Homework Answers:

1. a.

5	66
5	
6	0
6	2
6	4
6	
6	8888
7	000000
7	2222222
7	44444
7	66
7	88

More on next slide...

b. Mean ≈ 70.1 beats/min; median = 72 beats/min; mode = 72 beats/min.

c. Sample answer: The median of 72 beats/min best describes a “typical” pulse rate for this man. In addition, the mode is also 72 beats/minute. (The mode is the man’s most frequent pulse rate.) There are a few days when the man’s pulse rate is very low. These low values tend to pull the mean down.

2. a. Approximatly 56 of the fish had mercury levels below 0.30 µg/g.

b. Approximately 27 of the fish from the sample had mercury levels at or above 0.30 µg/g. Hence, around 32.5% of the fish in the sample had levels of mercury concentration above the EPA guidelines.

c. Because the data are skewed to the right, the few high mercury concentration values in the tail will inflate the mean but not affect the median. Hence, the mean mercury concentration will be larger than the median mercury concentration.

3. a. To compute the mean, sum the data and divide by 25: $\bar{x}$ = 1103/25 = 44.12.

To compute the median, order the data from smallest to largest. Select the (25 + 1)/2, or 13th data value from the ordered list:

28	35	37	37	38	38	40	40	42	43	43	44	45
45	46	46	46	47	47	49	49	51	54	55	58	

The median is 45 fries in a bag.

b. A stemplot appears below. We've chosen one that divides the stem into increments of 5.

2	8
3	
3	57788
4	002334
4	556667799
5	14
5	58

c. In this case, the choice between the mean and median is a matter of judgment. The difference between the two is less than one fry per bag. Some students may prefer the median because of the potential outlier of 28, which drags the mean down slightly.

Standard Deviation:

Another Measure of Spread

What other statistics have we used to measure spread?

- Range (all of data)
- IQR (middle half of data)
  - ↳ spread of skewed data

Video:

http://www.learner.org/courses/againstallodds/unitpages/unit06.html

No Guide today. Just watch and pay attention.

What About Spread? The Standard Deviation

- A more powerful measure of spread than the IQR is the standard deviation, which takes into account how far *each* data value is from the mean.
- A deviation is the distance that a data value is from the mean.
  - Since adding all deviations together would total zero, we square each deviation and find an average of sorts for the deviations.

What About Spread? The Standard Deviation (cont.)

- The variance, notated by s^2, is found by summing the squared deviations and (almost) averaging them:

$$s^2 = \frac{\sum (y - \bar{y})^2}{n - 1}$$

- The variance is problematic as a measure of spread—it is measured in *squared* units! (It is used more in higher stats courses.)

What About Spread? The Standard Deviation (cont.)

- The standard deviation, *s*, is just the square root of the variance and is measured in the same units as the original data.

$$s = \sqrt{\frac{\sum (y - \bar{y})^2}{n - 1}}$$

Thinking About Variation

- Since Statistics is about variation, spread is an important fundamental concept of Statistics.
- Measures of spread help us talk about what we *don't* know.
- When the data values are tightly clustered around the center of the distribution, the IQR and standard deviation will be small.
- When the data values are scattered far from the center, the IQR and standard deviation will be large.

* use IQR for skewed (med.)
* use S.D. for symmetric (mean)

Calculating Standard Deviation By Hand

Step 1 - Find the mean (average)

Step 2 - Find the difference between the mean and EACH piece of data.

Step 3 - Square each difference

Step 4 - Add up the squared differences

Step 5 - Divide them by (n-1)

(Number of pieces of data - 1)

Step 6 - Take the square root

YUCK!!!

Ex. 1: Find the standard deviation (by hand)

15, 28, 35, 30, 33, 46, 29, 32

Mean = $\frac{15+28+35+30+33+46+29+32}{8} = 31$

x	Diff	Diff^2
15 - 31	-16	256
28 - 31	-3	9
35 - 31	4	16
30 - 31	-1	1
33 - 31	2	4
46 - 31	15	225
29 - 31	-2	4
32 - 31	1	1
		516

$S_x = \sqrt{\frac{516}{8-1}} = 8.6$

Ex. 2: Find the standard deviation (by hand)

28, 28, 35, 30, 33, 33, 31, 30

Mean = $\frac{28+28+35+30+33+33+31+30}{8} = 31$

	$x-\bar{x}$	$(x-\bar{x})^2$
28 - 31	-3	9
28 - 31	-3	9
35 - 31	4	16
30 - 31	-1	1
33 - 31	2	4
33 - 31	2	4
31 - 31	0	0
30 - 31	-1	1
		44

$S_x = \sqrt{\frac{44}{8-1}} = 2.5$

Compare examples 1 & 2. Describe their similarities and differences.

They have the same mean, but their Std. deviation are different. This means they have the same center, but their spreads are different.
Ex. 1 has a larger spread than Ex. 2.

Homework tonight:

#3 don't make graphs

Worksheet - Packet pgs. 58 & 59

QUIZ TOMORROW!!!!

Homework tomorrow night:

Read pg. 61-68

pg. 82 #43, 44