You can see from the scatter plot that the data points do not fall exactly on a straight line, but they tend to follow very closely a straight

After you have drawn the scatter plot and observed that there is a linear relationship between the two variables X and Y, you could then determine the appropriate *correlation coefficient*. Recall that this measures the nature as well as the strength of the linear relationship between the two variables.

Pop-Up!

Correlation analysis is a statistical method for determining the nature and strength of the linear relationship between two variables X and Y, using a single numerical value known as the *correlation coefficient*.

Pearson's r

Karl Pearson developed a coefficient of linear correlation that could be used to determine the nature and strength of linear relationship

Pop-Up!

Pearson's r is given by

$$r = \frac{n \cdot \left(\sum_{i=1}^{n} x_i y_i \right) - \left(\sum_{i=1}^{n} x_i \right) \left(\sum_{i=1}^{n} y_i \right)}{\sqrt{\left[n \cdot \left(\sum_{i=1}^{n} x_i^2 \right) - \left(\sum_{i=1}^{n} x_i \right)^2 \right] - \left[n \cdot \left(\sum_{i=1}^{n} y_i^2 \right) - \left(\sum_{i=1}^{n} y_i \right)^2 \right]}},$$

Note that the formula on page 395 is a form of the sample correlation coefficient r in chapter 3 on page 80.

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left[\sum x^2 - \frac{\left(\sum x\right)^2}{n}\right]\left[\sum y^2 - \frac{\left(\sum y\right)^2}{n}\right]}}$$

The resulting value of this correlation coefficient ranges from –1 to +1. Specifically, the correlation coefficient gives you two pieces of information:

1. The sign of the correlation coefficient indicates the nature of the

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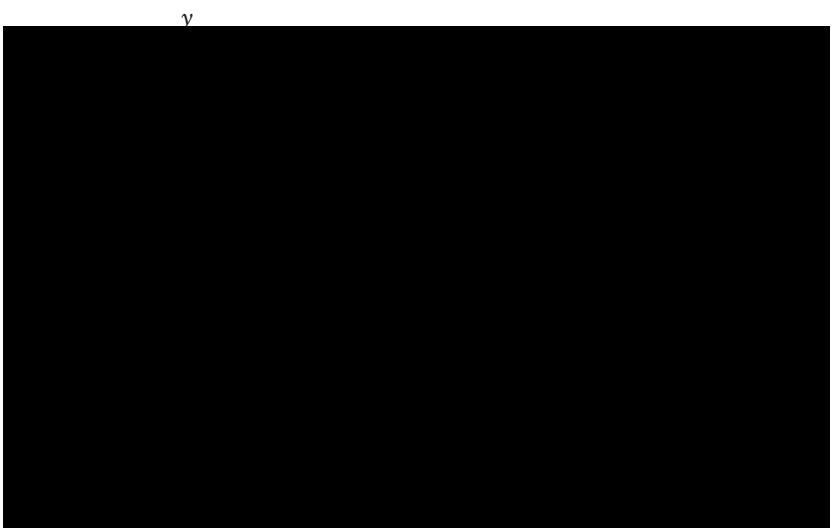

There is zero correlation between X and Y even though there appears to be a strong quadratic (parabolic) relationship between them.

Example 1

For the given data on page 394 on the Algebra and Statistics grades of a sample of $n = 12$ students, compute for the Pearson's r and interpret the results.

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