MATH 140
DR. MCLOUGHLIN'S CLASS
STATISTICAL FORMULAE FOR TEST 2

Let D = {X_1, X_2, X_3, . . . , X_n} be a finite data set from a population of interest and

C = {Y_1, Y_2, Y_3, . . . , Y_n} be a finite data set from a population of interest.

The population parameters for X are the mean, μ_X , the standard deviation, σ_X , etc. ; the population parameters for Y are the mean, μ_Y , the standard deviation, σ_Y , etc.; and, the population (Pearson product-moment) correlation is ρ_{XY}

$$\overline{X} = \frac{\sum_{k=1}^{n} X_k}{n} \qquad \overline{X} \text{ is } \hat{\mu}_X \qquad \overline{Y} = \frac{\sum_{k=1}^{n} Y_k}{n} \qquad \overline{Y} \text{ is } \hat{\mu}_Y$$

$$S_X^2 = \frac{\sum_{k=1}^{n} (X_k - \overline{X})^2}{n-1} \qquad S_X^2 \text{ is } \hat{\sigma}_X^2 \qquad S_Y^2 = \frac{\sum_{k=1}^{n} (Y_k - \overline{Y})^2}{n-1} \qquad S_Y^2 \text{ is } \hat{\sigma}_Y^2$$

$$S_X = \sqrt{\frac{\sum_{k=1}^{n} (X_k - \overline{X})^2}{(n-1)}} \qquad S_X \text{ is } \hat{\sigma}_X \qquad S_Y = \sqrt{\frac{\sum_{k=1}^{n} (Y_k - \overline{Y})^2}{(n-1)}} \qquad S_Y \text{ is } \hat{\sigma}_Y$$

$$r_{xy} = \frac{\sum_{k=1}^{n} (X_k - \overline{X})(Y_k - \overline{Y})}{\sqrt{\sum_{k=1}^{n} (X_k - \overline{X})^2 \sum_{k=1}^{n} (Y_k - \overline{Y})^2}} = \frac{\sum_{k=1}^{n} (X_k - \overline{X})(Y_k - \overline{Y})}{n\sqrt{(S_X)(S_Y)}} = \frac{\sum_{k=1}^{n} (z_{x_k})(z_{y_k})}{n} \qquad r_{xy} = \hat{\rho}_{XY}$$

for X: $Z_i = \dfrac{X_i - \mu_X}{\sigma_X}$ $\qquad Z = \dfrac{\overline{X} - \mu_{\overline{X}}}{\sigma_{\overline{X}}}$ $\qquad T = \dfrac{X - \overline{X}}{S_X}$ $\qquad T_{(n-1)} = \dfrac{\overline{X} - \mu_{\overline{X}}}{S_{\overline{X}}}$

for Y: $Z_i = \dfrac{Y_i - \mu_Y}{\sigma_Y}$ $\qquad Z = \dfrac{\overline{Y} - \mu_{\overline{Y}}}{\sigma_{\overline{Y}}}$ $\qquad T = \dfrac{Y - \overline{Y}}{S_Y}$ $\qquad T_{(n-1)} = \dfrac{\overline{Y} - \mu_{\overline{Y}}}{S_{\overline{Y}}}$

$${}_nC_k = \binom{n}{k} = \frac{n!}{k! \cdot (n-k)!}$$

The Binomial variate is the number of successes in n-independent Bernoulli trials where the probability of success at each trial is p. The parameters are p and n (the number of trials).

$p \in (0, 1)$ $n \in \mathbb{N}$ $x \in \{0, 1, 2, . . . , (n - 1), n\}$

Bin (x, p, n) = Pr (X = x) = $\begin{cases} \binom{n}{x} p^x (1-p)^{n-x} & x = 0,1,2,\ldots,n \\ 0 & \text{else} \end{cases}$

$\mu = np$

$\mu_2' = np(np + (1 - p))$

$\mu_3' = np((n-1)(n-2)p^2 + 3p(n - 1) + 1)$

$\sigma^2 = np(1 - p)$

$\mu_3 = np(1 - p)((1 - p) - p)$

$\mu_4 = np((1 + 3p(1-p)(n - 2))$