Impact of Zero

Mode is the item that occurs most often in a list.

Median is the middle number in a list (when the items are in order). If there is no middle number, average the two middle numbers. This can also be called Quartile 2 as it cuts the data in half (or two quarters).

Mean is the average of the list.

Range is the largest number in a list minus the smallest number
OR
max-min

MEASURES OF CENTRAL TENDENCY

BOX PLOT TERMS

Quartile 1
After halving the data (Quartile 2), look at the left half, and halve that (which quarters it). That number is called Quartile 1 or Q1. If there is no middle number, average the two middle numbers.

Quartile 3
After halving the data (Quartile 2), look at the right half, and halve that (which quarters it). That number is called Quartile 3 or Q3. If there is no middle number, average the two middle numbers.

Minimum is the smallest number in the list.

Maximum is the largest number in the list.

IQR, or inner quartile range, is the middle 50% of the data.

IQR = Q3 – Q1

Grading Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
59 – below	F

Stem and Leaf Plot:

Test Scores

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

QUESTIONS FOR STUDENTS:

1) How many tests did Conrad take? **11**
2) How many tests did he fail? **5**
3) How many tests did he pass? **6**
4) What is Conrad's average (mean) score? **56.9%**
5) What grade should he receive? **F**
6) Is he passing his class? **No**
7) What is his median score? **70**
8) What is the mode score? **70**
9) What is Conrad's highest score? **86**
10) What is his lowest score? **0**
11) What is the range of his scores? **86**
12) What would be the best representation of Conrad's scores: mode, median, or mean? Explain. **The mean is probably the best representation of Conrad's scores. The median/mode score (70) is too high to represent Conrad's scores because it doesn't reflect the failing scores.**

Replace Conrad's score of zero with a score of 60.

13) If Conrad had scored a 60 instead of the zero, what would his average score or mean score be? **62.4%**
14) What overall grade would he receive? **D**

15) Is he passing the class? **Yes**
16) What is his median score? **70**
17) What is the mode score? **70**
18) What is Conrad's highest score? **86**
19) What is his lowest score? **23**
20) What is the range of his scores? **63**
21) What would be the best representation of Conrad's score now: mode, median, or mean? Explain. **The mean is still a very strong representation of Conrad's data. It is 66% and that shows the reflection of the failure of two classes and one near failure (60).**
22) Write a paragraph describing the effect of scoring a 60 on the test instead of a zero. **Answers may vary.**
Example: The difference between the zero and the sixty is that Conrad is now passing the class instead of failing it. It does not have an effect on the median or the mode. With future successes he might be able to bring his grade up to a C.

Replace Conrad's original score of zero with a score of 80.

23) If Conrad had scored an 80 instead of the zero, what would his average (mean) be? **64.2%**
24) What grade would he receive then? **D**
25) Is he passing the class? **Yes**
26) What is his median score? **73**
27) What is the mode score? **70**
28) What is Conrad's highest score? **86**
29) What is his lowest score? **23**
30) What is the range of his scores? **63**
31) What would be the best representation of Conrad's score now: mode, median, or mean? Explain. **Answers may vary.**
Example: The two failing test scores are still reflected in the mean but not in the median and the mode; however, the mode (70) would now be more representative of the data.

32) Write a paragraph describing the effect of scoring 80 on his test instead of a zero. **Answers may vary.**

Example: The 80 changes Conrad's score to a D and now he is in a pretty good position to at least get a C in the class after more assignments.

33) Could Conrad replace the zero with any score that would allow him to have an average of B or A? Explain. **Answers may vary.**

Example: If you replaced the zero with a score of 100, Conrad's average would be 66% which is a mid D. Since it is not possible for him to score more than 100% on a test, he would need more tests/assignments to raise his grade to a C.

Complete the following table and use the data to answer questions 34-37.

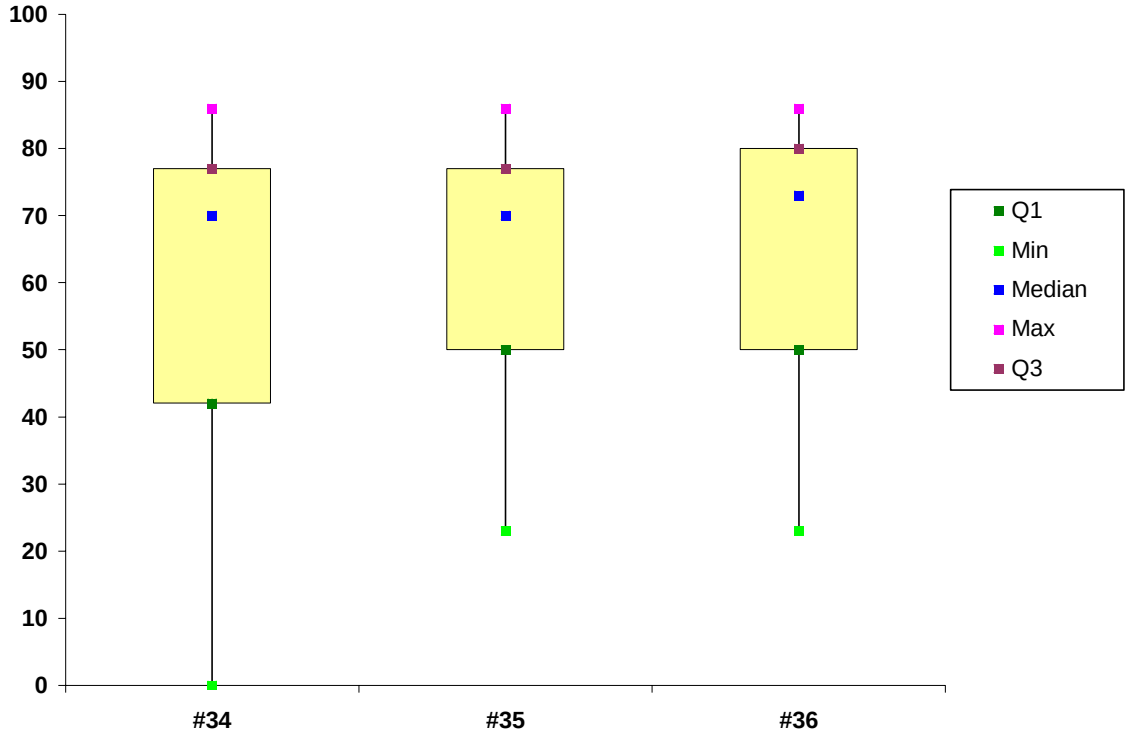
CONRAD'S TABLE OF TEST DATA

	Conrad's grade with the zero	**Grades with zero replaced with 60**	**Grades with zero replaced with 80**	**Comment on change**
Mean	56.9%	62.4%	64.2%	The additional 60 dispersed to 9 tests is about 5 points/test
Median	70	70	73	Not much change
Mode	70	70	70	No change
Minimum	0	23	23	Would only change with a test score higher than smallest test score
Maximum	86	86	86	No change
Range	86	63	63	Change depends on a different min and/or max.
Quartile 1	42	50	50	Change depends on whether or not new test grade is above or below the median
Quartile 3	77	77	80	Change depends on whether or not new test grade is above or below the median

34) Construct a box plot of Conrad's original scores.

35) Next to #34 construct a box plot of Conrad's scores replacing the zero with the score of 60.

36) Next to #35 construct another box plot of Conrad's scores replacing the original score of zero with the score of 80.



37) Compare the three box plots. Explain what you notice in comparing the three different box plots. **(Answers may vary.)**

Example: The three graphs have maximum and Q3 values that are very close together. The minimum value for #34 is much lower than the minimum values for #35 and #36. The lengths of the top/right whiskers are all similar but the length of the bottom/left whisker is much longer for #34 than it is for #35 or #36. The length of the "box" is shortest for #35 and longest for #34.