ISE 2211 • Exam V • 14 July 2020 NAME SOLUTION

The following is actual sample data pertaining to exams III and IV in this class, all in points (out of 100):

Exam III:

$n_1 = 13$

$\bar{x}_1 = 92.07$

$s_1 = 6.067$

Exam IV:

$n_2 = 16$

$\bar{x}_2 = 76.83$

$s_2 = 8.684$

Test the following hypotheses on the difference in mean exam scores using the *p*-value approach. State your final conclusion with respect to a significance level of $\alpha = 0.05$. Population variances are unknown and assumed unequal.

H_0: $\mu_1 - \mu_2 = 0$

H_1: $\mu_1 - \mu_2 \neq 0$

~~Based on available~~ evidence, state whether you think the class as a whole is doing okay, improving academically, or going all to hell.

$n_1, n_2 < 30$, σ_1, σ_2 unknown and unequal

$\longrightarrow$ need v

$$\frac{s_1^2}{n_1} = 2.831 \qquad \frac{s_2^2}{n_2} = 4.713$$

$$v = \frac{(2.831 + 4.713)^2}{\frac{2.831^2}{12} + \frac{4.713^2}{15}} = 26.49 \quad (+2) \longrightarrow \text{round down to } v = 26 \quad (+1)$$

$$t_0 = \frac{92.07 - 76.83 - 0}{\sqrt{2.831 + 4.713}} = 5.549 \quad (+1)$$

table @ $v = 25$ $\rightarrow$ $t_{.0005,26} = 3.707$ (+1)

lowest α !!!

$\therefore \frac{\text{p-value}}{2} < 0.0005 \rightarrow$ p-value < 0.001 (+1)

p-value $\lll 0.05$; (+1) strongly reject H_0 (+1)

Test the following hypotheses on the equality of exam score standard deviations using the fixed-significance-level approach at $\alpha = 0.05$:

$H_0: \sigma_1 = \sigma_2$

$H_1: \sigma_1 \neq \sigma_2$

Based on available evidence, was the assumption of unequal population standard deviations between the two exams justified in the first problem?

$$f_0 = \frac{S_1^2}{S_2^2} = \frac{6.067^2}{8.684^2} = 0.4881 \quad +1$$

Critical values:

$$f_{\alpha/2, n_1-1, n_2-1} = f_{.025, 12, 15} = 2.96 \quad +1$$

$$f_{1-\alpha/2, n_1-1, n_2-1} = \frac{1}{f_{\alpha/2, n_2-1, n_1-1}} = \frac{1}{f_{.025, 15, 12}} = \frac{1}{3.18} = 0.3145$$

+2

∴ f_0 is <u>not</u> in either critical region +1

∴ fail to reject H_0 +1

∴ probably could have assumed equal standard deviations in first problem! +1