Math 220 : Elementary Statistics — Kane Nashimoto
Exam 3 Solutions
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1. Inference about mean with σ known.

   (a) $H_0\colon \mu = 3.40$ vs. $H_a\colon \mu > 3.40$
   $$z^* = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{3.48 - 3.40}{0.20/\sqrt{34}} = 2.332$$
   Critical value : $+1.282$ ($z_{.10} = 1.282$)
   Reject H_0. ($\mu > 3.40$)

   (b) p-value $= P(Z \geq 2.35) = 1 - P(Z < 2.35) = 1 - .9906 = .0094$

2. Inference about proportion.

   (a) Let $\pi = .5$.
   $$n = \pi(1-\pi)\left(\frac{z_{.10/2}}{B}\right)^2 = (.5)(1-.5)\left(\frac{1.645}{.045}\right)^2 = 334.08 \;\Rightarrow\; 335$$

   (b) $p = 87/200 = .435$
   $$p \pm z_{.05/2}\sqrt{\frac{p(1-p)}{n}}\;;\; .435 \pm 1.960\sqrt{\frac{(.435)(1-.435)}{200}}\;;\; .435 \pm .069\;;\; (.366\,,\,.504)$$

3. Sampling distribution.

   Note : $\bar{X}$, mean weight of people, is normal.

   (a) $\mu_{\bar{X}} = \mu = 150.00$
   $\sigma_{\bar{X}} = \sigma/\sqrt{n} = 27.00/\sqrt{16} = 6.75$

   (b) Total weight exceeds 2,500 pounds whenever the mean weight, $\bar{X}$, exceeds 2,500 $\div$ 16 = 156.25 pounds. $\Rightarrow$ Any $\bar{x} > 156.25$.

   (c) $$P(\bar{X} > 156.25) = P\left(\frac{\bar{X} - \mu}{\sigma/\sqrt{n}} > \frac{156.25 - 150.00}{27.00/\sqrt{16}}\right) = P(Z > 0.93)$$
   $$= 1 - P(Z \leq 0.93) = 1 - .8238 = .1762$$

4. Inference about mean with σ unknown.

   (a) $$\bar{x} \pm t_{.01/2,\,25-1}\frac{s}{\sqrt{n}}\;;\; 92.30 \pm 2.797\frac{7.41}{\sqrt{25}}\;;\; 92.30 \pm 4.145\;;\; (88.155\,,\,96.445)$$

   (b) $H_0\colon \mu = 90.00$ vs. $H_a\colon \mu \neq 90.00$
   $$t^* = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{92.30 - 90.00}{7.41/\sqrt{25}} = 1.552$$
   Critical values : ± 2.797 ($t_{.01/2,\,25-1} = 2.797$)
   Retain H_0. ($\mu \approx 90.00$)