frac{x}{n} = \frac{60}{80} = .75 \rightarrow 75\%$

New York City has a very large population. n/N is less than .05 and the finite correction factor is not required.

$$\bar{p} \pm z\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$.75 \pm 2.58\sqrt{\frac{.75(1-.75)}{80}}$$

$$.75 \pm 2.58(.0484)$$

$$.625 \leftrightarrow .875$$

B. 95% confidence interval

$$\bar{p} \pm z\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$.75 \pm 1.96\sqrt{\frac{.75(1-.75)}{80}}$$

$$.75 \pm 1.96(.0484)$$

$$.655 \leftrightarrow .845$$

C. Using the same data, calculate the 99% confidence interval assuming the results came from a city of 1,500 voters.

$\frac{n}{N} = \frac{80}{1,500} = .053 > .05$

The finite correction factor is required.

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

$$= .0484\sqrt{\frac{1,500-80}{1,500-1}}$$

$$= .0471$$

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

$$.75 \pm 2.58(.0471)$$

$$.628 \leftrightarrow .872$$

III. Restaurant customers leave a tip approximately 70% of the time. A 95% confidence interval for the tip's proportion is desired. The answer should be correct within 5%. How many customers must be surveyed? Computer students set s to $\sqrt{pq} = \sqrt{.21} = .458$

$$n = \bar{p}(1-\bar{p})\left(\frac{z}{E}\right)^2 = .70(1-.70)\left(\frac{1.96}{.05}\right)^2 = .70(.30)(39.2)^2 = .21(1,537) = 322.77 \rightarrow 323$$

IV. Linda will consider opening a new video showcase in towns with average family income over $35,000. She requires a 99% confidence interval. The estimate should be within $1,000 of the population mean. Recently gathered data indicates the population standard deviation is $4,000. What size sample is required?

$$n = \left(\frac{z\sigma}{E}\right)^2$$

$$= \left[\frac{(2.58)(4,000)}{1,000}\right]^2$$

$$= [10.32]^2 = 106.502 \rightarrow 107$$

QQ 74 and 75