Transformations of Distributions

Using a set of test grades, the student will explore how adding a constant and/or multiplying the grades by a constant affects the measures of center and spread.

The following table contains scores from a test, out of 40 possible points, given in an Algebra I class.

Algebra test		
36	28	19
27	32	36
21	24	23
25	30	31
39	21	19
15	27	28
29	28	30
27	26	21

1. Enter the data into a list and name it **testgrades**.

2. Calculate the summary statistics for **testgrades.** Press (menu), *Statistics, Stat Calculations, One Variable Statistics*. Select 1 for the number of lists and **testgrades** for the X1 List.

Record the mean, median, and standard deviation of the test grades.

3. Find the IQR.
   - Insert a Calculator page. Press (ctrl) [I] and select *Add Calculator*.
   - Type **IQR** (ctrl) [:=] (var). Arrow to **stat.Q_3X** and press (−), (var) and arrow to **stat.Q_1X.** Press (enter) and the interquartile range should be displayed.

Include this measure with the mean, median, and standard deviation.

To explore the affect of adding and/or multiplying to the original test grades, another variable needs to be created. This keeps the original test grades intact.

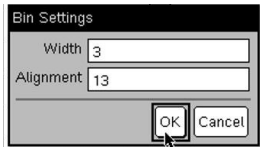
4. Insert another *Lists & Spreadsheet* page. Name column A: **adjtest** and in the formula bar, press (enter), (var), select **testgrades,** and press (enter). Once the same test grades appear, arrow up to the formula cell and press (del). This will allow you to make changes to **adjtest** later.

5. Calculate the *One Variable Statistics* for **adjtest**. Also create **adjiqr** on the calculator page.

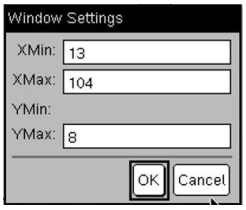
   - For *One Variable Statistics:*
     - Press (menu), *Statistics, Stat Calculations, One Variable Statistics*.
     - Select 1 for the number of lists and **adjtest** for the X1 List.
   - To calculate **adjiqr:**
     - Type **adjiqr** (ctrl) [:=] (var). Arrow to **stat2.Q_3X** and press (−), (var) and arrow to **stat2.Q_1X.**
     - Press (enter) and the interquartile range for **adjiqr** should be displayed. This should be the same value as **iqr**.

6. Insert a *Data & Statistics* page.

   - Press (tab) and select **adjtest**.
   - Arrow to an empty space in the graph and change the plot to *Histogram* by pressing (ctrl) (menu).
   - Press (ctrl) (menu) again and change the *Bin Settings* to the ones pictured at right.



   - Press (ctrl) (menu) one more time and arrow to *Zoom*. Input the following settings.

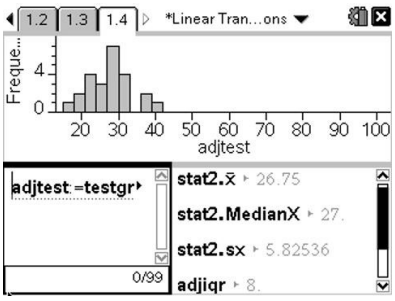


7. Change the layout of this page to a top window /2-bottom window layout, . Press (doc▾), arrow to *Page Layout*, *Select Layout*, *Layout 4*.

   - In the bottom left window press (menu) and *Add Calculator*.
   - In the bottom right window, press (menu) and *Add Notes*.

8. In the *Notes* window, press (ctrl) (menu) and select *Insert Math Box*.

   - Type **stat2.** and the one-variable statistics for **adjtest** will appear. Select $\bar{x}$.
   - Press (enter) and another *Math Box* will appear. Repeat the step above to insert the *Median* and s_x.
   - In the last *Math Box*, press (var) and select **adjiqr**.



You are now ready to explore changes to the set of test grades.

Mrs. Gillespie forgot to add the 10 extra credit points the class had earned for this quiz.

9. In the *Calculator* window, type **adjtest := testgrades + 10** and press (enter).

Describe the changes to the graph and each of the summary statistics in the Notes window.

For her gradebook, Mrs. Gillespie needs to enter the original grades as percentages.

10. In the *Calculator* window, type **adjtest := testgrades/40.*100** (Be sure to add the decimal after **40**)

Describe the changes to the graph and each of the summary statistics in the Notes window.

What will happen to the summary statistics if 10 is subtracted from **testgrades?** ***Be sure to include all four values.***

Now Mrs. Gillespie needs to calculate the percentages of the test grades with the 10 points added.

Estimate what will happen to the mean and standard deviation.

Verify your estimates using the Nspire.

What conclusions about measures of center and spread when a number is added to each value in a set of data?

What conclusions about measures of center and spread when each value in a set of data is multiplied or divided by the same number?