

Benford's Law

Benford's law, also called the first-digit law, is a phenomenological law about the frequency distribution of leading digits in many (but not all) real-life sets of numerical data.

The law states that in many naturally occurring collections of numbers the small digits occur disproportionately often as leading significant digits. For example, in sets which obey the law the number 1 would appear as the most significant digit about 30% of the time, while larger digits would occur in that position less frequently : 9 would appear less than 5% of the time.

It has been shown that this result applies to a wide variety of data sets, including electricity bills, street addresses, population numbers...



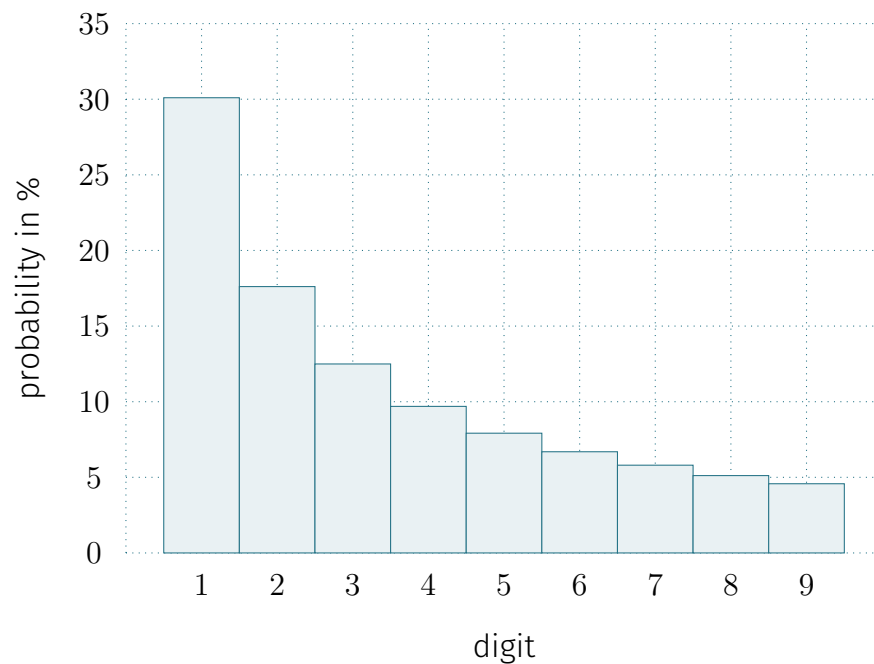
1. If all digits were distributed uniformly in a collection of numbers, what percentage would correspond to each number?
2. Give other examples where Benford's law could be observed.
3. The population of European Union countries in 2015 is given in the table below.

Germany	81 829 901	Italy	60 808 668
Austria	8 507 786	Latvia	2 028 200
Belgium	11 209 044	Lithuania	2 941 953
Bulgaria	7 351 234	Luxembourg	562 958
Cyprus	1 172 45	Malta	433 504
Croatia	4 242 067	Netherlands	16 791 405
Danmark	5 566 856	Poland	38 509 789
Spain	46 439 864	Portugal	10 427 301
Estonia	1 315 819	Czech Republic	10 537 800
Finland	5 450 614	Romania	19 779 963
France	66 627 602	United Kingdom	64 596 752
Greece	10 775 557	Slovakia	5 404 322
Hungary	9 908 798	Slovenia	2 059 313
Ireland	4 609 600	Sweden	9 639 741

Complete the table below with the number of countries whose leading digit is on line 1.
Work out the frequencies of these numbers.

[illegible]

4. The following graph represents the distribution of first digits, according to Benford's law. Each bar represents a digit, and the height of the bar is the percentage of numbers that starts with that digit.



5. Complete the following graph with the data you gathered in the table above. Does the population of European Union countries in 2015 follow Benford's Law?

