Math 10 - Final Exam Formula List

Policy: *we will explain typos or formatting issues, but not explain the meaning and usage of these equations.*

Summary Statistics

N = population size. $\mu = \frac{1}{N}\sum_{i=1}^{N} X_i$, population mean. $\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(X_i - \mu)^2$, population variance.

$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_i - \mu)^2}$, population standard deviation.

n = sample size. $\bar{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$, sample mean. $s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(Y_i - \bar{Y})^2$, estimate of population variance.

$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(Y_i - \bar{Y})^2}$, estimate of population standard deviation.

Single Population Standard Errors

Normal: $\frac{\sigma}{\sqrt{n}}$. t-distribution: $\frac{s}{\sqrt{n}}$, population proportion π known: $\sqrt{\frac{\pi(1-\pi)}{n}}$.
If π is not known, and p = sample proportion then use: $\sqrt{\frac{p(1-p)}{n}}$.

Difference Between Means Standard Errors

Normal: $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$, t-distribution: $\sqrt{\frac{2 \cdot MSE}{n}} = \sqrt{\frac{s_1^2 + s_2^2}{n}}$, where $MSE = \frac{s_1^2 + s_2^2}{2}$.

Regression

Slope coefficient $b = r \cdot \frac{s_y}{s_x}$, intercept $a = \bar{Y} - b\bar{X}$. n = number of bivariate data pairs (X_i, Y_i) in sample.

Degrees of freedom for hypothesis testing is $n - 2$.

ANOVA

k = number of samples/groups, n = data points in each sample/group.
$N = n \cdot k$ = total number of data points in all groups combined.

$F = \frac{MSB}{MSE}$. Degrees of freedom: $df_1 = df_{\text{numerator}} = (k-1)$, $df_2 = df_{\text{denominator}} = (N-k)$.

MSB $= \frac{SSQ_{\text{condition}}}{df_{\text{numerator}}} = n \cdot$ variance of the sample means.

MSE $= \frac{SSQ_{\text{error}}}{df_{\text{denominator}}} = \frac{s_1^2 + s_2^2 + \cdots + s_k^2}{k}$.

Chi-Square

$\sum \frac{(E-O)^2}{E}$, E = expected frequency, O = observed frequency.

Degrees of freedom $df = k - 1$, where k = number of categories.