Course: STAT-319
Term: 181
Homework # 5
Material: Chapters 8 and 9
Due Date: Tuesday, 13-November-2018

Q1: In a study of automobile collision insurance costs, a random sample of 80 body repair costs for a particular kind of damage had a mean of \$472.36 and a standard deviation of \$62.35. If $\bar{X} = \$472.36$ is used as a point estimate of the true average repair cost of this kind of damage, with what confidence can one assert that the sampling error does not exceed \$10?

Q2: The dean of a college wants to use the mean of a random sample to estimate the average amount of time students take to get from one class to the next, and she wants to be able to assert with 99% confidence that the error is at most 0.25 minute. If it can be presumed from experience that $\sigma = 1.40$ minutes, how large a sample will she have to take?

Q3: A sample of 15 pneumatic thermostats intended for use in a centralized heating unit has an average output pressure of 9 psi and a standard deviation of 1.5 psi. Assuming the data may be treated as a random sample from a normal population, determine a 90% confidence interval for the actual mean pressure of the thermostat.

Q4: An industrial engineer concerned with service at a large medical clinic recorded the duration of time from the time a patient called until a doctor or nurse returned the call. A sample of size 180 calls had a mean of 1.65 hours and a standard deviation of 0.82.

a) Obtain a 95% confidence interval for the population mean of time to return a call.
b) Does μ lie in your interval obtained in part (a)? Explain.

Q5: Refer to Q4.

a) Perform a test (using critical value approach) with the intention of establishing that the mean time to return a call is greater than 1.5 hours. Use $\alpha = 0.05$. Also confirm your decision using p-value approach.
b) In light of your conclusion in part (a), what error could you have made? Explain in the context of this problem.
c) In a long series of repeated experiments, with new random samples collected for each experiment, what proportion of the resulting tests would reject the null hypothesis if it prevailed? Explain your reasoning.

Q6: An industrial engineer collected data on the labor time required to produce an order of automobile mufflers using a heavy stamping machine. The data on times (hours) for n = 52 orders of different parts

2.15	2.27	0.99	0.63	2.45	1.3	2.63	2.2	0.99	1	1.05
3.44	0.49	0.93	2.52	1.05	1.39	1.22	3.17	0.85	1.18	2.27
1.52	0.48	1.33	4.2	1.37	2.7	0.63	1.13	3.81	0.2	1.08
2.92	2.87	2.62	1.03	2.76	0.97	0.78	4.68	5.2	1.9	0.55
1	2.95	0.45	0.7	2.43	3.65	4.55	0.33			

has $\bar{X} = 1.8646$ hours and $s^2 = 1.5623.$

Using the 90% confidence interval, based on the t distribution, for the mean labor time

N	**Mean**	**StDev**	**SE Mean**	**90% CI**
52	**1.86462**	**1.24992**	**0.17333**	**(1.57423, 2.15500)**

a) decide whether or not to reject $H_0 : \mu = 1.6$ in favor of $H_1 : \mu \neq 1.6$ at $\alpha = 0.10$;
b) decide whether or not to reject $H_0 : \mu = 2.2$ in favor of $H_1 : \mu \neq 2.2$ at $\alpha = 0.10$.
c) What is your decision in part (a) if $\alpha = 0.05$? Explain.

Q7: An engineering firm responsible for maintaining and improving the performance of thousands of wind turbines is asked to check on the sound levels. The purpose is to determine the proportion that currently would not meet proposed new sound level restrictions. How large a sample of wind turbines is needed to ensure that, with at least 95% confidence, the error in our estimate of the sample proportion is at most 0.06 if

a) nothing is known about the population proportion?
b) the population proportion is known not to exceed 0.20?

Q8: A supplier of imported Vernier calipers claims that 90% of their instruments have a precision of 0.999. Testing the null hypothesis p = 0.90 against the alternative hypothesis $p \neq 0.90$, what can we conclude at the level of significance $\alpha = 0.10$, if there were 665 calipers out of 700 with a precision of 0.999? Use critical value approach.