Math 220 : Elementary Statistics — Kane Nashimoto

Exam 3 Solutions

Fall 2006

1. Inference about mean with σ known.

   (a) $\bar{x} \pm z_{.10/2}\dfrac{\sigma}{\sqrt{n}}$; $28.5 \pm 1.645\dfrac{1.9}{\sqrt{40}}$; 28.5 ± 0.494 ; $(28.006\,,\ 28.994)$

   (b) $n = \left(\dfrac{z_{.10/2}\cdot\sigma}{B}\right)^2 = \left(\dfrac{1.645\cdot 1.9}{0.40}\right)^2 = 61.05 \ \Rightarrow\ 62$

2. Inference about mean with σ unknown.

   (a) $H_0\colon \mu = 399$ vs. $H_a\colon \mu < 399$

   $t^* = \dfrac{\bar{x}-\mu_0}{s/\sqrt{n}} = \dfrac{387-399}{7/\sqrt{30}} = -9.390$

   Critical value : -2.462 $(t_{.01,\,30-1} = 2.462)$

   Reject H_0. $(\mu < 399)$

   (b) Reject H_0. If a test rejects H_0 at $\alpha = .01$, it will reject H_0 at any $\alpha > .01$.

3. Sampling distribution.

   Note : $\bar{X}$, mean weight of carrots, is approximately normal by CLT.

   (a) $\mu_{\bar{X}} = \mu = 1.12$

   (b) $\sigma_{\bar{X}} = \sigma/\sqrt{n} = 0.09/\sqrt{35} = 0.015$

   (c) $P(\bar{X} > 1.10) = P\left(\dfrac{\bar{X}-\mu}{\sigma/\sqrt{n}} > \dfrac{1.10-1.12}{0.09/\sqrt{35}}\right) = P(Z > -1.31)$

   $= 1 - P(Z \le -1.31) = 1 - .0951 = .9049$

4. Inference about proportion.

   (a) $H_0\colon \pi = .20$ vs. $H_a\colon \pi \ne .20$

   $p = 33/183 = .180$

   $z^* = \dfrac{p-\pi_0}{\sqrt{\pi_0(1-\pi_0)/n}} = \dfrac{.180-.20}{\sqrt{(.20)(1-.20)/183}} = -0.676$

   Critical values : ± 1.960 $(z_{.05/2} = 1.960)$

   Retain H_0. $(\pi \approx .20)$

   (b) p-value $= 2P(Z \le -0.70) = 2(.2420) = .4840$

   (c) $p = 74/183 = .404$

   $p \pm z_{.05/2}\sqrt{\dfrac{p(1-p)}{n}}$; $.404 \pm 1.960\sqrt{\dfrac{(.404)(1-.404)}{183}}$; $.404 \pm .071$; $(.333\,,\ .475)$