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Iq Organizer

Topic Fractal Dimension
Date _____
Days needed _____

From Yesterday

Measuring simple objects

A ✔ **I** **C** **D** **R**

What is this object? An Amoeba? The coastline of Britain?

How long is the perimeter?
(or any island, continent, amoeba, etc)

How can we quantify rough, jagged, bumpy natural objects?

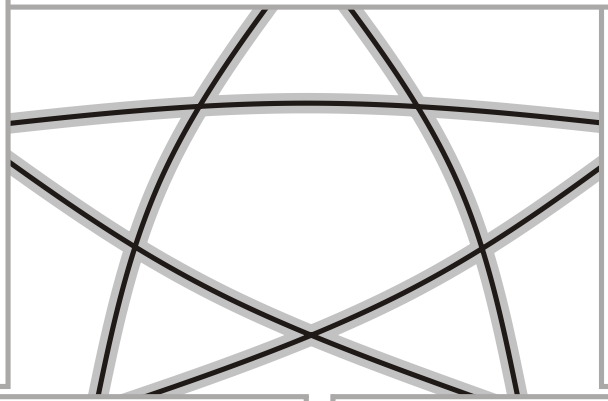
For Tomorrow

Explore fractal dimensions between 2 and 3

A **I** **C** **D** ✔ **R**

What does this exercise tell us about the accuracy of precise measurements? What answer would we get with an extremely small ruler? "Perimeter" is a useful concept, but it has limitations.

The Fractal Dimension captures the essential nature of an irregular shape in a single number. The roughness of the shape is the same at any scale. Why do you think a coastline has this property? Is the dimension or 'jaggedness' really constant around the coastline?



A ✔ **I** **C** **D** **R**

Using the image of Britain (or amoeba), measure the length of the coastline (or perimeter) using different lengths of a measuring device. Try measuring using 10cm, 5 cm, and 2cm rulers.

Standards Covered

Measurement, Perimeter, Dimension,

[geography]

A **I** ✔ **C** **D** **R**

The familiar concept of Perimeter is useful, but it breaks down for natural objects.

The familiar dimensions 1, 2, and 3 can be extended to describe infinitely complex natural objects.

A **I** **C** ✔ **D** **R**

Plot the relationship between the perimeter and the size of your measuring device. The measured value increases with decreasing ruler size.

When plotted on a log scale, the (-) slope of this line is the Fractal Dimension. A more jagged edge has a higher Fractal Dimension, closer to 2, while a less jagged edge has a dimension closer to 1.

Future Investigations

Use software tools to measure perimeters using different scales.

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