**Interpreting Scatterplots**

As in any graph of data, look for the *overall pattern* and for striking *departures* from that pattern.

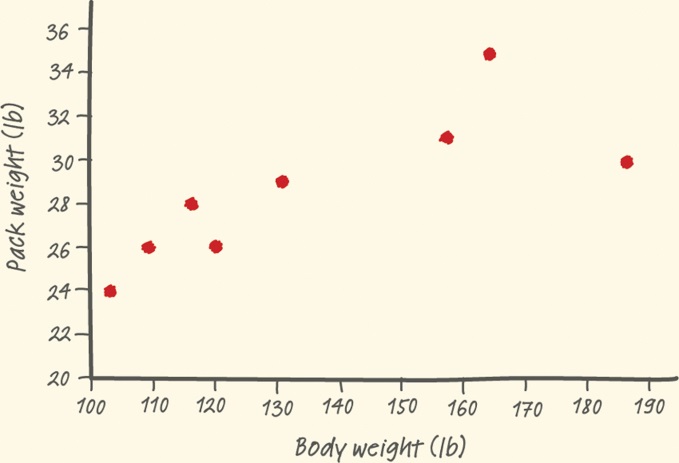
* You can describe the overall pattern of a scatterplot by the **direction**, **form**, and **strength** of the relationship.
* An important kind of departure is an **outlier**, an individual value that falls outside the overall pattern of the relationship.

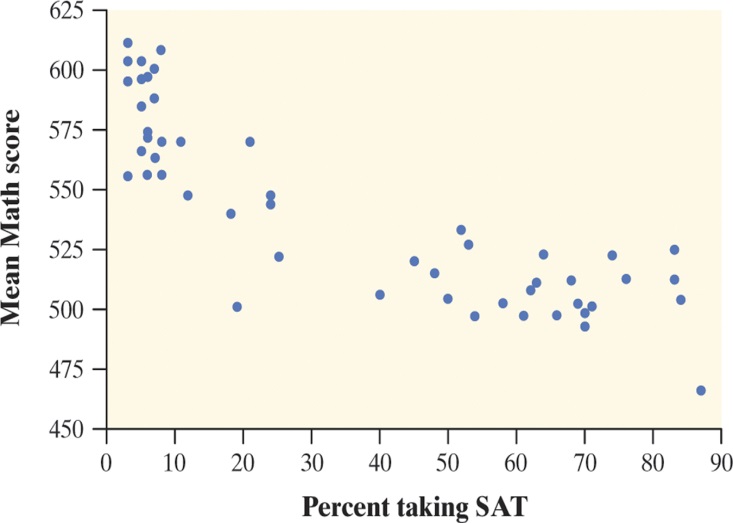
Direction – Positive or negative

Strength – the closer the points are to the line or curve that represents the middle, the stronger it is

Form – linear, curved

Examples



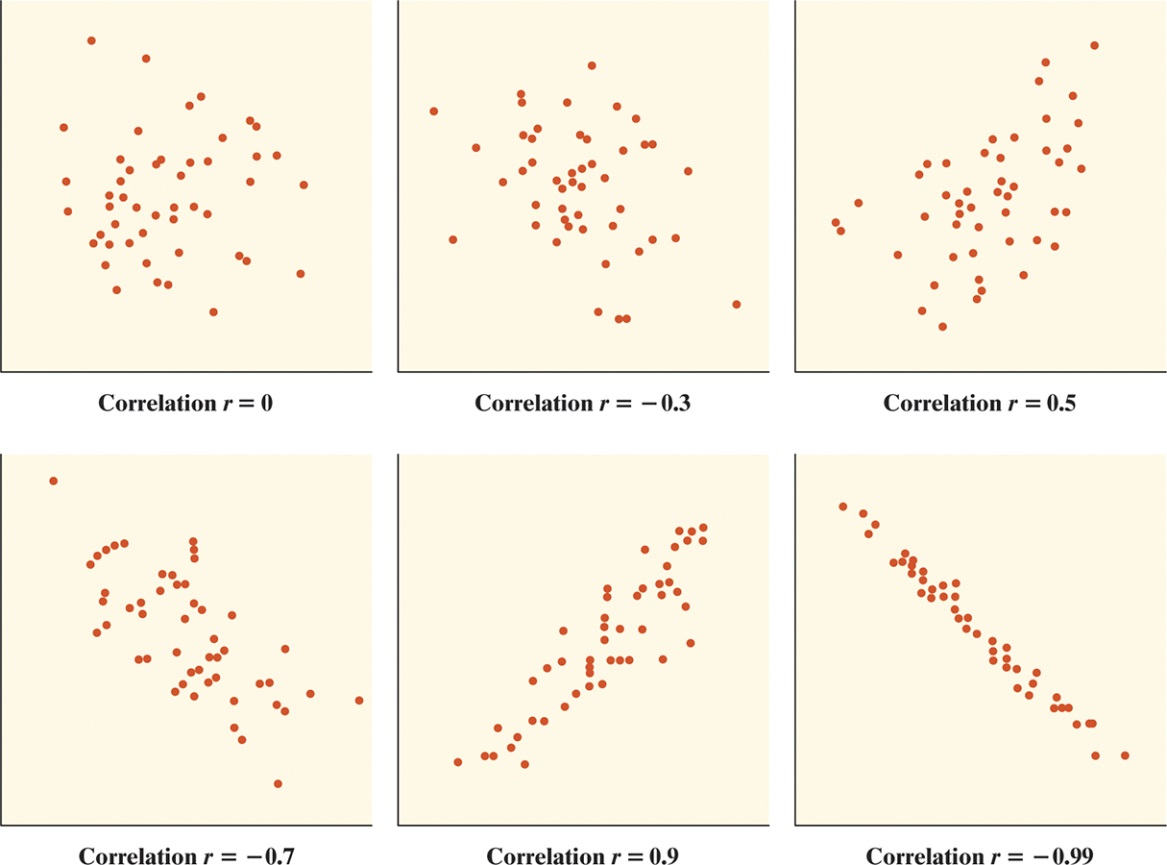


**Measuring Linear Association: Correlation**

Linear relationships are important because a straight line is a simple pattern that is quite common. Unfortunately, our eyes are not good judges of how strong a linear relationship is.

The **correlation *r*** measures the strength of the linear relationship between two quantitative variables.

* + *r* is always a number between -1 and 1
  + *r* > 0 indicates a positive association.
  + *r* < 0 indicates a negative association.
  + Values of *r* near 0 indicate a very weak linear relationship.
  + The strength of the linear relationship increases as *r* moves away from 0 towards -1 or 1.
  + The extreme values *r* = -1 and r = 1 occur only in the case of a perfect linear relationship.



**Using the Calculator for Scatterplots and Correlation**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Body weight (lb)** | 120 | 187 | 109 | 103 | 131 | 165 | 158 | 116 |
| **Backpack weight (lb)** | 26 | 30 | 26 | 24 | 29 | 35 | 31 | 28 |

Draw the scatterplot and find the correlation r on your calculator:

Home ---> 1 New Document ---> No

Add Lists & Spreadsheet

In Column A you enter your explanatory variable (remember label at top)

In Column B you enter your response variable (remember label at top)

* Make sure corresponding values are in the same row

Home ---> Add Data & Statistics

Drag cursor to bottom rectangle, click and choose your explanatory variable

Drag cursor to left rectangle, click and choose your response variable

**The scatterplot is created!!**

Home ---> Add Calculator

Menu ----> 6 Statistics ---> 1 Stat Calculations ---> 3 Linear Regression

For X List, hit right arrow and choose explanatory variable from list

Tab to Y List, hit right arrow and choose response variable from list

Tab to Save Regeqn to: and delete what is in box

OK

**The correlation r is one of the values shown!**

**Example**

|  |
| --- |
| The table shows the number *y* (in thousands) of alternative-fueled vehicles in use in the United States *x* years after 1997. Use your calculator to draw a scatterplot and find correlation r. |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *x* | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | *y* | 280 | 295 | 322 | 395 | 425 | 471 | 511 | 548 | |

**Facts about Correlation**

1. Correlation makes no distinction between explanatory and response variables.
2. *r* does not change when we change the units of measurement of *x*, *y*, or both.
3. The correlation *r* itself has no unit of measurement.
4. Correlation does not describe curved relationships between variables, no matter how strong the relationship is.
5. Correlation is not resistant. *r* is strongly affected by a few outlying observations.

**Assignment** (Hand in on separate sheet)

1. What would the explanatory and response variables be?
2. Draw a scatterplot
3. Find the correlation r
4. How would you describe this relationship?

|  |  |
| --- | --- |
| ***Ice Cream Sales vs Temperature*** | |
| **Temperature °C** | **Ice Cream Sales** |
| 14.2° | $215 |
| 16.4° | $325 |
| 11.9° | $185 |
| 15.2° | $332 |
| 18.5° | $406 |
| 22.1° | $522 |
| 19.4° | $412 |
| 25.1° | $614 |
| 23.4° | $544 |
| 18.1° | $421 |
| 22.6° | $445 |
| 17.2° | $408 |