

## STRETCHING & SHRINKING

### Materials:

- Graph paper
- Pencil
- Rubber bands
- Lab and transparency sheets

### Resources:

- Graphing calculator

### Lesson 1:

#### What will they learn?

- To make enlargements of simple figures with a rubber band stretcher or a geoboard.
- To describe or define similarity in an intuitive way.
- To look for relationships between lengths and areas in simple similar figures.

#### Where can we start?

- In pairs or groups of 3 all students make rubber band stretchers. (use 2 rubber bands each 3 inches long)
- Demonstrate how to use the stretcher on a circle or other shape.
- Give students time to use labsheet 1.1A & 1.1B to draw the figure. (ask students the first 2 questions below)
- Repeat the process with labsheet 1.2A & 1.2B and again ask the first 2 questions below with the new drawings.

#### What are some good questions?

- What is the relationship of the side lengths of the original figure and the image? (try to get students to see that side lengths have doubled and areas have quadrupled)
- How do the features of the original and the image compare?
- What do you think will happen in a 3 band stretcher?
- What do you think will happen in a 4 band stretcher?
- Give groups an extra rubber band and repeat the process with a 3 band stretcher.
- How does the shape of the image compare to the original?
- How do the lengths of the sides compare?
- How do the areas compare?
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[Developed by Natalie Palmer and Deb Ostein of Hall Memorial School]

### Options/Suggestions

For example: What features make this a good lesson?

- Students are actively involved in the lesson.
- Activity asks students to test and make predictions.

### **Lesson 2:**

#### Connections

- Using CMP Investigation #3 – Stretching and Shrinking

#### What will they learn?

- To recognize similar figures and be able to tell why they are similar.
- To understand that any 2 similar figures are related by a scale factor which is the ratio of the corresponding size.
- To build larger shapes from copies of a basic shape (rep-tile).
- To find rep-tiles by dividing a large shape into smaller similar shapes.
- To understand that side and perimeters grow by a scale factor.
- Use labsheet 3.2 to challenge students to figure out which shapes are rep-tiles (students need 4 of each shape to build larger rep-tiles). Use transparency 3.2 to direct students through the activity.
- Use labsheet 3.3 to challenge students to divide shapes into rep-tiles (discuss congruent-same shape same size). Use transparency 3.3 to direct students through the activity.

#### What are some good questions?

- For labsheet 3.2 – What is the relationship between the scale factor and the number of copies of the original shape needed to make a larger similar shape? Is the number of copies of an original shape used to make a new shape related to the side lengths or the area of the new shape?
- For labsheet 3.3 – Ask students to choose one of their shapes and divide the 4 small shapes the same way as the original. How many new shapes does it take to cover the original? For the shape you subdivided, what is the scale factor from the smallest to the original? How does the scale factor relate to the number of the smallest shapes it takes to cover the original? What is the relationship between the scale factor and the areas of the large and small figures?

### Options/Suggestions

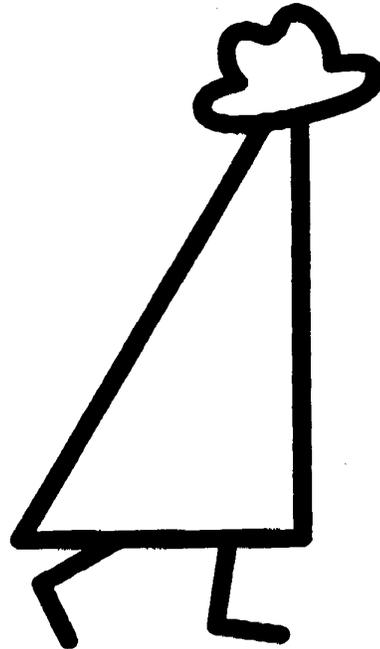
- CMP Stretching and Shrinking Investigation #2 – Similar Figures—This connects algebra and geometry using the coordinate plane – students explore algebraic rules that cause images to change size and to move about the coordinate plane – they compare angle measures and lengths of corresponding sides as they informally investigate transformations –students discover that for 2 figures to be similar corresponding angles must be congruent and corresponding sides must grow by the same scale factor.

**A.152**

**Right-handed Version**

$P$  is the anchor point.

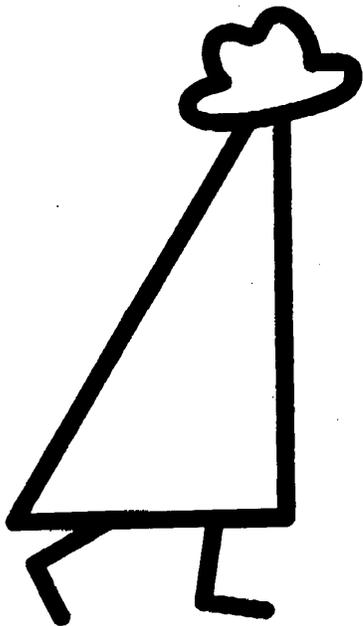
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**Left-handed Version**

*P* is the anchor point.



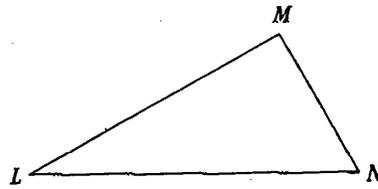
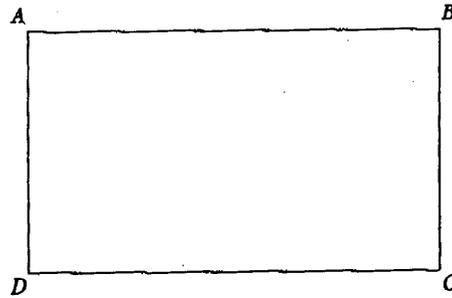
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**Right-handed Version**

$P$  is the anchor point.

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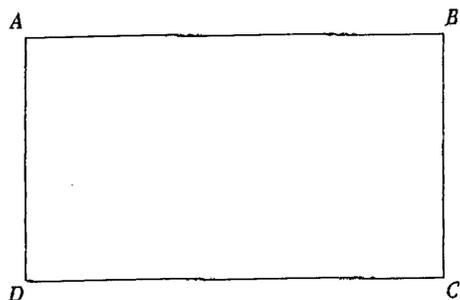


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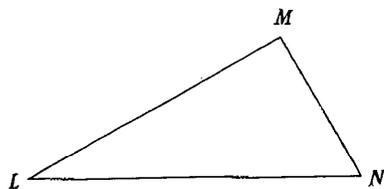
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**Left-handed Version**

$P$  is the anchor point.



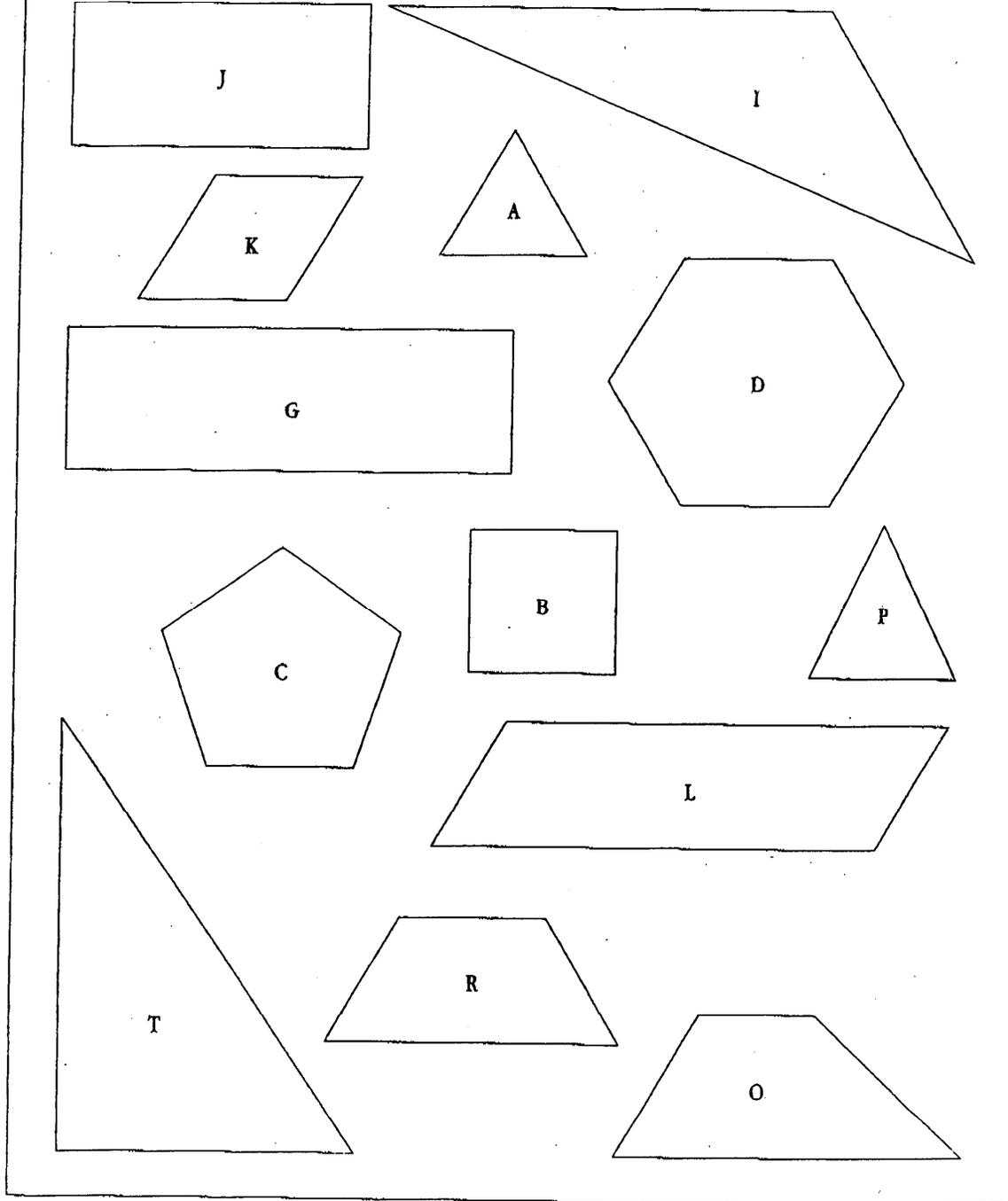
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### Shapes from the ShapeSet

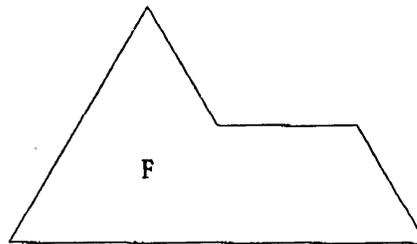
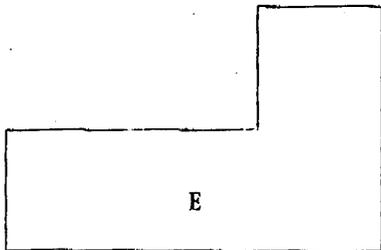
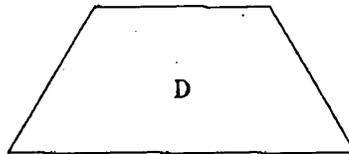
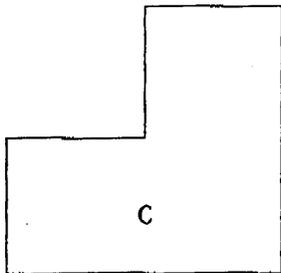
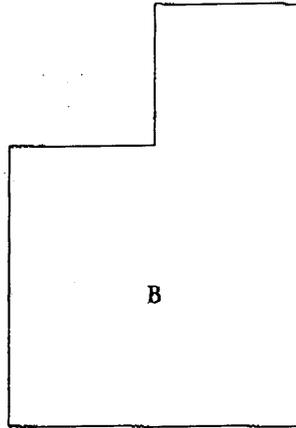
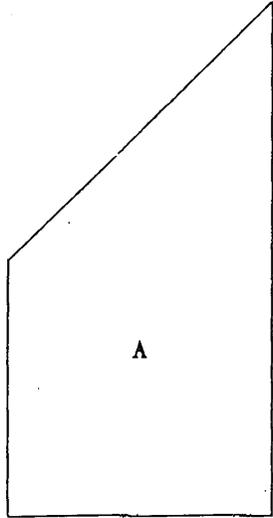


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**Shapes to Subdivide**



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