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MAT 222
Spring 2019
Quiz 4

“Our lives are not our own. We are bound to others, past and present, and by each crime and every kindness, we birth our future.”

– Sonmi-351, *Cloud Atlas*

Problem 1: A study was conducted to understand the difference in blood pressure between people with two different types (high and low) of sleeping habit. The sample data is summarized below.

Group	Count	Mean	Standard Deviation
High	8	111.40	6.77
Low	5	120.20	7.16

- (a) Construct a 90% confidence interval for the difference of the means for the high and low sleep groups. [Do not use pooled procedures.]

We have $dof = \min(8 - 1, 5 - 1) = 4$. This gives us $t^* = 2.132$. Then we have

$$(111.40 - 120.20) \pm 2.132 \cdot \sqrt{\frac{6.77^2}{8} + \frac{7.16^2}{5}} = -8.80 \pm 2.132 \cdot 4.0 = -8.80 \pm 8.528$$

Therefore, we are 90% certain that the mean of the difference between these groups is between -17.3 and -0.272 .

- (b) At a significance level of 1%, test the following hypothesis. Be sure to give your test statistic, p -value, and state your conclusion.

$$\begin{cases} H_0 : \mu_{\text{High}} = \mu_{\text{Low}} \\ H_a : \mu_{\text{High}} < \mu_{\text{Low}} \end{cases}$$

We have test statistic

$$t = \frac{(111.40 - 120.20) - 0}{\sqrt{\frac{6.77^2}{8} + \frac{7.16^2}{5}}} = \frac{-8.80}{4} = -2.20 \stackrel{dof=4}{\rightsquigarrow} 0.05.$$

Therefore, we have $p = 0.05$. Because $p \not< \alpha$, we fail to reject the null hypothesis that there is no difference between the means of the two groups.

- (c) Why might a pooled t -procedure be appropriate here? Justify your answer mathematically.

The ratio of the standard deviations, $6.77/7.16 = 0.95$, is between 0.5 and 2. Therefore, the standard deviations are not ‘too different’.