Test Chapter 6 and 7 Formulas

Chapter 6 Formulas
Conversion from x to Z and Z to x
with a Normal Distribution

Convert an x value to a Z score

$$z = \frac{(x - \text{mean})}{\text{standard deviation}}$$

$$z = \frac{(x-\mu)}{\sigma} \text{ or } z\frac{(x-\bar{x})}{s_x}$$

Convert a Z score to an x value

$$x = \text{mean} + \text{z score (standard deviation)}$$

$$x = \mu_x + (z)(\sigma_x) \text{ or } x = \bar{x} + (z)(s_x)$$

Central Limit Theorem:

Every possible **sample of size n** is taken from a population of values x_1 , x_2 , x_3 ....
and the average of each sample is recorded. This creates a population of sample means.
This population is called the Distribution of Sample Means and is labeled $\overline{X}$

The Distribution of Sample Means $\overline{X}$ is Normal
if the **distribution of x values is normal or n > 30**

$$\overline{\mu}_x = \mu_x \text{ and } \sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$$

Convert an $\bar{x}$ value to a Z score

$$z = \frac{(\bar{x} - \mu_{\bar{x}})}{\left(\frac{\sigma_x}{\sqrt{n}}\right)}$$

Using a Continuous Normal Distribution
to Approximate a Discrete Binomial Probability Distribution

If both $n \bullet p \geq 5$ **AND** $n \bullet q \geq 5$ **or if** $p = .5$ **(** where p is the probability of a success in 1 trial , and q is the probability of a failure in 1 trial and n is the numbers of trails) then the Discrete Binomial Probability Distribution can be **approximated** by a Continuous Normal Distribution of x values with a **mean** of $\mu_x = n \bullet p$ and a **standard deviation** of $\sigma_x = \sqrt{n \bullet p \bullet q}$

Convert an adjusted x value to a Z score
You must use a continuity correction for the x value in the binomial distribution.

$$z = \frac{(\text{adjusted x} - \mu_x)}{\sqrt{n \bullet p \bullet q}}$$

Chapter 7 Formulas

Confidence Intervals

$\hat{p} - E < p < \hat{p} + E$ where $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$ If If $n \bullet \hat{p} \geq 5$ and $n \bullet \hat{q} \geq 5$

$\bar{x} - E < \mu < \bar{x} + E$ where $E = z_{\alpha/2} \bullet \frac{\sigma}{\sqrt{n}}$ If the population is normal or n > 30

$\bar{x} - E < \mu < \bar{x} + E$ where $E = t_{\alpha/2} \bullet \frac{s_x}{\sqrt{n}}$ If the population is normal or n > 30

$\sqrt{\frac{(n-1)\ (s_x)^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)\ (s_x)^2}{\chi_L^2}}$ If the population is normal

Sample Size for estimating p

$$n = \left(z_{\alpha/2}\right)^2 \bullet \frac{.25}{E^2}$$

Sample Size for estimating μ_x

$n = \left[\frac{z_{\alpha/2} \bullet \sigma}{E}\right]^2$ if σ **IS** known

Sample Size for estimating σ

Sample size n to estimate σ	
To be 95 % confident that the estimate is within	of the value of σ the sample size n should be at least
1 %	19, 204
5 %	767
10 %	191
20 %	47
30 %	20
40 %	11
50 %	7

Sample size n to estimate σ	
To be 99 % confident that the estimate is within	of the value of σ the sample size n should be at least
1 %	33,218
5 %	1,335
10 %	335
20 %	84
30 %	37
40 %	21
50 %	13