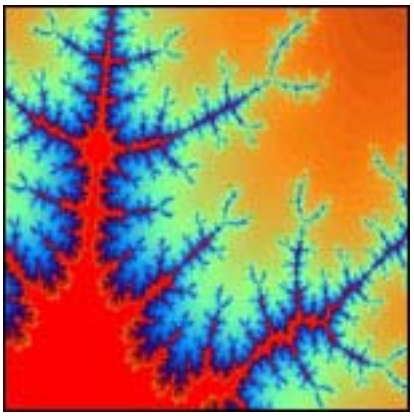


Pi, Pixels and Picasso
Supplemental Lesson Plan

Grade Levels: 6-8

This lesson was written to comply with the NCTM Standards. Teacher will use geometry to introduce students to modern mathematical research and to reinforce the arithmetic and geometry skills that they study in school. This lesson plan can be used to supplement the Edge Technologies, *Pi, Pixels, and Picasso* Computer Enrichment Program.

Kentucky Department of Education Standards: Middle level mathematics programs address Academic Expectations 1.5 to 1.9, Mathematical Communication and Reasoning; 1.16, Technology; 2.7, Number Concepts; 2.8, Mathematical Procedures; 2.9, Space and Dimensionality; 2.10, Measurement; 2.11, Change; 2.12, Mathematical Structure; 2.13, Probability and Statistics; Goal 5, Think and Solve Problems; and Goal 6, Connect and Integrate Knowledge.

Lesson Procedures: Students will study properties of fractals using computer tools they can access from the internet. The lessons are designed for students to work independently or with guidance from the teacher.

Mathematics Topics: Patterns, ordering fractions, area, perimeter, similarity, measurement, exponents

Key Terms: self-similarity, fractional dimension, iteration

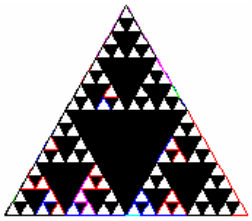
Cross-Curricular Application:

- Connects math, art, writing, history, and careers
- Shows how computer tools are useful in arithmetic and geometry

Materials and Media: Computers with graphics capabilities, although triangle grid paper and poster board is helpful.

Suggested Assessment: Questions included at the end of the mini-lesson. Students will create models of fractals, first on grid paper then using Java script. Students can research other mathematicians (i.e.: Pascal, Koch, Sierpinski) and discuss their contributions.

Cynthia Lanius



Making a Fractal: The Sierpinski Triangle

To make a fractal: Take a familiar geometric figure (a triangle or line segment, for example) and operate on it so that the new figure is more "complicated" in a special way. Then operate on that figure in the same way and get an even more complicated figure. Then do it again and again...and again.

Let's make a famous fractal called the ***Sierpinski Triangle.*** You will need triangular grid paper.

Step One
Draw an equilateral triangle with sides of 2 triangle units each. Connect the midpoints of each side.

How many equilateral triangles do you now have?
Shade out the triangle in the center.

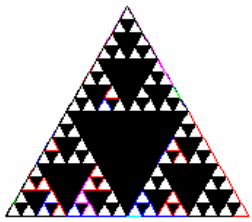
Step Two
Draw an equilateral triangle with sides of 4 triangle units each. Connect the midpoints of the sides and shade the triangle in the center as before.

Notice the three small triangles that also need to be shaded out in each of the three triangles on each corner.

Step Three
Draw an equilateral triangle with sides of 8 triangle units each. Follow the same procedure as before, making sure to follow the shading pattern. You will have 1 large, 3 medium, and 9 small triangles shaded.

Step Four
How about doing this one on a poster board? Follow the above pattern and complete the Sierpinski Triangle. Use your artistic creativity and shade the triangles in interesting color patterns. Does your figure look like this one? Then you are correct!

Teacher's Notes: Combine the students' triangles to form a larger Sierpinski Triangle. This makes a really nice wall hanging for the classroom.



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Questions On Sierpinski's Triangle

1. What fraction of the triangle in Step Two is NOT shaded?
2. What fraction did you NOT shade in the Step Three triangle?
3. Do you see a pattern here? Use the pattern to predict the fraction of the triangle you would NOT shade in the Step Four Triangle. Confirm your prediction and explain.
4. CHALLENGE: Develop a formula so that you could calculate the fraction of the area which is NOT shaded for any step.
5. Write the fractions in the above questions in order from least to greatest. Write a statement about how their order connects to the shading out process.
6. Find another interesting pattern in the fractal called the Sierpinski Triangle. Write a paragraph describing this pattern.

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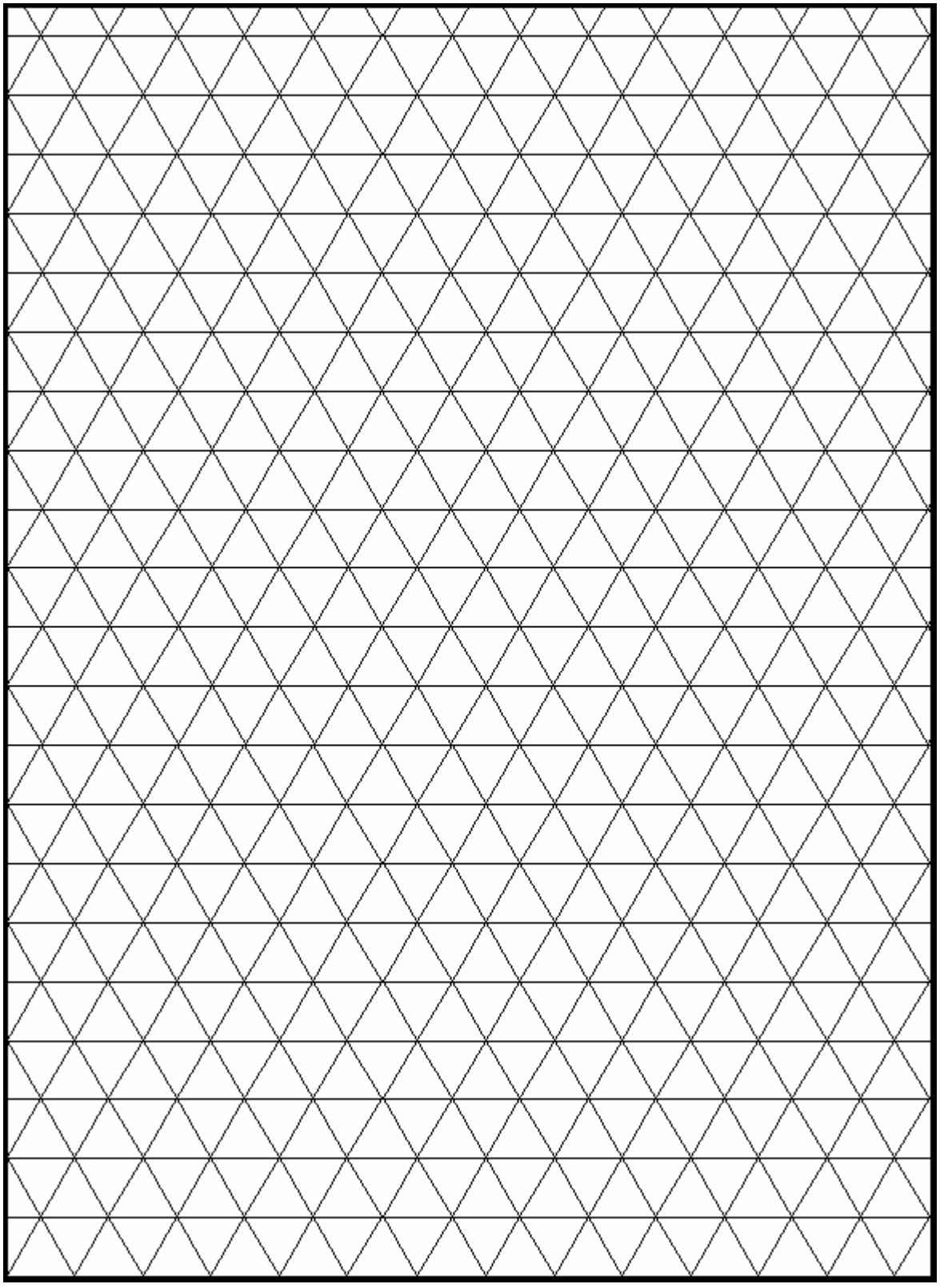

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