Math 110 - Review for Test 3

1. \( \hat{p} = \frac{8609}{16405} = 0.525 \), \( n = 16405 \), Conf. = .99, \( \alpha = 1 - .99 = .01 \)

Requirements: 8609 successes \( \geq 10 \)
16405 - 8609 fails = 7796 fails \( \geq 10 \)

\[ E = Z_{.05/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 2.576 \sqrt{\frac{0.525 \times 0.475}{16405}} = 0.0100 \]
\[ \hat{p} - E < p < \hat{p} + E \]

Conf. 1 ut
\[ 0.515 < p < 0.535 \]

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

2. \( n = \frac{Z_{.04/2}^2 \hat{p}(1-\hat{p})}{E^2} = \frac{2.576^2 \times (0.525 \times 0.475)}{.02^2} = 1605.9 \rightarrow 1606 \) at least

\( n \geq 30 \sqrt{\frac{\sigma}{\hat{p}}}, \) \( \hat{p} = 6.11, \) \( \sigma = 2.27, \) Conf. = .94, \( \alpha = .06 \)

\( \hat{p} - E < \mu < \hat{p} + E \rightarrow 5.512 < \mu < 6.708 \)

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

4. \( n = \left( \frac{Z_{.04/2} \sigma}{E} \right)^2 = \left( \frac{1.881 \times 2.27}{0.1} \right)^2 = 1823.2 \rightarrow 1824 \) at least

5. \( \bar{x} = 2.33, \) \( s = 2.00, \) \( n = 10, \) Conf. = .96, \( \alpha = .04 \)

Population is normal \( \checkmark \)

\[ E = Z_{.06/2} \frac{s}{\sqrt{n}} = 2.348 \times \frac{2.00}{\sqrt{10}} = 1.517, \] Conf. 1 ut

\[ 0.813 < \mu < 3.847 \]

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

6. \( n = 16405, \) \( \hat{p} = \bar{x} = \frac{8609}{16405} = 0.525, \) \( \alpha = .01 \)

\( H_0: p = .515, \) \( H_1: p > .515 \) Normality Check

\( n \hat{p} = 8448.6310, \) \( n \bar{x} = 16405(1-.515) = 79564.310 \)

Test Stat

\[ Z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.525 - 0.515}{\sqrt{\frac{0.515(1-0.515)}{16405}}} = 2.563 \]

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\( \alpha = .01 \)

The data support the claim that more than 51.5% of stillborns are male.