

EARTHQUAKE MAGNITUDE AND THE POWER LAW

Many natural phenomena show a relationship between size and frequency. The magnitude of earthquakes shows this relationship, large earthquakes are rare and small ones very common. The relationship is most clearly seen if the log of the size is plotted against the log of the frequency. With earthquakes the size is the magnitude and this is already a logarithmic scale.

Complete columns C and D and then plot magnitude against log of cumulative frequency on normal graph paper.

A	B	C	D
Magnitude	annual frequency	Cumulative frequency	Log₁₀ of cumulative frequency
8 and higher	1		
7	18		
6	120		
5	800		
4	6,200		
3	49,000		
2	365,000		
1	3,000,000		

Teacher's Section

The answers to the calculations are given below. With this data students can just plot the graph.

A	B	C	D
Magnitude	annual frequency	Cumulative frequency	Log₁₀ of cumulative frequency
8 and higher	1	1	0
7	18	19	1.27
6	120	139	2.14
5	800	939	2.97
4	6,200	7,139	3.85
3	49,000	56,139	4.74
2	365,000	421,139	5.62
1	3,000,000	3,421,139	6.53