MEASURES OF CENTRAL TENDENCY (AVERAGES)

NAME ______ WRITE ANSWERS TO #1- #7 ON THESE PAGES

- 1. Refer to the continuous frequency diagram provided with Problem Set #5C, showing a hypothetical distribution of income in \$000 among U.S. households. According to this diagram,
 - (a) *modal* household income is about _____
 - (b) *median* household income is about
 - (c) *mean* household income is about

Note: you have already answered question (b) as Question 6(g) in Problem Set #5C

2. *Twenty* households have a total of *fifty* children. Among these twenty households (circle NO if the answer cannot be determined from information given),

(a) the <i>modal</i> number of children is	or N	0
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(b) the *median* number of children is _____ or NO

(c) the *mean* number of children is _____ or NO

3.	A survey of households measures	# of	relative
	the variable NUMBER OF CHILDREN	<u>children</u>	frequency
	in each household. The frequency distri-		1
	distribution of this variable is shown:	0	10%
		1	26%
	(a) the <i>modal</i> number of children	2	16%
	per household is	3	14%
	-	4	10%
	(b) the <i>median</i> number of children	5	8%
	per household is	6	6%
	-	7	4%
	(c) the <i>mean</i> number of children	8	3%
	per household is	9	2%
	-	10	1%
			100%

- 4. A group of people has a total of \$100. The \$100 is then redistributed within the group, some people getting more and others less than before (but the total remains \$100). As a result of this redistribution (CIRCLE EVERY STATEMENT THAT IS TRUE),
 - (A) the mode of the distribution of \$ may change.
 - (B) the median of the distribution of \$ may change.
 - (C) the mean of the distribution of \$ may change.

5. In Problem Set #5A you constructed frequency tables (and bar charts) for both the 2008 ANES and the Fall 2010 Student Survey with respect to IDEOLOGY, HEALTH INSURANCE OPINION, and ABORTION OPINION, and you were asked to make broad comparative statements between the two groups. Now compare the two groups specifically with respect to their *average values* on each variable. For purposes of these calculations, find the average of the *code values* (1-5 for IDEOLOGY and HEALTH, 1-4 for ABORTION); with respect to the mean, this means that you are treating the code values as if they form an *interval scale* such that the difference between 1 (Liberal) and 2 (Slightly Liberal) is the same as the difference between 2 (Slightly Liberal) and 3 (Moderate), and likewise for other values and variables. (I did this in the PPT slides showing ANES and Student Survey opinion trends over time.)

IDEOLOGY		HEALTH INSURANCE		ABORTION	
ANES	Students	<u>ANES</u>	Students	<u>ANES</u>	Students

Modal Value

Median Value

Mean Value

Briefly explain how you calculated the mean values.

6. The following chart shows Washington annual snowfall over the past several decades. The "normal" snowfall of 15.2 inches is defined as average snowfall going back to whenever records began. But is this average the median or the mean snowfall? Would the other average be higher or lower than 15.2".



- 7. An instructor gives a test to students, on which scores anywhere from 0 to 50 can be achieved. Not having access to SPSS or even a calculator, he laboriously calculates the modal, median, and mean scores using paper and pencil. The instructor determines that the modal score is 37, the median score is 35, and the mean score is 32.238. Just before returning the tests, the instructor notices that one question that seemingly every student had gotten wrong was scored incorrectly and that therefore every student's score must be raised by three points.
 - (a) Does the instructor have to recalculate these scores from scratch? What are the new modal, median, and mean scores?

The instructor initially awarded students fractional points (e.g., $2\frac{1}{2}$) on some questions, and therefore some students had fractional overall scores (e.g., $39\frac{1}{2}$). So, after adding the three points to all scores, the instructor decides that such fractions are confusing and (since the only fractions involved were $\frac{1}{2}$'s) decides to get rid of them by doubling every student's overall score (so the range of possible scores is now from 0 to 100).

(b) Does he have to recalculate these scores from scratch? What are the new modal, median, and mean scores?

Finally, for some reason that can't be explained (except that it makes a good problem set question), the instructor then decides to award 5 additional points to the scores of the students who scored in the top 20% of the class.

(c) Does this affect the median score? If so what is the new median?

(d) Does this effect the mean score? If so, what is the new mean?

PS #6

8. You record the *height* and *weight* of every person in a large representative sample of adult Americans and then calculate the *median* and *mean* values of each variable. You find the median and mean values are just about the same for one of these variables but substantially different for the other. For which variable — height or weight — are the median and mean values substantially different and, for that variable, which measure of central tendency median or mean — would have the higher value? Briefly explain your reasoning. For the variable (pertaining to individuals in the sample) *number of siblings*, would the median and mean values be about the same or would one average value be distinctly higher the other? If the latter, which would be higher and why?

Note. The remaining questions are taken or adapted from early editions of David S. Moore, *Statistics: Concepts and Controversies*, a text book previously used in this course.

- 9. Last year a small accounting firm paid each of its five clerks \$22,000, two junior accountants \$50,000 each, and the firm's owner \$270,000. What is the mean salary paid at this firm? How many of the employees earn less than the mean? What is the median salary? What is the mode of the salaries?
- 10. According to the Department of Commerce, the mean and median prices of new houses sold in the United States in 1989 were \$129,900 and \$159,000. Which of these numbers is the mean, and which is the median? Explain your answer.
- 11. The mean age of 5 persons in a room is 30 years:. A 36-year-old person walks in. What is now the mean age of the persons in the room? Suppose that the median age is 30 years and a 36-year-old person enters. Can you find the new median age from this information?
- 12. You wish to measure the average speed of vehicles on the interstate highway on which you are driving, so you adjust your speed until the number of vehicles passing you equals the number you are passing. Have you found the mean speed, the median speed, or the modal speed of vehicles on the highway?
- A news article reports that of the 411 players on National Basketball Association rosters in February 1998, only 139 "made more than the league average salary" of \$2.36 million. Is \$2.36 million the mean or median salary for NBA players? How do you know?
- 14. You are planning a party and want to know how many cans of soda to buy. A genie offers to tell you either the mean number of cans guests will drink or the median number of cans. Which measure of central should you ask for? Why? To make your answer concrete, suppose there will be 30 guests and the genie can tell either that the mean will be 5 cans or the median will 3 cans. Given either projection, can you determine how many cans you should have on hand?