

Lesson 7: Patterns in Scatter Plots

Classwork

Example 1

In the previous lesson, you learned that scatterplots show trends in bivariate data.

When you look at a scatter plot, you should ask yourself the following questions:

- Does it look like there is a relationship between the two variables used to make the scatter plot?
- If there is a relationship, does it appear to be linear?
- If the relationship appears to be linear, is the relationship a positive linear relationship or a negative linear relationship?

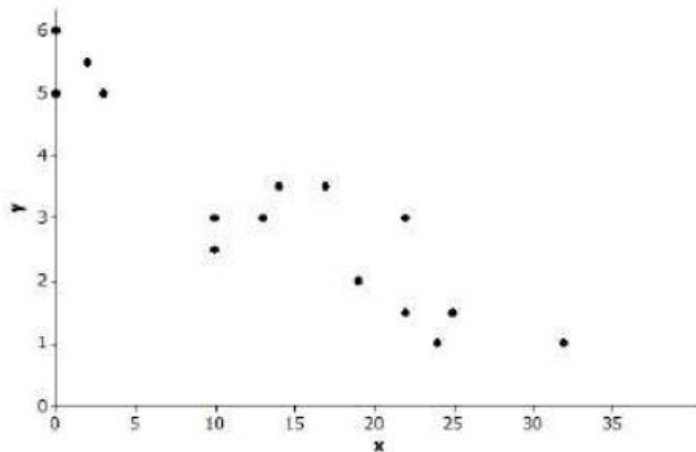
To answer the first question, look for patterns in the scatter plot. Does there appear to be a general pattern to the points in the scatter plot, or do the points look as if they are scattered at random? If you see a pattern, you can answer the second question by thinking about whether the pattern would be well-described by a line. Answering the third question requires you to distinguish between a positive linear relationship and a negative linear relationship. A positive linear relationship is one that is described by a line with a positive slope. A negative linear relationship is one that is described by a line with a negative slope.

Exercises 1–9

Take a look at the following five scatter plots. Answer the three questions above for each scatter plot.

1, 3, 5

1. Scatter Plot 1



Is there a relationship?

yes

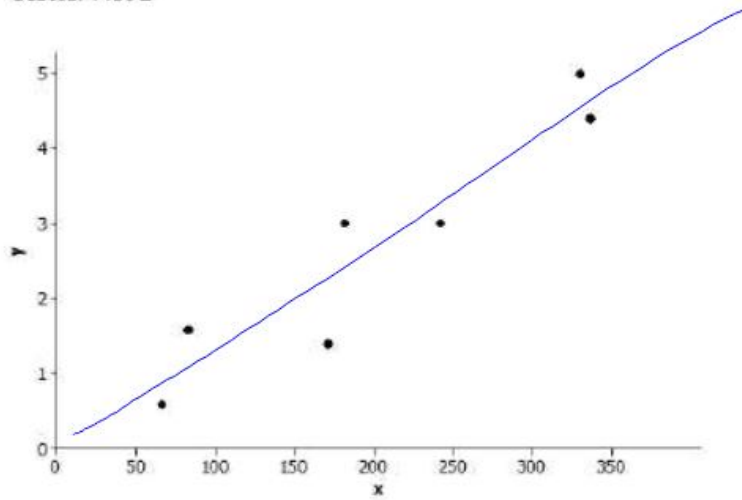
If there is a relationship, does it appear to be linear?

yes

If the relationship appears to be linear, is it a positive or negative linear relationship?

negative

2. Scatter Plot 2



Is there a relationship?

y = x

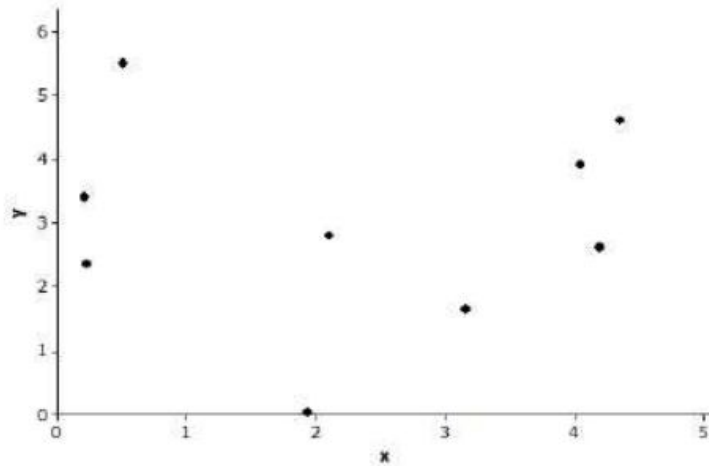
If there is a relationship, does it appear to be linear?

yes

If the relationship appears to be linear, is it a positive or negative linear relationship?

positive

3. Scatter Plot 3



Is there a relationship?

No

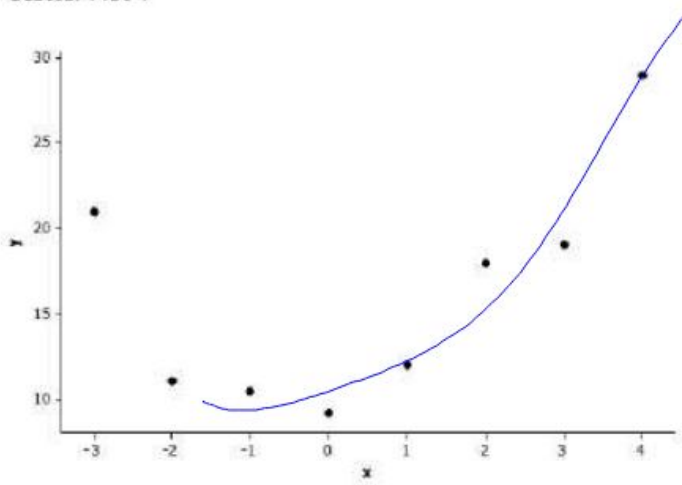
If there is a relationship, does it appear to be linear?

N/a

If the relationship appears to be linear, is it a positive or negative linear relationship?

N/a

4. Scatter Plot 4



Is there a relationship?

Yes

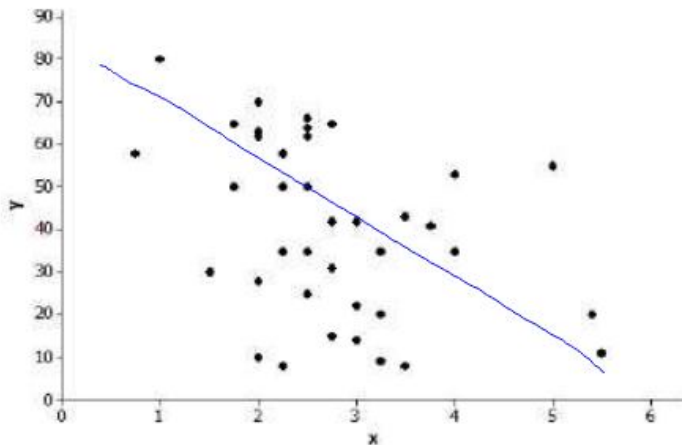
If there is a relationship, does it appear to be linear?

No

If the relationship appears to be linear, is it a positive or negative linear relationship?

Not linear, but increasing

5. Scatter Plot 5



Is there a relationship?

Yes

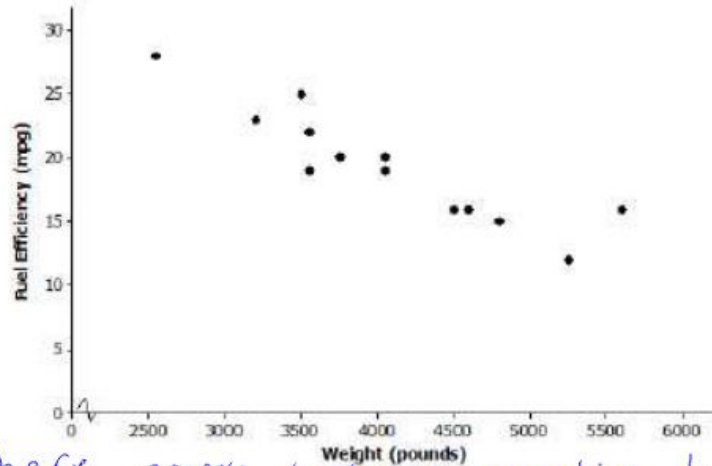
If there is a relationship, does it appear to be linear?

~~AB~~ Yes

If the relationship appears to be linear, is it a positive or negative linear relationship?

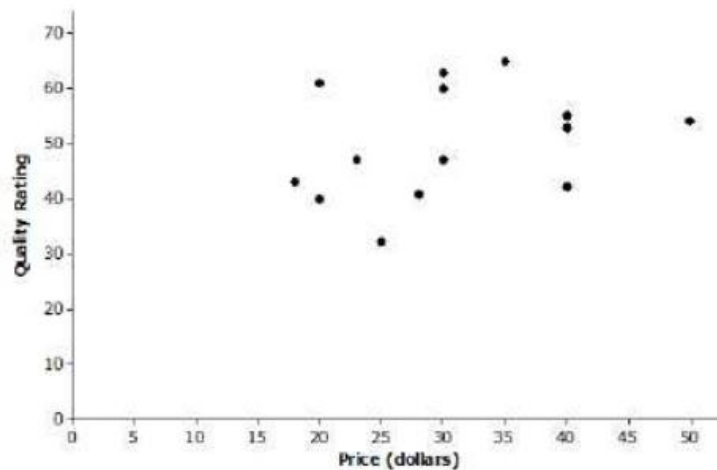
Negative

6. Below is a scatter plot of data on weight in pounds (x) and fuel efficiency in miles per gallon (y) for 13 cars. Using the questions at the beginning of this lesson as a guide, write a few sentences describing any possible relationship between x and y .



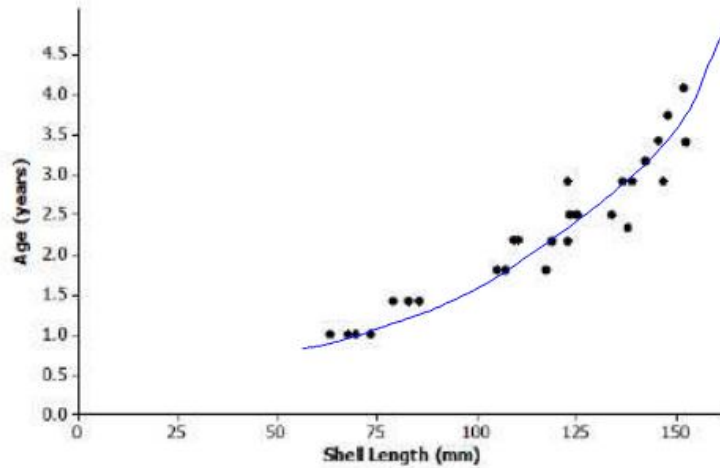
There appears to be a negative linear relationship between weight of vehicles & fuel efficiency. The heavier, the vehicle the lower efficiency it will have.

7. Below is a scatter plot of data on price in dollars (x) and quality rating (y) for 14 bike helmets. Using the questions at the beginning of this lesson as a guide, write a few sentences describing any possible relationship between x and y .

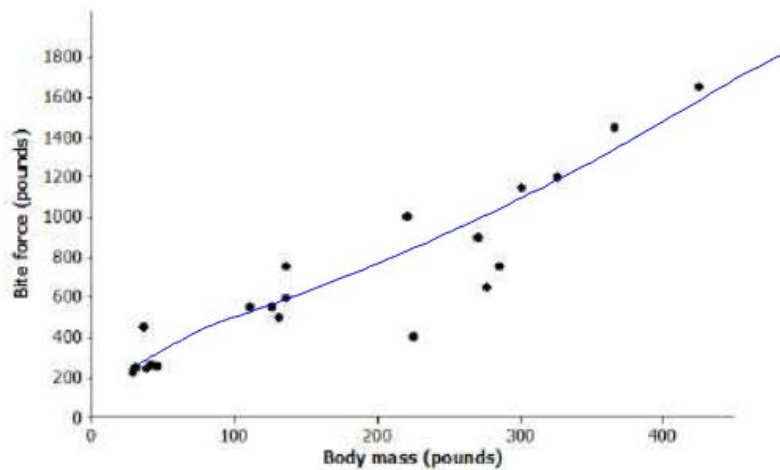


There appears to be no relationship between price & quality.

8. Below is a scatter plot of data on shell length in millimeters (x) and age in years (y) for 27 lobsters of known age. Using the questions at the beginning of this lesson as a guide, write a few sentences describing any possible relationship between x and y .



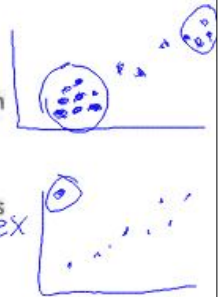
9. Below is a scatter plot of data from crocodiles on body mass in pounds (x) and bite force in pounds (y). Using the questions at the beginning of this lesson as a guide, write a few sentences describing any possible relationship between x and y .



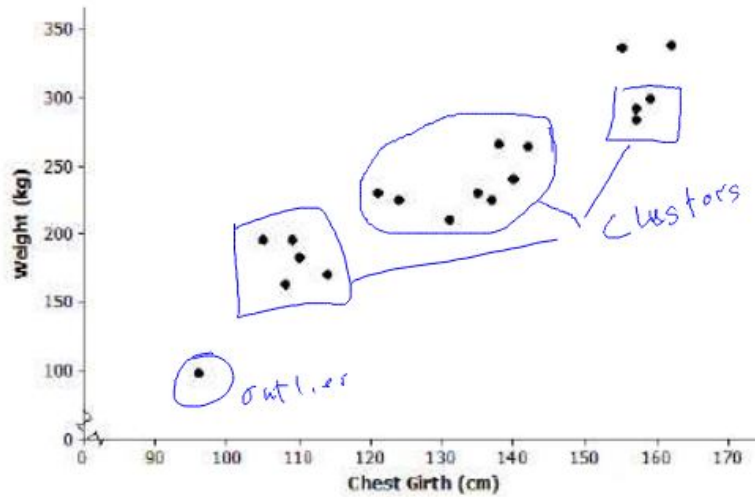
Example 2: Clusters and Outliers

In addition to looking for a general pattern in a scatter plot, you should also look for other interesting features that might help you understand the relationship between two variables. Two things to watch for are as follows:

- **CLUSTERS:** Usually the points in a scatter plot form a single cloud of points, but sometimes the points may form two or more distinct clouds of points. These clouds are called *clusters*. Investigating these clusters may tell you something useful about the data.
- **OUTLIERS:** An *outlier* is an unusual point in a scatter plot that does not seem to fit the general pattern or that is far away from the other points in the scatter plot.



The scatter plot below was constructed using data from a study of Rocky Mountain elk ("Estimating Elk Weight from Chest Girth," *Wildlife Society Bulletin*, 1996). The variables studied were chest girth in centimeter (x) and weight in kilogram (y).



Exercises 10–12

10. Do you notice any point in the scatter plot of elk weight versus chest girth that might be described as an outlier? If so, which one?

outlier in the lower left of the scatter plot

11. If you identified an outlier in Exercise 10, write a sentence describing how this data observation differs from the others in the data set.