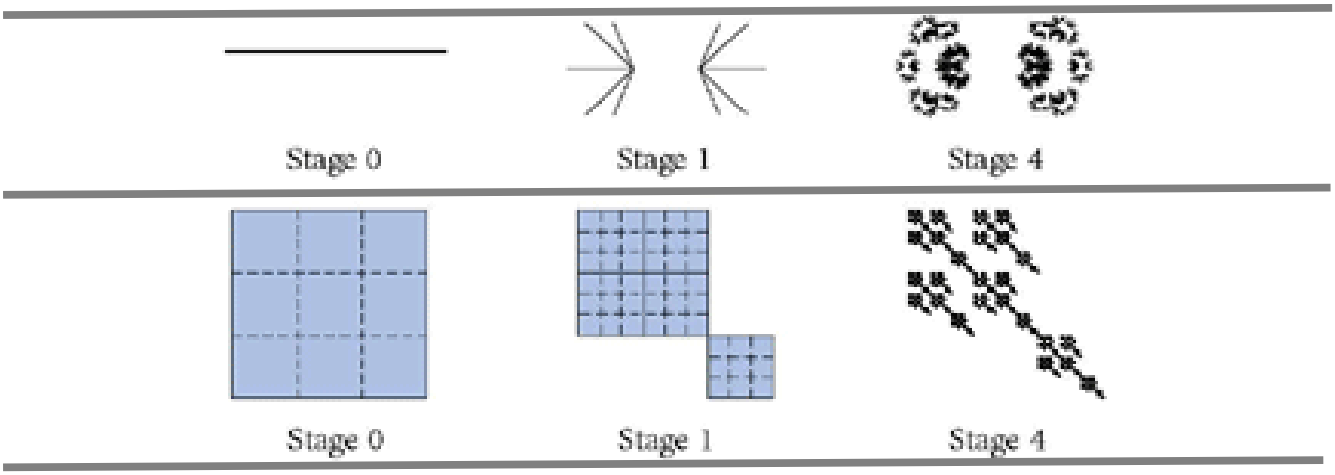
Algebra 1
Project: Invent a Fractal

Recursive procedures can produce surprising and even beautiful results. Consider these two fractals. (The top one was "invented" by high school student Andrew Riley.)
Would you have expected that the Stage 1 figures could lead to the Stage 4 figures?



Invent your own fractal. You can start with a line segment, as in the Koch snowflake or Andrew's fractal. Or, try a two-dimensional shape like Stage 0 of the Sierpinski triangle or the square in the "kite" above.

Your project should include the following elements, all shown neatly on one small poster. Strive to present work that looks good enough to display and is organized using a logical structure.

A. A detailed drawing of a higher-stage version of your fractal, along with (possibly smaller) drawings of the fractal at Stages 0, 1, and 2.

B. A written explanation of the recursive rule that someone could use to make the fractal, even if they've never seen it.

C. A table of values that shows how one aspect of the figure changes. Consider area, length, or the number of holes or branches at each stage.

D. A mathematical explanation of how to continue your table for higher stages. Demonstrate your skill with exponents and fractions! Include a formula for the n^{th} stage.

Be original! You may seek inspiration but try to create something new and unique.

Be on time! This project is late after Friday, September 27.

Criterion C: Communicating

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: 1. use limited mathematical language 2. use limited forms of mathematical representation to present information 3. communicate through lines of reasoning that are difficult to interpret.
3–4	The student is able to: 1. use some appropriate mathematical language 2. communicate through lines of reasoning that are able to be understood, although these are not always clear 3. adequately organize information using a logical structure
5–6	The student is able to: 1. usually use appropriate mathematical language 2. communicate through lines of reasoning that are clear although not always coherent or complete 3. present work that is usually clear and organized using a logical structure.
7–8	The student is able to: 1. consistently use appropriate mathematical language and notation 2. communicate through lines of reasoning that are complete and coherent 3. present work that is consistently clear and organized using a logical structure.

Criterion D: Applying mathematics in context

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: 1. identify some of the mathematical properties of an original fractal 2. apply mathematical strategies to find a formula for the nth stage, with limited success
3–4	The student is able to: 1. identify the mathematical properties of an original fractal 2. select appropriate mathematics to model the fractal 3. apply the selected mathematical strategies to reach a valid formula for the n^{th} stage
5–6	The student is able to: 1. identify the mathematical properties of an original, complex fractal 2. select appropriate mathematics to model the fractal 3. apply the selected mathematical strategies to reach a correct formula for the n^{th} stage
7–8	The student is able to: 1. identify the mathematical properties of a highly original, complex fractal 2. select appropriate mathematics to model the fractal 3. apply the selected mathematical strategies to reach a correct formula for the n^{th} stage