Similar Triangles

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For the lesson on 1/3/2016
At Chanel College, Coolock
Teacher: M. Fahy
Lesson plan developed by: M. Fahy, J. O'Keeffe, J. Cooper.

1. **Title of the Lesson:** Similar Triangles

2. **Brief description of the lesson**

To help students to realise the relationship between angles, and sides of similar triangles.
To help the students come up with a definition of similar triangles; why triangles are similar.

3. **Aims of the Lesson:**

Long-range/thematic goals:

I'd like to foster my students to become independent learners
I'd like my students to become more creative when devising approaches and methods to solve problems
I'd like to emphasise to students that a problem can have several equally valid solutions

Lesson specific aims:

The students will be able to work in groups and develop group problem solving skills.
The students will become confident and competent presenters.
The students will know what similar triangles are
The students will be able to identify similar triangles.

4. **Learning Outcomes:**

As a result of studying this topic students will be able to:
> Understand proportionality
> Understand equal angles
> Understand slope.
> Recognise similar triangles.
> Understand the definition of a similar triangle.

5. **Background and Rationale:**

In a typical lesson on similar triangles students are told why triangles are similar. We hope that students will discover the properties themselves by experiential learning. Students will be asked to recreate a pattern on the board and we hope that from that they discover the relationship between sides, angles and similar triangles. We also hope the students will get a better grasp of proportionality and slope.

6. **Research**

From the Maths Syllabus, Strand 2 Geometry and Trigonometry:
2.1 Synthetic geometry
Students should learn about Theorem 13 : If two triangles are similar, then their sides are proportional, in order (and converse).
Students should be able to apply the results of all theorems, converses and corollaries to solve problems.

7. Flow of the Lesson

Teaching Activity	Points of Consideration
1. Introduction Prior knowledge: Triangles; equilateral, isosceles, right angled. Area of a triangle. Rectangles, Area.	<u>3-4 minutes</u> Examples of triangles are put on the board. Teacher asks students to identify shapes and to give different properties of each one.
2. Posing the Task "Recreate the triangular pattern that is on the board with cut outs and different coloured cards. Feel free to use as many shapes as you like, stick the shapes together any way you like or overlap shapes."	<u>4 minutes</u> Pattern is put on the board with measurements on the lines (See Figure A) Students given card, with grid printed on them, in the same colours as the figure on the board. They are also given a copy of the figure in colour and to scale. They are given scissors, bluetac, rulers, glue and markers Remind students to measure twice and cut once
3. Anticipated Student Response As shown in the board plan, we anticipate the following responses from the students: a. Students will recreate the pattern using strips rather than triangles. b. Use rectangles and triangles. c. Students will use similar triangles.	<u>10-12 minutes</u> While students are working teacher will walk through the room observing good practice from students and nudging weaker students with ideas. Teacher will make a note of which students are using which methods and will organise students to present their work on the board based on the a,b,c from the anticipated response.

4. Comparing and Discussing
First student asked to present their solution will be one who used strips.
Second student asked to present their solution will be one who usedrectangles and strips and triangles
Third student asked to present their solution will be one who used similar triangles
	<u>15 minutes</u>
	<u>First Student</u>
	    Talk about why you decided to use this method. Can you see any pattern with the heights of your strips. Do you think any other shapes could be used apart from strips.
	<u>Second Student</u>
	    Talk about why you decided to use this method. Can you see any patterns to the triangles you created in each colour. (same) Can you measure the length of the diagonal line of each triangle? Can you see any patterns to the rectangles you created in each colour. (size is doubling/tripling) Can you think of any other way to do this?

	Third Student Talk about why you decided to use this method. Can you see any patterns to the triangles you created in each colour. (same) Can you measure the length of the diagonal line of each triangle? Do you notice any pattern? Do you notice anything about the differnet triangles measurements that you created? Is there any pattern to the angles of the triangles you've created?
5. Summing up Discussion about similar triangles. Angles, sides, slopes. Work towards definition of similar triangles.	5 minutes Use the summary of the lesson to reinforce idea of similar angles, proportionality of sides and definition of similar triangles. Use last example to illustrate all of the above.

8. Evaluation

- What is your plan for observing students?
  - Walk around the room observing the students' work.
  - Encouraging participation and expanding of ideas. (Lead teacher only)
- Discuss logistical issues such as who will observe, what will be observed, how to record data, etc.
  - Observe the shapes without measuring. Take notes.
  - Take note of false starts, and multiple approaches.
- What observational strategies will you use?
    Take notes. Take photos. Have a seating chart to more easily identify the efforts of each student.
- What types of student thinking and behaviour will observers focus on?
  - Ability to draw and cut right angles, parallel lines, and duplicate the angles.
  - Whether the student notice any numerical patterns.
- What additional kinds of evidence will be collected?
  - Examples of students work
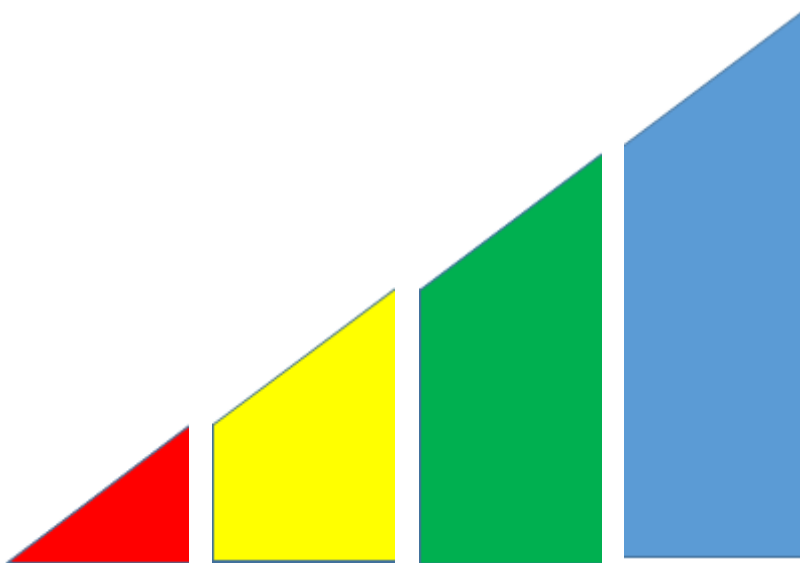 - Discussion recorded on the "expected answers" sheets on boards.
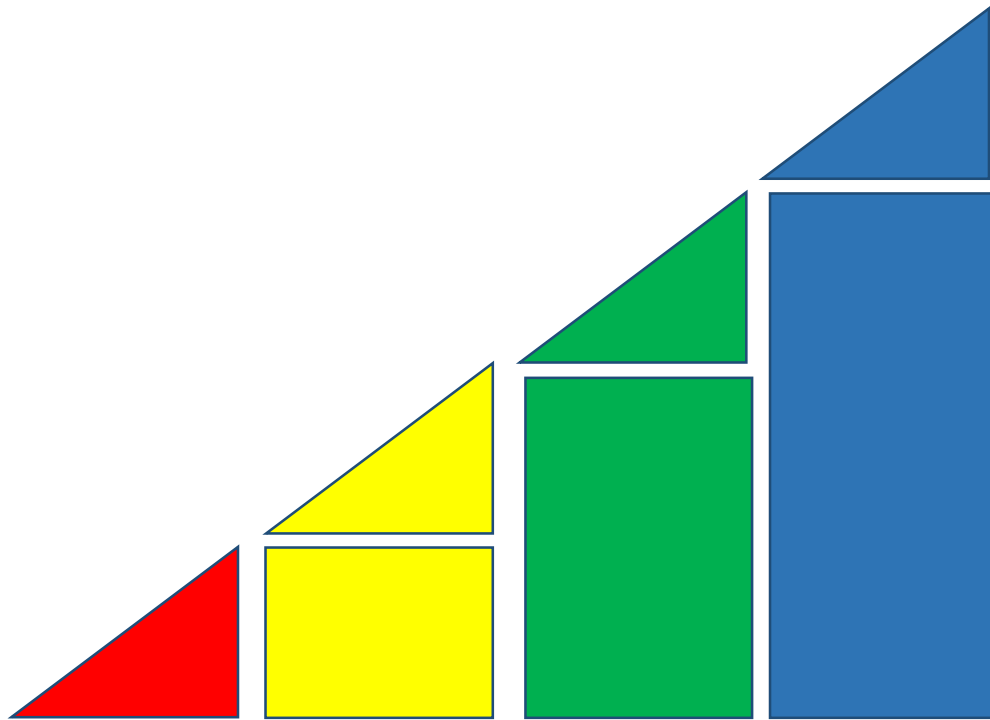
Figure A
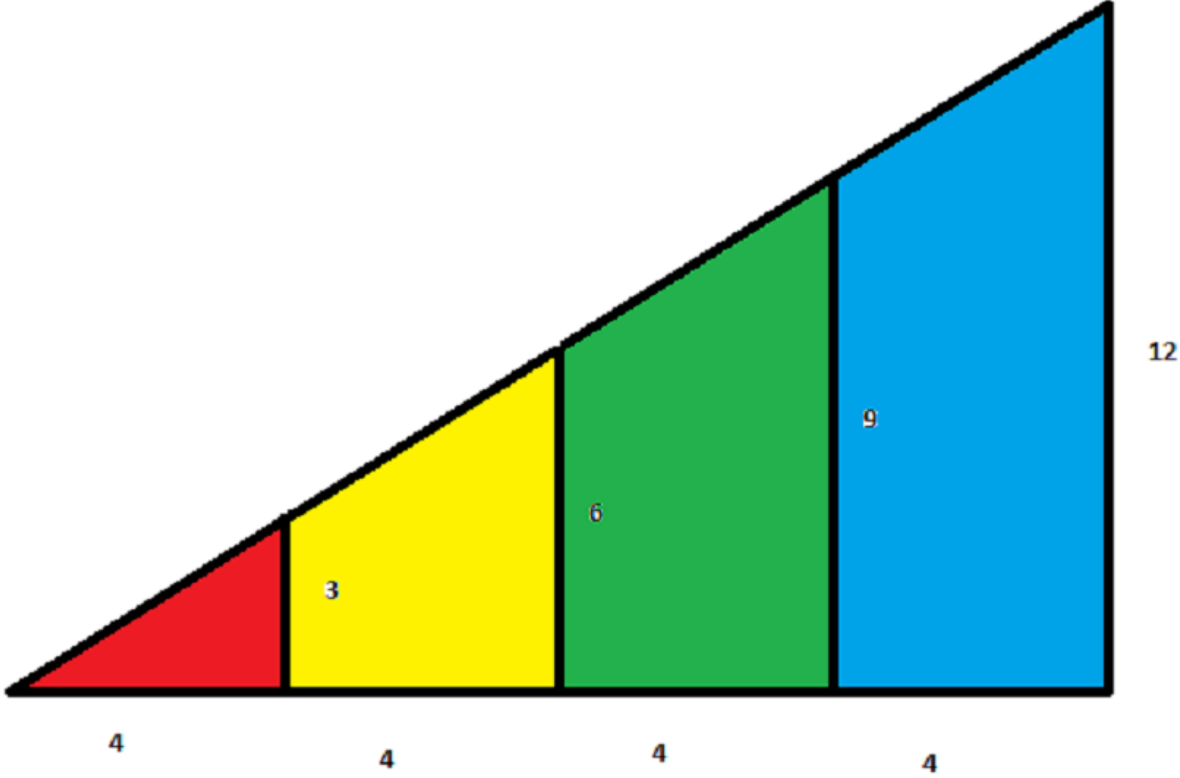
9. Board Plan

This section contains a diagram showing how work on the blackboard will be organized.
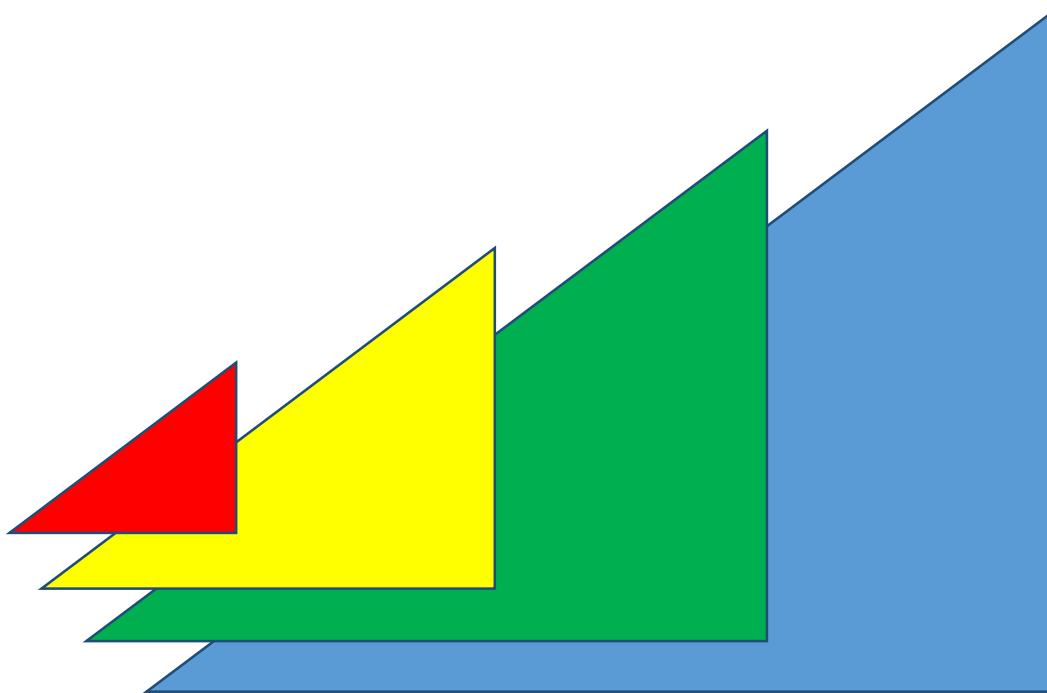

12 cm

4 cm   4 cm   4 cm   4 cm
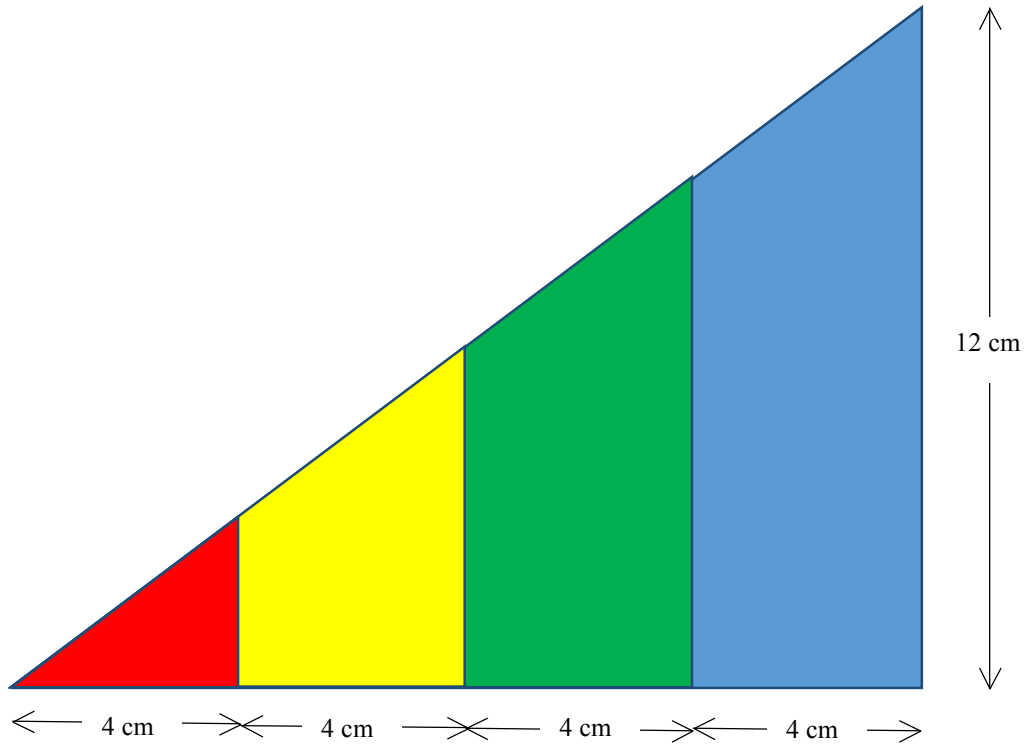
The pattern put on the board by the teacher
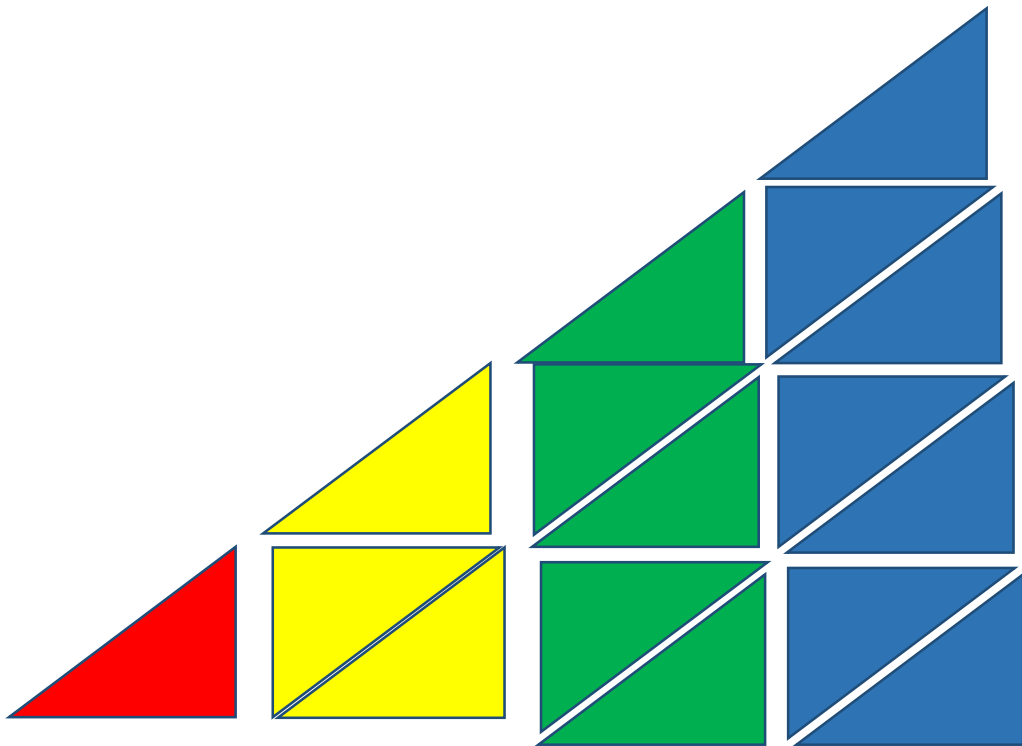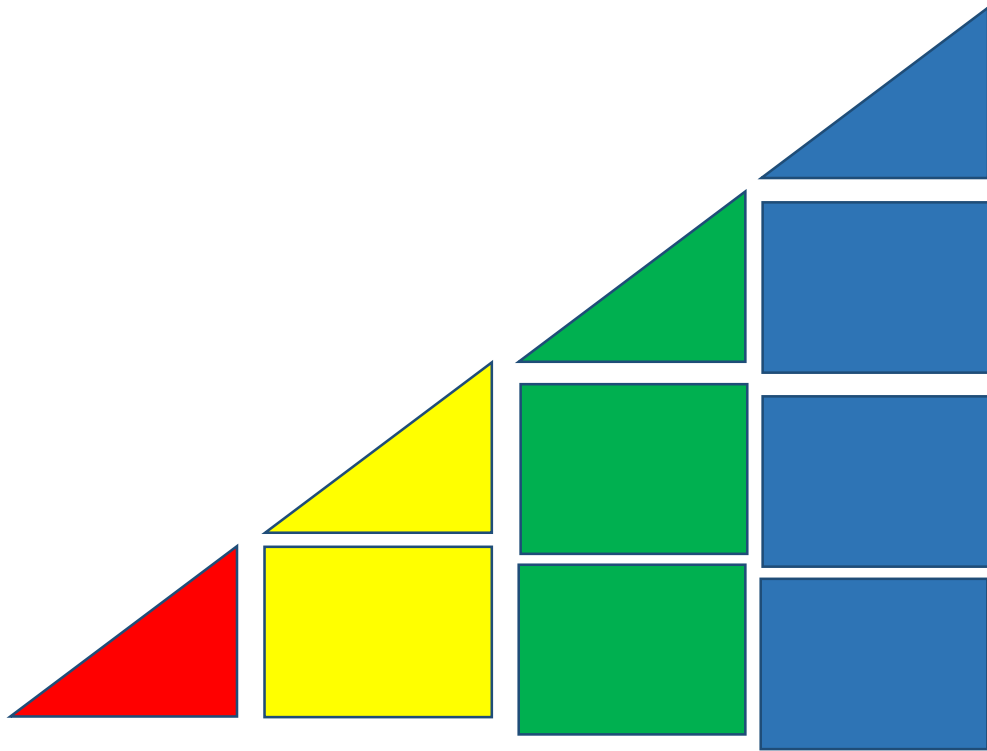

Student anticipated response (a)

Student anticipated response (b)

Student anticipated response (c)

Other possible solutions

10. Post-lesson reflection

During the introduction, students were able to recall the names of angles and various types of triangles from first year work. This meant that they were ready to progress to the task.

Students all grasped the problem as put to them to " recreate the pattern on the board". The following anticipated responses were offered by the students who were then able to explain their work at the board.

The first anticipated response of "pillars" was used by all the students.
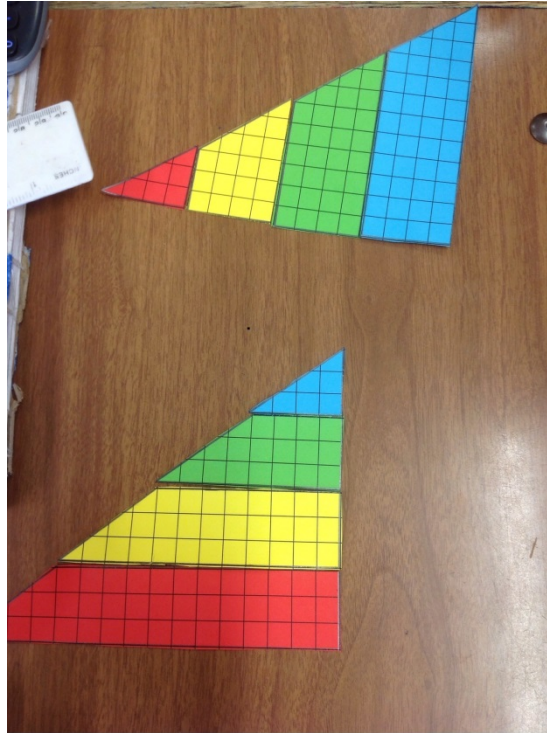
It was then necessary for the teacher to suggest the idea of repeating the problem using more than one type of shape. This led onto the idea of using rectangles and triangles. This led to the students using terms such as "getting bigger" and "the same". Students produced the second and third anticipated responses.

Students then came to the board to show and discuss their work. This led to the use of some expected terms. These included "same size", "getting bigger", "same shape", and "more".


The lesson lasted 40 minutes which, with this particular level of student, was not enough time to achieve the goal as set out in the lesson plan. We felt, however, that they were making excellent progress and in the post class discussion it was decided to try one more class with the group to see if they could come up with the overlapping triangles idea. It was suggested that with this group that the word "overlap" be used as a nudge. We feel that with a stronger group the task would be completed fully in a single class.

The second class began with a recap of where we had finished. The problem was set again with the focus now on using one type of shape only. It was also suggested to students that they consider overlapping shapes to create the pattern.

One of the expected outcomes " using the same size triangles" was used.
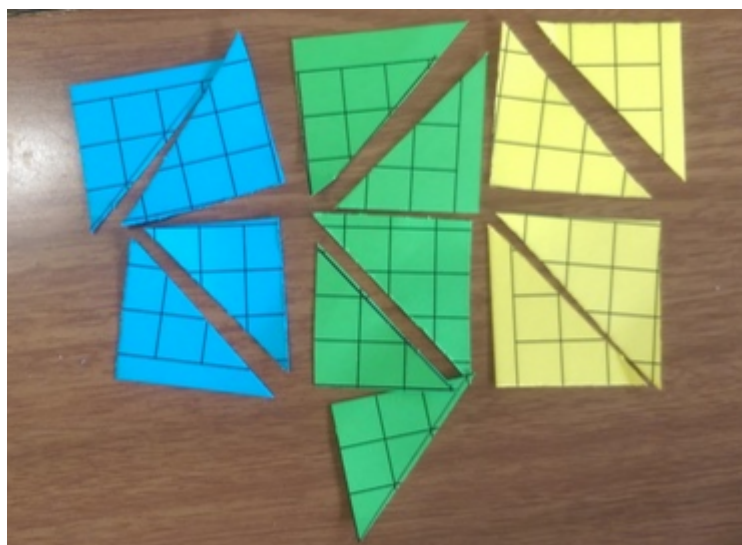
Again the idea of overlapping shapes was put to the group and this lead to them recreating the pattern in the desired way, using " similar triangles", but with several "variations" along the way.
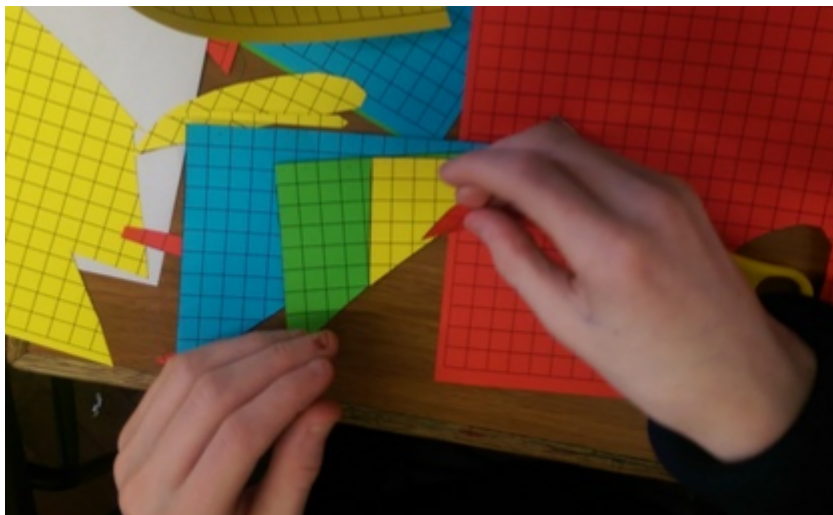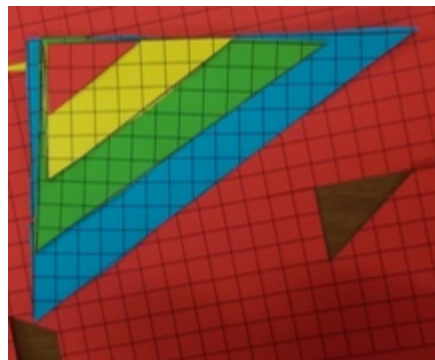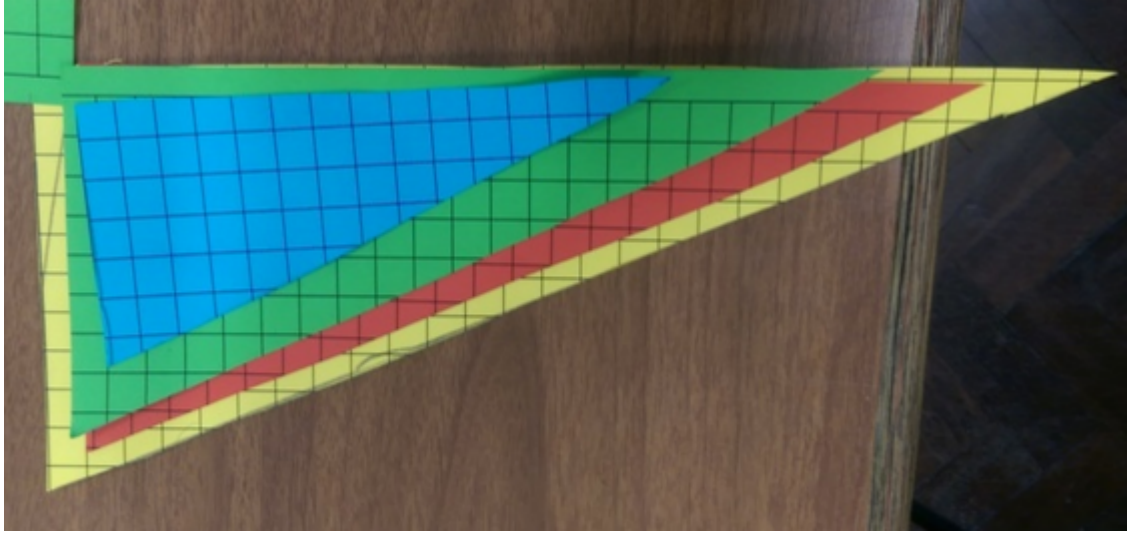
Students were brought to the board to show their developing ideas, ultimately leading to the final answer. Terms such as "increase in size", "same shape" and "proportion" were all mentioned by the students and discussed by the class as a group.
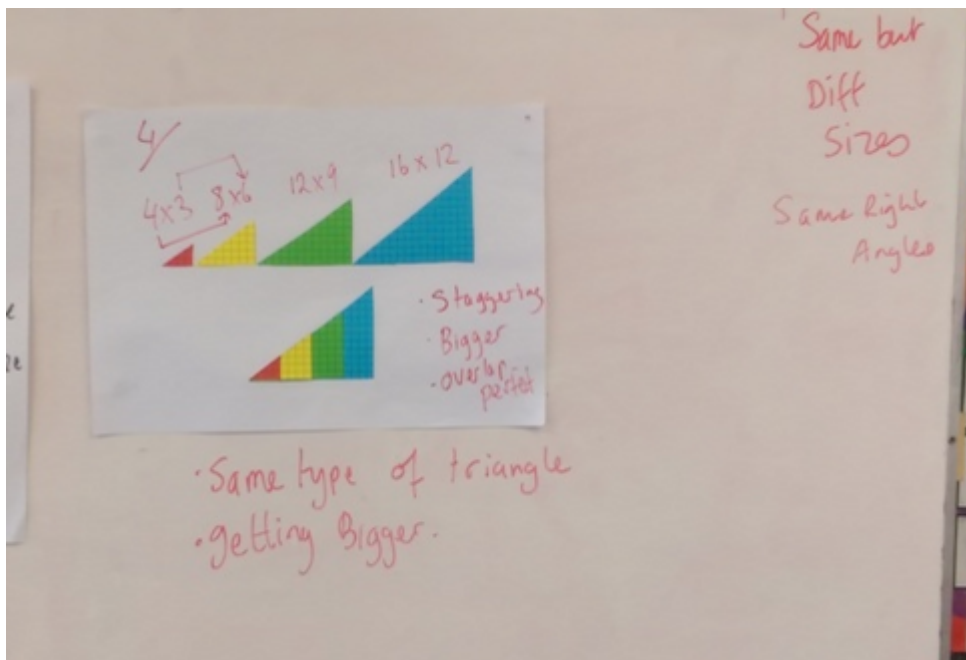
While the pattern was completed in the anticipated way we did not have the opportunity to build on the idea of similar triangles. We feel this was down to the level of the group and that the lesson worked in the way it was designed to work.

Overall, we were happy with how well the lesson worked. As stated above the lesson should be taught over a double period, or in two consecutive lessons, with an ordinary level group. With a higher level group we feel that they would achieve the goal in a single lesson.