MAT 223, Discussion Questions 9.11

1. The formula for the mean is

$$\bar{x} = \frac{\sum x_i}{n}$$

Describe what this formula means in your own words.

add up the measurements, then divide by the total # of measurements

2. How does the formula for a weighted average differ from the general formula for the arithmetic mean?

a weighted average $= \dfrac{\sum (x_i \cdot weight)}{\sum weights}$

3. How does the median differ from the mean? When are the two values going to be the same (or nearly so)?

the median is the middle value in a sorted list. the two values will be (approximately) the same when the distribution is (roughly) symmetric.

4. What is the mode? Can there be more than one?

The mode is the value repeated most often (in a discrete distribution). Yes, there can be more than one.

5. When should each measure of center be used as a "typical" value?

mean for roughly symmetric distributions
median for skewed distributions
mode for bimodal or multimodal distributions

6. How do the mean, median and mode relate to each other in a 1) symmetric distribution? 2) skewed left distribution? 3) skewed right distribution?

1) roughly the same   2) mean < median < mode
3) mode < median < mean.

7. Consider the data set for presidential ages at inauguration we saw earlier. I've dropped the decimals (for number of days), so that we can look at their ages in a more typical fashion.

President	AGE (in years)	President	AGE (in years)
George Washington	57	Benjamin Harrison	55
John Adams	61	Grover Cleveland	55
Thomas Jefferson	57	William McKinley	54
James Madison	58	Theodore Roosevelt	42
James Monroe	58	William Howard Taft	51
John Quincy Adams	57	Woodrow Wilson	56
Andrew Jackson	61	Warren G. Harding	55
Martin Van Buren	54	Calvin Coolidge	51
William Henry Harrison	68	Herbert Hoover	54
John Tyler	51	Franklin D. Roosevelt	51
James K. Polk	49	Harry S. Truman	60
Zachary Taylor	64	Dwight D. Eisenhower	62
Millard Fillmore	50	John F. Kennedy	43
Franklin Pierce	48	Lyndon B. Johnson	55
James Buchanan	65	Richard Nixon	56
Abraham Lincoln	52	Gerald Ford	61
Andrew Johnson	56	Jimmy Carter	52
Ulysses S. Grant	46	Ronald Reagan	69
Rutherford B. Hayes	54	George H. W. Bush	64
James A. Garfield	49	Bill Clinton	46
Chester A. Arthur	51	George W. Bush	54
Grover Cleveland	47	Barack Obama	47

Find the mean and the median (in your calculator if you can). How can you use the calculator to help you find the mode?

$\bar{x} = 54.70$ (1 Var Stats)

Med = 54.5

mode 51 & 55 (both appear 5 times)
sort data, look for most frequent occurrence

8. How do we calculate the range of a data set?

Max – min

9. Describe the procedure for calculating a standard deviation by hand (i.e. $\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$ or $s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$, unpack this formula. What is it telling you to do, in order?).

1) calculate the mean
2) subtract the mean from each measurement
3) square these values
4) add them up
5) divide by one less than the total # of measurements
6) take the square root

10. How do you find these values in your calculator?

use 1-Var Stats after entering data in L1

Sx is S

11. One interpretation of the standard deviation is that it is the average distance from the mean. What does this measure in statistical terms?

the dispersion of the data, spread of the distribution

more generally, variability

12. Read the article at http://www.socialresearchmethods.net/kb/relandval.php. How do reliability and validity relate to the mean and standard deviation?