

Class Activity

Line of Best Fit

A **line of best fit** (or "trend" line) is a straight line that best represents the data on a scatter plot. This line may pass through some of the points, none of the points, or all of the points.

You can examine lines of best fit with:

1. paper and pencil only,
2. a combination of graphing calculator and paper and pencil,
3. or solely with the graphing calculator.

Example: Is there a relationship between the fat grams and the total calories in fast food?

Sandwich	Total Fat (g)	Total Calories
Hamburger	9	260
Cheeseburger	13	320
Quarter Pounder	21	420
Quarter Pounder with Cheese	30	530
Big Mac	31	560
Arch Sandwich Special	31	550
Arch Special with Bacon	34	590

Crispy Chicken	25	500
Fish Fillet	28	560
Grilled Chicken	20	440
Grilled Chicken Light	5	300

Graphing Calculator Solution:

Can we predict the number of total calories based upon the total fat grams?

1. Enter the data in the calculator lists. Place the data in **L₁** and **L₂**.

STAT, #1Edit, type values into the lists

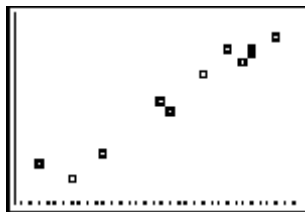
L1	L2	L3	3
9	260		
13	320		
21	420		
30	530		
31	560		
31	550		
34	590		

L3(1)=

2. Prepare a scatter plot of the data. Set up for the scatterplot.

2nd StatPlot - choices shown at right.

Choose **ZOOM #9 ZoomStat**. Graph shown below.



Plot2	Plot3
Off	
Type: <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Xlist: L1	
Ylist: L2	
Mark: <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

3. Have the calculator determine the line of best fit.

STAT → **CALC** #4 **LinReg(ax+b)**

Include the parameters **L₁**, **L₂**, **Y₁**.

(**Y₁** comes from **VARS** → **YVARS**, #Function, **Y₁**)

```
LinReg(ax+b) L1,
L2, Y1
```

You now have the values of *a* and *b* needed to write the equation of the **line of best fit**. See values at the right.

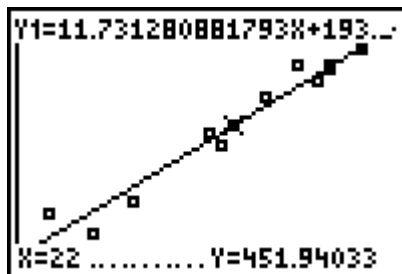
$$y = 11.73128088x + 193.8521475$$

```
EDIT TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7:QuartReg
```

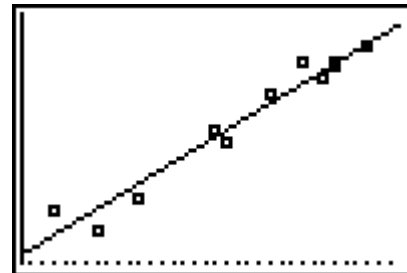
```
LinReg
y=ax+b
a=11.73128088
b=193.8521475
r^2=.9498583012
r=.9746067418
```

4. Graph the line of best fit. Simply hit **GRAPH**.

To get a predicted value **within the window**, hit **TRACE**, up arrow, and type the desired value.



The screen above shows $x = 22$.



Question: Predict the total calories based upon 22 grams of fat.

ANS: 451.940 calories

Compare this answer with the answer we got by hand.

32 A nutritionist collected information about different brands of beef hot dogs. She made a table showing the number of Calories and the amount of sodium in each hot dog.

Calories per Beef Hot Dog	Milligrams of Sodium per Beef Hot Dog
186	495
181	477
176	425
149	322
184	482
190	587
158	370
139	322

a) Write the correlation coefficient (**the notation used in the calculator is r**) for the line of best fit. Round your answer to the **nearest hundredth**.

b) Explain what the correlation coefficient suggests in the context of this problem.

It suggests a strong correlation.

What? _____

Why? _____

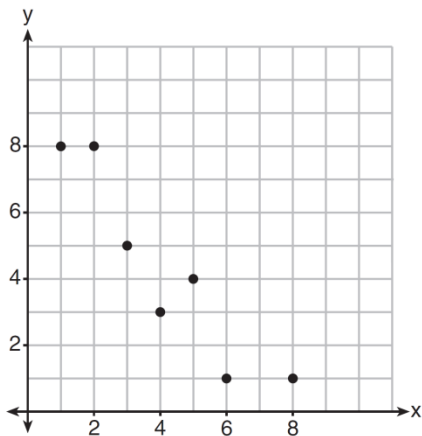
Expanded sentence:

c) State the linear regression equation (line of best fit) with the coefficient and base rounded to the nearest hundredth...

d) Using the written regression equation, estimate the milligrams of sodium per beef hot dog for a hot dog with 400 calories.

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11. What is the correlation coefficient of the linear fit of the data shown below, to the *nearest hundredth*?



- 1) 1.00
- 2) 0.93
- 3) -0.93
- 4) -1.00

15. The table below represents the function F .

x	3	4	6	7	8
$F(x)$	9	17	65	129	257

The equation that represents this function is

- 1) $F(x) = 3^x$
- 2) $F(x) = 3x$
- 3) $F(x) = 2^x + 1$
- 4) $F(x) = 2x + 3$

21. The table below shows the number of grams of carbohydrates, x , and the number of Calories, y , of six different foods.

Carbohydrates (x)	Calories (y)
8	120
9.5	138
10	147
6	88
7	108
4	62

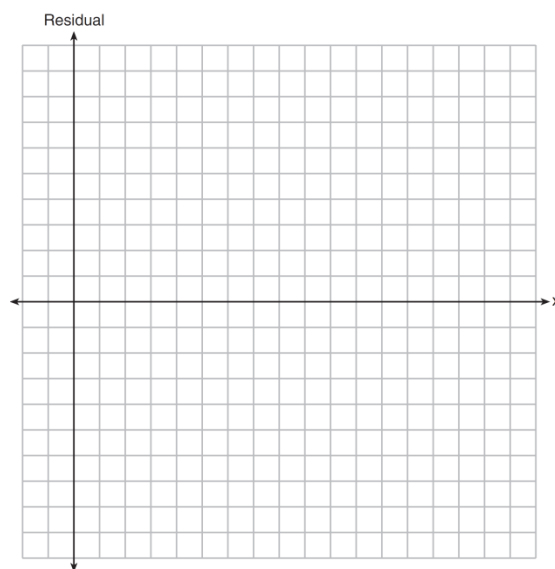
Which equation best represents the line of best fit for this set of data?

- 1) $y = 15x$
- 2) $y = 0.07x$
- 3) $y = 0.1x - 0.4$
- 4) $y = 14.1x + 5.8$

31. The table below represents the residuals for a line of best fit.

x	2	3	3	4	6	7	8	9	9	10
Residual	2	1	-1	-2	-3	-2	-1	2	0	3

Plot these residuals on the set of axes below.



Using the plot, assess the fit of the line for these residuals and justify your answer.