ISE 2211 • Exam III • 4 October 2019 /22 NAME SOLUTION

1) You just called Dr. Miller in his office to see how you did on the Differential Equations final exam. He said, "I ain't sayin'. But I can tell you that out of 26 students, the class average was 121 points with a standard deviation of 18 points and your score is NOT within a 95% confidence interval on mean. Take that, sucka!"
Write the interval, assuming population variance is unknown. Include a unit.

$n < 30$, unknown σ^2;

$\therefore$ use t-distribution (+1)

$$\mu: \bar{X} \pm t_{\alpha/2,n-1} \frac{S}{\sqrt{n}}$$

need $t_{\alpha/2,n-1} = t_{.025,25}$ (+1)

$= 2.060$ (+1) (table)

$$\mu: 121 \pm 2.060 \frac{18}{\sqrt{26}}$$

$113.7 < \mu < 128.3$ (+2)

points (+1)

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2) You just called Dr. Miller back to plead for amnesty. Instead of being sympathetic, he told you to write a 99% lower confidence bound on the variance of exam scores. Sketch the bound on the appropriate distribution and include a unit with your answer.

lower bound:

$$\frac{(n-1)s^2}{\chi^2_{\alpha,n-1}} < \sigma^2$$ (+1)

(+1)

$$\chi^2_{\alpha,n-1} = \chi^2_{.01,25}$$ (+1)

$$= 44.31$$ (+1) (table)

$$\frac{(26-1)18^2}{44.31} < \sigma^2$$

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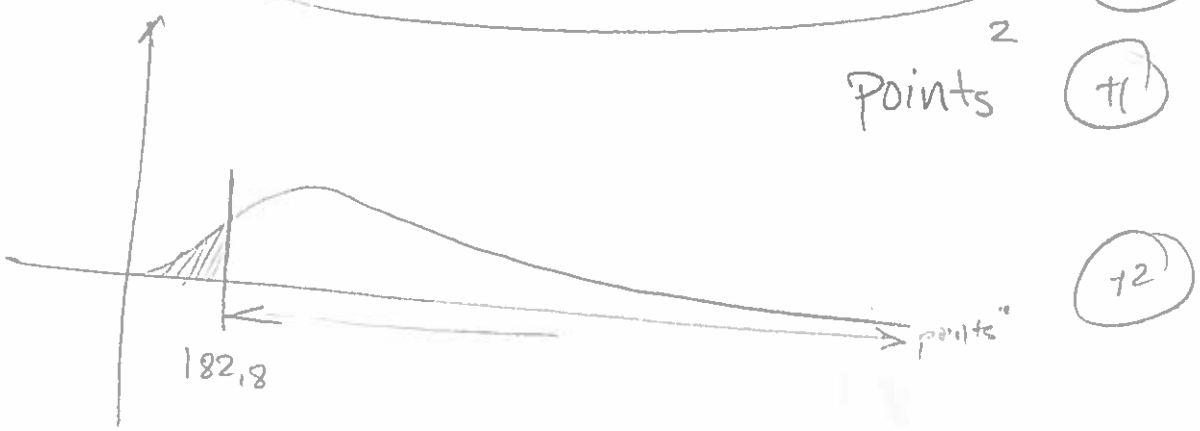
$$182.8 < \sigma^2$$ (+1)

Points^2 (+1)



(+2)

32) My deranged son Harold just rolled down the front of the couch 39 times, and was successful on 35 of them. Write a 95% confidence interval on the population proportion of successful couch rolls. Sketch the appropriate distribution, showing this interval. Also determine the number of couch rolls he needs to perform in order to get a confidence interval to within ± 1 couch roll.

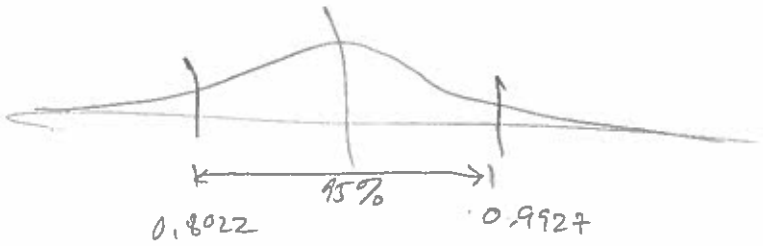
$$\hat{p} = \frac{35}{39} = 0.897 \quad (+1)$$

$$z_{\alpha/2} = 1.960 \quad (+1)$$

$$p: \hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$0.897 \pm 1.960\sqrt{\frac{.897(1-.897)}{39}}$$

$$0.8022 \leq p \leq 0.9927 \quad (+2)$$



(+1)

± 1 couch roll $\Rightarrow \pm \frac{1}{39} = \pm 0.02564$

$\therefore E = 0.02564$ (+1)

$$n = 0.25\left(\frac{1.960}{0.02564}\right)^2 = 1460.8 \quad (+1)$$

Use (1461 couch rolls) (+1)

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