Mean, Median, and mode (measures of central tendency) can be a good indicator for a set of data but it does not completely describe the data. Compare set A and Set B below:

Test Scores A	Test Scores B
95	71
90	70
85	69
80	68
75	67
70	66
65	65
60	64
55	63
50	62
45	61
40	60
35	59
Mean: 65	Mean: 65
Median: 65	Median: 65

Set A and Set B have the same mean or average test score of 65. Their median is also the same. But each set reflects a different set of grades.

We should consider looking at the range or the "spread" of the data.

Two measures of dispersion are range and standard Deviation.

I. Range

Range looks at the difference from lowest to highest values.

Range = (greatest value in data set) – (least value in data set)

EXAMPLE: what is the mean, median, and range for the set of quiz grades for Max and Molly?

Quiz	Max	Molly
1	28	27
2	22	27
3	21	28
4	26	6
5	18	27
Mean:	23	23
Median:	22	27
Range:	10	22

Who is the more consistent quiz taker? Why?
Look at the range.

Range can be misleading if it is not wisely interpreted. Molly is more consistent except for one score

II. Standard Deviation

Standard Deviation is based on deviations from the mean of a set of data values.

Calculation of Standard Deviation

Let a sample of n numbers $x_1, x_2, \ldots, x_n$ have mean $\bar{x}$. Then the **sample standard deviation, s,** of the numbers is calculated as follows.

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

The individual steps involved in this calculation are as follows.

Step 1 Calculate $\bar{x}$, the mean of the numbers.
Step 2 Find the deviations from the mean.
Step 3 Square each deviation.
Step 4 Sum the squared deviations.
Step 5 Divide the sum in Step 4 by $n - 1$.
Step 6 Take the square root of the quotient in Step 5.

Example: Find the standard deviation of the following sample using the step-by-step process above.

32, 41, 47, 53, 57

Step 1: Calculate the mean. $n =$ 5 $\bar{x} =$ 46

Step 2: Find the deviations from the mean. (data value minus the mean)

Value	32	41	47	53	57
Deviation	-14	-5	1	7	11

Step 3: Square each deviation.

Value	32	41	47	53	57
Deviation^2	196	25	1	49	121

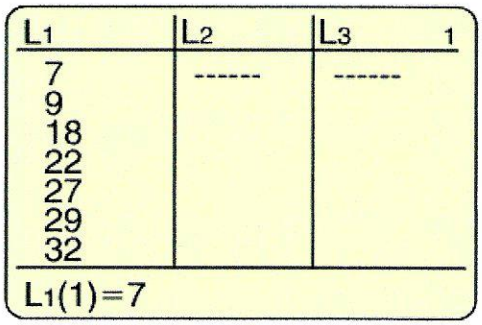
Step 4: Sum the squared deviations. $196 + 25 + 1 + 49 + 121 = 392$

Step 5: Divide that sum from step 4 by $n - 1$. $\frac{392}{4} = 98$

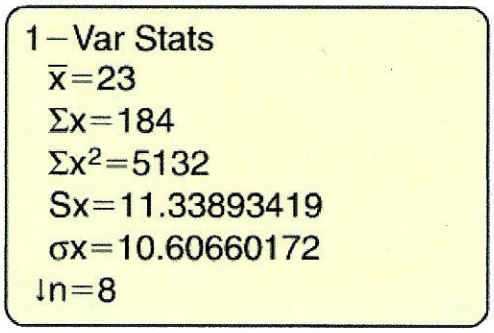
Step 6: Square root the quotient from step 5. $\sqrt{98} = 9.90$

EXAMPLE: Using your calculator, find the standard deviation for the sample.

7, 9, 18, 22, 27, 29, 32, 40



STAT
EDIT
1:EDIT
Type numbers in L1 (list one)



STAT
CALC
1: 1 – VAR STATS (one variable statistics)
ENTER (the calculator will default to L1)

$\bar{x}$ mean of the data values

Σx sum of the data values

Σx^2 sum of the squared data values

Sx standard deviation of sample

σx standard deviation of population

EXAMPLE: Using your calculator, find the standard deviation for the sample.

32, 41, 47, 53, 57

$Sx =$ 9.9