

## True/False

For each of the following questions indicate true or false, then **fully explain** your answer. You may use examples to illustrate your answer.

- (I) To create a confidence interval for  $\mu_1 - \mu_2$  (a two sample problem), we must assume that the sample sizes  $n_1, n_2$  are above 30.

- (II) The calculation of the p-value depends on your value of  $\alpha$ .

- (III) The larger the value of  $t_s$  in a two-sided test for  $\mu_1 - \mu_2$ , the less our sample data agrees with  $H_0$ .

- (IV) In general, the larger the value of  $MSW$ , the more variance there was within each group.

## Full Detail

Work out the following problems. **Show your work.**

1. Different methods of treating cloth to repel mosquitoes were being tested, with treatments  $T1$  = Chemical I,  $T2$  = Chemical II, and  $C$  = Combination of chemicals I and II. The number of bites suffered by the subjects wearing the cloth in one day was measured, and summary statistics follow:

Number of Bites	$C$	$T1$	$T2$	Overall
Sample mean	5.37	8.03	8.13	7.18
Sample Std. Dev	3.07	3.01	3.46	3.40
Sample Size	30	30	30	90

Further,  $SSB = 147.033$ .

- (a) Calculate the value of  $MSW$ .
- (b) The test-statistic is  $F_S = 7.2432$ , with p-value 0.001231. State your conclusion about the appropriate null hypothesis in terms of the problem, assuming  $\alpha = 0.05$ .
- (c) Which 95% Bonferroni confidence interval for  $\mu_a - \mu_b$  would be certain to have lower and upper bounds that do not cover zero? Explain your answer, **and do not calculate all the confidence intervals**.
- (d) Someone states that the probability the null hypothesis is true is 0.001231. Do you agree with this statement? Explain your answer.

2. Out of 150 plants infected with a parasite, 88 of them survived after they were treated with a product. You may assume a random sample was taken.
- (a) Find the 90% Wilson-Adjusted confidence interval for the true proportion,  $p$ .
- (b) Interpret your interval in terms of the problem.
- (c) A farmer has 1000 infected plants, and asks you to estimate how many of them would survive if they are treated with this product. What is your estimate? Explain your answer.
- (d) List all the assumptions needed for this type of confidence interval.

3. The number of hours of sleep per night was measured for subjects who smoked and did not smoke, with the following summary statistics:

	Smokers	Non-Smokers
Sample Mean	7.04	5.9
Sample Standard Deviation	1.25	1.31
Sample Size	60	39

You may assume a random sample was taken from each group, and that the appropriate degrees of freedom are: 78. Assume the question of interest is if the average hours of sleep differs between the two groups.

- (a) Find the 99% confidence interval for  $\mu_1 - \mu_2$ .
- (b) Interpret your interval in terms of the problem, being as specific as you can.
- (c) What does your confidence interval suggest about the range of the p-value for the hypothesis test  $H_0 : \mu_1 = \mu_2$ ?  
**Using only information about your confidence interval, explain your answer.**
- (d) Interpret a Type I Error for the appropriate hypothesis in terms of the problem.

## Scratch Work