Chapter 16: How Many Things Fit Inside Other Things

Worksheet to accompany

David Feldman, *Chaos and Fractals: An Elementary Introduction*,
Oxford University Press, 2012

1. Draw a short line segment. Now draw a line segment that's three times as long. How many smaller line segments fit inside the big line segment?

2. Draw a small square. Now draw a square that's three times as big. (I.e., three times as tall and deep.) How many smaller squares fit inside the square?

3. Draw a small cube. Now draw a small cube that's three times as long, deep, and tall. How many smaller cubes will fit inside the big cube?

4. Complete the following table:

Shape	Growth Factor	Number of small copies that fit within big copy
Line		
Square		
Cube		

5. What property of a shape determines how many small copies of it fit within a big copy?

6. Come up with a formula that relates the growth factor, the number of small copies.

Making A Snowflake[1]

1. Get some plastic beads.

2. Make a snowflake by starting with a single bead as a seed. Then, at each step, make four copies and place a copy on the corner of the shape you had at the previous step. I'll draw a picture on the board, and Mafe, Nynke, Will, or I can help. Start making the shape in the middle of the table. It gets large quickly and grows in all directions, so you'll need a lot of space.

3. Answer the same questions for the snowflake that you did for the other geometrical shapes.
   (a) How many small copies fit inside the big copy?
   (b) What is the growth factor?
   (c) What is the dimension of the snowflake?

4. Ponder.

[1] sorta