PSTAT 5E
Summer 2009

Name:
Perm:

Formulas

$i = \frac{p}{100} n$ $\quad IQR = Q3 - Q1$ $\quad \overline{x} = \frac{\sum x}{n}$ $\quad s^2 = \frac{\sum (x - \overline{x})^2}{n-1} = \frac{\sum x^2 - n\,\overline{x}^2}{n-1}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\quad P(A|B) = \frac{P(A \cap B)}{P(B)}$

$$P(A|B) = \frac{P(B|A)P(A)}{P(B|A)P(A) + P(B|A^C)P(A^C)}$$

For a Discrete Random Variable:

$$\mu = E(X) = \sum_{all\ x} x\, f(x) \qquad \sigma^2 = Var(X) = \sum_{all\ x} (x-\mu)^2\ f(x) = E(X^2) - [E(X)]^2$$

If X is a Binomial Random Variable then: $\quad P(X = k) = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k}$

$$\mu = E(X) = np \qquad \sigma^2 = np(1-p)$$

If X is a Uniform(a, b), then f(x) = $\frac{1}{b-a}$ $\ for\ a \le x \le b$

$$\mu = E[X] = \frac{a+b}{2}, \ \sigma^2 = Var(X) = \frac{(b-a)^2}{12}$$

Z-Transformation: $\quad Z = \frac{X-\mu}{\sigma}$, $Z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}}$, $Z = \frac{\bar{p}-p}{\sqrt{\frac{p(1-p)}{n}}}$

CLT: 1. If n ≥ 30 then $\bar{X}$ is Normal with mean = μ and st. dev. = $\frac{\sigma}{\sqrt{n}}$

2. If $np \geq 5$ and $n(1-p) \geq 5$ then $\bar{p}$ is Normal with mean = p and st. dev. = $\sqrt{\frac{p(1-p)}{n}}$

Fact: If you start with a Normal Population, then $\bar{X}$ is *always* Normally Distributed with mean = μ and st. dev. = $\frac{\sigma}{\sqrt{n}}$

PSTAT 5E Name:
Summer 2009 Perm:

Confidence Intervals:

$$\bar{x} \pm Z\alpha/_2 \frac{\sigma}{\sqrt{n}} \qquad \bar{x} \pm t_{n-1,\alpha/_2} \frac{s}{\sqrt{n}} \qquad \bar{p} \pm Z\alpha/_2 \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$(\bar{x}_1 - \bar{x}_2) \pm Z\alpha/_2 \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \qquad (\bar{p}_1 - \bar{p}_2) \pm Z\alpha/_2 \sqrt{\frac{\bar{p}_1(1-\bar{p}_1)}{n_1} + \frac{\bar{p}_2(1-\bar{p}_2)}{n_2}}$$

Minimum Sample Size:

$$n = \left(\frac{Z\alpha/_2\ \sigma}{E}\right)^2 \qquad n = \frac{(Z\alpha/_2)^2\ p^*(1-p^*)}{E^2}$$

Test Statistics:

$$Z^* = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}} \sim N(0,1) \qquad t^* = \frac{\bar{x}-\mu_0}{s/\sqrt{n}} \sim t_{n-1}$$

$$Z^* = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_{10} - \mu_{20})}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \sim N(0,1) \qquad t^* = \frac{\bar{x} - \mu_d}{s_d/\sqrt{n}} \sim t_{n-1}$$

$$Z^* = \frac{\bar{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \sim N(0,1)$$

$$Z^* = \frac{\overline{p_1} - \overline{p_2}}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \sim N(0,1) \quad \text{where } \bar{p} = \frac{n_1\bar{p}_1 + n_2\bar{p}_2}{n_1 + n_2}$$

Regression:

$$s_{xy} = \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{n-1} \qquad r_{xy} = \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum(x_i-\bar{x})^2}\ \sqrt{\sum(y_i-\bar{y})^2}}$$

$$b_1 = \frac{\sum(x_i-\bar{x})(y_i-\bar{y})}{\sum(x_i-\bar{x})^2} = \frac{\sum x_i y_i - (\sum x_i)(\sum y_i)/n}{\sum x_i^2 - (\sum x_i)^2/n} \qquad b_0 = \bar{y} - b_1\,\bar{x}$$

PSTAT 5E
Summer 2009

Name:
Perm:

$$SSE = \sum(y_i - \hat{y}_i)^2 \quad SST = \sum(y_i - \bar{y})^2 \quad SSR = \sum(\hat{y}_i - \bar{y})^2$$

$$\mathrm{SST} = \mathrm{SSE} + \mathrm{SSR} \qquad r^2 = \frac{SSR}{SST} \qquad s_E^2 = MSE = \frac{SSE}{n-2}$$

$$t^* = \frac{b_1}{\frac{s_E}{\sqrt{\sum(x_i-\bar{x})^2}}} \sim t_{n-2} \qquad b_1 \pm t_{n-2,\alpha/2} \frac{s_E}{\sqrt{\sum(x_i-\bar{x})^2}}$$

$$\widehat{y_p} \mp t_{n-2,\alpha/2}\, s_E \sqrt{\frac{1}{n} + \frac{(x_p-\bar{x})^2}{\sum(x_i-\bar{x})^2}}$$

$$\widehat{y_p} \mp t_{n-2,\alpha/2}\, s_E \sqrt{1 + \frac{1}{n} + \frac{(x_p-\bar{x})^2}{\sum(x_i-\bar{x})^2}}$$