Exam 3 Notes

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C4S6:
The Lognormal Distribution

$Y \sim Lognorm(\mu, \sigma)$
$E[Y] = e^{\mu+\sigma^2/2}$
$Var(Y) = \sigma_y^2 = e^{2\mu} \cdot (e^{2\sigma^2} - e^{\sigma^2})$
$P(a \leq Y \leq b) = P(\frac{\ln a - \mu}{\sigma} \leq Z \leq \frac{\ln b - \mu}{\sigma})$

C4S7:
The Exponential Distribution

$Y \sim Exp(\lambda)$
$E[Y] = \frac{1}{\lambda}$
$Var(Y) = \frac{1}{\lambda^2}$
$P(X > x) = e^{-\lambda \cdot x}$
$P(X \leq x) = 1 - e^{-\lambda \cdot x}$

C4S11:
The Central Limit Theorem

$\bar{X} \dot{\sim} N(\mu, \frac{\sigma}{\sqrt{n}})$
$z = \frac{x-\mu}{\frac{\sigma}{\sqrt{n}}}$
Let $X \sim Bin(n,p)$ given sufficient sample size $X \dot{\sim} N(np, np(1-p))$
Sufficient sample size if $n \cdot \hat{p}$ and $n \cdot (1-\hat{p})$ are both greater than 10
$\hat{p} \dot{\sim} N(p, \frac{p(1-p)}{n})$
Let $X \sim Poi(\lambda)$ if λ is large enough we can use $X \dot{\sim} N(\lambda, \lambda)$
$z = \frac{x-\lambda}{\sqrt{\lambda}}$
Sample size is sufficient if $\lambda > 10$

C5S1:
Large Sample Confidence Intervals

$\bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$
Sufficient sample size: $n \geq (\frac{z_{\alpha/2} \cdot \sigma}{E})^2$
Always round sample size up to next integer
Get z value from last row of Table A3 where $\nu = \infty$

Confidence Level	90%	95%	98%	99%
α	0.10	0.05	0.02	0.01
$z_{\alpha/2}$	1.645	1.960	2.326	2.576

C5S2:
Confidence Intervals for Proportions

$\tilde{n} = n + 4$ and $\tilde{p} = \frac{x+2}{n+4}$
$\tilde{p} \pm z_\alpha \cdot \sqrt{\frac{\tilde{p}(1-\tilde{p})}{\tilde{n}}}$

C5S3:
Small Sample Confidence Intervals

$\bar{x} \pm t_{\alpha/2,\nu} \cdot \frac{s}{\sqrt{n}}$
Sufficient sample size: $n \geq (\frac{t_{\alpha/2,\nu} \cdot s}{E})^2$

C5S6:
Small Sample Confidence Intervals for Difference Between Two Means

If $\sigma_1 = \sigma_2$
$s_p = \sqrt{\frac{(n_1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$
$\nu = n_1 + n_2 - 2$
$(\bar{x_1} - \bar{x_2}) \pm t_{\alpha/2,v} \cdot s_p \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$
If $\sigma_1 \neq \sigma_2$

$$\nu = \frac{(\frac{s_1^2}{n^1} + \frac{s_2^2}{n_2})^2}{\frac{(\frac{s_1^2}{n_1})^2}{n_1-1} + \frac{(\frac{s_2^2}{n_2})^2}{n_2-1}}$$

$(\bar{x_1} - \bar{x_2}) \pm t_{\alpha/2,v} \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

C5S9:
Confidence Intervals

Prediction Intervals:
$\bar{x} \pm t_{\alpha/2,\nu} \cdot s \cdot \sqrt{1 + \frac{1}{n}}$
Tolerance Intervals: $\bar{x} \pm k_{n,\alpha,\gamma} \cdot s$
Use Table A4.
γ contains x% of the sample
α is with x% confidence