Exploring Fractals

Discussion Points

- What is a fractal? Can you define it in your own words?
- How do fractals differ from traditional geometric shapes?
- Where do we encounter fractals in nature? Give at least two examples.
- Why do you think fractals are useful or interesting in mathematical research?
- How does the idea of recursion relate to fractals? Can you think of non-mathematical examples of recursion?
- Fractals often exhibit infinite complexity within a finite space. What philosophical or scientific implications could this have?

Have You Considered...?

- Using computer programming to generate your own fractals?
- Exploring the connections between fractals and art – for example, in digital design or Islamic geometry?
- Reading about the Mandelbrot Set and how it's visualised?
- Investigating how fractals model real-world phenomena – such as coastlines, blood vessels, or financial systems?
- Looking at how fractals appear in music or sound waves?

Further Reading & Exploration

- ☐ **Benoît Mandelbrot** – *The Fractal Geometry of Nature*
- ☐ **James Gleick** – *Chaos: Making a New Science*
- ☐ **NOVA's "Hunting the Hidden Dimension"** (PBS documentary)
  A full-length documentary exploring the role of fractals in nature and technology.
- ☐ **Fractal Foundation** – fractalfoundation.org
  A great site for accessible explanations and fractal art tools.
- ☐ **Paul Bourke's Fractal Gallery** – paulbourke.net/fractals
  A deeper technical dive into fractal visualisation, with lots of images.
- ☐ **Fractal Zoomers** – Try an interactive Mandelbrot zoom on fractals.io or mathigon.org
- ☐ **Robert Kaplan & Ellen Kaplan** – *The Art of the Infinite: The Pleasures of Mathematics*
  Explores mathematical beauty and paradox, including discussions relevant to fractals and recursion.
- ☐ **Ron Eglash** – *African Fractals*
  Explores how fractal geometry appears in African indigenous designs and how those patterns connect to modern computing.
- ☐ **Matthew Weinburg –** *Chasing Dragons Between Dimensions*
  Exploration of philosophy and real world applications, blending maths, history, physiology, etc.