Math 116 Fall 2003—HW #1 Due: Fri. Sep. 5

Reading for HW # 1: Devore §1.1–1.4

Problems from Devore (wording shortened in some cases without affecting meaning):

§1.2 # 12: Consider the following specific gravity values for various wood types:

.31	.35	.36	.36	.37	.38	.40	.40	.40
.41	.41	.42	.42	.42	.42	.42	.43	.44
.45	.46	.46	.47	.48	.48	.48	.51	.54
.54	.55	.58	.62	.66	.66	.67	.68	.75

Construct a stem-and-leaf display using repeated stems (i.e., two per tenths digit) and comment on any interesting features of the display.

§1.2 # 16, parts ab only: Consider the following data for strength of cylinders (in MPa):

6.1	5.8	7.8	7.1	7.2	9.2	6.6	8.3	7.0	8.3
7.8	8.1	7.4	8.5	8.9	9.8	9.7	14.1	12.6	11.2

and the following data (from Example 1.2 in the book) for strength of rods:S

5.9	7.2	7.3	6.3	8.1	6.8	7.0	7.6	6.8	6.5
7.0	6.3	7.9	9.0	8.2	8.7	7.8	9.7	7.4	7.7
9.7	7.8	7.7	11.6	11.3	11.8	10.7			

(a) Construct a comparative stem-and-leaf display of the beam and cylinder data. Does the cylinder data appear to be symmetric? Does the cylinder data appear to have any outliers? What proportion of the cylinder data exceed 10 MPa?

(b) In what ways are the two sides of the display similar? Are there any obvious differences?

§1.2, # 17, part c only: Consider the following data on the number of faulty transducers in a batch:

2	1	2	4	0	1	3	2	0	5
3	3	1	3	2	4	7	0	2	3
0	4	2	1	3	1	1	3	4	1
2	3	2	2	8	4	5	1	3	1
5	0	2	3	2	1	0	6	4	2
1	6	0	3	3	3	6	1	2	3

(c) Draw a histogram of the data using relative frequencies on the vertical scale and comment on its features.

§1.3, # 33: Consider the following data on a bicyclist's single-leg power for a high workload:

244	191	160	187	180	176	174
205	211	183	211	180	194	200

(a) Calculate and interpret the sample mean and median.

(b) Suppose that the first observation had been 204 rather than 244. How would the mean and median change?

(c) Calculate a trimmed mean by eliminating the smallest and largest observations. What is the corresponding trimming percentage?

(d) Assume we also have values for single-leg power for a low workload. The sample mean for $n = 13$ observations was $\bar{x} = 119.8$ (actually 119.7692), and the 14th observation, somewhat of an outlier, was 159. What is the value of $\bar{x}$ for entire sample?

§1.3, # 36, parts abc only: Consider the following data on escape times (in seconds) from an offshore oil platform:

389	356	359	363	375	424	325	394	402
373	373	370	364	366	364	325	339	393
392	369	374	359	356	403	334	397	

(a) Construct a stem-and-leaf display of the data. How does it suggest the mean and median will compare?

(b) Calculate the mean and median.

(c) By how much could the largest time be increased without affecting the value of the median? By how much could it be decreased without affecting the median?

§1.3, # 42:

(a) If a constant c is added to each x_i in a sample, yielding $y_i = x_i + c$, how do the sample mean and median of y_i's relate to the mean and median of the x_i's? Verify your conjectures.

(b) If each x_i is multiplied by a constant c, yielding $y_i = cx_i$, answer the question in part (a). Verify your conjectures.

§1.4, # 44, parts a, c, and (b or d): Consider the following data on oxygen consumption of firefighters:

29.5 49.3 30.6 28.2 28.0 26.3 33.9 29.4 23.5 31.6

(a) Compute the sample range

(b or d) Compute the sample variance (either by the method from class or a "shortcut" given in the book).

(c) Compute the sample standard deviation.

§1.4, # 50: In 1997, a woman sued a computer keyboard manufacturer, charging that her repetitive stress injuries were caused by the keyboard. The injury awarded about \$ 3.5 million for pain and suffering, but the court set aside the award. In making this determination, the court identified a "normative" group of 27 similar cases and specified a reasonable award as one within two standard deviations of the mean of the awards in the 27 cases. The 27 awards were (in \$ 1000's):

37	60	75	115	135	140	149
150	238	290	340	410	600	750
750	750	1050	1100	1139	1150	1200
1200	1250	1576	1700	1825	2000,	

from which $\sum x_i = 20179$ and $\sum x_i^2 = 24657511$. What is the maximum possible amount that could be awarded under the two-standard-deviation rule?

§1.4, # 56: Consider the following data on the amount of aluminum contamination (ppm) in plastic of a certain type:

30	30	60	63	70	79	87	90	101
102	115	118	119	119	120	125	140	145
172	182	183	191	222	244	291	511	

Construct a boxplot for this data, and comment on its features.

§1.4, # 59, part c only: Blood cocaine concentrations (mg/L) was determined both for a sample of individuals who had died from cocaine-induced excited delirium (ED) and for a sample of those who had died from a cocaine overdse without excited delirium. Here is the ED data:

0	0	0	0	0.1	0.1	0.1	0.1
0.2	0.2	0.3	0.3	0.3	0.4	0.5	
0.7	0.8	1.0	1.5	2.7	2.8		
3.5	4.0	8.9	9.2	11.7	21.0		

and here is the non-ED data:

0	0	0	0	0	0.1	0.1	0.1
0.1	0.2	0.2	0.2	0.3	0.3	0.3	
0.4	0.5	0.5	0.6	0.8	0.9	1.0	
1.2	1.4	1.5	1.7	2.0	3.2	3.5	4.1
4.3	4.8	5.0	5.6	5.9	6.0	6.4	7.9
8.3	8.7	9.1	9.6	9.9	11.0	11.5	
12.2	12.7	14.0	16.6	17.8			

(c) Construct a comparative boxplot and use it as a basis for comparing and contrasting the ED and non-ED samples.

Supplementary Problems for Ch. 1, # 62: Consider the following information on ultimate tensile strength (lb/in) for a sample of $n = 4$ hard zirconium copper wire specimens:

$$\bar{x} = 76381, \quad s = 180.$$

If the smallest x_i is 76683 and the largest is 77048 determine the values of the middle two data points (and don't do it by successive guessing!)

Supplementary Problems for Ch. 1, # 64: Consider the following data on the amount of incoming solar radiation received in a greenhouse:

6.3	6.4	7.7	8.4	8.5	8.8	8.9
9.0	9.1	10.0	10.1	10.2	10.6	10.6
10.7	10.7	10.8	10.9	11.1	11.2	11.2
11.4	11.9	11.9	12.2	13.1		

Use some of the methods discussed in this chapter to describe and summarize this data.