AP Statistics – Inference Review *Group Project*

The following problems cover all the types of inference we have studied thus far: hypothesis tests and confidence intervals, for means and proportions, involving one or two samples. Over the next two days you will create group solutions as a way to review for the upcoming test.

- Day 1: In your groups, read the problems, decide what procedure is appropriate for each, and decide who will do which ones.
- Homework: Write up complete solutions for your problems (on separate sheets of paper).
- Day 2: In your groups, read everyone's solutions and make any additions or corrections. When you are satisfied with all of them, staple them together (in order) and hand them in. Put each group member's name on the top page.

1. **Survey Responses** Few people who receive questionnaires in the mail actually fill them out and return them – often fewer than 10%! One researcher thinks he can improve the response rate by including a coupon good for a free pint of ice cream along with the questionnaire. The researcher believes that people will want the ice cream, and feel guilty if they don't return the questionnaire. To test this conjecture he mails questionnaires with ice cream coupons to 150 randomly selected people. After two weeks 41 of the surveys have been returned.
   a) Create a 95% confidence interval for the return rate.
   b) Encouraged by this response rate, this researcher now plans to replicate the study in hopes of estimating the return rate this strategy might achieve to within 5%. How many new questionnaires must he mail out?

2. **Scoring** The table shows the average number of points scored in home and away games by 8 randomly selected NFL teams during the 2002 season. Assuming that the offensive performance of these teams is representative of other teams during this season and others, do these data provide evidence of a home field advantage when it comes to scoring?

	Ave. points scored	
Team	Home	Away
Jets	24.3	21.2
Ravens	19.8	19.8
Texans	13.5	13.1
49ers	25.2	20.6
Giants	18.9	23.0
Bucs	26.5	20.8
Eagles	24.1	25.5
Packers	24.6	23.0

3. **Pets** A National Cancer Institute study published in 1991 examined the incidence of cancer in dogs. Of 827 dogs whose owners used the weed killer 2-4-D on their lawns or gardens, 473 were found to have cancer. Only 19 of the 130 dogs that had not been exposed to this herbicide had cancer. Construct a 95% confidence interval for the difference in pets' cancer risk.

4. **Grapes** An agronomist hopes that a new fertilizer she has developed will enable grape growers to increase the yield of each grapevine by at least 5 pounds. To test this fertilizer she applied it to 44 vines and used the traditional growing strategies on 47 other vines. The fertilized vines produced a mean of 58.4 pounds of grapes with standard deviation 3.7 pounds, while the unfertilized vines yielded an average of 52.1 pounds with standard deviation 3.4 pounds of grapes. Do these experimental results confirm the agronomist's expectations?

5. **Car Insurance** An insurance company advertises that 90% of their accident claims are settled within 30 days. A consumer group randomly selects 104 of last year's claims from the company's files, and finds that only 89 of them were settled within 30 days. Is the company guilty of false advertising?

6. **Cigarettes** Some of the cigarettes sold in the US claim to be "low tar". How much less tar would a smoker get by smoking low tar brands instead of regular cigarettes? Samples of 15 brands of each type were randomly chosen from the 1206 varieties (no kidding) that are marketed. Their tar contents (mg/cig) are listed in the table below. Find a 95 % confidence interval for the difference between regular and low tar brands.

Type	Milligrams of tar per cigarette														
Regular	18	10	14	15	15	12	17	11	14	17	12	14	15	15	12
Low Tar	9	5	10	4	8	9	9	3	7	12	6	10	8	11	8

7. **Brownies** Wegman's (a food market chain) has developed a new store-brand brownie mix. Before they start selling the mix they want to compare how well people like their brownies to brownies made from a popular national brand mix. In order to see if there was any difference in consumer opinion, Wegman's asked 124 shoppers to participate in a taste test. Each was given a brownie to try. Subjects were not told which kind of brownie they got - that was determined randomly. 58% of the 62 shoppers who tasted a Wegman's brownie said they liked it well enough to buy the mix, compared to 66% of the others who said they would be willing to buy the national brand. Does this result indicate that consumer interest in the Wegman's mix is comparable to the national brand?

8. **Taxes** Waiters are expected to keep track of their income from tips and report it on their income tax forms. The Internal Revenue Service suspects that one waiter (we'll call him "John") has been under-reporting his income, so they are auditing his tax return. An IRS agent goes through the restaurant's files and obtains a random sample of 80 credit card receipts from people John served. The average tip size shown on these receipts was $9.68 with a standard deviation of $2.72.
   a) Create a 90% confidence interval for the mean size of all of John's tips.
   b) On his tax return John had claimed that his tips averaged $8.73. Based on their confidence interval, does the IRS have a case against him? Explain.