

POS 3713 Midterm Exam  
Formula Sheet

Note: the sample mean is referred to as Xbar in the formulas below.

**Descriptive Statistics**

- 1) *Measures of central tendency*

Mean:  $Xbar = \Sigma X/N$

- 2) *Measures of Dispersion*

$$IQV = \frac{k(N^2 - \Sigma f^2)}{N^2(k-1)}$$
 where k = # of categories,  $\Sigma f^2$  = sum of frequencies squared,  
N = sample size

Variance:  $s^2 = \frac{\Sigma(X - Xbar)^2}{N-1}$  Standard deviation:  $s = \sqrt{s^2}$

Standard error for sampling distribution of the mean:  $s.e. = \sigma/\sqrt{N}$

**Inferential Statistics**

- 1) *Confidence Intervals* (Note:  $\alpha = 1 - \text{confidence level}$ ; 95% confidence,  $\alpha = .05$ )

For the mean:

- A) If  $\sigma$  is known or  $N \geq 100$ :

$$\mu = Xbar \pm Z_{\alpha/2} * (\sigma/\sqrt{N})$$

- B) If  $\sigma$  is unknown and  $N < 100$ :

$$\mu = Xbar \pm t_{\alpha/2} * (s/\sqrt{N-1})$$

$$df = N - 1$$

For equations A-B above:

X = sample mean

$Z_{\alpha/2}$  = Z score for two-tailed test

$\sigma$  = population standard deviation

s = sample standard deviation

For the proportion:

$$\pi = P_s \pm Z_{\alpha/2} \sqrt{[P_u(1-P_u)/N]}$$

where  $P_s$  = sample proportion,  $P_u$  = population proportion (assume  $P_u = .5$  if it is unknown)

- 2) *Hypothesis Testing*

Hypothesis Test for the Sample Mean

- A) If  $\sigma$  is known or  $N > 100$ :

$$z = \frac{Xbar - \mu}{\sigma/\sqrt{N}}$$

- B) If  $\sigma$  is unknown and  $N < 100$ :

$$t = \frac{Xbar - \mu}{s/\sqrt{N-1}} \quad df = N - 1$$

Hypothesis Test for the Proportion

$$z = \frac{P_s - P_u}{\sqrt{[P_u(1-P_u)/N]}}$$

**Z and t scores**

$$Z = \frac{X - \mu}{\sigma} \quad \text{or} \quad \frac{X - Xbar}{s}$$

Student t: used for small samples ( $N < 100$  &  $\sigma$  is unknown),  $t = \frac{X - Xbar}{s}$

