MATH 119: FINAL FORMULA SHEETS

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These will be given to you on the Final. You will need to understand them, though!

Sample Proportion of Successes

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

Hypothesis Test for a Population Proportion or Probability p

(Assume $X \sim \text{Bin}(n, p)$. To justify a **normal approximation**, verify: $np \geq 5$, and $nq \geq 5$ under H_0, where $q = 1 - p$.)

The z Test Statistic for Tests for p

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$$

where p and q are obtained under H_0.

Hypothesis Test for a Population Mean μ (if σ is Unknown)

Assumptions:

- We are conducting a hypothesis test for a **population mean** μ.
- σ is unknown.
- Central Limit Theorem (CLT) applies:
  - § $X \overset{\text{approx.}}{\sim} \text{Normal}$, or
  - § $n > 30$

The t Test Statistic for Tests for μ (if σ is unknown)

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

where μ is obtained under H_0.

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

(SEE NEXT PAGE!)

Hypothesis Test for a Population SD σ or Variance σ^2

Assumptions:

- We are conducting a hypothesis test for a **population SD σ** or **variance σ^2**.
- $X \overset{\text{approx.}}{\sim}$ Normal

The χ^2 Test Statistic for Tests for σ or σ^2

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

where σ^2 is obtained under H_0.

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

χ^2 Test for Goodness-of-Fit

- Expected frequency for category *i*: np_i, where p_i is obtained under H_0.
- We use the χ^2 distribution on $(k-1)$ **degrees of freedom (df)**, where k = the **number of categories**.
- Not needed for the Final: Test $\chi^2 = \sum \frac{(O-E)^2}{E}$

χ^2 Test for Independence

- We use the χ^2 distribution on $(r-1)(c-1)$ **degrees of freedom (df)**, where r = the **number of rows** and c = the **number of columns**.
- Not needed for the Final:

  Expected frequency for a cell = $\frac{(\text{row total})(\text{column total})}{n}$

- Not needed for the Final: Test $\chi^2 = \sum \frac{(O-E)^2}{E}$

Least squares regression line

Population data: $y = \beta_0 + \beta_1 x$ **Sample data:** $\hat{y} = b_0 + b_1 x$

Coefficient of Determination

r^2