

TI-83/84 How To Series

Topic: Draw and Read a Box Plot

Use box plots when you want to determine the five number summary as well as any possible outliers for a set of univariate data.

Let's start with a set of definitions:

Minimum – the smallest value in a data set.

Maximum – the largest value in a data set.

Quartile 1 (Q1 or Lower Quartile) – the value that separates the lower quarter of the values (first 25%) from the upper three-quarters of the values (other 75%). It is also the median of the lower half of the data.

Median – a measure of center that is the value that divides an ordered set of data values into two equal halves.

Quartile 3 (Q3 or Upper Quartile) – the value that separates the lower three-quarters of the values (first 75%) from the upper quarter of the values (other 25%). It is also the median of the upper half of the data.

Outlier – a value that stands apart from the bulk of the data.

Interquartile range (IQR) – A measure of spread equal to the distance between the upper and lower quartiles: $IQR = Q_3 - Q_1$

In this example we will learn how to draw and interpret a box plot.

The following set of data are the ages of “Best Actresses” for the years 1951 - 2000:

38, 45, 24, 26, 48, 41, 27, 40, 38, 28, 27, 31, 37, 30, 24, 34, 60, 61, 26, 35, 34, 34, 26, 37, 42, 41, 35, 31, 41, 33, 30, 74, 33, 49, 38, 61, 21, 41, 26, 80, 42, 29, 33, 35, 45, 49, 39, 34, 26, 25, 32

(There are 51 ages listed because there was a double award in 1968)

Steps

1. Clear the memory of your calculator
2. Input the data into L1 of your calculator.

STAT

ENTER

Keystrokes get to your list screen

L1	L2	L3	1
██████████	-----	-----	

L1(1) =

Enter the data above into L1 of your calculator.

BE CAREFUL. Many students make mistakes entering in data. Always double check the number of data points entered corresponds to the number of data points given.

In our case, the number of data points given is 51 and the number entered is 51 as well. Look at the screen L1(52) indicates the calculator is waiting for the user to enter in data point 52, but since we do not have one we stop. Therefore, 51 data points have been entered.

L1	L2	L3	1
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52			

L1(52) =

If you miss a data point or you need to delete a data point refer to [Drawing a Scatter Plot](#).

- Now we can plot our box plot. Please note: the window for the box plot is different than a histogram. An explanation is found below.

2nd Y=

Bring up the plot screen.

Notice how all plots are Off. We need to turn Plot 1 on.

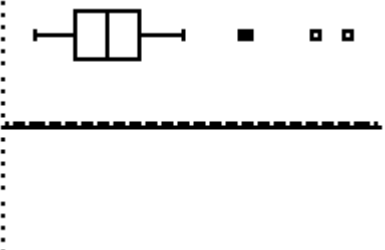
STAT PLOTS			
1	Plot1...Off		
	└─ L1	└─ L2	□
2	Plot2...Off		
	└─ L1	└─ L2	□
3	Plot3...Off		
	└─ L1	└─ L2	□
4	PlotsOff		

<p>ENTER ENTER</p> <p>Turn on Plot 1.</p>	<pre> 2nd Plot1 Plot2 Plot3 Off Off Type: [Box] [Line] [Bar] [Normal] [Dot] [Cross] Xlist:L1 Ylist:L2 Mark: [Box] + . </pre>	
<p>↓ → → → ENTER</p> <p>Select the box plot by using your arrow keys. Note: there are two options for box plots, always use the one with the outliers.</p> <p>Notice or Xlist indicates L1. This is good because our data is in fact stored in L1.(Step 2)</p>	<pre> 2nd Plot1 Plot2 Plot3 Off Off Type: [Line] [Box] [Bar] [Normal] [Dot] [Cross] Xlist:L1 Frea:1 Mark: [Box] + . </pre>	

4. Set up the window.

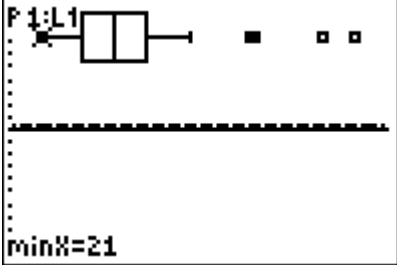
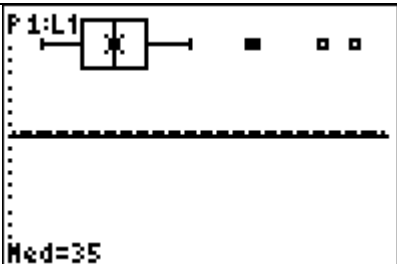
<p>ZOOM</p> <p>Go to zoom and select ZoomStat (number 9)</p>	<pre> 2nd MEMORY 4:ZDecimal 5:ZSquare 6:ZStandard 7:ZTrig 8:ZInteger 9:ZOOMStat 0:ZoomFit </pre>	
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5. Graph the box plot.

<p>After you select the option in step 5 above, the graph will automatically come up.</p>		
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Box plots tell us many things; however, the student should be aware that box plots do not necessarily tell us the *shape* of the data, like a histogram would.

6. Finding values on the box plot.

<p>TRACE ▶</p> <p>When the TRACE feature is activated you can scroll left and right to find out about individual bars of the histogram.</p> <p>In this case $\text{min} = 21$. There are also five distinct outliers in the data. If we had chosen the type of box plot without outliers we would not have seen these.</p>	 <p>minX=21</p>
<p>▶ ▶</p> <p>Scrolling over more, tells us that the median age of the actresses is 35.</p> <p>Scrolling over even more, tells us that the outliers are: 60, 61, 61, 74, 80</p>	 <p>Med=35</p>

7. If you want a fine-number summary without the graph, do the following:

<p>STAT ▶</p> <p>Select the 1-Var Stats from the Stat→ Calc function.</p>	<pre> EDIT [] [] [] [] TESTS 1:1-Var Stats 2:2-Var Stats 3:Med-Med 4:LinReg(ax+b) 5:QuadReg 6:CubicReg 7:↓QuartReg </pre>
<p>ENTER ENTER</p> <p>This brings up a slew of information, including mean, standard deviation and if you scroll down your five number summary, which is the same information found on the graph.</p>	<pre> 1-Var Stats x̄=37.56862745 Σx=1916 Σx²=79510 Sx=12.27070479 σx=12.1498082 ↓n=51 █ </pre> <pre> 1-Var Stats ↑n=51 minX=21 Q1=29 Med=35 Q3=41 maxX=80 █ </pre>

