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Patterns in Data

*By looking closely at data, and tables or graphs of data, it is possible to identify **patterns** and use these patterns to predict what the next value in the data set might be.*

What is a Pattern?

When something changes, repeats, or occurs in a predictable way, then a *pattern of change* is present.

Many things change according to a pattern. For example, the seasons change in the pattern: fall, winter, spring, and summer. And each day, nighttime changes to daytime and back again.

In scientific investigations, the data collected may also follow a pattern. Being able to see patterns in data can help a scientist understand what is causing the pattern and to predict what the next value in the data set might be.

To find the pattern, think about what change happens between the first number and the second number in a data set. Look to see if the same number is added to, or subtracted from, the first number to get the second number. Or if maybe the first number is multiplied or divided by another number to get the second number. Then use that information to predict the next value in the data set.

For example, in the set of data:

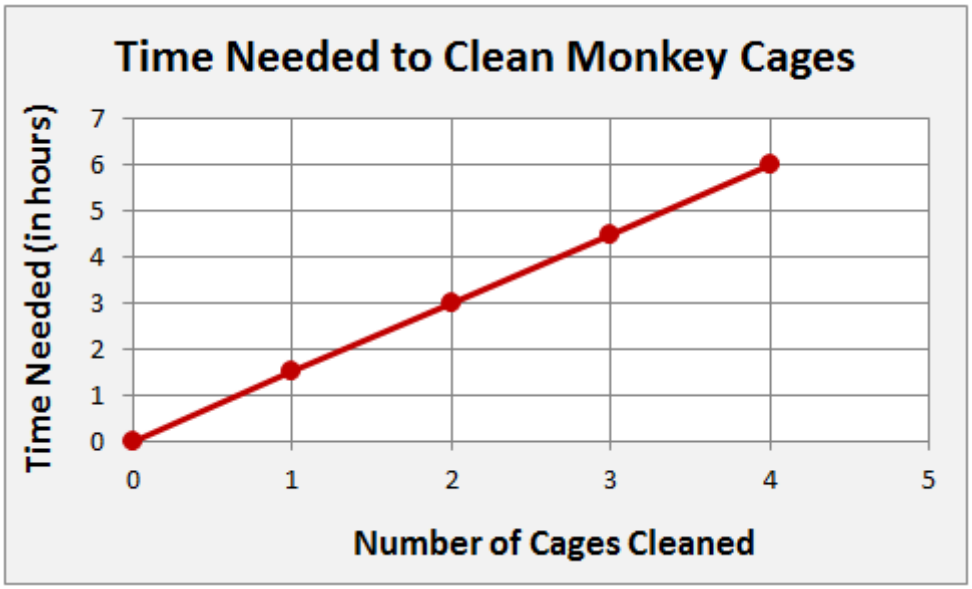
0, 3, 6, 9, 12, 15, 18...

the next value in the data set would be a **21**, because each number in the pattern is three more than the last.

Identifying Patterns in Graphed Data

Patterns can be found in all kinds of graphs and tables. To learn how to find the pattern in a graph, think about the example below.

A zookeeper wanted to predict how long it would take him to clean all 10 of the monkey cages in his zoo. So he cleaned the first four cages and kept track of how long it took him to clean each. Then he put his data in the graph below. There is a pattern in the data on the graph.



To identify the pattern in the zookeeper's data, first determine how much the y-axis value changed for each mark on the x-axis, which stands for 1 cage. Start at the red dot above number 1 on the graph line. Imagine a horizontal (flat) line that goes from the dot over to the y-axis. The line would hit the y-axis halfway between the 1 and the 2. Since the units for the y-axis are hours, it must have taken the zookeeper 1.5 hours to clean the first cage.

Doing the same analysis on each data point, we find that it took the zookeeper 1.5 hours to clean each cage. Since the amount of time needed changes in a regular pattern with each additional cage cleaned, we can predict that it will take the zookeeper 7.5 hours to clean five monkey cages, or 15 hours to clean all 10 cages.

Identifying Trends in Data

If a set of data is changing in the same general way, but not in a regular pattern, it is possible to guess what the next value in the data set might be, even when it is not possible to predict *exactly* what the value will be.

If the values in a set of data change in relation to each other in a general way, but not in an exact way, the data show a **trend**. A trend is a general change, such as increasing or decreasing numbers.

To find a trend, first think about whether all of the numbers are close to each other. If all of the numbers are almost the same, predict the next value in the data set by looking at the numbers and choosing a number that is close.

For example, look at the table below. It shows the amount of rain that Simpletown received each year between 2005 and 2008.

Rain Received in Simpletown from 2005 to 2008

Year	Amount of Rain (in inches)
2005	16
2006	17
2007	15
2008	18

The information in the table shows that Simpletown usually receives between 15 and 18 inches of rain per year. So a good prediction about how much rain Simpletown will receive in following years would be about 17 inches of rain.

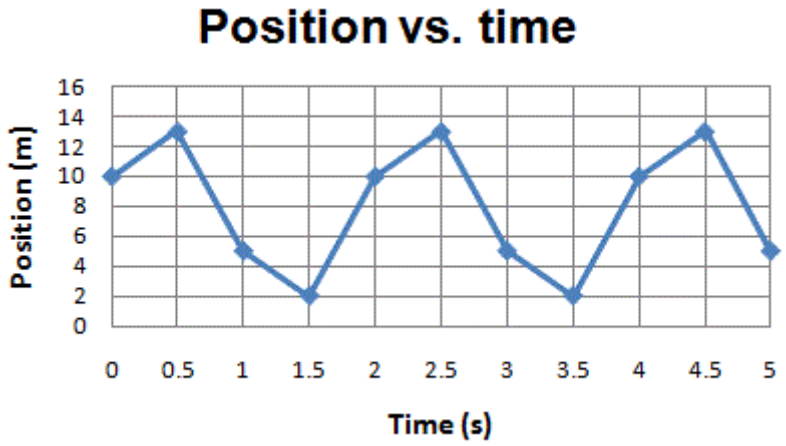
If the numbers in a data set are not close to each other, but they are all going up, the trend is showing that the next number in the data set will be higher than the last number. If the numbers are all going down, the next number will likely be lower than the last number.

Irregular & Repetitive Patterns

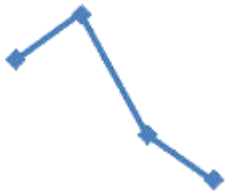
A repetitive pattern has the same set of values over and over. An irregular pattern changes in an irregular or random way.

If the data does not have a simple trend, such as all going up or all going down, it may have a repetitive pattern or an irregular pattern.

- **Repetitive pattern**— A repetitive pattern has the same set of points repeated over and over in the same order. Look at the following example.

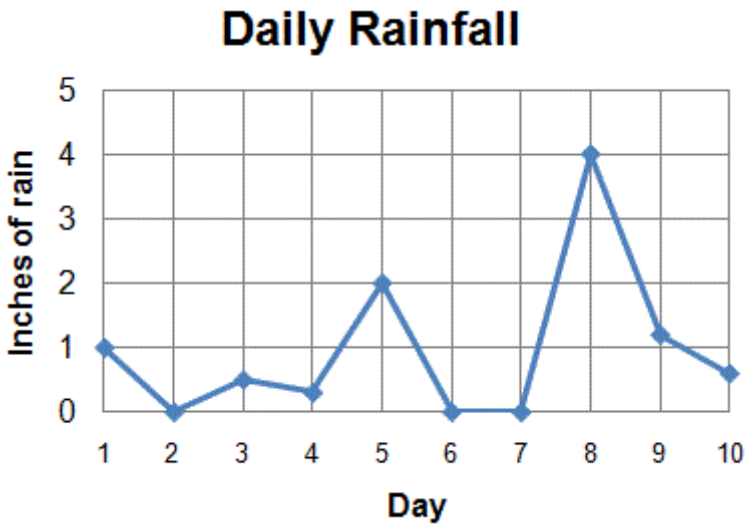


In this graph, a simple set of four points:



is repeated almost three times. Because the set of data is repeated, it makes a *repetitive pattern*.

- **Irregular pattern**— In an irregular pattern, the value of each data point may be larger or smaller than the one before it. The change from one point to another may be large or small as well. The graph below shows an irregular pattern because no part of the graph repeats exactly, and there is no trend.



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