## STAT 305 D Homework 8

## Due Apr 4, 2013 at 12:40 PM in class

1. For each of the following random intervals, find the probability that the interval contains the number, 0 .
a. $(Z-2, Z+2), Z \sim N(0,1)$
b. $(X-4, X+4), X \sim N(0,4)$
c. $(X-6, X+6), X \sim N(0,9)$
d. $(X-2 \sigma, X+2 \sigma), X \sim N\left(0, \sigma^{2}\right)$ for some $\sigma>0$.
2. Vardeman and Jobe chapter 6 section 1 exercise 1 (page 344).

Interpret the statement, "The interval from 6.3 to 7.9 is a $95 \%$ confidence interval for the mean $\mu$."
3. Vardeman and Jobe chapter 6 section 1 exercise 2 (page 344).

In Chapter Exercise 2 of Chapter 3, there is a data set consisting of the aluminum contents of 26 bihourly samples of recycled PET plastic from a recycling facility. Those 26 measurements have $\bar{y}=142.7 \mathrm{ppm}$ and $s \approx 98.2 \mathrm{ppm}$. Use these facts to respond to the following. (Assume that $n=26$ is large enough to permit the use of large-sample formulas in this case.)
(a) Make a $90 \%$ two-sided confidence interval for the mean aluminum content of such specimens over the 52 -hour study period.
(b) Make a $95 \%$ two-sided confidence interval for the mean aluminum content of such specimens over the 52 -hour study period. How does this compare to your answer to part (a)?
(c) Make a $90 \%$ upper confidence bound for the mean aluminum content of such samples over the 52 -hour study period. (Find \# such that $(-\infty, \#)$ is a $90 \%$ confidence interval.) How does this value compare to the upper endpoint of your interval from part (a)?
(d) Make a $95 \%$ upper confidence bound for the mean aluminum content of such samples over the 52 -hour study period. How does this value compare to your answer to part (c)?
(e) Interpret your interval from (a) for someone with little statistical background. (Speak in the context of the recycling study and use Definition 2 as your guide.)
4. Vardeman and Jobe chapter 6 section 1 exercise 3 (page 344).

Return to the context of Exercise 2. Suppose that in order to monitor for possible process changes, future samples of PET will be taken. If it is desirable to estimate the mean aluminum content with $\pm 20$ ppm precision and $90 \%$ confidence, what future sample size do you recommend?
5. Vardeman and Jobe chapter 6 section 1 exercise 4 (page 344).

DuToit, Hansen, and Osborne measured the diameters of some no. 10 machine screws with two different calipers (digital and vernier scale). Part of
their data are recorded here. Given in the small frequency table are the measurements obtained on 50 screws by one of the students using the digital calipers.

| Diameter (mm) | Frequency |
| :---: | :---: |
| 4.52 | 1 |
| 4.66 | 4 |
| 4.67 | 7 |
| 4.68 | 7 |
| 4.69 | 14 |
| 4.70 | 9 |
| 4.71 | 4 |
| 4.72 | 4 |

(a) Compute the sample mean and standard deviation for these data.
(b) Use your sample values from (a) and make a $98 \%$ two-sided confidence interval for the mean diameter of such screws as measured by this student with these calipers.
(c) Repeat part (b) using $99 \%$ confidence. How does this interval compare with the one from (b)?
(d) Use your values from (a) and find a $98 \%$ lower confidence bound for the mean diameter. (Find a number \# such that (\#, $\infty$ ) is a $98 \%$ confidence interval.) How does this value compare to the lower endpoint of your interval from (b)?
(e) Repeat (d) using $99 \%$ confidence. How does the value computed here compare to your answer to (d)?
(f) Interpret your interval from (b) for someone with little statistical background. (Speak in the context of the diameter measurement study and use Definition 2 as your guide.)
6. Weekly feedback. You get full credit as long as you write something.
a. Is there any aspect of the subject matter that you currently struggle with? If so, what specifically do you find difficult or confusing? The more detailed you are, the better I can help you.
b. Do you have any questions or concerns about the material, class logistics, or anything else? If so, fire away.

