Lesson Title: Exploring similarity (Written by K. Nettling Yoak and D. Ellis, 1/18/04)

Lesson Summary: Students will use dynamic software to draw line segments and quadrilaterals, comparing corresponding sides and generating ratios and proportions. In extension activities students will look for real life objects and prove or disprove similarity between 2 objects and explore the relationship between the ratios or areas and of side lengths in similar figures.

Key Words: Ratio, proportion, scale factor, similar, congruent, corresponding sides

NCTM Standards:
Geometry 6-8:
Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects
Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship

Measurement 6-8:
Solve problems involving scale factors, using ratio and proportion

Ohio Grade 7 Geometry Indicators:
Use proportional reasoning to describe and express relationships between parts and attributes of similar and congruent figures.
Apply properties of congruent or similar triangles to solve problems involving missing lengths and angle measures.
Determine and use scale factors for similar figures to solve problems using proportional reasoning.

Learning Objectives: Using dynamic geometry software, students will be able to draw lines and quadrilaterals that are similar or congruent and describe the proportions relating corresponding parts of each figure. Within the context of their descriptions/discussions, students will use key words appropriately.

Materials: Computers with geometry software and calculators

Procedures
Attention Getter: Distribute student activity sheet and read the opening problem asking the student to draw a line congruent to the one on their paper. Discuss with group why their lines are congruent

Grouping: Pair students for this activity or, if enough computers are available allow students to work independently of one another. Once they are done with their activity sheet encourage students to share their findings and discuss accuracy.
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Lesson goals: Learn to draw lines and figures that are similar or congruent, and describe the proportions relating corresponding parts of each figure.

Investigation:

Pre-Lesson Activity: Draw a segment congruent to the one below, and explain why it is congruent (use the definition of congruent).

Part I

1. Using geometry software, create two line segments with lengths of 4 cm and 5 cm.

2. Write a ratio of the lengths of the line segments. ___________________________

3. Determine and draw two more line segments whose lengths are in the same ratio of the first two. Record the lengths here, and explain and/or show why the lengths of the new segments have the same ratio as the lengths of the old segments.

4. Now, given the following six segment lengths, determine three pairs of segments that are in the ratio 2:3.

   4 1/2 cm    2 cm    6 cm    1 1/3 cm    4 cm    3 cm

Part II

1. Next, write four proportions to show the relationships between corresponding sides on the following figures:
2. Now, with your computer, draw a figure similar to the ones above, and describe in detail why it is similar. (You will present your figure and your description to the class.)

Extension activities:

1. Find two two-dimensional or three-dimensional figures/objects in real life that you believe may be similar. Take enough measurements on each to write potential proportions for corresponding lengths on each one. Using these potential proportions, determine whether the figures really are similar, and justify your decision. Show all of your work and reasoning on a separate sheet of paper.

2. Using the first two figures in Part II of the Investigation, find the area of each figure and determine the ratio of their areas. Describe how this compares to the ratio of the lengths of corresponding sides, and determine the specific relationship that exists between these ratios.