MATH 119: QUIZ 4 FORMULA SHEETS

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These will be given to you on Quiz 4. You will need to understand them, though!

Sample Proportion of Successes

$$\hat{p} = \frac{x}{n}$$

$(1-\alpha)$ **Confidence Interval (CI) for μ, where σ is Known**

(Assume the Central Limit Theorem (CLT) applies.)

$$\mu = \bar{x} \pm E$$

where the **margin of error**

$$E = z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

That is,

$$\mu = \bar{x} \pm z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

Rounding Rule for E

Round off (or up) the margin of error E to the **same number of decimal places** as the given value of $\bar{x}$.

Determining Sample Size n for Estimating μ

For a $(1-\alpha)$ **confidence level** and a desired **margin of error** E, the required sample size n is given by:

$$n = \left\lceil \left(\frac{z_{\alpha/2}\,\sigma}{E}\right)^2 \right\rceil$$

where $\lceil\;\rceil$ is the ceiling (or "round-up") operator.

(SEE NEXT PAGE!)

$(1-\alpha)$ Confidence Interval (CI) for μ, where σ is Unknown

(Assume the Central Limit Theorem (CLT) applies.)

$$\mu = \bar{x} \pm E$$

where the **margin of error**

$$E = t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$$

That is,

$$\mu = \bar{x} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$$

We use the t distribution on $(n-1)$ **degrees of freedom (df)**.

<u>Rounding Rule for E</u>

Round off (or up) the margin of error E to the **same number of decimal places** as the given value of $\bar{x}$.

$(1-\alpha)$ Confidence Interval (CI) for p

(Assume $X \sim \text{Bin}(n, p)$. To justify a **normal approximation**, verify: $n\hat{p} \geq 5$, and $n\hat{q} \geq 5$.)

$$p = \hat{p} \pm E$$

where the **margin of error**

$$E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

That is,

$$p = \hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

<u>(SEE NEXT PAGE!)</u>

Determining Sample Size n for Estimating p

For a $(1-\alpha)$ **confidence level** and a desired **margin of error** E, the **conservative** estimate for the required sample size n is given by:

$$n = \left\lceil \frac{\left(z_{\alpha/2}\right)^2 (0.25)}{E^2} \right\rceil$$

where $\lceil \quad \rceil$ is the ceiling (or "round-up") operator.

$(1-\alpha)$ Confidence Intervals (CIs) for σ^2 and σ

(Assume $X \overset{\text{approx.}}{\sim} \text{Normal}$.)

$$\frac{(n-1)s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_L^2}$$

$$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$$

We use the χ^2 distribution on $(n-1)$ **degrees of freedom (df)**.

χ_R^2 is the right (greater) CV.

χ_L^2 is the left (lesser) CV.

Rounding Rule for the Limits of the CIs

Round off (or "out") the limits of the CIs to the **same number of decimal places** as the given value of s^2 or s.