ISE 2211 • Exam IV • 16 October 2020 NAME SOLUTION

Last week, we developed several confidence and prediction intervals and one-sided confidence bounds from the following data: 61 Hogwarts students, mean score 2.082, standard deviation 1.520, unknown σ.
Test the following hypotheses on mean exam score using the using the fixed level of significance approach at $\alpha = 0.05$. Roughly sketch the appropriate distribution, showing your test statistic, critical value(s), and critical region(s). Don't forget to clearly state your final conclusion regarding the null hypothesis.

H_0: $\mu = 2.000$
H_0: $\mu > 2.000$

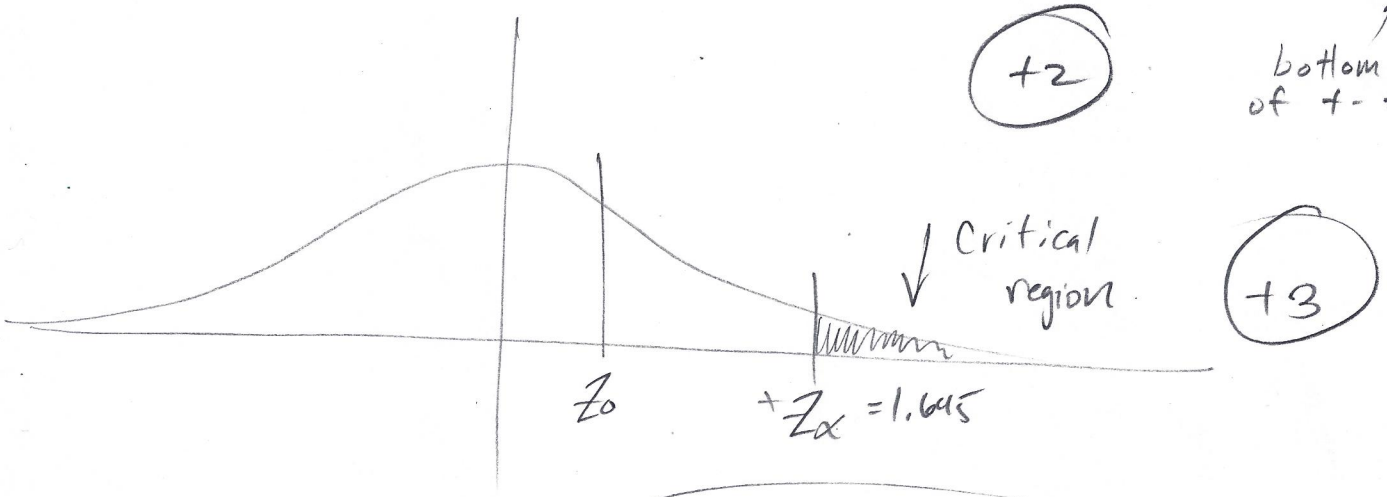
unknown σ, $n > 30$ $\rightarrow$ Z-distribution (+1)

$$\therefore Z_0 = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{2.082 - 2}{1.520/\sqrt{61}}$$

$$Z_0 = 0.4213 \quad (+2)$$

critical value, upper one-sided: $+Z_\alpha = Z_{.05} = 1.645$ (+2)

bottom row of t-table



(+3)

$Z_0 \not> +Z_\alpha$ $\therefore$ fail to reject H_0 (+2)

Now test the following hypotheses on standard deviation using the *p*-value approach. Roughly sketch the appropriate distribution, showing your test statistic and region(s) corresponding to the *p*-value. State your final conclusion with respect to a significance level of $\alpha = 0.05$.

H_0: $\sigma = 1.5$

H_1: $\sigma > 1.5$

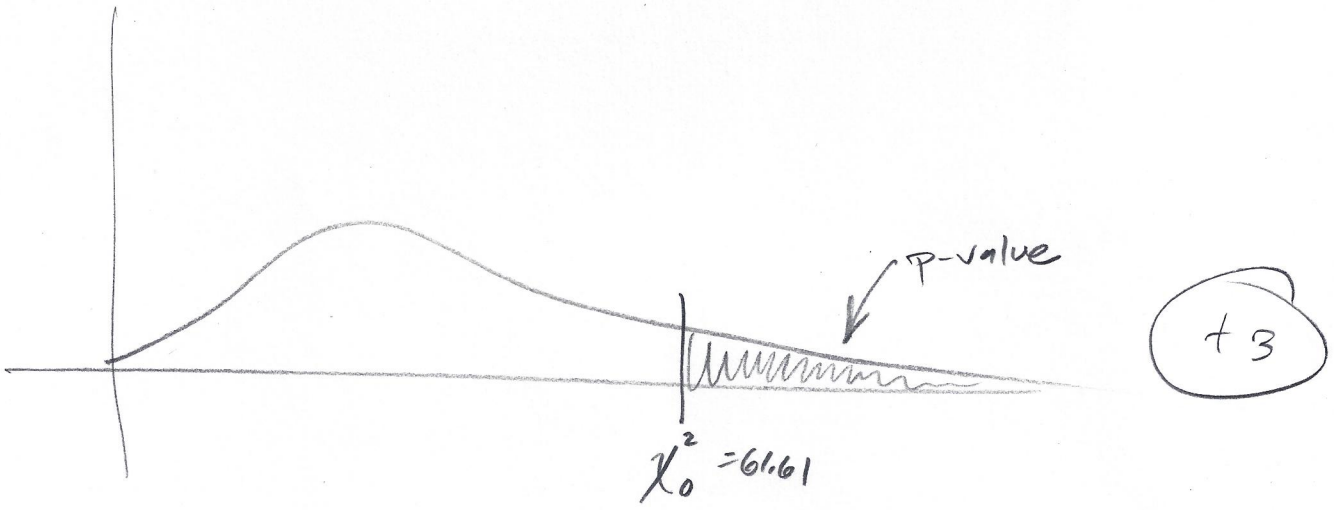
$$\chi^2_0 = \frac{(n-1)s^2}{\sigma_0^2} = \frac{60 \cdot 1.520^2}{1.5^2} = 61.61$$

+2

from table: $\chi^2_{0.500,60} = 59.33$

$\chi^2_{0.100,60} = 74.40$

+2



+3

$0.100 < p\text{-value} < 0.500$

+1

range $> \alpha = 0.05$; ∴ fail to reject H_0

+2

Finally, if six students received a "Troll" on their exams, and the proportion of Troll scores is historically 6.3% in a given class, test the following hypotheses on the proportion of Troll scores using the confidence interval approach at $\alpha = 0.05$:

H_0: $p = 6.3\%$

H_1: $p \neq 6.3\%$

given: $0.02363 < p < 0.1731$

P_o is inside C.I. (+1)

$\therefore$ fail to reject H_o (+1)