STA 291 - 420, Summer 2008
Formulas for Final Exam

- Test statistic for one sample mean

$$z = \frac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}} \quad or \quad t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$$

- Test statistic for 2 sample means $\quad t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$

- Test statistic for one sample proportion

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

- Test statistic for 2 sample proportions

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})/n_1 + \hat{p}(1-\hat{p})/n_2}}$$

- Sample size n necessary for margin of error B when estimating a population ...

...mean: $n = \sigma^2 \cdot \left(\frac{z}{B}\right)^2$ ...proportion: $n = \hat{p} \cdot (1-\hat{p}) \cdot \left(\frac{z}{B}\right)^2$

- Large sample confidence interval for the population proportion

$$\hat{p} \pm z \cdot \frac{\sqrt{\hat{p} \cdot (1-\hat{p})}}{\sqrt{n}}$$

- Confidence interval for the population mean, μ, when σ is ...

...known: $\bar{X} \pm z \cdot \frac{\sigma}{\sqrt{n}}$ ...unknown: $\bar{X} \pm t \cdot \frac{s}{\sqrt{n}}$

- Standard Deviation for a sample mean (standard Error)

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

- z-Score for an individual observation

$$z = \frac{x - \mu}{\sigma} \qquad x = \mu + z \cdot \sigma$$

- Binomial distribution (parameters n and p)

$$P(X = k) = \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k} \quad \text{for } k = 0, 1, \ldots, n, \qquad E(X) = n \cdot p, \quad Var(X) = n \cdot p \cdot (1-p)$$

- Bernoulli distribution (parameter p)

$$P(X = 1) = p, \quad P(X = 0) = 1 - p, \qquad E(X) = p, \quad Var(X) = p \cdot (1-p)$$

confidence level	90%	95%	99%
$z_{\alpha/2}$	1.645	1.96	2.575

- Variance of a (discrete) random variable

$$Var(X) = \sigma^2 = \sum_i (x_i - \mu)^2 \cdot P(X = x_i)$$

- Expected value of a (discrete) random variable

$$E(X) = \mu = \sum_i x_i \cdot P(X = x_i)$$

- Additive law of probability

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

- Conditional probability

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

- Independence of A, B:

$$P(A|B) = P(A) \qquad \text{or} \qquad P(A \cap B) = P(A) \cdot P(B)$$

- Sample mean $\bar{x}$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{x_1 + x_2 + \cdots + x_n}{n}$$

- Sample variance s^2

$$s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1} = \frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \cdots + (x_n - \bar{x})^2}{n-1}$$

- Sample standard deviation s

$$s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} = \sqrt{\text{sample variance}}$$