Big and Small

Purpose:

The purpose of this activity is to engage students in applying their knowledge of fractions in a geometric context.

Achievement Objectives:

GM2-1: Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time.
GM2-4: Identify and describe the plane shapes found in objects.
NA2-5: Know simple fractions in everyday use.

Description of mathematics:

In readiness for this problem, the students should have familiarity with each of the following components of mathematics. The problem may be solved with different combinations of these components.

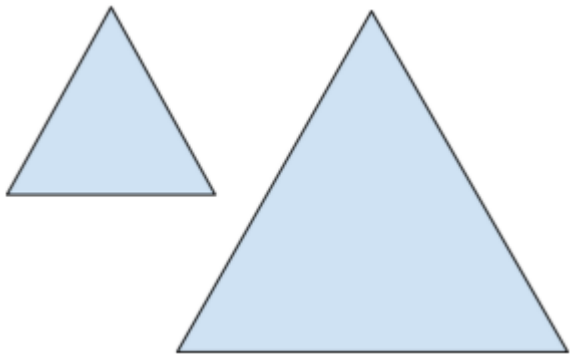
- naming polygons
- regular polygons
- length
- congruent shapes
- area
- non standard units of area
- using fractions to express a proportion

This activity may be carried out with guidance, or by allowing the student to follow their own method of solution. It may be attempted practically, or by using measuring construction techniques. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

Here are two equilateral triangles. One has sides that are 3cm long and the other has sides that are 6cm long.

What fraction of the large triangle's area is the small triangle?

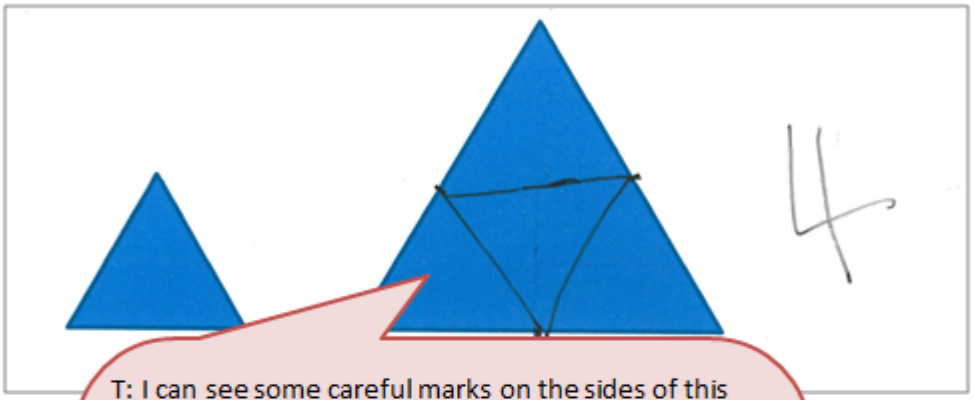


The procedural approach

The student is able to resolve the larger equilateral triangle into a tessellation of smaller equilateral triangles and use this to pattern to find solve the problem.

Prompts from the teacher could be:

1. Draw, or cut out an equilateral triangle of side length 6 cm.
2. On your larger triangle, mark out a smaller equilateral triangle of side length 3 cm.
3. Fit into the larger triangle, as many of these smaller triangles as you can without any overlapping?
4. Why don't we want any of the smaller triangles to overlap?
5. Is there any space left over or is the larger triangle completely full?
6. How many smaller triangles fit into the larger one?
7. What fraction of the large triangle's **area** is the small triangle?



T: I can see some careful marks on the sides of this triangle. Tell me about those.

S: That's where I measured out 3cm triangles in the corners, and then I drew those in. And then there was one more in the middle.

T: Does this have side lengths of 3cm too?

S: Um… I'll check… Yes.

T: So is that why you've written 4?

S: Yeah it looked about right.

T: So now you've checked it, can you say what fraction the smaller triangles area is of the large?

S: It's four times … no the other way. It's one quarter.

The conceptual approach

The student is able to The student is able to find and express a smaller area as a proportion of a larger.

Prompts from the teacher could be:

1. Cut out an equilateral triangle of side length 6 cm. You may also like to cut out a smaller equilateral triangle of side length 3 cm.
2. Fold the larger triangle in such a way as to mark of a section that is equivalent to the smaller triangle.
3. Keep folding to fit as many smaller triangles as you can into the larger.
4. How many smaller triangles fit into the larger one?
5. What fraction of the large triangle's **area** is the small triangle?