

Unit 1A Calculator Guide

AP Statistics - Mr. Levy

Instructions: These are the four calculator procedures you are responsible for in Unit 1A. Work through them with the calculator in your hand — reading the steps is not the same as doing them. Every keystroke you need is printed here.

Quiz: Friday, September 4.

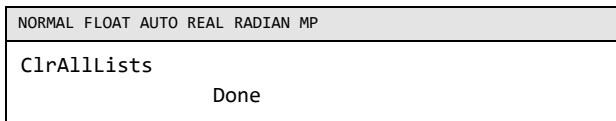
1. Start clean

Old numbers left in a list are the most common reason a correct procedure produces a wrong answer. Do this before every new problem.

- a) Open the memory menu. `mem` is the blue label printed above the `+` key.



- b) Choose **4: ClrAllLists** and press enter.



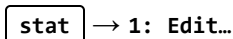
Every list is now empty. That is what you want.

*If L1 is missing from the editor entirely, press **stat**, choose **5: SetUpEditor**, then press enter. L1 through L6 come back.*

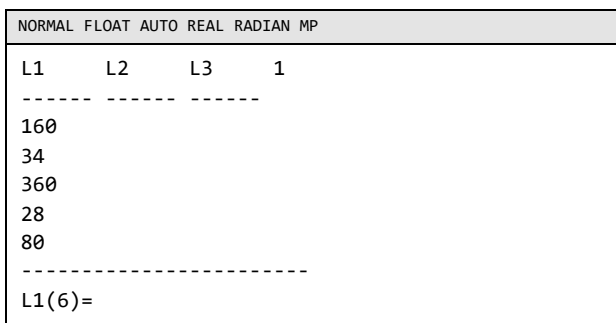
2. Put the data into L1

Every other procedure reads from L1, so this step has to be right.

- a) Open the list editor.



- b) With the cursor in the **L1** column, type the first value and press enter. The cursor drops down one row. Keep going until every value is in.



Five values in, cursor waiting on the sixth.

- c) When the last value is in, leave the editor. `quit` is printed above `mode`.



Fixing mistakes: to **correct** a value, arrow onto it, retype it, press enter. To **delete** a row, arrow onto it and press **del**. To **insert** a missing value, arrow to where it belongs and press **2nd del**, which is **ins**.

To empty only L1, arrow **up onto the L1 heading** and press **clear**, then press the down arrow. Do **not** press **del** while the heading is highlighted — that removes L1 from the editor rather than emptying it, and it looks like you have destroyed your list.

3. Sort a list with SortA(

SortA(means **sort ascending**: smallest to largest. It is how you check your typing, and how you find the median and quartiles by hand.

- a) Open the STAT menu and choose the sort.

stat → **2: SortA(**

- b) Name the list, close the parenthesis, and press enter. L1 is printed above the 1 key.

2nd **1** → **)** → **enter**

NORMAL	FLOAT	AUTO	REAL	RADIAN	MP
SortA(L1)					
Done					

Done is the whole confirmation. Nothing else happens on this screen.

- c) Go and look at the list. That is the entire point of sorting it.

stat → **1: Edit...**

There is no undo. **SortA(** rearranges the list permanently. If your data is **paired** — values in L1 with their frequencies in L2, or x in L1 with y in L2 — sorting L1 by itself scrambles the pairing and every answer after that is wrong. Sort them together instead: **SortA(L1,L2)**. L1 is sorted and L2 is carried along to match.

Run 1-Var Stats before you sort and again afterwards. **Nothing changes**. The mean, the standard deviation, the quartiles and the histogram are all identical. Sorting changes the order, not the distribution — the order data arrives in is not part of what you are describing.

4. Get summary statistics with 1-Var Stats

One command produces the mean, the standard deviation and the whole five-number summary.

- a) Open STAT, then move **right** to the CALC tab.

stat → **▶** → **1: 1-Var Stats**

- b) Set **List** to L1. Leave **FreqList** completely blank. Arrow down to **Calculate** and press enter.

2nd **1** → **Calculate** → **enter**

NORMAL	FLOAT	AUTO	REAL	RADIAN	MP
1-Var Stats					
List:L1					
FreqList:					
Calculate					

If anything is sitting in FreqList, clear it out first.

- c) Read the first screen.

NORMAL	FLOAT	AUTO	REAL	RADIAN	MP
1-Var Stats					
$\bar{x}=112.75$					
$\Sigma x=2255$					
$\Sigma x^2=458665$					
$Sx=103.7237602$					
$\sigma x=101.0974159$					
$n=20$					
$\downarrow \min X=0$					

The arrow on the last line means there is more below.

- d) Press the **down arrow** to reach the five-number summary. Most people forget this step and then say the calculator does not give quartiles.

NORMAL	FLOAT	AUTO	REAL	RADIAN	MP
$\uparrow n=20$					
$\min X=0$					
$Q_1=36$					
$\text{Med}=64.5$					
$Q_3=200$					
$\max X=360$					

Use **Sx**, not **σx** . **Sx** is the sample standard deviation, which is what this course wants whenever your data is a sample — effectively always. The two numbers are always close, which is exactly why choosing the wrong one is easy to miss. Look for the **S**.

The calculator does not display the **IQR** or the **range**. Compute them yourself from the second screen: **$IQR = Q_3 - Q_1$** and **$range = \max X - \min X$** .

5. Build a histogram

More steps than the others, and the one place things go wrong quietly. Follow them in order.

- a) Check for leftover equations. Press **y=**. If anything is typed on any line, put the cursor on that line and press **clear**. Skip this and a stray curve gets drawn across your histogram.

y= → **clear**

- b) Open **STAT PLOT**, printed above **y=**, and choose **Plot1**.

2nd **y=** → **1: Plot1**

- c) Highlight **On** and press enter. Arrow down to **Type** and move across to the **third icon on the top row**, which is the histogram. Press enter on it.

NORMAL	FLOAT	AUTO	REAL	RADIAN	MP
Plot1 Plot2 Plot3					
On Off					
Type: • • ■					
• • •					
Xlist:L1					
Freq:1					

Six icons, two rows of three. Histogram is top row, far right.

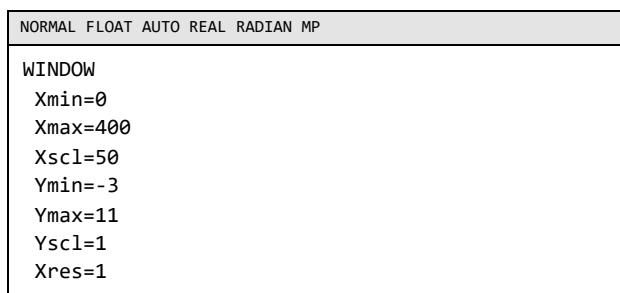
- d) Set **Xlist** to L1 and set **Freq** to the number **1**. Freq must be the digit 1, not a list, unless you were given a frequency table.

2nd **1** then Freq → **1**

- e) Let the calculator find a starting window. You will get a histogram, but with awkward bar widths. That is normal.

zoom → **9: ZoomStat**

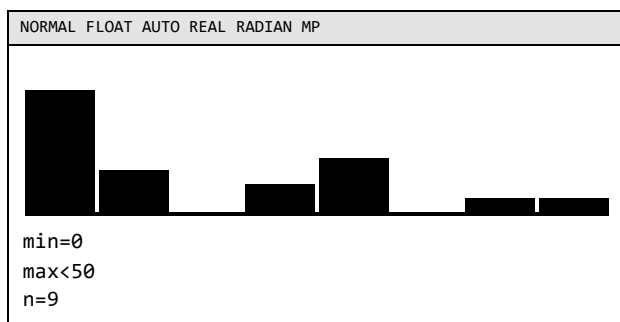
- f) Press window and set the numbers yourself. **Xscl is the bar width** — it is the setting that decides what your histogram looks like.



Ymax must exceed your tallest bar. Ymin goes slightly negative so the trace readout does not sit on top of the bars.

- g) Draw it, then trace it. Left and right step you from bar to bar, and each bar reports its interval and how many values fall in it.

graph → **trace** → **◀** **▶**



Nine values in the first bar.

Read that first bar as $0 \leq x < 50$. The left edge is included and the right edge belongs to the next bar — that is how a value of exactly 50 gets counted.

*Before you move on, go back into **window** and change **Xscl** to 100, then to 25, pressing **graph** each time. Same data, three genuinely different-looking pictures. Bar width is a choice you are making, and it changes the story the graph tells.*

Practice

Run the whole sequence start to finish on both sets. Write your answers down *before* you turn to the answer key.

6. Caffeine, in milligrams per serving, for twenty drinks. The same data we used in class.

160	34	360	28	80	210	0	75	200	41	205	22	300	47	150	54	200	5	46	38
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- a) Enter all twenty values into L1, then sort the list with **SortA(L1)**. Write the sorted list here.
- b) Run 1-Var Stats. Record the mean, S_x , and all five numbers of the five-number summary.
- c) Compute the IQR and the range by hand.
- d) Build a histogram with $X_{\min} = 0$, $X_{\max} = 400$, $X_{\text{scl}} = 50$. Trace it and record how many values fall in each bar.

Bar	0–50	50–100	100–150	150–200	200–250	250–300	300–350	350–400
Count								

- e) Describe the shape of the distribution. Is there one clump or two? Be ready to defend your answer out loud.

7. Hours of sleep for ten students. Smaller, and with decimals, so you get practice with the . key.

5	8	6.5	7	9	6	7.5	8	4	7
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- a) Clear L1 first, then enter these ten values and sort them.

- b) Find the mean, S_x , and the five-number summary.

- c) Find the IQR.

- d) With only ten values you can check the calculator by hand. Count in from each end to find the median and the quartiles yourself. Do they match what the calculator gave you?

If Something Goes Wrong

Every one of these has happened to every student in the class. None of them means your calculator is broken.

What you see	What it means, and how to fix it
ERR: INVALID DIM	A stat plot is switched on but points at a list that is empty or misnamed. Press 2nd y= , choose 4: PlotsOff , then set Plot1 up again from step 5b.
ERR: DIM MISMATCH	Two lists of different lengths are being used together. Usually Freq is set to a list instead of the number 1. Set Freq back to 1.
ERR: SYNTAX	Almost always the wrong minus sign. (-) beside enter makes a number negative; the tall - on the right is subtraction. They are not interchangeable. Also check for a missing closing parenthesis.
A curve or line drawn across the histogram	An equation has been left in y= . Go there and press clear on every line.
Blank graph, or bars off the screen	The window does not match the data. Press zoom , choose 9: ZoomStat to get back to something sensible, then reset Xscl.
L1 is not in the editor	You pressed del on the list heading. Press stat , choose 5: SetUpEditor , press enter.
Every statistic is wrong	Old data is still in the list, or there are more values than you think. Check n on the 1-Var Stats screen. If n is not what you expected, that is your answer. Clear the lists and start over.
Answers appear as fractions	The calculator is in a different answer mode. Press mode and set the answer row to DEC , with NORMAL and FLOAT selected above it.

*Written for the TI-84 Plus CE. Older TI-84 and TI-83 Plus models use the same keys; a few menus look slightly different, and 1-Var Stats may require you to type **1-Var Stats L1** on the home screen rather than filling in a form.*

Unit 1A Calculator Guide — Answer Key

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How to use this: check your own written answers against these before you decide you have the procedure down. If a number is off, the italic note under each answer names the mistake that usually produces it.

6. Caffeine, twenty drinks

a) Sorted list:

0 5 22 28 34 38 41 46 47 54 75 80 150 160 200 200 205 210 300 360

b) and c)

$\bar{x}$ (mean)	112.75	minX	0
S_x	103.7237602	Q_1	36
σ_x (<i>not this one</i>)	101.0974159	Med	64.5
n	20	Q_3	200
IQR = 200 – 36	164	maxX	360
Range = 360 – 0	360		

*Rounded to two decimals, S_x is **103.72**. If you wrote 101.10 you read σ_x off the screen instead of S_x .*

d) Histogram counts at Xscl = 50:

Bar	0–50	50–100	100–150	150–200	200–250	250–300	300–350	350–400
Count	9	3	0	2	4	0	1	1

The counts must total 20. If yours do not, you have a typo in L1 — sort it and compare against part (a).

e) Two clumps, not one — the distribution is bimodal. Sodas and teas pile up below 100 mg, then coffee and energy drinks cluster again around 200 mg, with almost nothing in between.

*This is the reason the mean of 112.75 is a poor summary: **no drink on the list is anywhere near 112.75 mg**. Neither is the median of 64.5. A single number cannot describe a distribution with two separate peaks — which is why you graph the data before you trust any statistic that claims to summarise it.*

7. Hours of sleep, ten students

a) Sorted list:

4 5 6 6.5 7 7 7.5 8 8 9

b) and c)

$\bar{x}$ (mean)	6.8	minX	4
S_x	1.494434118	Q_1	6
σ_x (not this one)	1.417744688	Med	7
n	10	Q_3	8
$IQR = 8 - 6$	2	maxX	9

d) Ten values, so the median sits between the 5th and the 6th. Both are 7, so **Med = 7**. The bottom half is 4, 5, 6, 6.5, 7, whose middle value is **$Q_1 = 6$** . The top half is 7, 7.5, 8, 8, 9, whose middle value is **$Q_3 = 8$** . These are the same answers the calculator gave.

If your quartiles came out as 6.5 and 7.75, you used a method that averages across the median. This calculator, and this course, split the sorted list in half and take the median of each half — with n even, no value is left out.