UNIVERSITY OF TEXAS AT AUSTIN

Quiz # 9

Comparing two population means. $F-$test.

Provide your **complete solution** for the following problem(s).

Problem 9.1. (7 points) *Source: "Probability and Statistics for Engineers and Scientists" by Walpole, Myers, Myers, and Ye.*
A study was conducted in which two types of engines: *Awesome (A)* and *Beautiful (B)* were compared. Gas mileage, in mpg, was measured. Fifty experiments were conducted using engine type A and seventy-five experiments were done with engine type B. The type of gasoline used and all other conditions were kept constant.

The observed average gas mileage for engine type A was 36 mpg and for engine type B it was 42 mpg.

Let μ_A and μ_B denote the population mean gas mileages for engine A and B, respectively. Assume that the **population** standard deviations are 6 and 8 for engines A and B, respectively.

Find the 96%-confidence interval for $\mu_B - \mu_A$.

Hint: The $z-$procedure works just as well with known population standard deviations.

Problem 9.2. (8 points) *Source: "Probability and Statistics for Engineers and Scientists" by Walpole, Myers, Myers, and Ye.*

An experiment was performed to compare the abrasive wear of two different laminated materials. Twelve pieces of material #1 were tested and ten pieces of material #2 were tested. In each case, the depth of wear was recorded.

The sample of #1 resulted in an average (coded) wear of 85 with a **sample** standard deviation of 4, while the sample of #2 resulted in an average (coded) wear of 81 with a **sample** standard deviation of 5.

You want to use the $F-$test to see if you can "pool" the two samples, i.e., you want to test if the population variances of the two materials' wears are equal.

(i) (2 points) Formulate the null and the alternative hypotheses.

(ii) (4 points) Find the distribution of your test-statistic and the rejection region with the significance level of 0.05.

(iii) (2 points) Calculate the observed value of the test-statistic, and state the result of your test.