Name: *Caleb McWhorter — Solutions* **MAT 121**
Summer 2018 **Homework 10**

Problem 1: Construct a 95% confidence interval for the standard deviation, σ, of a population when a SRS of size $n = 25$ is taken from a normal distribution if the sample standard deviation is 13.1.

$$\frac{(n-1)\,s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)\,s^2}{\chi_L^2}$$

$$\frac{24 \cdot 13.1^2}{39.364} < \sigma^2 < \frac{24 \cdot 13.1^2}{12.401}$$

$$104.63 < \sigma^2 < 332.122$$

$$\sqrt{104.63} < \sqrt{\sigma^2} < \sqrt{332.122}$$

$$10.23 < \sigma < 18.22$$

Problem 2: In a weight loss program, 27 adults used a new drug that supposedly increases short term weight loss gains with exercise. After 6 weeks, their average weight loss was found to be 7.3 lb with a standard deviation of 0.8 lb. Construct a 90% confidence interval to estimate the standard deviation of weight loss for any person taking the drug with exercise.

$$\frac{(n-1)\,s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)\,s^2}{\chi_L^2}$$

$$\frac{26 \cdot 0.8^2}{38.885} < \sigma^2 < \frac{26 \cdot 0.8^2}{15.379}$$

$$0.4279 < \sigma^2 < 1.0820$$

$$\sqrt{0.4279} < \sqrt{\sigma^2} < \sqrt{1.0820}$$

$$0.654 < \sigma < 1.040$$

Problem 3: Assume the following data values constitute a SRS from a normal distribution:

$$7,\ 9,\ 7,\ 2,\ 10,\ 6,\ 5,\ 5,\ 8,\ 8,\ 11$$

Compute a 99% confidence interval to estimate the population standard deviation, σ.

$$n = 11, \quad d.o.f. = 10, \quad \overline{x} = \frac{7+9+7+2+10+6+5+5+8+8+11}{11} = \frac{78}{11} = 7.09$$

x	$x - \overline{x}$	$(x - \overline{x})^2$
7	-0.0909	0.0083
9	1.9091	3.6446
7	-0.0909	0.0083
2	-5.0909	25.9174.
10	2.9091	8.4628
6	-1.0909	1.1901
5	-2.0909	4.3719
5	-2.0909	4.3719
8	0.9091	0.8264
8	0.9091	0.8264
11	3.9091	15.2810
		Total: 64.9091

$$\sigma^2 = \frac{1}{n-1}\sum(x-\overline{x})^2$$

$$\sigma^2 = \frac{1}{10} \cdot 64.9091$$

$$\sigma^2 = 6.49091$$

$$\sigma \approx 2.55$$

$$\frac{(n-1)\,s^2}{\chi^2_R} < \sigma^2 < \frac{(n-1)\,s^2}{\chi^2_L}$$

$$\frac{10 \cdot 2.55^2}{25.188} < \sigma^2 < \frac{10 \cdot 2.55^2}{2.156}$$

$$2.5816 < \sigma^2 < 30.16$$

$$\sqrt{2.5816} < \sqrt{\sigma^2} < \sqrt{30.16}$$

$$1.61 < \sigma < 5.49$$