

1. [10+5] In January 2007, *Consumer Reports* published their study of bacterial contamination of chicken sold in the United States. They purchased 525 broiler chickens from various kinds of food stores in 23 states and tested them for types of bacteria that caused food-borne illnesses. Lab results indicated that 83% of these chickens were infected with *Camphylobacter*.
 - (a) Construct a 95% confidence interval for the proportion of chickens sold in the United States infected with *Camphylobacter*. State the assumptions that need to be satisfied for this calculation. Explain what your confidence interval says about chickens sold in the United States.
 - (b) A spokesperson for the US Department of Agriculture dismissed the *Consumer Reports* funding, saying, "That 500 samples out of 9 billion chickens slaughtered a year ... With the small numbers they [tested], I don't know that one would want to change one's buying habit." Is this criticism valid? Explain.

2. [10+10+10] A factory hiring people to work on an assembly line gives job applicants a test of manual agility. This test counts how many strangely shaped the applicant can fit into matching holes in a one-minute period. The table summarizes the data by gender of the job applicant. Assume that all conditions necessary for inference are met.

	MALE	FEMALE
Number of subjects	50	50
<i>Pegs placed:</i>		
Mean	19.39	17.91
SD	2.52	3.39

- (a) Find 95% confidence intervals for the average number of pegs that males and females can each place.
- (b) Is there strong evidence that men and women perform differently? Test the appropriate hypothesis.
- (c) Find a 95% confidence interval for the difference in the mean number of pegs that can be placed by men and women.

3. [15] In 1996, 20% of the students at a major university had an overall GPA of 3.5 or higher (on a scale of 4). In 2000, a random sample of 1100 student records from the same university found that 25% had a GPA of 3.5 or higher. Is this evidence of grade inflation? Be sure to comment on the assumptions/conditions required to justify this calculation.
4. [10] Having done poorly on their math final exams in June, six students repeat the course in summer school, then take another exam in August. If we consider these students representative of all students who might attend summer school in other years, do these results provide evidence that the program is worthwhile? Compute the p -value for a hypothesis and construct a 95% confidence interval to support your conclusions.

June	54	49	68	66	62	62
Aug.	50	65	74	64	68	72

5. [10+10] Students investigating the packaging of potato chips purchased 6 bags of Lay's Ruffles marked with a net weight of 28.3 grams. They carefully weighed the contents of each bag, recording the following weights (in grams): 29.3, 28.2, 29.1, 28.8, 28.9, 28.5.
- (a) Create a 95% confidence interval for the mean weight for such bags of chips. Discuss the conditions that need to be satisfied and the assumptions that you are making about the data in order to do this calculation.
- (b) Perform a hypothesis test on the company's claim that the net weight of their product is 28.3 grams. Discuss the conditions that need to be satisfied and the assumptions you are making.

6. [10+10] Researchers interested in comparing the effectiveness of two pain medications randomly selected a group of patients who had been complaining of a certain type of joint pain. They randomly divided these people into two groups, administering medication A to first and medication B to the second. Of the 112 people in the first group who received medication A, 84 said it was effective. Of the 108 in the group receiving medication B, 66 reported that it was effective.
- (a) Is there strong evidence of a difference between the two types of medication? Test an appropriate hypothesis and state your conclusion. State all assumptions and justify the steps of your calculations.
- (b) Find a 95% confidence interval for the difference in proportions of people who may find these medications effective. State all assumptions and justify the steps of your calculations.

Appendix:

A relevant formula for certain 2 sample t-tests/intervals (which may or may not be relevant in this exam) is

$$d.o.f = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1-1} \left(\frac{s_1^2}{n_1}\right)^2 + \frac{1}{n_2-1} \left(\frac{s_2^2}{n_2}\right)^2}$$

For fractional values, use tables after rounding appropriately.