ALGEBRA II ACTIVITY 15:
FINDING STANDARD DEVIATION
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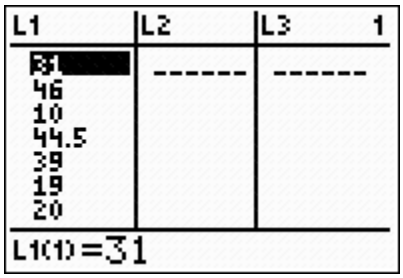
ACTIVITY OVERVIEW:
In this activity we will

- Find the mean of a set of data
- Use the mean and operations on lists to find the deviation from the mean, the variance, and the standard deviation

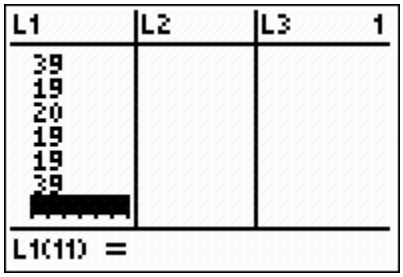
Fast Food Item Grams of Fat
McD's Big Mac—31
BK Whopper—46
Taco Bell Beef Tacos—10
Subway Sub w/Toppings—44.5
Domino's Med Chz Pizza—39
KFC Fried Chicken—19
Wendy's Hamburger—20
Arby's RB Sandwich—19
Hardee's RB Sandwich—19
Pizza Hut Med Chz Pizza—39

In this activity you will learn how the standard deviation of data from a population sample is calculated. *Standard Deviation* tells you, on average, how spread out are the data from the mean. Above is list of 10 popular fast food items and their fat grams. This is only a sample of the fast food items out there, so we will calculate sample variance and standard deviation.

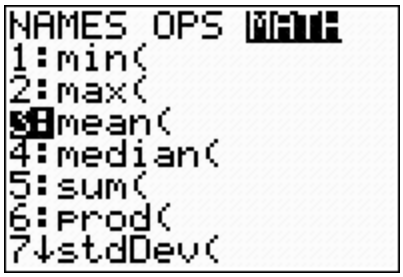
Press [STAT] [ENTER] and enter the fat grams into **L1**.



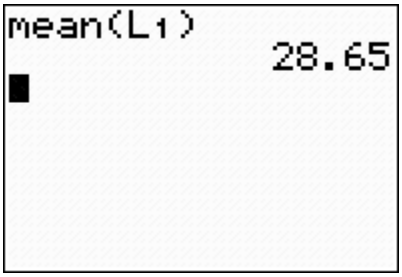
When you have entered all 10 numbers you screen should look like this. Press [2nd] [MODE] to return to the home screen.



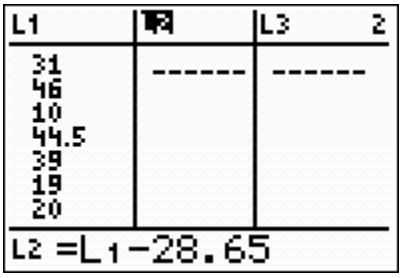
Press [2nd] [STAT] and arrow over to the **MATH** menu. Select **3:mean(**.



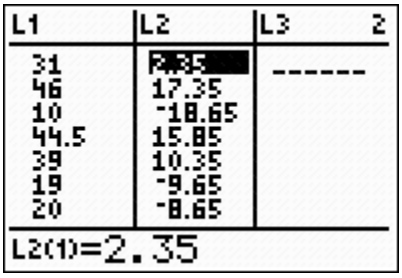
Type [2nd][1][)][ENTER] to find the mean grams of fat in popular fast food items. These fast food items have, on average, 28.65 grams of fat.



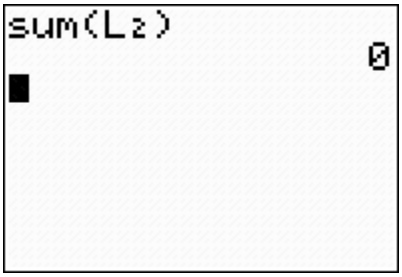
Press [STAT][ENTER]. Arrow to the top of **L2**. To find out how much each item deviates from the mean, type in the command [2nd][1][−][2][8][.][6][5] as shown here.



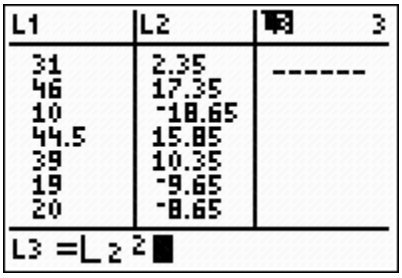
Press [ENTER]. Some results are negative. When does this occur? When are results positive?



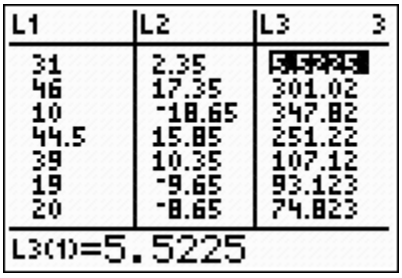
If you sum this list the result is zero. Why?



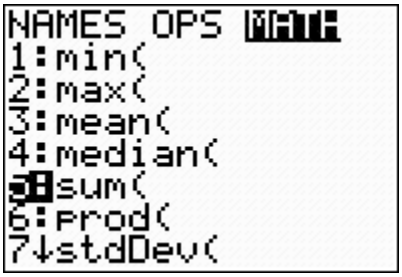
To study how much the actual data items vary, square the deviations to get all positive results. Arrow to the top of **L3**. Enter [2nd][2][x^2].



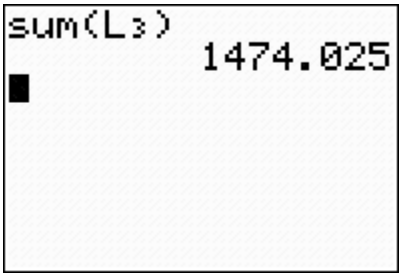
Press [ENTER].



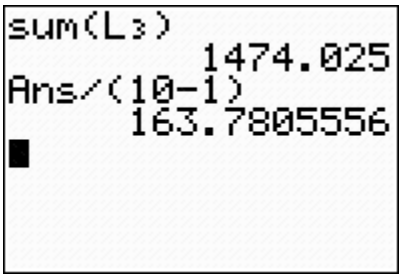
Press 2nd MODE to return to the home screen. Press 2nd STAT and arrow over to the **MATH** menu. Select **5:sum(**.



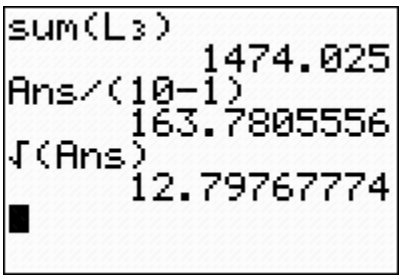
Type 2nd 3) ENTER to find the *sum of the squares of the deviations*.



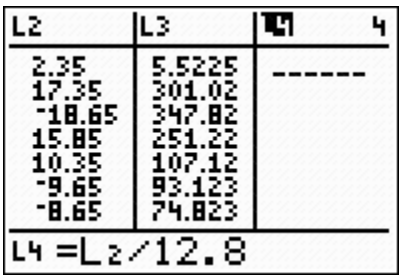
There were N=10 numbers in our sample of fast food items. To find the *variance* divide the sum of the squares by (N-1). [NOTE: You may wish to explore explanations for why to divide by N-1 rather than N as you would if you were calculating with numbers from the entire population. Essentially, statisticians have determined that dividing by N leads to an underestimate of variance.]



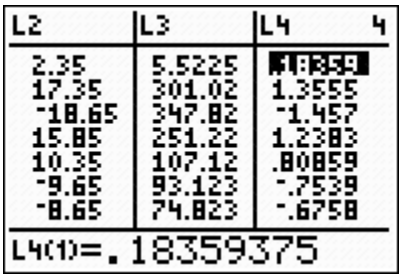
Since the *variance* is such a large number that seems unrelated to the fat grams for the fast food items, perform one more step. Take the square root of the *variance* to find the *standard deviation.* To do this press 2nd x² 2nd (-)) ENTER to find the square root of the previous answer.



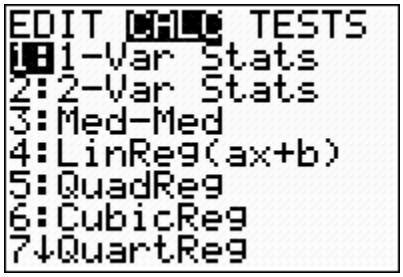
So, the standard deviation for the fat grams in our sample of fast food is 12.8 grams. This now becomes a unit by which to measure how far individual items are away from the mean of 28.65. Press STAT ENTER to return to the lists. Arrow to the top of L4 and enter 2nd 2 ÷ 1 2 . 8.



Press ENTER. By dividing the deviation by the standard deviation you can see how many *standard deviations from the mean* each items is. The sign also tells you if the item was above or below the mean. For example, the amount of fat in a BK Whopper is 1.35 standard deviations above the mean. You can extend this discussion to study normal distribution.



The calculator can calculate all of this information in just a few keys. Now that you know the process, try the shortcut. Press [STAT]. Right arrow to **CALC** and select **1: 1-Var Stats**.



The command will appear on the home screen. Type [2nd][1] to instruct the calculator to use **L1**. Press [ENTER]. Can you decipher some of these numbers now?