Math 323
Lab 5
Note: I will be in on Tuesday, August 3rd from 11-1pm if you need help.

Note: answers may vary depending on rounding. Review lab #4.

1. A firm establishes a committee to investigate the amount each contract costs over and above the amount quoted in the original contract (overruns). The committee has determined that the standard deviation of overruns is $17,500. How large a sample should they use if they want to be 95% confident that the mean overrun is in error by no more than $2000 [295]

2. The earnings per share for a random sample of technology stocks listed on the NYSE were (in $'s):
    1.90   2.15   2.01   0.89   1.53   1.89   2.12   2.05   1.75   2.22   3.44
    Assume the population is normally distributed. How large a sample should be used if the estimate of the mean NYSE technology stock earnings is to be in error by no more than $.10. You want to have a 97% level of confidence in your sample. [175]

3. Assume that we want to estimate the mean IQ scores for the population of professors. How many professors must be randomly selected for IQ test if we want 95% confidence that the sample means is within 2 IQ points of the population mean? Assume the standard deviation is 15. [217]

4. You have been hired by the Ford Motor Company to do market research, and you must estimate the percentage of household in which a vehicle is owned. How many households must you survey if you want to be 94% confident that your sample percentage has a margin of error of three percentage points?
    (a) Assume that a previous study suggested that vehicles are owned in 86% of households. [473]
    (b) Assume that there is no available information that can be used to estimate the percentage of households in which a vehicle is owned. [982]

5. Business schools A and B reported the following summary of GMAT verbal scores:

	N	$\bar{x}$	s^2
A	11	39.75	48.59
B	13	33.74	44.68

    Assume populations are normally distributed.
    (a) Is the population variance of school A greater than school B based on the sample data? [F = 1.0875, P(F>1.0875) = .4388, no]
    (b) Construct a 95% confidence interval for the true population standard deviation ratio. Comment on this interval if school A is taken as the numerator. [0.5681, 1.9843]
    (c) Construct a 95% confidence interval for the true population mean difference using the conclusion found in (b) and comment on this interval. [.2187, 11.8013]
    (d) Find the 95% confidence interval for the true population mean difference using the opposite of the conclusion found in (b) and comment on this interval. [-.2308,12.2508]
    Note: When one/both samples are ≤ 30, the t distribution is used when the population variances are assumed to be different where df = smaller of n1-1 and n2-1

6. 16 alkaline and 16 heavy-duty Radio shack batteries were placed individually in a circuit consisting of two flashlight bulbs wired in parallel, a switch, a battery holder, and a Hewlet Packard 427-Analog DC voltmeter. Each battery was drained to a reference failure voltage of 0.9 volts and the time to failure (min) was measured.:

Alkaline				Heavy-duty			
105	141	147	158	29	22	22	27
140	143	108	125	26	17	22	23
116	139	146	134	23	27	23	24
140	149	142	140	22	25	22	26

    Assume the populations of times to failure is normally distributed.

(a) Is the population variance for Alkaline greater than that for heavy-duty? Fcalc=26.9141, P(F>26.9141) ~0, yes]

(b) Find the 95% confidence interval for the ratio of standard deviations. [3.0677, 8.7729] Comment on it.

7. Let p1 denote the percentage of people who were unemployed in March, and let p2 denote the percentage of people who were unemployed in August. Suppose that during late March, the government instituted policies designed to lower the unemployment rate. We want to construct a 90% CI for the true difference in proportions. In March, in a random sample of 1000 people, 75 were unemployed. During August, in an independent random sample of 1000 people, 65 were unemployed. What is your conclusion based on the CI? [-.0088, .0288]

8. A USA Today study reported the longest average workweeks for non-supervisory employees in private industry to be mining (45.4 hours) and manufacturing (42.3 hours). The same article reported the shortest average workweeks to be retail trade (29 hours) and services (32.3 hours). A study conducted in the state of Illinois found the following results:

Industry	N	Ave hours per week	Standard deviation
Mining	15	47.3	5.5
Manufacturing	10	43.5	4.9

Assume that there is a statistically significant difference in the variability of hours per week worked in the mining and manufacturing industries and that the data is normally distributed. Construct a 95% confidence interval estimate of the mean difference in hours per week worked for non-supervisory employees. Interpret this interval.   [-.9543, 8.5543] Hint: similar to question 5 (d).

9. Of a random sample of 100 stocks on the Toronto Stock Exchange, 32 made a gain today. A random sample of 100 stocks on the Montreal Stock Exchange showed 27 stocks making a gain. Construct a 95% confidence interval, estimating the difference in the proportion of stocks making a gain on the two exchanges. Interpret this interval.   [-0.0762, 0.1762]

10. The residents of Cardston have complained for many years that they pay higher traffic fines than the residents of their adversary, Raymond. A local newspaper hired a statistician to determine whether there was any merit to this argument. The statistician randomly selected 25 residents from Cardston and 25 residents from Raymond, all of whom had received a speeding ticket. Fines are normally distributed and assume variances are not equal. The fine paid by each Cardston and Raymond resident were recorded. The summary statistics are as follows:
    Town   Mean   Standard deviation
    Cardston $60.00 $12
    Raymond $50.00 $10
Construct a 95% confidence interval, estimating the mean difference in traffic fines paid by Cardston residents and Raymond residents. Comment on this interval. [3.5519,16.4481] Hint: similar to question 5(d).

11. In a province wide poll of 2000 men and 2010 women, 980 and 1025 women report that they are opposed to the death penalty in ALL circumstances.
    Find a 90% confidence interval estimate for the difference in the proportion of men opposed to the death penalty and corresponding proportion of women.   [-0.046, 0.006]

12. Independent random samples taken at two local liquor stores provide the following information regarding customers' purchases.

Store	Bob's Booze	Len's Liquor Emporium
N	46	39
Mean	$52.40	$61.75
s^2	$9.50	$7.25

Assuming that there does exist a difference in the variability between the two liquor stores, produce the 95% CI for the true mean difference. Does the data indicate that the average purchases at Len's exceed those at Bob's by more than $5, on average (use the CI)? [$5.78, $12.92]