LessonTitle: Growing Generations of Similar Figures Pre 4.1a

Utah State Core PreAlgebra Standards 2.1, 3.1, 4.2 Geometry Standards 3.1 Process Standards 1-5

Summary

In this activity, students build larger and larger similar figures using pattern blocks. They keep track of the area growth and generalize the patterns.

Enduring Understanding

The concept of similarity has been used throughout history to solve problems relating to land and distance.

Essential Questions

How do you measure things you can't reach?

Skill Focus

- Similarity
- Exponential growth
- Dimensions and area

Vocabulary Focus

Triangle, rhombus, hexagon, similar

Materials

Pattern Blocks

Launch

What does similar mean? What is a generation? How do we make the next generation of a square using only squares? How do you create similar figures? What is a scale factor?

What happens to the area of a figure when the dimensions are multiplied by a scale factor?
Using the similarity principle, Erastosthenes found the circumference of the world before anyone had traveled it. The Egyptians used similarity to figure out property lines after the Nile flooded. Scale drawings and models involve the idea as well. Understanding and applying the concepts related to similarity provide us with a major tool for solving problems.

Explore (Teacher and student roles)

Discourse help and suggestions.
1) For trapezoids, it is possible to build larger trapezoids which aren't similar. This is where your discussion can lead to the idea that the ratios of the sides must be the same and the angles must be equal. You can see this if you hold a trapezoid a few feet above the new trapezoid. If you close one eye and can't make the trapezoid in your hand exactly fit over the shape on the desk then the new shape isn't similar, the angles aren't equal and the ratio of corresponding sides aren't equal.
2) For hexagons the students will quickly discover this can't be done unless they exchange hexagons for 3 blue rhombuses or 2 trapezoids. Then you just keep track of hexagon areas.
3) It's fun to build a very large hexagon or trapezoid and then see what generation it is.
4) Ask the question, "What happens to area when you double the dimensions? Triple them?"
5) The scales factor is simply what you multiply by each time

Summarize

Students explain how they know if the different trapezoids and hexagons they have build are indeed "similar" and how they know what "generation" they are.

The teacher relates the student explanation to ratios of the sides using proportions.

Apply

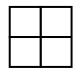
Assess

Growing Generations of Similar Figures

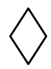
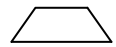
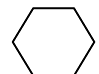
Name__________________

Build growing generations of similar figures. (the same shape but larger)

Use the same pattern block units for each succeeding generation. For example, how many square pattern blocks will you use to create the next larger square for each generation? How many triangle blocks will you use to create the next larger triangle, etc.

Example: Generation 1  Generation 2 

Hint: You may need to think in terms of hexagon areas, not hexagons.

Generation	Scale Factor	 Units of area	 Units of area	 Units of area	 Units of area	 Units of area
1		1	1	1	1	1
2						
3						
4						
5						
20						

1) What is the rule you would use to figure out the 20th generation without building the generation?

2) How can you know if the generation you are building is similar (by mathematical definition) to the preceding generations?

3) What happens to area when you double dimensions of a given polygon? Triple them?

4) Explain all you learned about similar figures. Be certain to talk about angles and ratios of corresponding sides.