

Line of Best Fit Classwork

Practice Activity #1

Linear Regression Line --- a best fitting line for a certain group of data that have been plotted. This allows you to make predictions about where other points would most likely fall.

Example: Below is a table of asteroid names, their average distances from the sun (in millions of miles), and their orbital periods (the time it takes them, in years, to revolve around the sun).

Question 1: About how long would it take an asteroid that is 230 million miles from the sun to make 1 revolution?

Question 2: If an asteroid was discovered, and astronomers knew that its orbital period was almost exactly 4 years, about how far would you predict this asteroid to be from the sun?

Asteroid Name	Average Distance from the Sun	Orbital Period
Ceres	257.0	4.60
Pallas	257.4	4.61
Juno	247.8	4.36
Vesta	219.3	3.63
Astraea	239.3	4.14
Hebe	225.2	3.78
Iris	221.4	3.68
Flora	204.4	3.27
Metis	221.7	3.69
Hygeia	222.6	5.59

1. Make a scatterplot of the table above on your graphing calculator.
2. Graph the Linear Regression Equation in the form $y = mx + b$

Answer to Question #1 above: It takes about _____ years for an asteroid that is 230 million miles from the sun to make one revolution.

Answer to Question #2 above: An asteroid that has an orbital period of 4 years could be predicted to be about _____ miles from the sun.

Instructions for Creating a Scatterplot and Linear Regression Line on the TI - 83 Calculator

1. Let's begin solving the asteroid problem given above by entering our data points into 2 lists in the calculator. The lists are found under the STAT key.
2. To enter or edit data points, which is what we want to do, you must use the EDIT menu.

3. So, hit STAT, then the EDIT menu, then edit again. Enter the values for the asteroids' distances into the first list, which the calculator creatively calls L1. Enter the asteroids' orbital periods into the second list, L2.
4. To plot these data points on a graph, we must create a stat plot; this key is located above the Y= key, just below the screen on the far left. Hit the STAT PLOT key.
5. Now, you must choose Plot 1 by turning it dark, or selecting it, by moving the cursor on top of it (use the arrow keys). Now, hit ENTER; now that you're inside the Plot 1 area, turn it on by selecting ON, then hit ENTER.
6. Select the first graph to draw, let the Xlist be L1 and let the Ylist be L2. The bottom line inside here lets you choose what kind of marks you want on your graph: dots, little plus signs, or little squares. Select whichever one you like best. We are now ready to graph!
7. In order to see your points on the graph, we must set the window up accordingly. Hit the WINDOW key. Our lowest X value (smallest distance) in L1 is 204.4 , so let's let Xmin = 200. Our largest X value is 257.4 , so let Xmax = 260. Since the difference between Xmax and Xmin is 60 , let the Xscl = 10. That way, our x-axis will show 6 marks each 10 units apart. Similarly, let Ymin = 3, Ymax = 6, and Yscl = 1.
8. Now graph the scatterplot by hitting GRAPH.

***If you don't see your scatterplot, here are a couple of possible reasons why:

- a. If your calculator says, ERR: DIM Mismatch, check your 2 lists to see if you have the same number of elements in each list (you may not). Do this using STAT , EDIT, edit.
 - b. If nothing appears on your graph, you may not have turned Plot 1 on. Do STAT PLOT, then turn Plot 1 on. Now, hit GRAPH again.
 - c. Your Window is not set up as you thought it was. Hit WINDOW and check it.
9. It's time to get the linear regression line to go through the scatterplot. Hit STAT, go to the CALC menu, then choice #4, LinReg(ax + b). This will take you to the home screen, showing you LinReg (ax+b). Hit ENTER, and values for a and b will be given.

You should get:

$$a = .0196$$

$$b = -.3963$$

You can write these values down and then go into the Y= menu, then manually type in $y = .0196x - .3963$

OR, you can import these values, letting the calculator copy them in for you. To do this, hit the $y=$ key. (Clear out any equations currently in here.) Put the cursor to the right of $Y1 =$. Let's find the linear regression equation and put it here.

Hit the VARS key located just below the down arrow key. Go to #5, statistics, and enter this. See the new menu at the top? The regression equation is under the EQ menu, so select EQ using the right arrow key. Now, choice #1 is RegEQ... select this one, then hit ENTER. Your regression equation should have been copied into the $Y1 =$ section of the calculator, and it should be in the form $y = ax + b$. Now, hit GRAPH, and you should see the line of regression cut through the scatterplot.

YOU DID IT!!!

10. You can now hit the TRACE key to answer Question 1 about how many years it takes an asteroid to make one revolution, given its distance. Simply hit TRACE, hold down the right arrow key until the x -value at the bottom of the screen is around 230, and record the corresponding y - value. To answer Question 2, get the y - value to be near 4, and record the corresponding x - value to predict the distance.

*NOTE: When doing the next problem, you can use L1 and L2 again, or L3 and L4 if you want to keep the previous data in L1 and L2. If you use L3 and L4, you must remember to turn Plot 1 off (since it is using L1 and L2) and turn Plot 2 on, using L3 and L4 inside of Plot 2. Also, don't forget to change the window, or range, for the new problem, or you probably won't see your scatterplot when you hit GRAPH.

Practice Activity #1

Student Number	High School GPA	Freshmen College GPA
1	2.00	1.60
2	2.25	2.00
3	2.60	1.80
4	2.65	2.80
5	2.80	2.10
6	3.10	2.00
7	2.90	2.65
8	3.25	2.25
9	3.30	2.60
10	3.60	3.00
11	3.25	3.10

Let High School GPA be your x values (List 1) and College GPAs be your y values (List 2).

1. Make a scatterplot of the data. (You may need to clear your old statistics and your old graph: CLRSTAT and CLRDRAW)

2. Find the Regression Equation in the form $y = mx + b$

3. Graph the Regression Equation on your scatterplot to make sure it looks like the best - fitting line.

4. a.) If you earn a 3.80 GPA in high school, predict what you would get in college for your Freshman year. Freshman year GPA would be _____.

b.) If a freshman in college got a 3.60 GPA, what would she have got for her high school GPA? High School GPA would have been _____.