USING THE GOLDEN RATIO PRINCIPLE TO CREATE A CONTINUOUS PRINT BY MEANS OF THE GRAPHIC PROGRAM ADOBE ILLUTRATOR®

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Abstract: This paper aims to exemplify the use of the golden ratio principle for the creation of a continuous print. The ratio of 1:1.618 signifies the bases for the creation of the componing elements of the print and corresponds to the rapport. The print is achieved using the graphics program Adobe Illustrator®, starting with the drawing of the rectangle in which the circles, which are the components of the print, will be framed. Adobe Illustrator® is a program that specializes in creating and editing vector graphics. This program has become one of the most popular software in the industry for creating vector graphics that can be scaled and edited without losing resolution or clarity. The program allows you to draw both simple and complex shapes using various tools and palettes, logos, sketches, illustrations. Objects created in Adobe Illustrator can be printed or published exactly as they were made. The subsequent use of the print as well as of the single base element is multiple, this paper describes needed steps for creating a continuous print, but the single initial element can be used for a placed print in a smaller size, such as logo which is the most representative form of product identification. A closer look reveals that the Fibonacci sequence has found its usefulness in a variety of activities, including art, sculpture, architecture, music, and graphics.

Key words: golden ratio, Adobe Illustrator ®, continuous print, graphics.

1. INTRODUCTION

Fibonacci's famous sequence has captivated mathematicians, artists, designers, and scientists for centuries. Among the many mathematical curiosities discovered and studied by many scientists, are those related to a sequence of numbers that have a few features, studied by Fibonacci. A closer look reveals that the Fibonacci sequence has found its use in a variety of activities, including art, sculpture, architecture, music, and graphics [1].

The Fibonacci sequence starts with the numbers 0 and 1, and each next number is equal to the sum of the two numbers that precede it. The sequence therefore has the following appearance: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233 [1].

The golden ratio is a two-part division of a line segment, but not into two equal parts, but into two asymmetrical parts. The division must be made in such a way that, from the infinity of

points that forms the segment, only one satisfies the ideal ratio in which the two subsegments are located. This is called the golden number and is denoted by Ø or S=1,618033989, found among the features of the sequence of Fibonacci. This way of dividing the segment has had different names in history, among which the most widespread since the antiquity, was: division in average and extreme ratio [1].

M. Ohm gave it the name of the golden section or gold cut, a name that is preserved to this day. Thus this particular ratio can be applied to any geometric shape, including circles. If we insert a circle in the squares drawn according to the ratio, the actual ratio between them is 1: 1,618 then we get what we call golden circles that can be used in designing a logo or even a print, as is the one presented in the current paper, and its realization is done by means of the graphics program Adobe Illustrator® [2, 3].

2. GENERAL INFORMATION

2.1 Achieving the rectangular

The first steps to be taken to make a continuous print are to draw the rectangles in which the circles are to be inserted. To make the rectangle, open a new document in the Adobe Illustrator® graphics program [4, 5, 6, 7] and in the workspace select from the toolbar, the tool for predefined rectangles and by holding down the *Shift key* a square is drawn, afterwards by holding down the *Alt key* copy the initially drawn square. The copied sqare should be postioned under the initial drawn sqare as shown in **Fig. 1**.
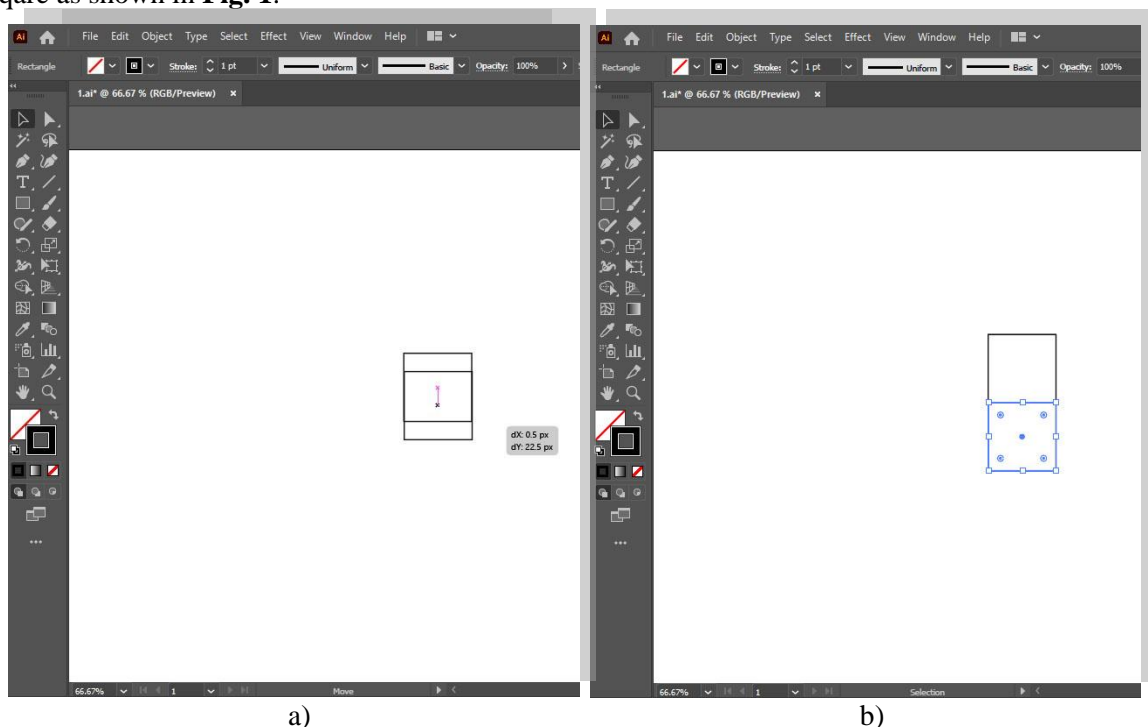

a)   b)

***Fig. 1**: Drawing the first sqares with Illustrator®*

After positioning the second square, a new square is made on the side to the overlapping squares, the *Shift key* must be held and starting from the top left point a new square is drawn which must be aligned to the original two squares. After drawing the third square, select the drawing and rotate it 90 °, as shown in **Fig. 2**.
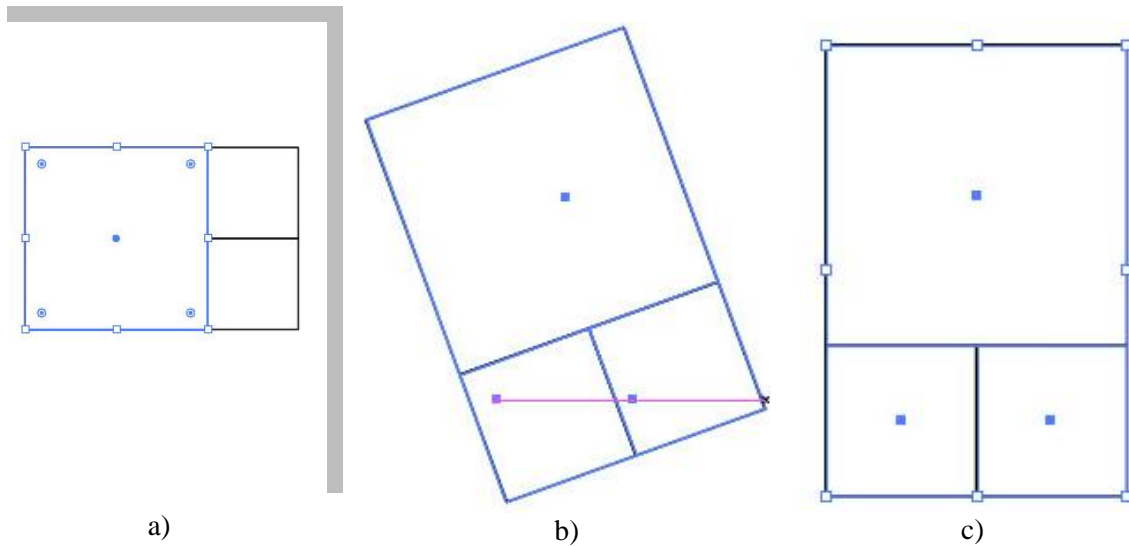
a)   b)   c)

Fig. 2*: Drawing of the following square and its rotation*

The next step involves drawing a new square, starting from the top point - the left side, which must be perfectly aligned to the already drawn squares. After drawing the new square, we move on to rotating the newly obtained drawing, (**Fig. 3 a**, **b**). Repeat the process of drawing a new square until the graphic contains the desired number of elements (squares), (**Fig. 3 c**).
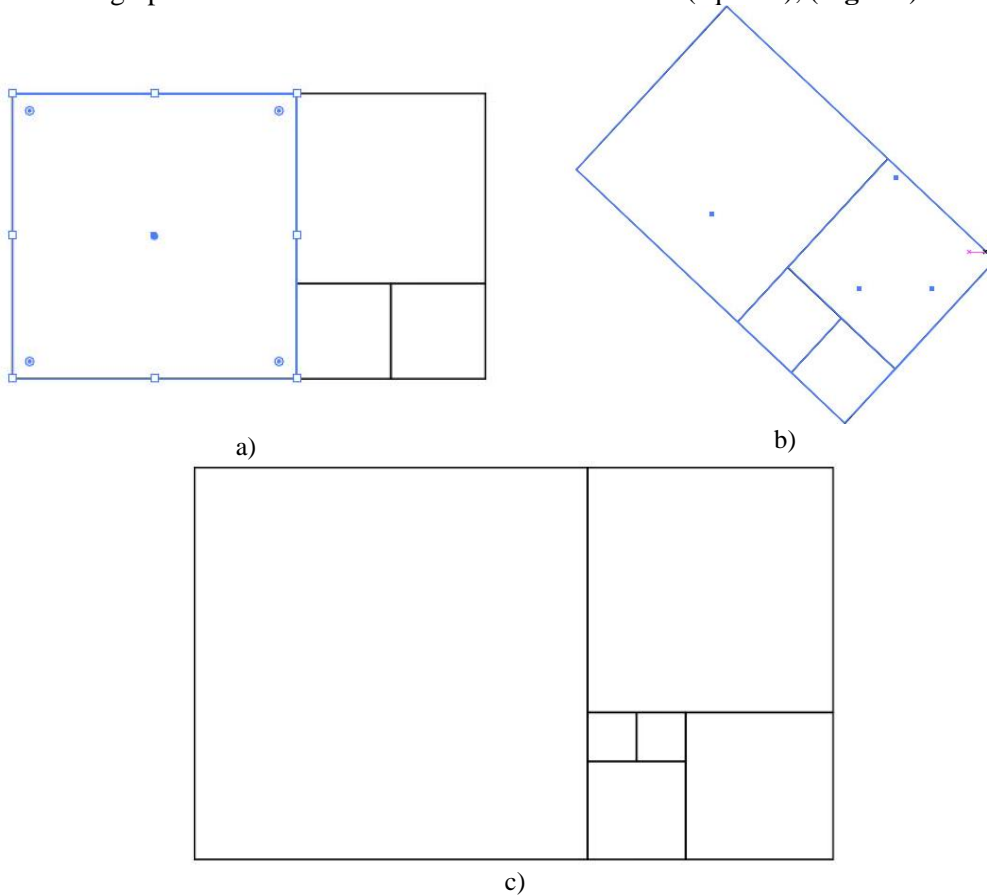

a)   b)

c)

Fig. 3*: Repeat the drawing process until the desired result is achieved*

2.2 Achieving the circles

We select the ellipse tool from the toolbar and starting from the very center of each square by holding down the *Shift* and *Alt keys*, we draw the circles that will fit in the size of the squares perfectly, **Fig. 4**.
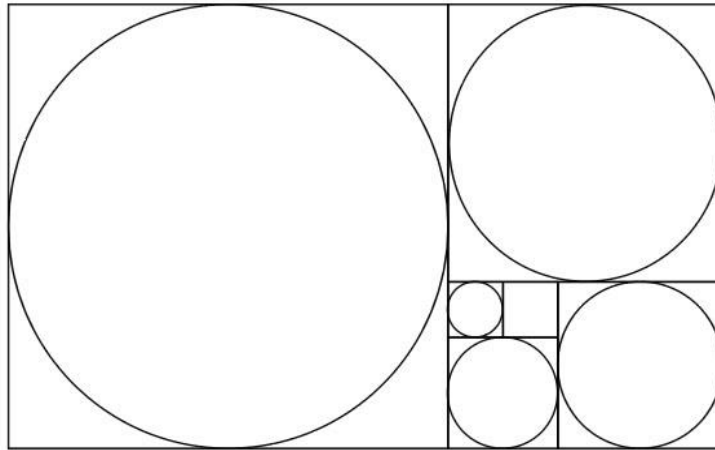

Fig. 4: Drawing the circles that will form the elements of the print pattern

3. CREATING THE PRINT

After the circles are drawn and finalised, what follows is the extraction and moving. This is done by activating the selection tool, holding down the *Shift key* and selecting the circles. Their positioning or overlap depends on the desired pattern as shown in **Fig. 5**.
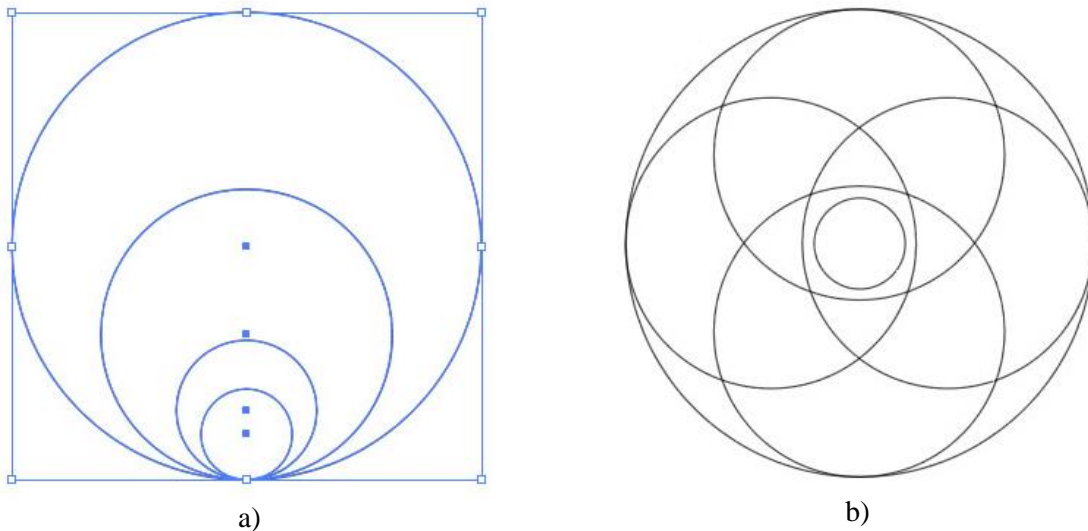

a)   b)

Fig. 5: Positioning the extracted circles in order to achieve the desired pattern

The finalization of the pattern is done with the key combination Alt and the selection of the *Shape builder tool*, depending on the desired result, the parts of the pattern that are not desired are deleted as shown in **Fig. 6**.

The next step is to select the colors and insert them into the pattern. To the elements the color can be individually assigned as shown **Fig. 7**.
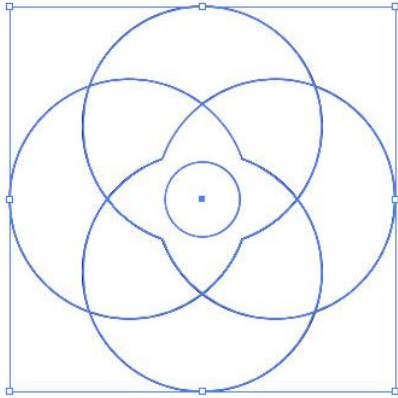

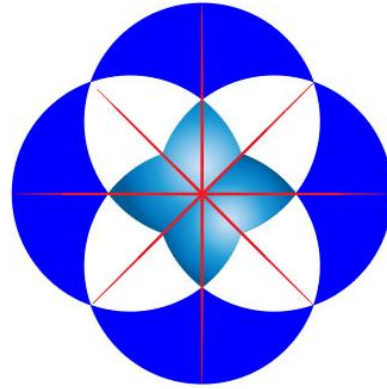*Fig. 6: Finalising the pattern by deleting the undesired areas*

Fig. 7: Selection and insertion of the desired colors

The next step is to select the pattern and determine its size. In the example presented in this paper the size is set to 3 x 3cm, so to prepare the print a square with sides of 12cm is created. The background color is chosen according to preferences, and the positioning of the pattern is as follows 4 elements verticaly and 4 elements horizontaly as shown in **Fig. 8**.
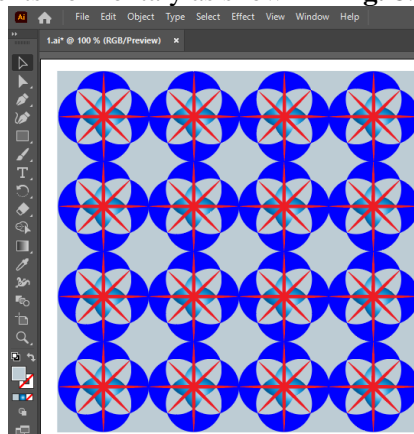

Fig. 8: Positioning the pattern elements for the final print

After inserting the patterns horizontally and vertically, select the entire section of the print and add it to the color and swatch panel. Once added to the swatch panel, the size and the shape in which it can be inserted varies, so it can be used both as a continuous print or as a placed print as shown in **Fig. 9**.
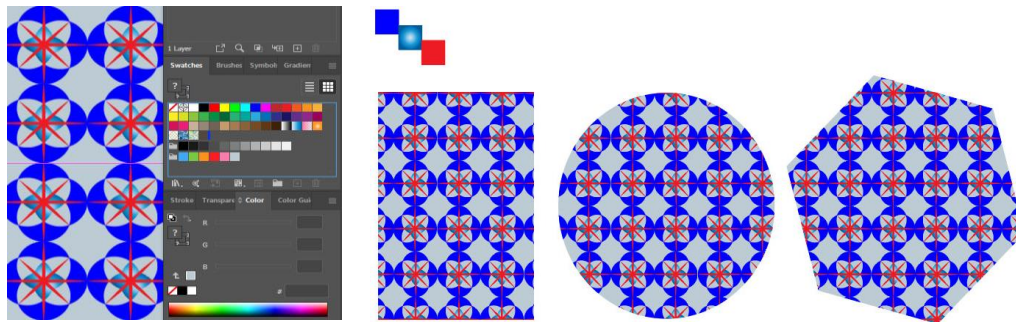
Fig. 9*: Inserting the finalised print to the swatch and color panel*

5. CONCLUSIONS

The Adobe Illustrator® graphics program with a multitude of features and tools makes it easy to translate creativity into high-fidelity, accurate graphics or complex sketches that can be easily modified and exported to a variety of file types for multiple future use. Therefore, for the design of the graphic element presented in this paper, the Adobe Illustrator® program was a real support, the basis of inspiration being the golden ratio.

The use of the golden ratio is present and used for the proportion set of works of art in general. In graphics, this ratio is the basis for the creation of various and known logos, which is the most representative way of identifying a product.

The beauty of all creations makes us assume that there is a certain need hidden behind any natural form.

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