

Dynamic Analysis of Two-Variable Data

Dec 18/2018

The simplest relationship between two variables is linear, which allows us to easily determine a line of best fit and correlation coefficient. There are also more complex relationships, such as quadratic, exponential, and sinusoidal.

With any statistical analysis, it is necessary to examine the data carefully, starting with the correct model. Once a model is selected, we also look for other factors, such as:

- (1) Outlier: A point that does not follow the trend of the data.
- (2) Hidden Variable: Affects or obscures the relationship between two variables, resulting in a false correlation.

Dec 17-7:20 PM

A residual plot can be useful in spotting potential outliers.

x	y	y_LOBF	y_residual
1	15	$y = 3.5(1) + 11.7 = 15.2$	$15 - 15.2 = -0.2$
2	18	$y = 3.5(2) + 11.7 = 18.7$	$18 - 18.7 = -0.7$
3	23	22.2	0.8
4	27	25.7	1.3
5	28	29.2	-1.2

$$y_{\text{LOBF}} = mx + b$$

$$y_{\text{residual}} = y - y_{\text{LOBF}}$$

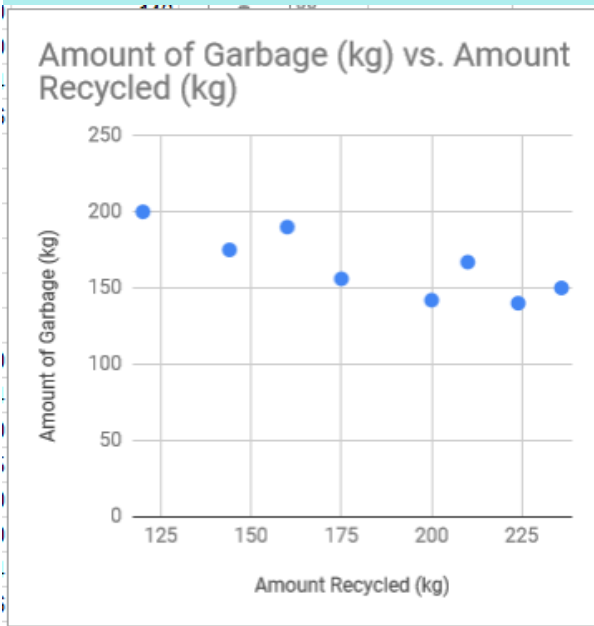
$$m = 3.5 \quad \text{"=slope(dataY,dataX)"}$$

$$b = 11.7 \quad \text{"=intercept(dataY,dataX)"}$$

Dec 17-7:45 PM

p.404, Example 1:

Amount Recycled (kg)	Amount of Garbage (kg)
120	200
144	175
160	190
175	156
200	142
210	167
224	140
236	150

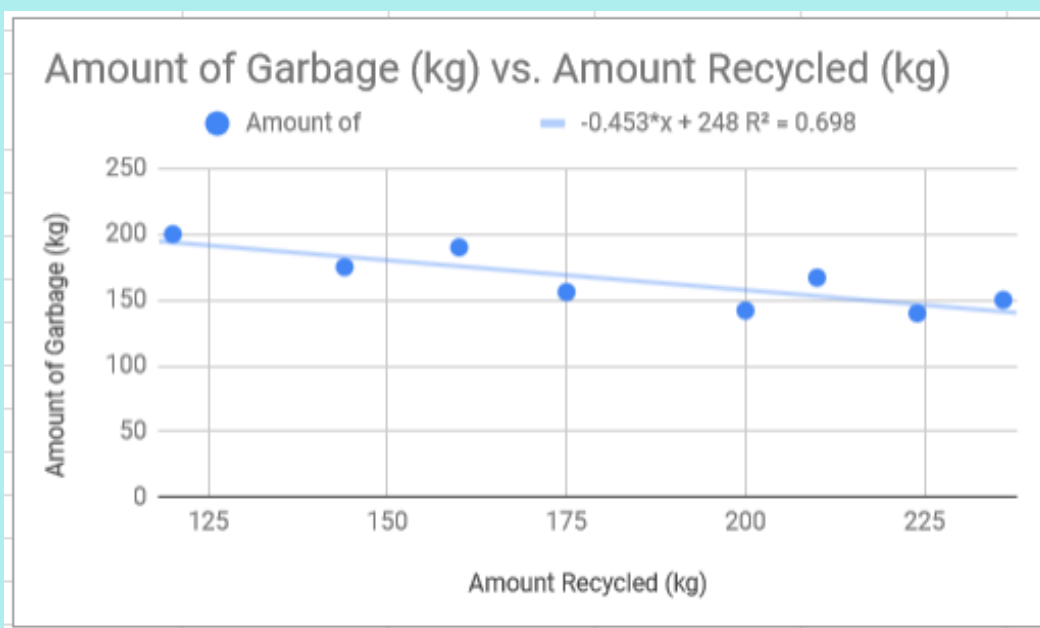


Dec 18-9:30 AM

$$y = -0.453x + 248$$

$$r^2 = 0.698$$

$$r = -0.835$$



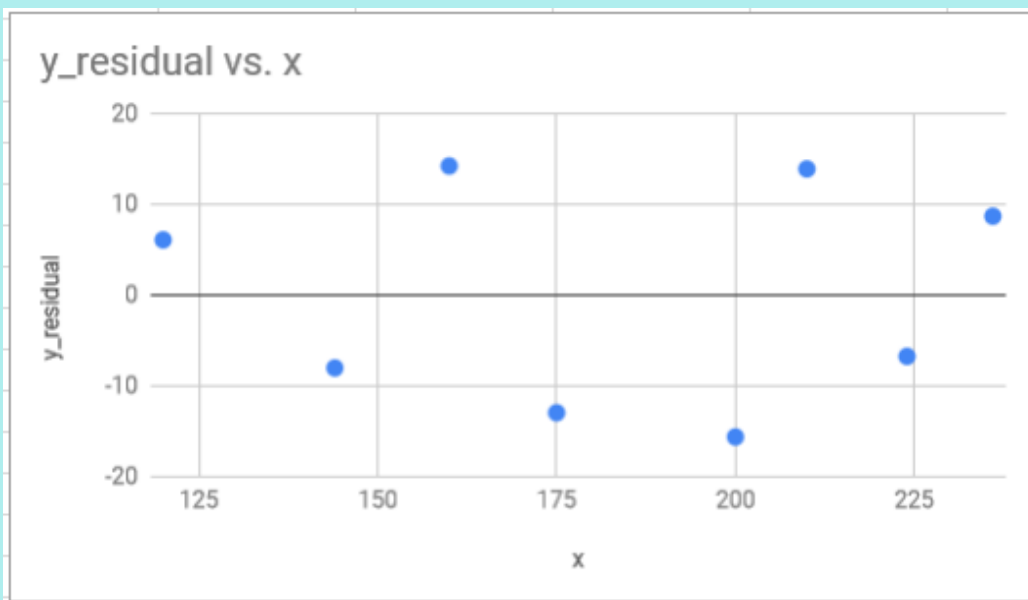
Dec 17-7:52 PM

x	y	y_LOBF	y_residual
120	200	193.8533812	6.146618772
144	175	182.9695911	-7.96959106
160	190	175.7137309	14.28626905
175	156	168.9113621	-12.91136209
200	142	157.5740807	-15.57408067
210	167	153.0391681	13.9608319
224	140	146.6902905	-6.690290498
236	150	141.2483954	8.751604587

use  $y = mx + b$  and  
x-values to calculate

$$y_{\text{residual}} = y - y_{\text{LOBF}}$$

Dec 18-9:34 AM



There is no clear pattern in the residual plot. Points are randomly located above and below the horizontal axis. This indicates that we probably have a good linear model.

Dec 18-9:40 AM

Assigned Work:

read p.406 - 412

- example with outlier
- example with hidden variable

p.413 # 1 - 3, 4 - 6 (spreadsheet)

Dec 18-9:44 AM