# Fractal From Wikipedia, the free encyclopedia





The [Mandelbrot set](http://en.wikipedia.org/wiki/Mandelbrot_set) is a famous example of a fractal

**1) Read the text and underline definitions. Which grammar patterns do they use?**

A **fractal** is "a rough or fragmented geometric shape that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole," a property called self-similarity. Roots of the idea of fractals go back to the 17th century, while mathematically rigorous treatment of fractals can be traced back to functions studied by [Karl Weierstrass](http://en.wikipedia.org/wiki/Karl_Weierstrass), [Georg Cantor](http://en.wikipedia.org/wiki/Georg_Cantor) and [Felix Hausdorff](http://en.wikipedia.org/wiki/Felix_Hausdorff) a century later in studying functions that were [continuous](http://en.wikipedia.org/wiki/Continuous_function) but not [differentiable](http://en.wikipedia.org/wiki/Differentiable); however, the term [fractal](http://en.wiktionary.org/wiki/fractal) was coined by [Benoît Mandelbrot](http://en.wikipedia.org/wiki/Beno%C3%AEt_Mandelbrot) in 1975 and was derived from the [Latin](http://en.wikipedia.org/wiki/Latin) [fractus](http://en.wiktionary.org/wiki/fractus) meaning "broken" or "fractured." A mathematical fractal is based on an [equation](http://en.wikipedia.org/wiki/Equation) that undergoes iteration in a form of [feedback](http://en.wikipedia.org/wiki/Feedback) based on [recursion](http://en.wikipedia.org/wiki/Recursion). There are several examples of fractals, which are defined as portraying exact self-similarity, quasi self-similarity, or statistical self-similarity. While fractals are a mathematical construct, they are found in nature, which has led to their inclusion in [artwork](http://en.wikipedia.org/wiki/Artwork). They are useful in medicine, soil mechanics, [seismology](http://en.wikipedia.org/wiki/Seismology), and [technical analysis](http://en.wikipedia.org/wiki/Technical_analysis).

Because they appear similar at all levels of magnification, fractals are often considered to be infinitely complex (in informal terms). Natural objects that are approximated by fractals to a degree include clouds, mountain ranges, lightning bolts, coastlines, snow flakes, various vegetables (cauliflower and broccoli), and animal coloration patterns. However, not all self-similar objects are fractals—for example, the [real line](http://en.wikipedia.org/wiki/Real_line) (a straight [Euclidean](http://en.wikipedia.org/wiki/Line_%28geometry%29) line) is formally self-similar but fails to have other fractal characteristics; for instance, it is regular enough to be described in Euclidean terms.

Images of fractals can be created using [fractal-generating software](http://en.wikipedia.org/wiki/Fractal-generating_software). Images produced by such software are normally referred to as being fractals even if they do not have the above characteristics, such as when it is possible to zoom into a region of the fractal that does not exhibit any fractal properties. Also, these may include calculation or display [artifacts](http://en.wikipedia.org/wiki/Artifact_%28error%29) which are not characteristics of true fractals.

## 2. Answer Qs. a) Who was the first to use the term “fractal?

##  b) Where can fractals be useful?

##  c) Is a straight Euclidean line a fractal? Why Y/N?

##  d) Where can you find fractals in nature?