Isometrically

Deduction

Prerequisite knowledge

- Different forms of symmetry (rotation and reflection)

Why do this problem?

The problem invites working systematically in a spatial environment and complements the problem 'Symmetry challenge', but in a less familiar setting. This problem relates closely to 'Symmetry challenge' and could be treated either as an extension activity or as something to revisit to reinforce the very systematic way data needs to be collected.

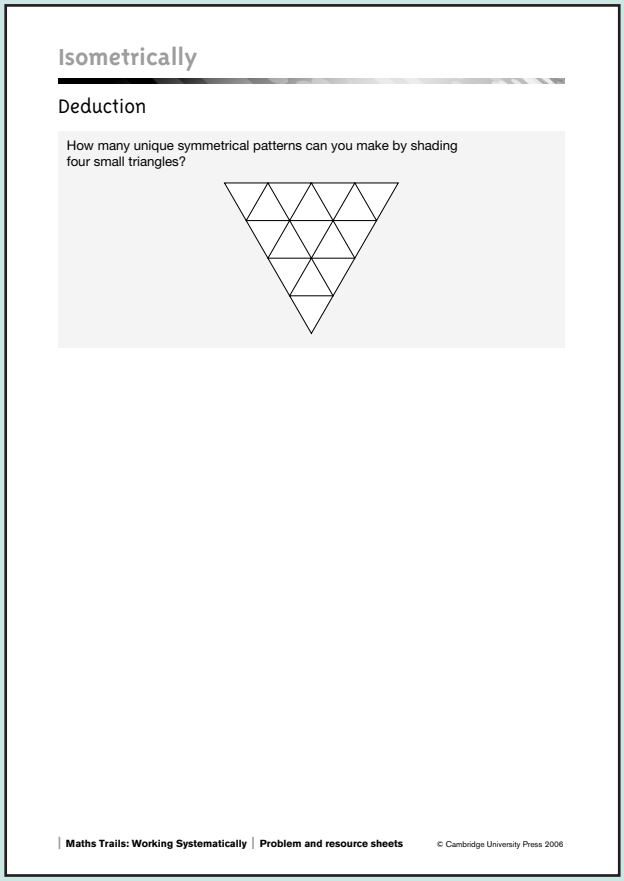
Time

One lesson

Resources

CD-ROM: problem sheet, resource sheets of blank grids and examples

NRICH website (optional): www.nrich.maths.org, October 2003, 'Isometrically'


Isometrically

Deduction

How many unique symmetrical patterns can you make by shading four small triangles?

Maths Trails: Working Systematically | Problem and resource sheets © Cambridge University Press 2006

Introducing the problem

Show the class the resource sheet of blank grids and ask them to find as many symmetrical patterns in 15 minutes as possible, shading only four small triangles.

Ask for feedback from the class:

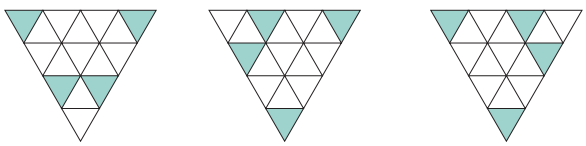
- How many patterns did you find?
- Do you think you have them all?
- Will you be able to convince others that you have them all?

Main part of the lesson

Ask the class to work in pairs on finding all the symmetries, displaying them on their resource sheets in an ordered way so that they can explain their methods to the rest of the group.

Pupils may need some guidance as they work. To help to explain symmetrically equivalent shadings, a resource sheet of examples is provided. Ask the pupils:

- Are the following shadings the same or different?



- What symmetries are possible if you shade triangles on a line of symmetry?
- Try shading 2, 3, 4, ... triangles only on a line of symmetry. What symmetries are now possible?

At the end of the session pupils should display their patterns for others to look at.

Plenary

Ask the groups to look at all of the displays and see which ones tell a clear story of how the group was 'systematic'.

- Can you guess the next pattern in a sequence?
- Do you feel confident that the group will not miss any symmetries out if they complete the task?

The problem can be extended to discuss all possible symmetrical shadings.

Solution notes

There are 52 symmetrical patterns with four triangles shaded.