Math 220 : Elementary Statistics Kane Nashimoto
Exam 3 Solutions
Fall 2005

1. Inference about mean with σ unknown.

   (a) $H_0\colon \mu = 65.00$ vs. $H_a\colon \mu \neq 65.00$
   $t^* = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} = \dfrac{62.50 - 65.00}{5.00/\sqrt{26}} = -2.550$
   Critical values : ± 2.060 $(t_{.05/2,\,26-1} = 2.060)$
   Reject H_0. $(\mu < 65.00)$

   (b) Reject H_0. If a test rejects H_0 at $\alpha = .05$, it will reject H_0 at any $\alpha > .05$.

2. Sampling distribution.

   (a) $\bar{X}$, mean waiting time, is approximately normal with $\mu_{\bar{X}} = \mu = 3.20$ and $\sigma_{\bar{X}} = \sigma/\sqrt{n} = 1.15/\sqrt{40}$. This is due to the central limit theorem.

   (b) $P(\bar{X} > 3.00) = P\left(\dfrac{\bar{X} - \mu}{\sigma/\sqrt{n}} > \dfrac{3.00 - 3.20}{1.15/\sqrt{40}}\right) = P(Z > -1.10)$
   $= 1 - P(Z \leq -1.10) = 1 - .1357 = .8643$

3. Inference about mean with σ known.

   (a) $n = \left(\dfrac{z_{.05/2} \cdot \sigma}{B}\right)^2 = \left(\dfrac{1.960 \cdot 0.45}{0.12}\right)^2 = 54.02 \;\Rightarrow\; 55$

   (b) $\bar{x} \pm z_{.05/2}\dfrac{\sigma}{\sqrt{n}}$; $14.24 \pm 1.960\dfrac{0.45}{\sqrt{35}}$; 14.24 ± 0.149 ; $(14.091\,,\ 14.389)$

4. Inference about proportion.

   (a) $H_0\colon \pi = .70$ vs. $H_a\colon \pi > .70$
   $p = 97/132 = .735$
   $z^* = \dfrac{p - \pi_0}{\sqrt{\pi_0(1-\pi_0)/n}} = \dfrac{.735 - .70}{\sqrt{(.70)(1-.70)/132}} = 0.877$
   Critical value : $+2.326$ $(z_{.01} = 2.326)$
   Retain H_0. $(\pi \approx .70)$

   (b) p-value $= P(Z \geq 0.85) = 1 - P(Z < 0.85) = 1 - .8023 = .1977$

   (c) $n(1 - \pi_0) = 132(1 - .70) = 39.60$ (> 10)
   $\Rightarrow$ Assumption is satisfied.