ARCHITAN

MEASUREMENT • NUMBER

- Similarity
- Ratio
- Proportion

Getting Ready

What You'll Need

Tangrams, 1 set per child

Tangram paper, several sheets per child, page 90

Scissors, 1 per child

Metric ruler, 1 per child

Protractor, 1 per child

Overhead Tangrams and/or Tangram paper transparency (optional)

Overview

Children make a set of Tangram pieces that is three times larger than the plastic Tangram set. In this activity, children have the opportunity to:

- apply the concept of similarity to pairs of polygons
- use ratio and proportion in measuring and enlarging polygons

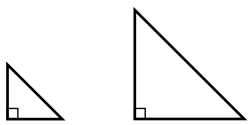
The Activity

Children may use a metric ruler and a protractor to make the larger shape, or they may use the small Tangram triangle itself to measure sides and angles.

Introducing

- Display a small Tangram triangle. Ask children to work in pairs using any strategy they like to draw a triangle that has the same shape as this one but with sides that are twice as long.
- Compare the triangles and discuss the methods that were used to make the larger triangle similar to the original one.
- Point out the proportional relationships between the triangles noting that in similar triangles, sides must be in proportion, and corresponding angles must be congruent. If necessary, review the notation for representing a scale of the ratio; in this case:

1 to 2 or 1:2



On Their Own

Can you enlarge each Tangram piece to three times its original size?

- Be an architect and use your Tangram set as a blueprint to construct a large set of paper Tangram pieces. Make the ratio of each plastic Tangram piece to the corresponding piece in the larger set 1 to 3.
- Copy the new set of pieces onto Tangram paper.
- Cut out your pieces.
- Be ready to tell how you know that each piece is similar to, or is an enlargement of, the corresponding Tangram piece.

The Bigger Picture

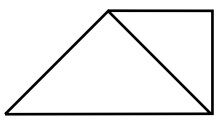
Thinking and Sharing

Use prompts such as these to promote class discussion:

- What strategies did you use to make enlargements of the pieces? Did you use the same strategies for all the pieces? If not, why?
- What is the same about a piece and its enlargement? What's different?
- Which piece was the easiest to enlarge? Which was the hardest?
- Did you have to measure every side of every piece before enlarging it? Why or why not?
- What pieces from the Tangram set were already similar? How do you know?

Writing

Have children describe how they could enlarge this shape made from Tangram pieces.



Extending the Activity

Have children make another set of Tangrams, this time using the enlargement of the medium triangle they made in this activity as the smallest piece.

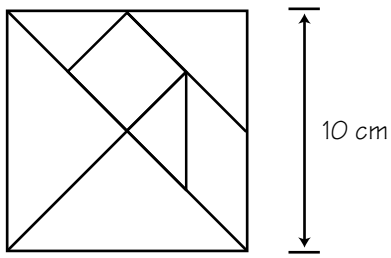
Teacher Talk

Where's the Mathematics?

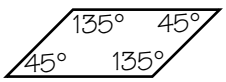
As children work through this activity, they see what happens to lengths and angles when polygons are enlarged. Using problem solving and measuring skills, children apply scale ratios in a concrete situation. They see how change in scale affects the measurement of the sides, angles, and area of polygons.

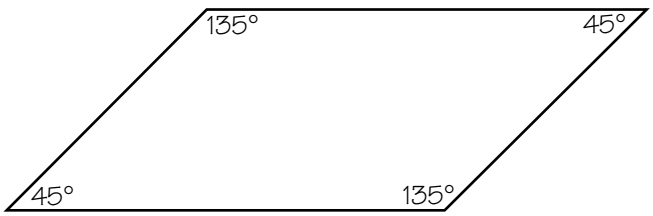
Children may approach the problem of making their enlargements in a variety of ways. Some children may make a large square with sides three times longer than a square built from one set of Tangram pieces. These children may then fold or draw lines within the square to make the larger Tangram pieces.

Size of Square Built From Actual Tangram Pieces



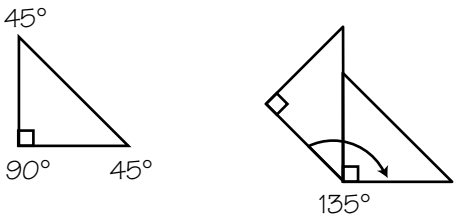
Other children may approach the task by measuring sides and angles and enlarging pieces one at a time. For example:



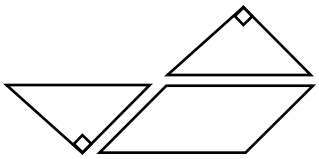


5 x 3 = 15 cm

Children may have used a protractor to measure the angles or may have measured angles by using triangles.



As children see the need to measure lines and angles, they may substitute the use of the small Tangram triangle for the ruler. These children may note that all of the Tangram sides can be measured with the sides of the small triangle.



Children who have had experience measuring area with a small Tangram triangle may use this knowledge to enlarge the Tangram set. Once children have made the small triangle in the larger scale, they can make copies of that triangle and then use them to build the remaining Tangram pieces.