Assessing Normalcy

ID: 11142

Time required
45 minutes

Activity Overview

In this activity, students will learn four characteristics of a normal curve: symmetric and mound-shaped, mean and median approximately equal, 68-95-99.7 rule, and a linear normal probability plot. They will use these to determine if a data set is approximately normal.

Topic: Normal Distributions

- *Histograms*
- *Measures of central tendency*
- *Percentiles*
- *Normal Probability plot*

Teacher Preparation and Notes

- *This activity can be used to review or teach the characteristics of a normal distribution. The questions in the teacher notes are given to enhance the discussion if the lesson is used as a teaching (and not review) tool. Prior to the activity, students should be able to create and scale histograms, calculate mean, median, and standard deviation. They should have been introduced to a sketch of a normal curve and the 68-95-99.7 rule.*
- *Students need to clear all functions before beginning the activity.*
- *The list TWO will be used for the activity. The other lists THREE and GAME can be used if there is extra time in class or for homework.*
- ***To download the student worksheet and list files, go to education.ti.com/exchange and enter "11142" in the quick search box.***

Associated Materials

- *StatWeek04_Normalcy_worksheet_TI84.doc*
- *Lists: TWO.8xl, THREE.8xl, GAME.8xl*

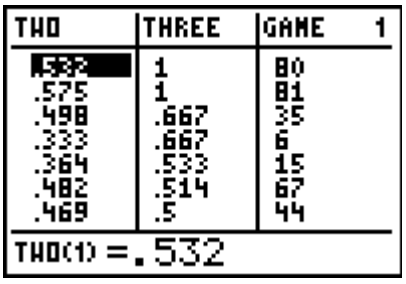
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Assessing Approximate Normality in AP Statistics (TI-84 Plus family) — 8526*
- *Plotting a Normal Curve (TI-Navigator) — 8573*
- *What's Normal, Anyway? (TI-84 Plus family) — 9415*

Introduction

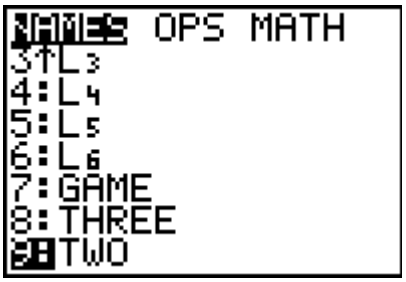
Before beginning the activity, transfer the list files to the students' calculators. They will need to use the **SetUpEditor** command so that the lists appear as shown at the right. The list TWO will be used for the activity and the lists THREE and GAME should be used for extra practice.



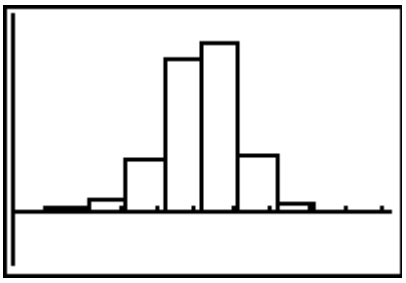
Note that the lists L1 to L6 that usually appear will not be shown.

Testing Criteria #1: the histogram

Students are to construct a histogram representing data set **TWO**. To do this, they will need to set up **Plot1** as shown in the screenshot on the worksheet. The **Xlist** can be selected by pressing [2nd] [LIST] and select it from the list.



From looking at the graph, students are to determine if the graph is symmetric and bell-shaped. This test is very subjective, but also determines if further tests are needed.

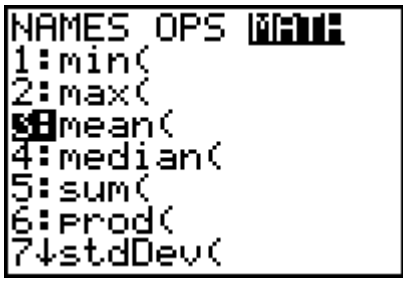


Discussion Questions

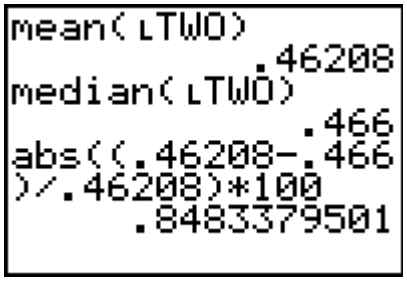
- Can this graph be changed (scaling) so that it doesn't appear symmetric and bell-shaped? If so, how?
- Conversely, is it possible to have a graph that can be made to look symmetric but is not? If so, how?

Testing Criteria #2: the mean and median

Students will evaluate the second criteria by calculating the mean and median of the data. The commands, **mean**, **median**, and **stdDev** can all be found in the MATH menu ([2nd] [LIST] ◄).



Students will need to be on the Home screen before selecting the commands.



The values of the mean and median vary by less than a hundredth, but finding the percent difference between them confirms that they are approximately the same.

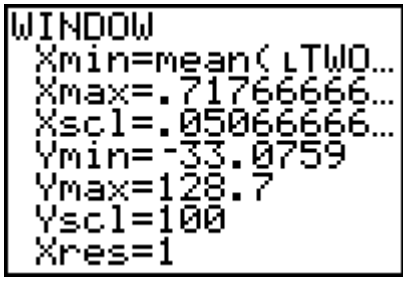
Discussion Questions

- How close is close enough?
- Why is it important to look at the percent difference between the mean and median?
- For example, is a difference of 0.004 always a small enough difference?

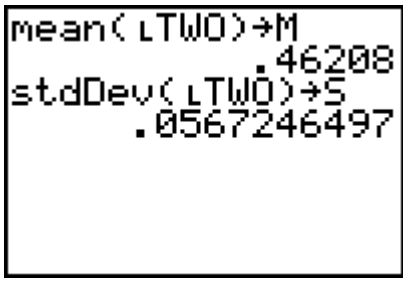
Testing Criteria #3: the 68-95-99.7 rule

Students will test the list TWO data to see if it follows the rule for the percentage of data within a standard deviation.

They can follow the set up given on the worksheet to adjust the histogram so that each bar reflects the parts of the standard deviations.



Another way to set up the window is to calculate the mean and stdDev on the Home screen and store the values (STO▸). Then use the letters to set up the window as follows:



- Xmin = M – 4∗S
- Xmax = M + 4∗S
- Xscl = S

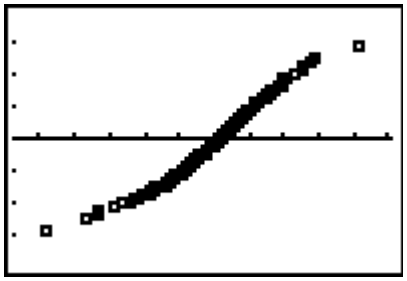
Once the graph is created, students can use TRACE to count the number of values in each bin of the histogram. Finally, they can find the percentage of values within one, two, and three standard deviations on the Home screen and compare these with the 68-95-99.7 rule. Students should complete a table like the one shown on the right.

Bin (in SDs)	Number	%
[–4, –3]	3	1%
[–3, –2]	6	2%
[–2, –1]	30	10%
[–1, 0]	100	33%
[0, 1]	122	41%
[1, 2]	33	11%
[2, 3]	4	1.3%
[3, 4]	1	0.3%

Note: 0 represents the mean in the table.

Testing Criteria #4: the normal probability plot

Students will test the fourth criteria by creating a normal probability plot which compares the data values to the expected/theoretical normal distribution. They need to set up **Plot1** as shown on the worksheet and then use **ZoomStat** to view the graph.



Students should see that the plot is almost a straight line with a little bit of a curve. This tells them that the data is approximately normal.

Discussion Question

- Why are there two points that seem to deviate greatly from the overall pattern? Return to the List Editor and investigate which points they may be.

After completing the evaluation of all four criteria, students need to determine if the data set of two-point percentages is approximately normal.

Discussion Questions

- Why does it matter if the data is normal?
- In context of the data, what does it mean if a data point is in the first standard deviation? In the positive side of the third standard deviation?
- If you are a coach in the NBA, knowing that the data for two-point percentages is normal, how could you use it to compare your team to the rest of the players?

Explain to students that if the data set passes all four tests, then it is approximately normal and can be modeled with a normal curve. In addition, *z*-scores can be calculated and comparisons can be made.

Homework or Extension

There are two additional data sets in the first spreadsheet – three point shooting percentages (THREE) and number of games played (GAME). Students can practice the method to determine if the other two data sets are relatively normal.