TI-83 PLUS FOR MAT 120

Clearing data

Before beginning a new statistics problem, be sure that you have cleared out the data from previous problems.

The TI-83 Plus uses lists (L_1, L_2, etc.) for entering statistical data. This worksheet will only use L_1 and L_2. Before beginning each new problem, clear these two lists by using the keys and menu selections below. Throughout this worksheet, be sure to use the comma key whenever you see a comma in the bolded instructions.

STAT **1:Edit** Position the cursor on the heading for L_1. Press **CLEAR** **ENTER.** L_1 should now be cleared. Repeat the process for L_2 by positioning the cursor on the heading for L_2 and pressing **CLEAR** **ENTER**.

....

Using the 1-Var Stats function to find the mean, standard deviation, and median for single variable data.

This function on the calculator finds the *mean*, *standard deviation*, and *median*. It can be used for a group of individual data items or for a frequency table.

Example 1

5, 12, 11, 4, 8, 3, 7

Find the **mean**, **sample standard deviation**, **population standard deviation**, and the **median** for this data set.

Since we have only individual data items, we will enter them into L_1 using the keystrokes and menu items listed below:

STAT **1:Edit**

Put your cursor in the column for L_1. Type in the first data item followed by the ENTER key. Continue until each data item has been entered into the list.

5 ENTER 12 ENTER 11 ENTER 4 ENTER 8 ENTER
3 ENTER 7 ENTER

Now that the data is entered, you can find the mean, standard deviation, and median by selecting

STAT CALC 1:1-Var Stats 2nd L_1 ENTER.

On you screen, you will see these items. The ones bolded on this worksheet are the ones that you will be interested in.

$\overline{X}$ = 7.142857143 — $\overline{X}$ is the mean.
$\Sigma x = 50$
$\Sigma x^2 = 428$
Sx = 3.436498772 — Sx is the sample standard deviation.
σx = 3.181579636 — σx is the population standard deviation.
↓n = 7 — n is the total number of data items.

Use your down arrow ➔ to see these additional items:

minx = 3
$Q_1 = 4$
Med = 7 — Med is the median.
$Q_3 = 11$
maxX = 12

> ∗ Helpful hints∗
>
> Variance can be found by squaring the standard deviation.
>
> To find the sample variance, type in **3.436498772** (the sample standard deviation) and press the **X^2** and **ENTER** keys. The sample variance is **11.80952381**.
>
> To find the population variance, type in **3.181579636** (the population standard deviation) and press the **X^2** and **ENTER** keys. The population variance is **10.12244898**.
>
> ....
>
> Q_1 is the 1st quartile, and Q_3 is the 3rd quartile.
>
> The smallest data item is minX, and the largest data item is maxX.

Example 2

Classes	Midpoint	Frequency
50-54	52	4
55-59	57	25
60-64	62	12
65-69	67	10
70-74	72	3

Find the **mean**, **sample standard deviation**, **population standard deviation**, and the **median** for this frequency distribution.

> ∗ Helpful hint∗
> Begin by clearing the data used in the previous problem. If you do not remember how, refer to **Clearing data** at the beginning of this worksheet.

Finding the mean, standard deviation, and median for this problem is similar to the process used in the previous problem. The midpoints are considered to be data and will, therefore, be entered into L_1. The frequencies will be entered into L_2.

Be sure that your cursor is in the column for L_1 at this point. Type in each midpoint, followed by the ENTER key.

52 ENTER 57 ENTER 62 ENTER 67 ENTER 72 ENTER

Use the right cursor arrow ➔ to move to L_2. Type in each frequency, followed by the ENTER key.

4 ENTER 25 ENTER 12 ENTER 10 ENTER 3 ENTER

Now that the data is entered, you can find the mean, standard deviation, and median by selecting

STAT CALC 1:1-Var Stats 2nd L_1 , 2nd L_2 ENTER.

Watch for commas!

On you screen, you will see these items. Remember to use your down arrow ↓ to see last five items.

$\bar{X}$ = 60.42592593 — $\bar{X}$ is the mean.
Σx = 3263
Σx^2 = 198611
Sx = 5.214645023 — Sx is the sample standard deviation.
σx = 5.166135642 — σx is the population standard deviation.
↓n = 54 — n is the total frequency.

minx = 52
Q_1 = 57
Med = 57 — Med is the median.
Q_3 = 62
maxX = 72

> ∗ Helpful hint∗
> As in the previous problem, variance can be found by squaring the standard deviation.
>
> To find the sample variance, square the sample standard deviation. The sample variance is **27.19252272**.
>
> To find the population variance, square the population standard deviation. The population variance is **26.68895747**.

Drawing a histogram on the calculator

If you have done any graphing on the calculator, there may be old graphs still in the calculator. You will want to take the following steps to eliminate any old graphs that may be lurking about.

Press **Y=**. Delete any equations there by pressing **CLEAR** when the cursor is positioned on the equation. This will eliminate algebraic graphs.

Select **2nd DRAW 1:ClrDraw ENTER** "Done" should appear on the screen. This will clear drawings.

Now we will tell the calculator to draw the histogram for the frequency distribution in Example 2.

Under the **Window** key, use these values to set up the viewing window

Xmin=52	Xmin is the smallest midpoint.
Xmax=77	Xmax is the largest midpoint plus the class width
Xscl=5	Xscl is the class width
Ymin=0	Ymin should be zero.
Ymax=30	Ymax should be just a little larger than the largest frequency.
Yscl=5	Use an appropriate value for Yscl.
Xres=1	Xres should always be 1.

> ∗Helpful hint∗
> These values are appropriate for the histogram for the frequency distribution in Example 2. When drawing histograms for a different frequency distribution, you will need to use values appropriate to that distribution.

Use these steps to tell the calculator what kind of graph you want to see.

Press **2^{nd}** **STAT PLOT** (Same key as Y=) Be sure that items 2, 3, and 4 on this menu are **Off**.
Select **1:Plot 1** from the menu.

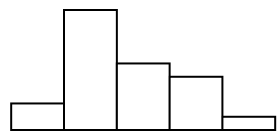
Select the items that are highlighted
ON Off

TYPE:  Select this one. It is the histogram.

Xlist: **L_1** You must type in the lists that you want for both of these if they are not already there.
Freq: **L_2** To get L_1, press **2nd** **L_1**. To get L_2, press **2nd** **L_2**.

Press **GRAPH** key to see the histogram.

On the screen, you should see this histogram.



Using the LinReg (ax + b) function to find the correlation coefficient and the regression line

Example 3

X	**5**	**6**	**8**	**9**	**10**
Y	**14**	**11**	**9**	**7**	**6**

Find the **linear correlation coefficient** and the equation for the regression line for the data on this table. The *regression line* may also be called the *least squares line* or the *line that best fits the data*.

The default for the TI-83 Plus calculator is for the correlation coefficient (the r value) not to appear automatically when you calculate linear regression. You can change this by pressing **2^{nd}** **CATALOG**. Then cursor down the menu until you see DiagnosticOn. Select **DiagnosticOn** and press **ENTER**. "Done" on the screen means that the r value will automatically appear on the screen whenever you calculate linear regression. This procedure does not have to be redone unless you reset the memory on the calculator.

For linear regression, the x values will be entered into L_1. The y values will be entered into L_2. Don't forget to clear out the data from the previous problem from both lists before entering the data from this problem.

Be sure that your cursor is in the column for L_1 at this point. Type in each X, followed by the ENTER key.

5 ENTER 6 ENTER 8 ENTER 9 ENTER 10 ENTER

Use the right cursor arrow ➔ to move to L_2. Type in each Y, followed by the ENTER key.

14 ENTER 11 ENTER 9 ENTER 7 ENTER 6 ENTER

Now that the data is entered, you can find the linear correlation coefficient and the information needed for the regression line by selecting

STAT CALC 4:LinReg (ax + b) 2^{nd} L_1 , 2^{nd} L_2 ENTER.

Your screen will show the following
y= ax + b
a = -1.523255814
b = 20.97674419
r^2 = .9686723865
r = -.9842115558

a = the slope of the regression line
b = the y-intercept

The equation for the line is y = -1.523x + 20.977.

r, the linear correlation coefficient = -.984

Example 4
For the table of data in Example 3, estimate y when x = 7.

Recall that the equation for the regression line in Example 3 was **y = -1.523x + 20.977**. Replace x in the equation with 7 and solve for y.

$$y = -1.523(7) + 20.977$$
$$Y = 10.316$$

For the given table of data, when x = 7, **y = 10.316.**

Drawing a scatter plot on the calculator

You will want to be certain that you don't have any previous graphs still in the calculator. They can be eliminated using the same steps that were used before drawing the histogram. To eliminate algebraic graphs, press **Y=**. Delete equations there by pressing **CLEAR** when the cursor is positioned on the equation. To eliminate any drawings, select **2nd** **DRAW** **1:ClrDraw** **ENTER** .

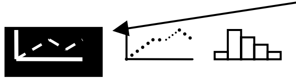
Under the **Window** key, use these values to set up the viewing window

Xmin=0
Xmax=12
Xscl=1
Ymin=0
Ymax=15
Yscl=1
Xres=1

∗Helpful hint∗
The range for x should include the x values in the problem. The range for y should include the y values from the problem. The values listed here are appropriate for the scatter plot for the data in Example 3. When drawing scatter plots of different data, you will need to use values appropriate to that data.

Press **2nd** **STAT PLOT** (Same key as Y=) Be sure that items 2, 3, and 4 on this menu are **Off**.
Select **1:Plot 1** from the menu.

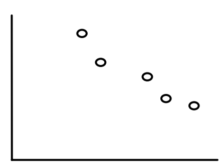
Select the items that are highlighted
ON Off — Select this one. It is the scatter plot.

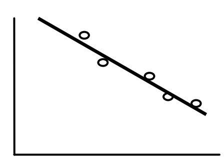
TYPE: 

Xlist: **L_1**
Ylist: **L_2**
You must type in the lists that you want for both of these if they are not already there. To get L1, press **2nd** **L_1**. To get L2, press **2nd** **L_2**.

Press **GRAPH** key to see the scatter plot.

On the screen, you should see this diagram.





To have the calculator draw the regression line on the scatter plot, press
Y = **VARS** **5:Statistics** **EQ** **1:RegEQ**.
Press **GRAPH** again to see the scatter plot with the line superimposed on it.

Using the factorial, permutation, and combination functions

Example 5
Calculate 6!.

6! is read as **six factorial**. It is the product of (6)(5)(4)(3)(2)(1). The calculator has a special key that allows you to find the factorial for any whole number up through 69.

To let the calculator perform this calculation for you, type **6**. Then select **MATH** **PRB** **4:!** **ENTER**. The answer is **720**.

Permutations and combinations are methods of calculating the number of ways in which something can be done.

Permutations–order matters
One commonly used clue for this type of calculation is that you are looking for how many **arrangements** that can be made. A notation commonly used for permutations is $_n\mathbf{P}_r$. The total number of available items is **n**. The number of items being arranged at one time is **r**.

Combinations–order does not matter
One common clue for combinations is that you are looking for how many **different groups** that can be made. A commonly used notation is $_n\mathbf{C}_r$. The total number of available items is **n**. The number of items being put into a group at one time is **r**.

Example 6
a. If I have 10 pictures, how many different **arrangements** can I make using 4 pictures at a time?
b. If I have 25 pictures, how many different **arrangements** can I make using 6 pictures at a time?

a. To calculate $_{10}P_4$, for 10 pictures arranged 4 at the time, use the following keystrokes

10 MATH PRB 2:$_n$P$_r$ 4 ENTER. The answer is **5040**.

b. To calculate $_{25}P_6$, for 25 pictures arranged 6 at the time, use the following keystrokes

25 MATH PRB 2:$_n$P$_r$ 6 ENTER. The answer is **127,512,000**.

Example 7
If I have 25 pictures, how many **different groups** can I make using 6 pictures at a time?

To calculate $_{25}C_6$, for 25 pictures grouped 6 at the time, use the following keystrokes

25 MATH PRB 3:$_n$C$_r$ 6 ENTER. The answer is **177,100**.

Using the normalcdf and invNorm functions

These two functions can be used on data that is normally distributed. That means that the data fits the normal or bell curve.

Normalcdf finds a probability that can be represented by a shaded area on a normal curve. To use this function, there is a specific order in which you must enter information into the calculator.

Normalcdf(lower bound, upper bound, μ, σ)

- lower bound: Point at which the shading starts (left boundary)
- upper bound: Point at which the shading ends (right boundary)
- μ: Population mean
- σ: Population standard deviation

∗Helpful hints∗
Use -1E99 when lower bound is $-\infty$.

Use 1E99 when upper bound is $+\infty$

If you don't specify μ and σ, the calculator defaults to $\mu = 0$ and $\sigma = 1$.

If the Central Limit Theorem applies to the problem, use the value of $\frac{\sigma}{\sqrt{n}}$ for σ.

Example 8
Find the shaded area for this normal curve. Use $\mu = 50$ and $\sigma = 5.4$.

Use the keystrokes below to find the shaded area. Don't forget the commas.

2nd DISTR 2:normalcdf(42 , 55 , 50 , 5.4)

Answer is **.7535185948**.

InvNorm calculates a percentile, raw score, data item, or cutoff value for normally distributed data. To use this function, there is a specific order in which you must enter information into the calculator.

invNorm(left area, μ, σ)

left area	μ	σ
For this area, always use the percentage that is considered to be the bottom. Never use the top percentage.	Population mean	Population standard deviation

> ∗Helpful hint∗
> If you don't specify μ and σ, the calculator defaults to $\mu = 0$ and $\sigma = 1$.

Example 9
For a normal distribution with $\mu = 50$ and $\sigma = 5.4$, find the raw score that separates the bottom 15% from the top 85% of the scores.

Use the keystrokes below to find the raw score. Don't forget the commas.

2nd DISTR 3:invNorm(.15 , 50 , 5.4)

Answer is **44.40325975**.

Other useful functions

Press **STAT** **TESTS**, and look at the menu items located there. The ones that you are most likely to be able to use in MAT 120 are listed on the table below.

Menu item	When to use it
1:Z-Test	When testing a claim about a single mean
3:2-SampZTest	When testing a claim which compares the means for two groups
5:1-PropZTest	When testing a claim about a proportion or a percentage
7:ZInterval	When constructing a confidence interval with a large sample group ($n \geq 30$)
8:TInterval	When constructing a confidence interval with a small sample group ($n < 30$)

Downloaded program

To calculate probabilities for problems involving binomials, there is a program that can be downloaded to your calculator. It is the **BINOMIAL** program. Teachers who plan to use the program will download it to their students.