

## Math 254 – Chi-Squared Distribution

1. The lighting company Lightbulbs'R'Us claims that its 100W incandescent bulbs will last on average 4.0 years with a standard deviation of 0.5 years. Some skeptical scientists take a sample of five bulbs and measure their average lifetimes. Although their sample mean is close to the claimed value, the sample standard deviation is found to be 1.2 years.
  - a) Calculate a 90% confidence interval for the true population standard deviation for the lightbulbs' lifetime based on the scientists' sample.
  - b) Compare your interval to the manufacturer's claim. Do the sample data support the claim?
2. Camosun surveyed 12 graduates from its Applied Communications program and found that their average starting salary was \$38,905.42 with a standard deviation of \$2615.19. Calculate a 90% confidence interval for the standard deviation for the entire population of Camosun Applied Communications graduates.
3. A Victoria city bus driver claims that the time for the downtown-to-Interurban run never varies by more than 1.3 minutes. A random sample of 12 trips yielded a standard deviation of 1.7 minutes. Do the sample data present sufficient evidence to reject the driver's claim? Do a test of hypothesis with a 90% confidence level.

### Answers

1. The population standard deviation lies between 0.8 and 2.8 years. Since the manufacturer's claim does not lie within this interval, the sample data do not support the claim (at least with 90% confidence).
2. The standard deviation is between \$1955 and \$4055 at the 90% confidence level.
3.  $\chi^2 = 18.8107$ , while for  $df = 11$ ,  $\chi^2_{0.1} = 17.275$ . So reject  $H_0$ . The data do not support the driver's claim.