Further investigations:
When you make copies at an office supply store, look at the enlargement/reduction feature. Ask your student to explain how it should be set to enlarge a document and how it should be set to reduce it.

Look in your kitchen for similar objects such as dishes. Ask your student to determine the scale factor relating two such objects and to determine the ratio of their areas.

Help your student measure the length and width of a large object such as a car. Ask her to determine the dimensions of a model of that object using a scale factor of 1:64.

When you and your student read the newspaper, measure the length of a head of someone in a picture. Measure the length of your own head. What scale factor could the newspaper have used? How long would your pet's head be if it were in the picture?

Find the scale located in the legend on a map of the USA. Calculate the distance from your home to Washington D.C.

With your student, watch the movie, Honey I Shrunk the Kids. Discuss with your student the scale factor used. How would shrinking by such a scale factor affect the surface area (or skin) of the children? How would it affect their volume or weight?

Terminology:

Congruent figures: Figures that have the same size and the same shape.

Dilation: Transformation that changes the size of a figure, but not its shape.

Proportion: An equation that states that two ratios are equal.

Ratio: Comparison of two quantities by division. A ratio may be written \( \frac{r}{s}, \frac{r}{s}, \text{ or } r \text{ to } s \).

Scale factor: The ratio of two lengths of any corresponding sides of two similar figures.

Similar figures: Figures that have the same shape, but not necessarily the same size.

Related Files:
www.ceismc.gatech.edu/csi

Staying in Shape

Students will:

- Enlarge or reduce geometric shapes using a given scale factor
- Given a figure in the coordinate plane, determine the coordinates resulting from a dilation
- Compare geometric figures for similarity and describe similarities by listing corresponding parts
- Describe relationships among scale factors, length ratios, and area ratios of similar geometric figures
- Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures

Classroom Cases:

1. The diagram below shows two similar polygons.

   ![Diagram of two similar polygons](image)

   A. Write a rule for finding the coordinate of a point on Figure B from a corresponding point on Figure A.
   B. Write a rule for finding the coordinate of a point on Figure A from a corresponding point on Figure B.
   C. What is the scale factor from Figure A to Figure B? How are the perimeters and areas related?

   **Case Closed - Evidence:**
   A. \((x, y) \rightarrow (2x, 2y)\)  
   B. \((x, y) \rightarrow (0.5x, 0.5y)\)
   C. The scale factor from Figure A to Figure B is 2 to 1. The perimeters are related by the same factor, so the perimeter of Figure B is twice as long as the perimeter of Figure A. The area of Figure B is four times the area of Figure A because the areas are related by the square of the scale factor \((2/1)^2\).

2. Your principal wants to hang a banner to congratulate the basketball team on its season. The drawing for the banner is 8 inches by 15 inches. If the width of the banner will be three feet, how long should the banner be?

   **Case Closed - Evidence:**
   Since the banner and the drawing will be similar, their sides must be proportional.  
   \[
   \frac{\text{Length}}{15 \text{ inches}} = \frac{8 \text{ inches}}{36 \text{ inches}}
   \]
   I can solve the equation by multiplying both sides of the equation by 36.
   \[
   36 \times 15 = 36 \times \frac{8}{36}
   \]
   The banner should be 67.5 inches long.

3. The figure to the right is a suncatcher composed of eight congruent triangles. What is the ratio of the perimeter of the shaded area to the perimeter of the suncatcher? What is the ratio of their areas?

   **Case Closed - Evidence:**
   The perimeter of the shaded area is 4 units. The suncatcher has a perimeter of 8 units, so the ratio is 4:8 or 1:2. Since the shaded area is made up of two congruent triangles, and the suncatcher is made up of eight triangles, the ratio of their areas is 2:8 or 1:4.