

Project: Investigating Zipf's Law*For use after Chapter 7*

Objective Use Zipf's Law to model the relationship between population and rank for cities in a country.

Materials encyclopedia, almanac, or Internet access; graphing calculator

Investigation Zipf's Law makes a generalization about the relationship between population and rank for cities.

Zipf's Law

For the cities in any country, rank is a power function of population.

1. Choose a country that interests you. Use an encyclopedia, almanac, or the Internet to make a list of the country's largest cities, their populations, and their ranks. Your list should include at least 10 cities. If you have trouble finding data for at least 10 cities, choose another country.
2. Use a graphing calculator to make a scatter plot of the data pairs $(\ln P, \ln R)$, where P is the population and R is the rank. Fit a line to the plotted points and find an equation of the line.
3. Is a power model a good fit for the data?
4. Find a power model for the data.
5. Use your power model to predict the rank of a city not on your list. How well does the predicted rank match the actual rank?
6. Repeat this investigation for one or two additional countries. You can also try using states instead of countries. Do you have similar results?

Present Your Results Write a report to summarize your results. Your report should include a statement of the goal of your project, a brief discussion of your chosen country and its people, a map, and your answers to the numbered questions above. How well do you think Zipf's Law describes the relationship between rank and population of the cities in a country?