Problems to be handed in:

1) In a random sample of 725 selected for interview from a population of 13,916 teachers in Washington, 113 said they thought that the amount of standardized testing was retarding the learning of students in their classes.

   a) Find the best estimate of the percentage of all teachers in Washington who are dissatisfied.

   b) Find the standard error of your estimate of the percentage of all teachers who are dissatisfied.

   c) Find the best estimate of the overall number of teachers who are dissatisfied.

   d) Find a 95% confidence interval for the percentage of dissatisfied teachers.

   e) In implementing the policy of standardized testing, the state wants to keep the percentage of dissatisfied teachers at or below 10%. Could this reasonably be the case, or do you have convincing evidence that the percentage is larger than 10%? Justify your answer with reference to a test.

2) The bakery at the QFC in University Village produces loaves of bread with “1 pound” written on the label. Here are weights of randomly sampled loaves from the production last week:

   1.02, 0.97, 0.98, 1.10, 1.00, 1.02, 0.98, 1.03, 1.03, 1.05, 1.02, 1.06

   The mean is $\bar{X} = 1.0216$ and the sample standard deviation is $s = 0.0371$.

   a) Find a 95% confidence interval for the mean weight of all loaves produced last week.

   b) State the null and alternative hypotheses.

   c) Perform the hypothesis test at the $\alpha = 0.05$ significance level.

   d) What error, if any, might you have committed?

3) The owner of a Downtown parking lot suspects that the person she hired to run the lot is stealing some money from the receipts. The receipts as provided by the employee indicate that the average number of cars parked in the lot is 125 per day and that, on average, each car is parked 3.5 hours. In order to determine whether the employee is stealing, the owner watches the lot for 5 days. On those days the number of cars parked is as follows:

   120, 130, 124, 127, 128
For the 629 cars that the owner observed during the 5 days, the mean and the standard deviation of the time spent on the lot were 3.6 and 0.4 hours, respectively.

a) What are the two ways that the employee can be stealing? For each of these ways, can the owner conclude at the 5% level of significance that the employee is stealing?

b) What are the meanings of Type I and Type II errors in this case?

c) If you are the owner, do you want a small or large confidence level (i.e. small level of significance, $\alpha$). Why?

d) If you are the employee, do you want a small or large confidence level (i.e. small level of significance, $\alpha$). Why?

4) Your work for social support network that is considering a new system of connecting clients to consolers and wishes to test if the new contact times are significantly different, on average, than the existing your current system. From past records it is established that the mean contact time of the current system is 2.38 days. A test of the new system shows that, with 48 clients, the average contact time was 1.91 days with a sample standard deviation of 0.43 days.

a) Identify the null and alternative hypotheses for a two-sided test, using both words and mathematical symbols.

b) Perform a two-sided test at the 5% significance level and describe the result.

c) Perform a two-sided test at the 1% significance level and describe the result.

d) State the $p$-value as either $p > 0.05$, $p < 0.05$, $p < 0.01$, or $p < 0.001$.

e) Summarize the results in a brief paragraph to your fellow workers.