Communications

Pictures inspired by Theo van Doesburg

JOHN SHARP

In response to Marion Walter's encouragement in her article in FLM **21**(2) to produce "some more visual pieces that readers might submit and that could be used to make FLM richer visually" (p. 26), I have produced a number of 'variations' on van Doesburg's *Arithmetic Composition I*. The key to the following pictures is as follows.

Figures 1 and 2 are concerned with squares being added to a rectangle instead of a square as in van Doesburg's original painting

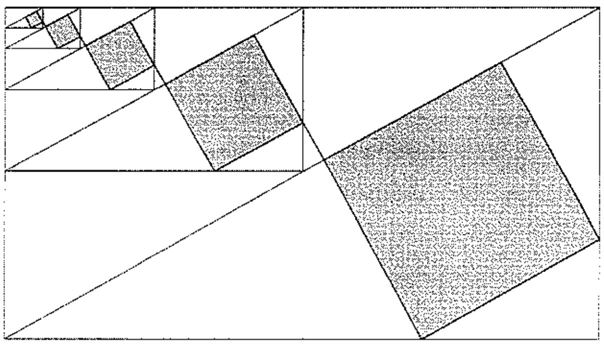

Figure 1:

Figure 1 is a rectangle where the sides are in the ratio of 1:1.79406. and the side of the square is continuous with the side of the next square see Sharp (in press)

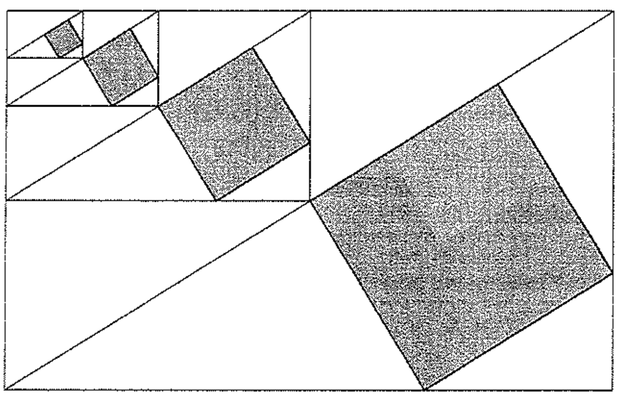

Figure 2:

Figure 2 is a rectangle where the sides are in the ratio of the golden section and the square corner is at the same position as the corner of the next rectangle.

Figures 3 and 4 are concerned with the same-shaped rectangle instead of a square.

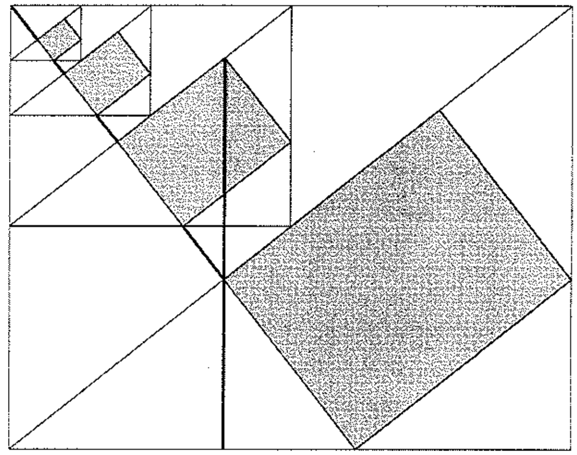

Figure 3:

Figure 3 is a rectangle where the sides are in ratio of the square root of the golden section. This time, the sides of the rectangles are continuous, but the vertical line is also interesting in the way the vertices of the rectangles are in line.

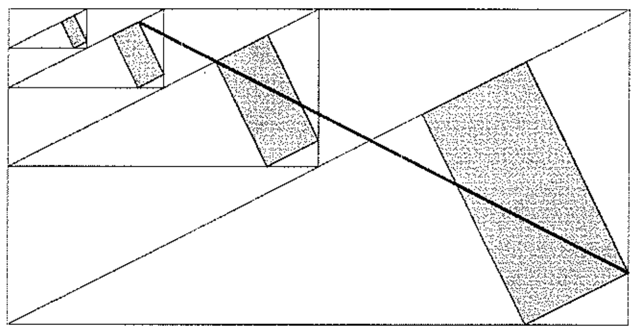

Figure 4:

Figure 4 is a rectangle with the ratio 1:2. Note how points are in a line

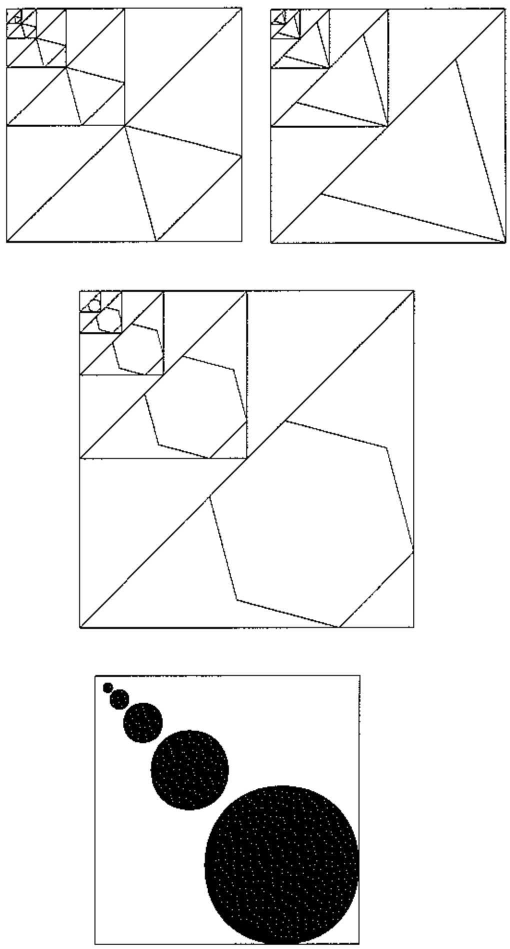

Figure 5:

Figure 5 is an extension for other polygons in van Doesburg's square, plus a set of circles which are the incircles of the triangles See Sharp (in press) for more detail.

Reference

Sharp, J (in press) 'Geometry inspires art – art inspires geometry', *Mathematics in School*.

Re-constructing a Painting with Geometric Eyes

NATHALIE SINCLAIR

Upon receiving issue **21**(2) of *For the Learning of Mathematics*, I turned right to the 'cover story', which featured Marion Walter's (2001) vivid mathematisation of Theo van Doesburg's painting *Arithmetic Composition 1*. I had just begun working with a small group of grade eight students who were working independently on a geometry course I was to visit every week with some tasks using *The Geometer's Sketchpad*. The first chapter of their school textbook focuses on inductive reasoning. As I was preparing a suitable task, I remembered the many interesting mathematical patterns Marion had mined, including the inductive geometric pattern suggested by the painting's self-similarity

By asking the students to construct the painting with *Sketchpad*, I hoped to probe some of their inductive reasoning skills and, also, to introduce a few new *Sketchpad* commands – this was only our third class together and we had not yet constructed a square! I was also interested in seeing how my students would interpret the painting, not so much as art critics, but rather in terms of the mathematical properties and relationships they would notice. The image on the canvas may be singular and static, but the process of construction, which van Doesburg emphasises in his work (his painting is not just an *arrangement* of squares), seems more multiple and dynamic. Might the painting pose a problem that could be 'solved' in many different ways?

First steps

To start, we briefly discussed the painting. Not surprisingly, the students noticed the diagonal symmetry, as well as the leftward 'leaning' of the painting. They seemed quickly drawn to the tilted black squares, but then noticed a host of other squares Using the language of inductive reasoning, we talked about what the 'next step' of the painting would be, as well as the 'previous step' I was hoping to elicit some of Marion's mathematical observations, such as the relationship between successive horizontal squares, but the students were anxious to begin

Everyone first attempted to construct the largest horizontal square: after all, it is the container, frame and boundary of the entire painting *Constructing* a square in *Sketchpad* is not a trivial matter; one must first know what defines a square and then know how to use the appropriate tools. I have noticed that most students start by using the *segment* tool to draw four equal sides (the salient property of the square) and then attempt, when the time comes, to arrange the segments at right angles (the more tacit property) I let the students I was working with draw squares using only the *segment* tool and then showed them how to use the *circle* tool to construct equal segments. Since they had already learned to construct both perpendicular and parallel lines, they were then able to construct their container squares Except Aleah She was stuck on her horizontal segment, insisting on 'turning it' up to a vertical position – not wanting perhaps to bother with circles and perpendicular lines. I showed her how to turn her segment using the *rotate* command. Once she had completed her square, she proudly showed the technique to Sara

I asked Sara which technique she preferred, Aleah's rotation method or her own 'compass and straightedge' one? Sara thought the rotation method much easier and much quicker to perform (given the grammar of *Sketchpad's* tools at least, where rotation is a one-step action) But she described the compass and straightedge method as "more perfect and more mathematical" I am not sure whether Sara has a classical aesthetic or whether she had been enculturated into believing that things which are more technical, more complicated, are (in turn) more mathematical. Whatever the reason, she managed to convince Becca and Zhavain, but not Aleah