



Benford's Law

Teachers' Notes

This resource is a brilliant investigation for more able students especially as it is so unintuitive. It links together a mathematical model with real data and it is interesting that it will only work with naturally occurring events. Thus the link with the Fibonacci sequence which is also linked to naturally occurring sequences is fascinating! It also has the feature that it will not work with data that have too many constraints or are too narrow. Using an example given by *Walthoe et al 1999*, it will not work with the times for the Olympic 400m or the ages of politicians.

Many people have written about the law and we give a number of these references below together with some other ideas of data to investigate.

There is an article about the law by Bradley, J. R. and Farnsworth, D.L. in the *Teaching Statistics Journal Spring 2009* Volume 31(1) p2-6 which is where the reference to the New York State occupations data is to be found.

References:

- Benford, F. (1938). **The law of anomalous numbers**. *Proceedings of the American Philosophical Society*, 78(4), 551-572
- Giles, D.E. (2007). **Benford's Law and naturally occurring prices in certain eBay auctions**. *Applied Economics letters*, 14(3), 157-161.
- Kumar, K. & Bhattacharya, S. (2007). **Detecting the dubious digits: Benford's Law in forensic accounting**. *Significance*, 4(2), 81-83.
- Nigrini, M. (1996). **A taxpayer compliance application of Benford's Law**. *Journal of the American taxation association*. 18. 72-91
- Walthoe, J. Hunt, R & Pearson, M. **Looking out for number one**. *+Plus Magazine*, Sept 1999

Data to try it with:

(Remember the data is best as numbers not per anything or percentages!)

- Size of files stored on a PC
- Length of the world's rivers
- Numbers in newspapers' front page headlines
- Dow Jones index history,

Wolfram also has a downloadable demonstration graph with a lot of data sets already included available from:

<http://demonstrations.wolfram.com/CountryDataAndBenfordsLaw/>

Wikipedia has many lists data can be taken from including lists of lakes and lists of length of rivers etc.

There is also an American video about Benford's Law at

www.kirix.com/blog/2008/07/22/fun-and-fraud-detection-with-benfords-law/