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# APM203 section 7 notes

December 06, 2005

# 1   Fractal dimension

Fractals are, roughly, complex geometric shapes with structure at arbitrarily small scales, usually with some degree of self-similarity.

- **Similarity dimension** (for self-similar fractals): If scaling down by a factor of $r$ leads to $m$ copies of the original set, then the similarity dimension is

$$d_{sim} = \frac{\ln m}{\ln r}$$

- **Box dimension** (one possible dimension definition for fractals that are not self-similar): If a set $S$ in 2-dimensional [D-dimensional] space requires $N(\varepsilon)$ boxes [D-dimensional cubes] of side $\varepsilon$ to cover it, then its box dimension is

$$d_{box} = \lim_{\varepsilon \to \infty} \frac{\ln N(\varepsilon)}{\ln(1/\varepsilon)}$$