

ECEN321: Engineering Statistics

Assignment 8

Due: 9:00 a.m., Wednesday 3 June 2020

Confidence Intervals

1. (Navidi 5.2.2) During a recent drought, a water utility in a certain town sampled 100 residential water bills and found that 73 of the residences had reduced their water consumption over that of the previous year.
 - (a) Find a 95% confidence interval for the proportion of residences that reduced their water consumption. [2 marks]
 - (b) Find a 99% confidence interval for the proportion of residences that reduced their water consumption. [2 marks]
 - (c) Find the sample size needed for a 95% confidence interval to specify the proportion to within ± 0.05 [2 marks]
 - (d) Find the sample size needed for a 99% confidence interval to specify the proportion to within ± 0.05 [2 marks]
 - (e) Someone claims that more than 70% of residences reduced their water consumption. With what level of confidence can this statement be made? [3 marks]
 - (f) If 95% confidence intervals are computed for 200 towns, what is the probability that more than 192 of the confidence intervals cover the true proportions? [4 marks]
2. (Navidi 5.3.8) A chemist made eight independent measurements of the melting point of tungsten. She obtained a sample mean of 3410.14 degrees Celsius and a sample standard deviation of 1.018 degrees.
 - (a) Use the Student's t distribution to find a 95% confidence interval for the melting point of tungsten. [2 marks]
 - (b) Use the Student's t distribution to find a 98% confidence interval for the melting point of tungsten. [2 marks]
 - (c) If the eight measurements had been 3409.76, 3409.80, 3412.66, 3409.79, 3409.76, 3409.77, 3409.80, 3409.78, would the confidence intervals above be valid? Explain. [1 mark]
3. (Navidi 5.6.13) A computer system administrator notices that computers running a particular operating system seem to freeze up more often as the installation of the operating system ages. She measures the time (in minutes) before freeze-up for seven computers one month after installation, and for nine computers seven months after installation. The results are as follows:
One month after install: 207.4 233.1 215.9 235.1 225.6 244.4 245.3
Seven months after install: 84.3 53.2 127.3 201.3 174.2 246.2 149.4 156.4 103.3
Find a 95% confidence interval for the mean difference in time to freeze-up between the first month and the seventh. [4 marks]