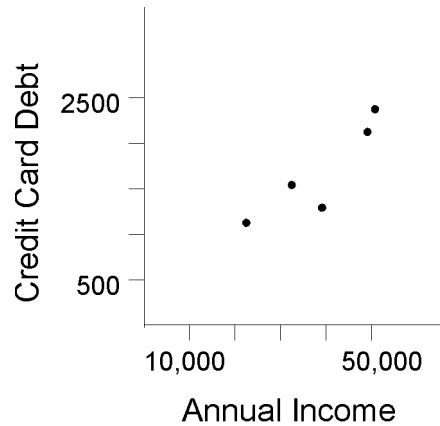


SOLUTIONS - CHAPTER 2 QUIZ

- 2.1 A scatter plot of the data shows that the data follows a general upward trend. Linear models are often useful because of their simplicity and so the least-squares line is a good starting place to model this data.



- 2.2 An annual income of \$40,000 would mean that $x = 40000$. Insert this value into the least-squares equation to find

$$\begin{aligned}y &= 0.039(40000) + 200.70 \\ &= 1760.70\end{aligned}$$

The estimated credit card debt is \$1760.70.

- 2.3 A credit card debt of \$1900 would mean that $y = 1900$. Insert this value into the least-squares equation to find

$$\begin{aligned}1900 &= 0.039x + 200.70 \\ 1699.30 &= 0.039x \\ x &= 43571.79\end{aligned}$$

The estimated income is \$43,571.79.

- 2.4 A correlation coefficient of 0.89 means that the data is reasonably well modeled with a linear function. Since the sign of the correlation coefficient is positive, as the x -value of our model increases, the y -value also increases. For this example, $r = 0.89$ says that as annual income increases, the credit card debt also increases.

- 2.5 The regression equation is $y = (114/35)x - 2 \approx 3.257x - 2$.

Linear System Method To solve the system by hand, we will need the following quantities,

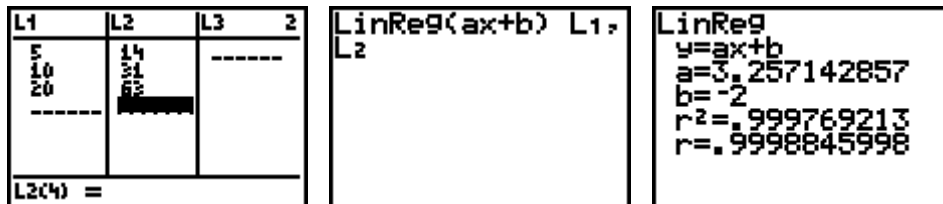
$$\begin{aligned}\sum x &= 5 + 10 + 20 = 35 \\ \sum y &= 14 + 31 + 63 = 108 \\ \sum x^2 &= 25 + 100 + 400 = 525 \\ \sum xy &= 1640\end{aligned}$$

The linear system to be solved is

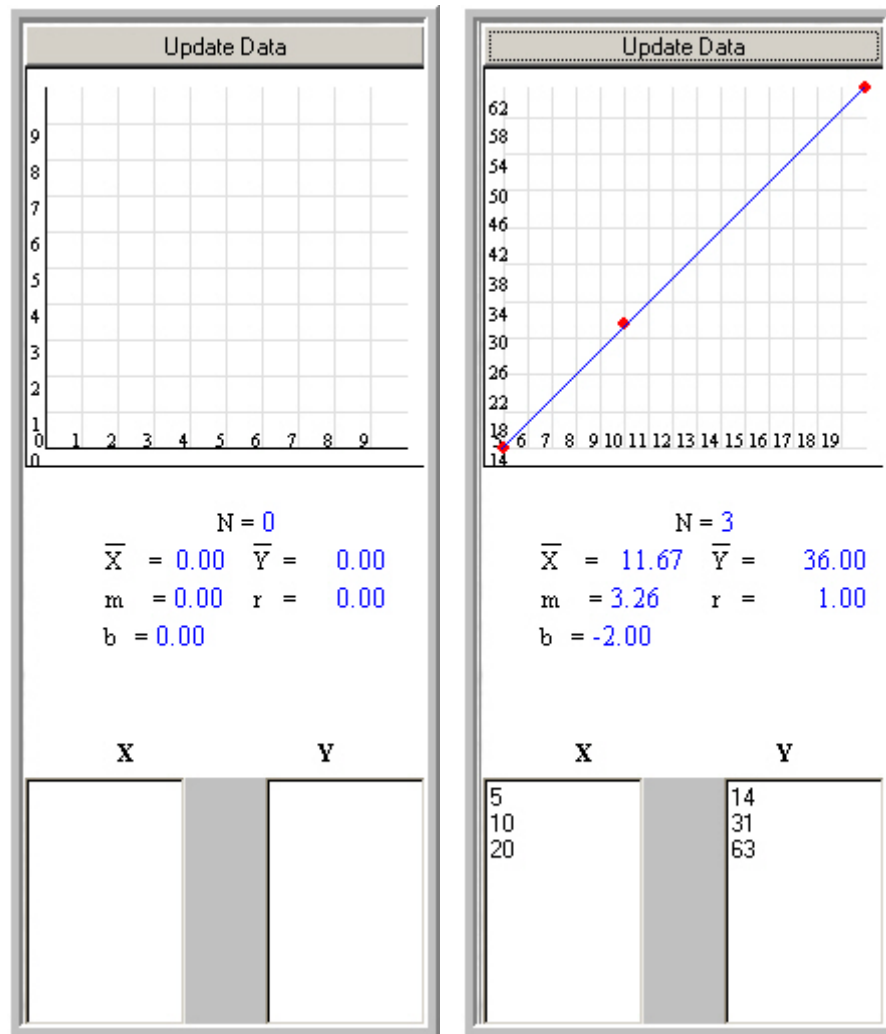
$$\begin{aligned}525m + 35b &= 1640 \\35m + 3b &= 108.\end{aligned}$$

The solution to this linear system will determine the values of the slope, m , and the y -intercept, b .

Calculator Method (TI-83) Enter the x data into list $L1$ and the y data into list $L2$. Go to the [STAT] button and choose the CALC menu. From the CALC menu chose 4:LinReg(ax+b) then [ENTER]. Add the names of the two lists (separated by a comma) and hit [ENTER] again.



Applet Method Enter the data into the columns using the number of pennies for X and the weight in grams for Y . Click the Update Data button to see the scatter plot of the data, the least-squares line and regression equation.



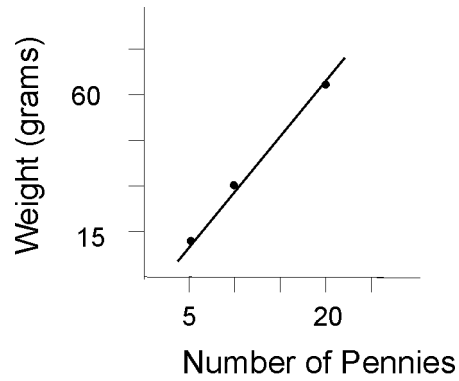
2.6 If each penny weighs 3 grams, then the weight of x pennies will be $3x$ and so $y = 3x$ would be the equation for a perfectly accurate scale.

2.7 For 12 pennies we have $x = 12$. Use this value of x in the least-squares equation,

$$y = 3.257 \times 12 - 2 = 37.084$$

or a weight of about 37.1 grams.

2.8 The scale seems to be fairly accurate near the middle, but seems to weigh too low for small weights and slightly too much for heavier weights.



- 2.9** Data that fall exactly on a line with positive slope will have a correlation coefficient of 1 and data that fall exactly on a line with negative slope will have a correlation coefficient of -1 . Therefore, if the correlation coefficient is close to either 1 or -1 , the data is very linear and the least-squares line is likely a good model for the data.
- 2.10** A correlation coefficient that is close to zero means that the data is not linear and perhaps a non-linear model would be better.