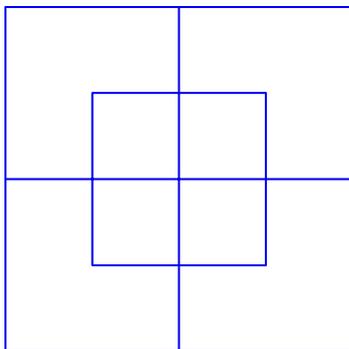## Diagrams

What do you see?

Diagrams on a page will often be interpreted in different ways by different students.

Look at this example.

Individually, write your own descriptions of this figure.

Then compare.

Were your responses the same, or different?

Now draw the diagram freehand (yes, pencil and paper).

How did your approach to the drawing compare with your description?

You probably made a number of assumptions in order to interpret the diagram. The following questions should all be answered:

- Does the size matter?
- Are all the angles assumed to be fixed?
- Are all the squares the same size?
- Is the square at the centre the same size as the corner squares?
- Is the side length of the four small squares exactly half of the corner squares?
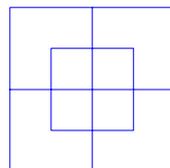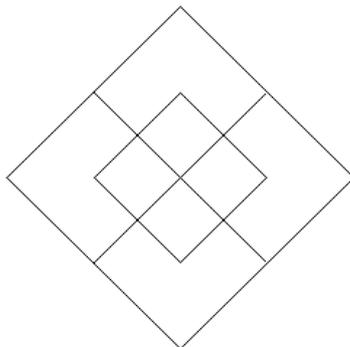
Generally, it might be important to establish whether or not a rotation or an enlargement of the diagram is to be regarded as the same diagram.

And what about other transformations?

We naturally make various assumptions otherwise progress would be too slow.

Right-angled triangles

Traditionally, right-angled triangles are often presented with the two sides forming the right-angle horizontal and vertical.
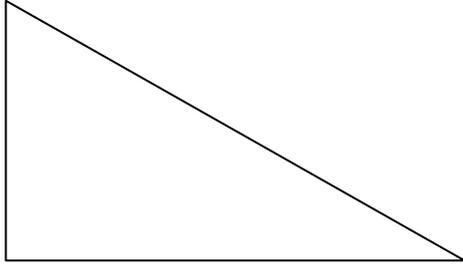
The result is that the image above resides in the students' minds. In the first instance this may aid recognition, but in the long run it will lead to a deficient conceptual understanding of the right-angled triangle. Students must encounter right-angled triangles (and all other shapes) in different orientations.

Dynamic geometry software provides a very rich and general picture of shapes. A static diagram only illustrates one example, from which some learners are able to generalise, but many others are not.

Semi-regular tessellation

Here is a semi-regular tessellation made from squares, equilateral triangles and hexagons.

You probably all see different images when you look at the diagram
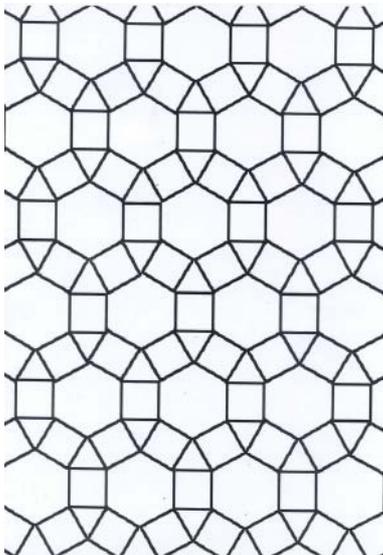
Your task is to work out the ratio of the number of different shapes present. For each hexagon how many squares and how many triangles are there?

A good approach would be to find a shape within the diagram that is repeated. Try to VISUALISE a combination of the given shapes that are repeated. TRY TO DO IT IN YOUR HEAD without using a pen or pencil.

If that was hard you might want to shade some of the shapes to find the answer.

Shading takes a long time compared with the formation of a mental image, but it may be a more reliable approach.

Probability chart

Do a simple experiment, such as rolling two dice 50 times in order to evaluate the experimental probability of scoring four or less.

Each time you 'win' (scoring 2, 3 or 4) move down one level to the right.

Each time you 'lose' move down one level to the left.

Draw your path with a continuous line, moving down each time from where you were. After 50 trials the line reaches the bottom of the chart and it then shows the percentage of 'wins'.

Discuss the importance of this chart and what it conveys. What is the value of using this chart, rather than simply counting he number of times you 'win' and the number of times you 'lose'.