4.5 Analyzing Lines of Fit

Enter Data into the Calculator	To see the Scatter Plot	To Find the Equation of the line y = mx + b	To See the Line of Best Fir on the Scatter Plot	To Find the Correlation Coefficient (r-value)
1) Stat 2) Edit 3) Data for the x – values go in list 1 and the y-values go in list 2  *** If there is data already in the list, go up to L1 & L2 and hit clear NOT DELETE!***	1) 2nd y = 2) Plot 1 ENTER 3) ON ENTER 4) Window or Zoom 9 5) Graph You must tell the calculator how to number the x- & y-axes 	1) STAT 2) CALC 3) 4 LINREG 4) Calculate Write this equation down on paper in the form y = mx + b ** round to 3 places if necessary 	1) y = 2) VARS 3) 5 Statistics 4) EQ 5) 1 RegEQ 6) Zoom 9 	1) STAT 2) CALC 3) 4 LINREG 4) Calculate If it is missing then: 1) 2nd 0 2) Diagnostics ON ENTER 3) Repeat Steps 1 – 4 above 

Calculator steps:

☆ Enter data on on graphing calculator:

STAT, EDIT

Type data into L1 (x's) and L2 (y's)

☆ To see the data on a scatterplot:

you must turn a stat plot on: 2nd, y= (turn plot ON)

you must set the window (you are telling the calculator how to number the x and y axes) Zoom: 9

Graph

☆ To have calculator find the equation for the line of best fit: STAT - CALC - 4) linear regression - enter

Enter equation in y = (when you graph now, you should see the scatter plot along with the line of best fit)

Nov 1-10:14 AM

4.5 Analyzing Lines of Fit Both Days All in One with Class Example with work

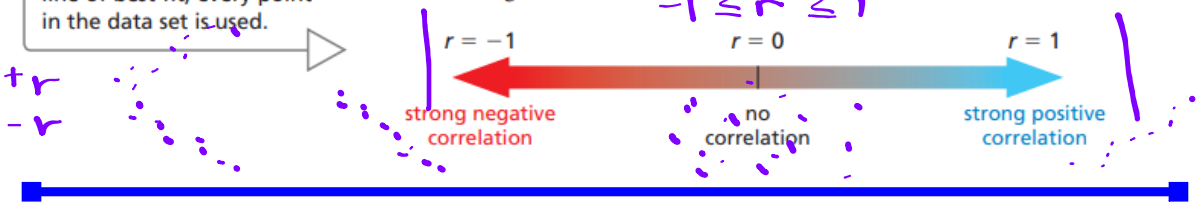
Finding Lines of Best Fit LINREG

STUDY TIP

You know how to use two points to find an equation of a line of fit. When finding an equation of the line of best fit, every point in the data set is used.

Graphing calculators use a method called **linear regression** to find a precise line of fit called a **line of best fit**. This line best models a set of data. A calculator often gives a value r, called the **correlation coefficient**. This value tells whether the correlation is positive or negative and how closely the equation models the data. Values of r range from -1 to 1. When r is close to 1 or -1, there is a strong correlation between the variables. As r, gets closer to 0, the correlation becomes weaker.

$-1 \le r \le 1$



+r
−r

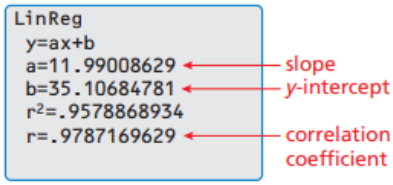
Correlation coefficient:

Stat - Calc - 4) LinReg - Calculate

- scroll down to find "r" value

2nd 0 Catalog - Diagnostics ON

- will put r on your calculator

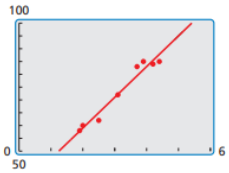


Nov 1-10:44 AM

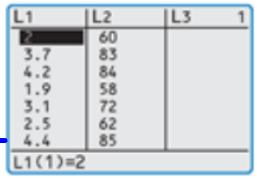
Using a graph or its equation to *approximate* a value between two known values is called **interpolation**. Using a graph or its equation to *predict* a value outside the range of known values is called **extrapolation**. In general, the farther removed a value is from the known values, the less confidence you can have in the accuracy of the prediction.

extrapolation ← values → interpolating → extrapolation

Step 3 Enter the equation $y = 12.0x + 35$ into the calculator. Then plot the data and graph the equation in the same viewing window.



Predicting within the data is interpolation



L1	L2	L3 1
2	60	
3.7	83	
4.2	84	
1.9	58	
3.1	72	
2.5	62	
4.4	85	

L1(1)=2

(2.5, _____)

(_____, 80 min)

Predicting outside the data is extrapolation

(_____, 90 min)

(6, _____)

Nov 1-10:50 AM

4.5 Analyzing Lines of Fit Both Days All in One with Class Example with work

Example 1:

The table shows the total numbers y of people who reported an earthquake x minutes after it ended.

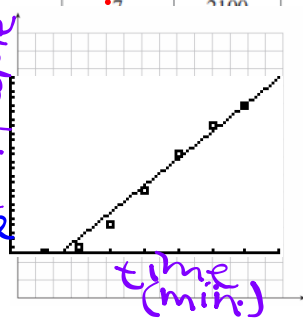
Minutes, x	People, y
1	10
2	100
3	400
4	900
5	1400
6	1800

a) Using a graphing calculator to find the equation of the line of best fit. Then plot the data and graph the equation on the same graph.

LinReg
y=ax+b
a=381.0714286
b=-565.7142857

$y = 381.071x - 565.714$

$-1 \le r \le 1$



b) Identify and interpret the correlation coefficient.

LinReg
y=ax+b
a=381.0714286
b=-565.7142857
r²=.9778615503
r=.98888688236

$r = 0.989$ → mean. positive strong relationship

c) Interpret the slope and y-intercept of the line of best fit. $m = 381.071$

≈ 381 people / minute

extrapolation

- # of people has no meaning in this scenario.

d) Predict the number of people to report an earthquake 15 minutes after it ended. $x = 15$ $? = y$

$f(15) = 381.071(15) - 565.714$

≈ 5150.351

381.071(15)-565
5150.351

5,150 people

e) How do you know if this prediction is reliable? test on graph

Dec 16-2:23 PM

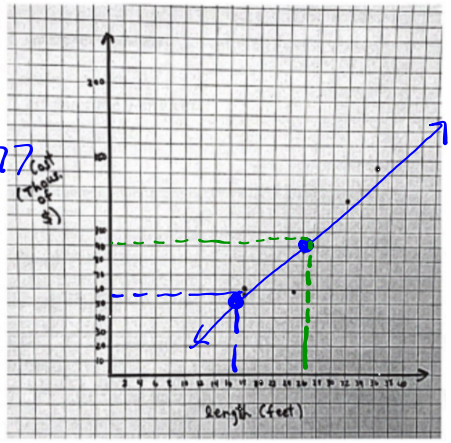
In-class example problem from the worksheet packet: The table shows the lengths x and cost y of several sailboats.

a. Draw a scatter plot of the data *(this has already been done for you in order to save time in class.)*

Length (feet) x	Cost (thousands of dollars) y
27	94
18	56
25	58
32	123
18	60
26	87
36	145

LinReg
y=ax+b
a=4.872180451
b=-37.67669173
r²=.8755332591
r=.9356993423

$y = 4.872x - 37.677$



b. Draw your line of best fit and find two points on your line.

(16, 50) and (26, 90)

c. Use these points to find the equation of your line in slope-intercept form (like you've been doing all chapter.)

$(x_1, y_1) = (16, 50)$ & $(x_2, y_2) = (26, 90)$

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{90-50}{26-16} = \frac{40}{10} = \boxed{4}$$

point-slope: $y - y_1 = m(x - x_1)$

$y - 50 = 4(x - 16)$

$y - 50 = 4x - 64$

$+50 \quad +50$

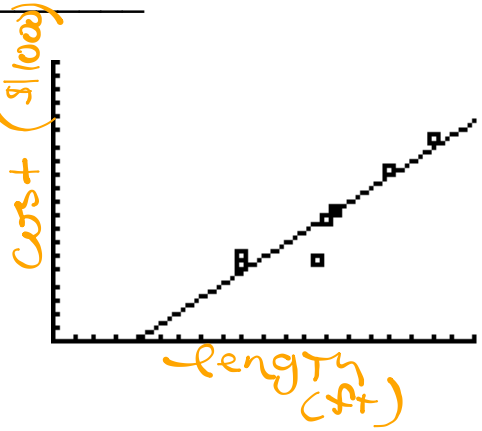
$\boxed{y = 4x - 14}$

d. Use the graphing calculator (if you have one) to find an equation of the line of best fit. Then plot the data and graph the equation in the same viewing window.

Equation: $y = 4.872x - 37.677$

LinReg
y=ax+b
a=4.872180451
b=-37.67669173
r²=.8755332591
r=.9356993423

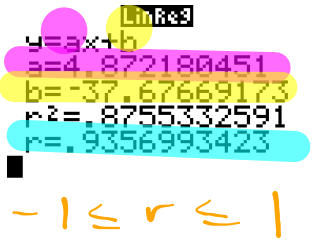
WINDOW
Xmin=0
Xmax=40
Xscl=2
Ymin=0
Ymax=200
Yscl=10
↓Xres=1



e. Find and interpret the correlation coefficient. (If you do not have a graphing calculator, just explain in a copmlete sentence how well you feel your line fits the data and why you think so.)

Correlation coefficient: $r = 0.936$

Interpret: Strong positive relationship



$-1 \le r \le 1$

f. Interpret the slope: $m = 4.872$ $\frac{\$}{ft}$

For every \$4.872, you gain 1 ft. in length.

Interpret the y-intercept: $b = -37.677$.

this # has no meaning in this scenario

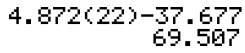
g. Use the equation to predict the cost of a sailboard that is 22 feet long.

$x = 22$ $y = ?$ $y = 4.872x - 37.677$

$f(22) = ?$

$= 4.872(22) - 37.677$

≈ 69.507



A 22 ft sailboat costs \$69,507.

Now finish the rest of this worksheet packet as your homework. If you have questions do not hesitate to ask me.

It is only two more problems like we just did together. Use what we just did to remind yourself of what you should do for each problem. USE PROPER NOTATION.