Math 110 – Review for Test 3

1. $\hat{p} = \frac{8609}{16405} = .525$, $n = 16405$, conf $= .99$, $\alpha = 1 - .99 = .01$

Requirements: 8609 successes ≥ 10

$16405 - 8609$ fails $= 7796$ fails ≥ 10

$E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 2.576\sqrt{\frac{.525 \cdot .475}{16405}} = .0100$

Conf. Int: $\hat{p} - E < p < \hat{p} + E$

$.515 < p < .535$

Conc: We are 99% confident that between 51.5% and 53.5% of stillborn births are boys.

2. $n = \frac{z_{\alpha/2}^2 \hat{p}\hat{q}}{E^2} = \frac{2.576^2(.525)(.475)}{.02^2} = \underbrace{1605.9}_{\text{at least}} \rightarrow 1606$

3. $n = 51$, $\bar{x} = 6.11$, $\sigma = 2.27$, conf $= .94$, $\alpha = .06$

$n > 30$ ✓,

$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} = 1.881 \cdot \frac{2.27}{\sqrt{51}} = .598$

Conf. Int

↳ $\bar{x} - E < \mu < \bar{x} + E \rightarrow 5.512 < \mu < 6.708$

We are 94% conf. that the mean litter size for rats is between 5.512 and 6.708.

4. $n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.881 \cdot 2.27}{0.1}\right)^2 = \underbrace{1823.2}_{\text{at least}} \rightarrow 1824$

5. $\bar{x} = 2.33$, $s = 2.00$, $n = 10$, conf $= 0.96$, $\alpha = .04$

Population is normal ✓

$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}} = 2.398 \cdot \frac{2.00}{\sqrt{10}} = 1.517$,

Conf. Int: $\bar{x} - E < \mu < \bar{x} + E$.

Conf Int $\rightarrow 0.813 < \mu < 3.847$

We are 96% confident that the mean sleep gained is between 0.813 and 3.847 hours.

6. $n = 16405$, $\hat{p} = \frac{x}{n} = \frac{8609}{16405} = .525$, $\alpha = .01$

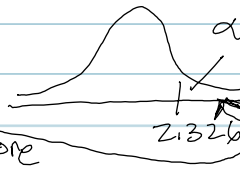
$H_0: p = .515$, $H_1: p > .515$. Normality check

$np = 8448.6 \geq 10$, $nq = 16405(1 - .515) = 7956.4 \geq 10$ ✓

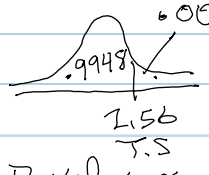
Test Stat

$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{.525 - .515}{\sqrt{\frac{.515(1-.515)}{16405}}} = 2.563$

Crit. Val



P-val $= .0052$



T.S

P-val $< \alpha$ Reject

The data support the claim that more than 51.50% of stillborns are male.