

## Stat13 Homework 1

[http://www.stat.ucla.edu/~dinov/courses\\_students.html](http://www.stat.ucla.edu/~dinov/courses_students.html)

### Suggested Solutions

- 2.7 A dendritic tree is a branched structure that emanates from the body of a nerve cell. As part of a study of brain development, 36 nerve cells were taken from the brains of newborn guinea pigs. The investigators counted the number of dendritic branch segments emanating from each nerve cell. The numbers were as follows:

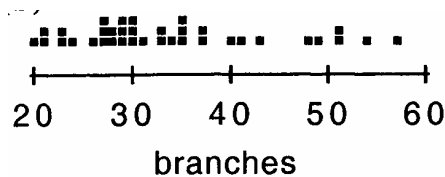
23 30 54 28 31 29 34 35 30  
27 21 43 51 35 51 49 35 24  
26 29 21 29 37 27 28 33 33  
23 37 27 40 48 41 20 30 57

- (a) Construct a stem-and-leaf diagram of the data.  
(b) Construct a dotplot of the data.

**Ans:** (a) We use split stems in the following stem-and-leaf diagram.

```
2 | 011334
2 | 677788999
3 | 0001334
3 | 55577
4 | 013
4 | 89
5 | 114
5 | 7
```

(b)



- 2.8 Consider the data presented in Exercise 2.7. Construct a frequency distribution and display it as a table and as a histogram.

**Ans:** There is no single correct answer. One possibility is

<b>Branches</b>	<b>Frequency (no. cells)</b>
20-24	6
25-29	9
39-34	7
35-39	5
40-44	3
45-49	2
50-54	3
55-59	1
<b>Total</b>	<b>36</b>

**2.25** Consider the data from Exercise 2.24. Determine the mean of the 36 observations.

<b>Number of piglets</b>	<b>Frequency (Number of sows)</b>
5	1
6	0
7	2
8	3
9	3
10	9
11	8
12	5
13	3
14	2
<b>Total</b>	<b>36</b>

**Ans:**  $\bar{y} = \frac{5 \times 1 + 6 \times 0 + 7 \times 2 + \dots + 14 \times 2}{36} = \frac{375}{36} = 10.4$

**2.46** Dopamine is a chemical that plays a role in the transmission of signals in the brain.

A pharmacologist measured the amount of dopamine in the brain of each of seven rats. The dopamine levels (nmol/g) were as follows:

6.8 5.3 6.0 5.9 6.8 7.4 6.2

- Calculate the mean and standard deviation.
- Determine the median and the interquartile range.
- Calculate the coefficient of variation.
- Replace the observation 7.4 by 10.4 and repeat parts (a) and (b). Which of the descriptive measures display resistance and which do not?

**Ans:**

(a)  $\bar{y} = 6.343$ ;  $s = 0.7020$ .

- (b) Median = 6.2; Q1=5.9, Q3 = 6.8, IQR = 6.8 - 5.9 = .9.
- (c) Coefficient of variation =  $0.7020/6.343 = 0.111$  or 11.1 %.
- (d) New  $\bar{y} = 6.77$ ; new  $s = 1.68$ ; new median = 6.2, new IQR =0.9. The median and interquartile range display resistance in that they do not change. The standard deviation changes greatly, showing its lack of resistance. The mean changes a modest amount.

**2.62** A botanist grew 15 pepper plants on the same greenhouse bench. After 21 days, she measured the total stem length (cm) of each plant, and obtained the following values:

12.4 12.2 13.4  
 10.9 12.2 12.1  
 11.8 13.5 12.0  
 14.1 12.7 13.2  
 12.6 11.9 13.1

- (a) Construct a stem-and-leaf display for these data, and use it to determine the quartiles.
- (b) Calculate the interquartile range.

**Ans:**

- (a) In the ordered stem-and-leaf diagram below, the quartiles are underlined and the median is in bold face italic

```

10 | 9
11 | 89
12 | 0122467
13 | 1245
14 | 1
  
```

- (b) IQR=13.2-12=1.2

**2.69** One measure of physical fitness is maximal oxygen uptake, which is the maximum rate at which a person can consume oxygen. A treadmill test was used to determine the maximal oxygen uptake of nine college women before and after participation in a ten-week program of vigorous exercise. The accompanying table shows the before and after measurements and the change (after-before); all values are in mL O<sub>2</sub> per mm per kg body weight.

<i>Participant</i>	<b>Maximal Oxygen Uptake</b>		
	<i>Before</i>	<i>After</i>	<i>Change</i>
1	48.6	38.8	-9.8
2	38.0	40.7	2.7
3	31.2	32.0	.8
4	45.5	45.4	-.1
5	41.7	43.2	1.5
6	41.8	45.3	3.5
7	37.9	38.9	1.0
8	39.2	43.5	4.3
9	47.2	45.0	-2.2

The following computations are to be done on the *change* in maximal oxygen uptake (the right-hand column).

- Calculate the mean and the standard deviation
- Determine the median.
- Eliminate participant 1 from the data and repeat parts (a) and (b). Which of the descriptive measures display resistance and which do not?

**Ans:**

- (a)  $\bar{y} = 0.19$ ;  $s = 4.22$ .
- (b) Median = 1.0.
- (c) New mean = 1.44; new SD = 2.08; new median =  $(1.0 + 1.5)/2 = 1.25$ . The median displays resistance. The mean and the SD change greatly, showing lack of resistance.