Visual Modeling

Activity 1. Concentric figures

Try the following instruction:

?REPEAT 30 [SETPC ANY POINT ANY WAIT 1000]

Have you got a similar result to that one in Figure 1?

Let us try writing a procedure which draws a bit more regular set of colorful concentric circles. The first greatest one should have a given diameter, and each next one should be 0.8 times smaller than the previous one.

```
TO TARGET :N :D
    IF :N = 0 [STOP]
    SETPC ANY POINT :D
    TARGET :N – 1 0.8 * :D
END
```

Do you understand the procedure? If n = 0, stop - you do not have to do anything, otherwise you have to draw the biggest circle filled with the colour previously set (at random) and then to draw the remaining n −1 filled circles. Try the procedure for different input values:

? TARGET 9 200

Maybe you are surprised why we use the command **POINT** to get the filled circle. If you don't like it, you can replace the command by **FILLEDCIRCLE**. But if you add some other small changes in your **NEWTARGET** procedure the results will look different.

```
TO NEWTARGET :N :D
    IF :N = 0 [STOP]
    SETPC ANY SETFC ANY SETPW ANY FILLEDCIRCLE :D
    TARGET :N – 1 0.8 * :D
END
```

Try it.

? NEWTARGET 9 200

Problem 1

Define a procedure **SQUARETARGET :N :SIDE** which draws a target made of **:N** squares like the one on figure 4. The greatest one should have a given **:SIDE.**

Problem 2

Define a procedure **SPINSQUARE :N :SIDE :ANGLE** which creates a set of **:N** spinning squares like on the figure 5. The greatest square should have a given **:SIDE** and each next one should be rotated with respect to the previous one by the given **:ANGLE**.
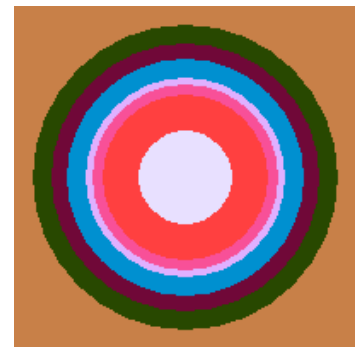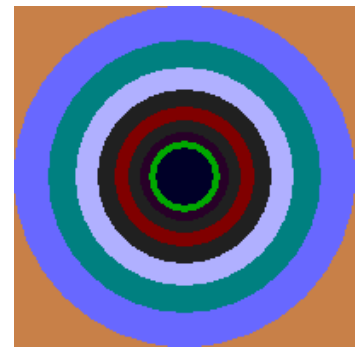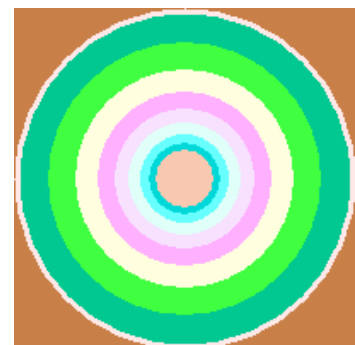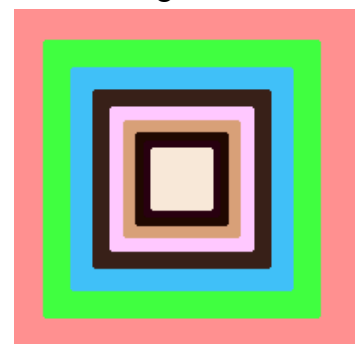

Figure 1

Figure 2
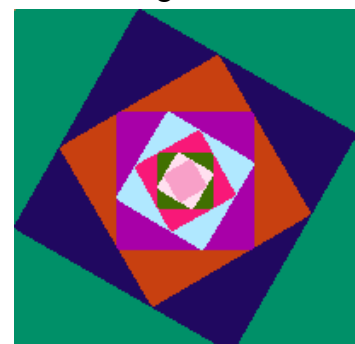

Figure 3

Figure 4

Figure 5

Activity 2. Homage to the square

Figure 1

Joseph Albers (1888 – 1976) German-American painter and art teacher was one of the most influential people in the twentieth century art. Qualified and then taught preliminary course himself at the Bauhaus in Weimar (Germany). Emigrated to the USA and taught at Black Mountain College, North Carolina. His pupils included Motherwell, De Kooning and Raushenberg. 1956-1960 Head of Department of Design at Yale University School of Art. Albers became interested in geometric abstraction as early as 1920 and is best known for his series of paintings entitled *Homage to the Square* (see figure 2). Can be regarded as a forerunner of Op Art and Minimal Art.
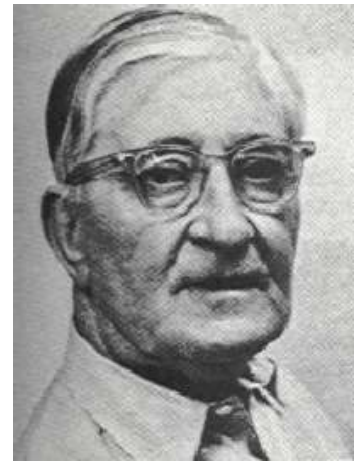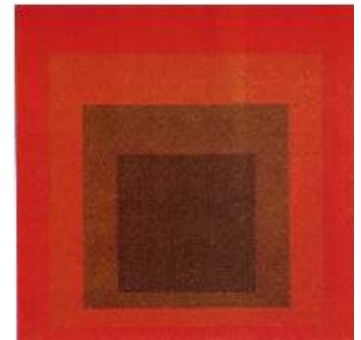

Figure 2

Problem

Define **ALBERS** procedure (it is up to you how many parameters it should have) which draws a variety of Albers style squares like the ones in figure 3.
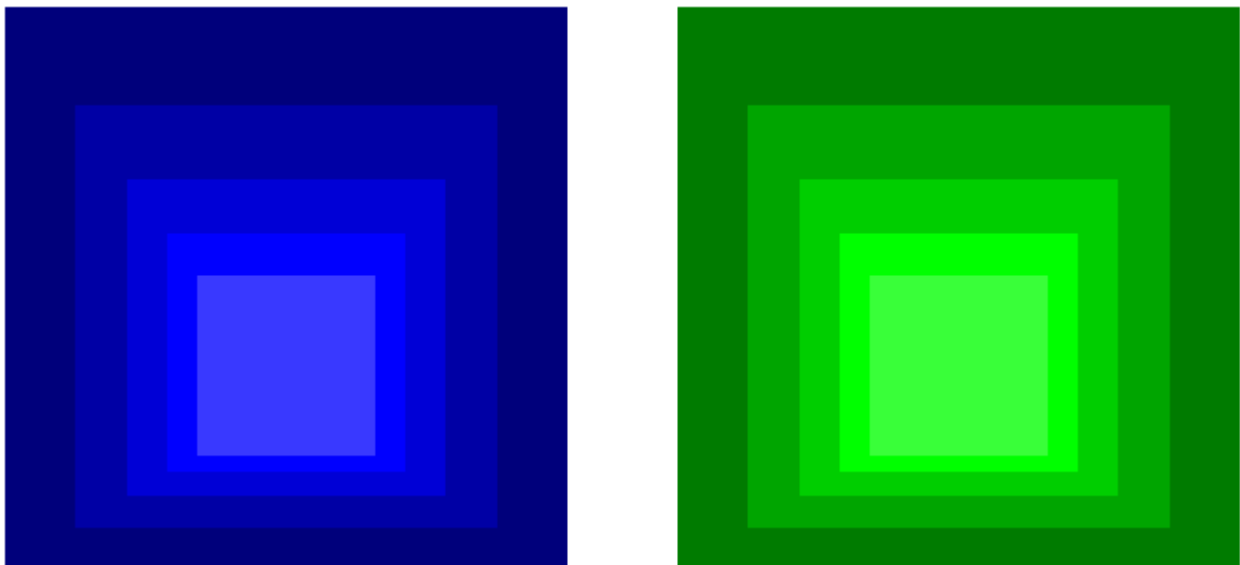

Figure 3

Activity 3. Grids of squares

If you have solved problem 2 (activity 1), you can use the idea of the solution in a plenty of other contexts.

Problem 1

Define **NETOFSQUARES :N :M :SIDE** procedure of drawing **:N × :M** randomly oriented black squares inscribed in the meshes of a square net.
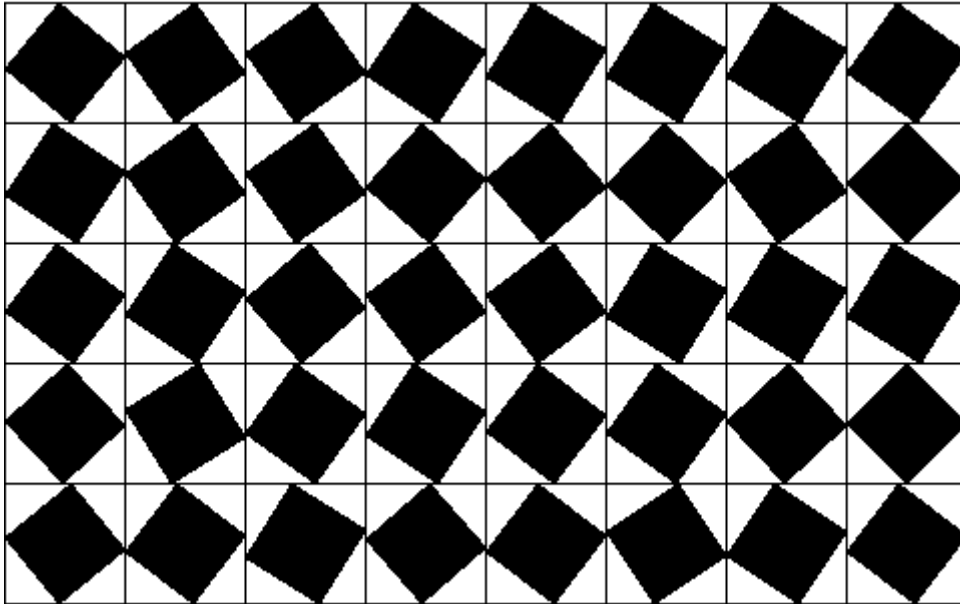

Figure 1

Problem 2

Define **NMSQUARES :N :M :SIDE** procedure of drawing **:N × :M** randomly orientated black squares inscribed in the meshes of an invisible square net.
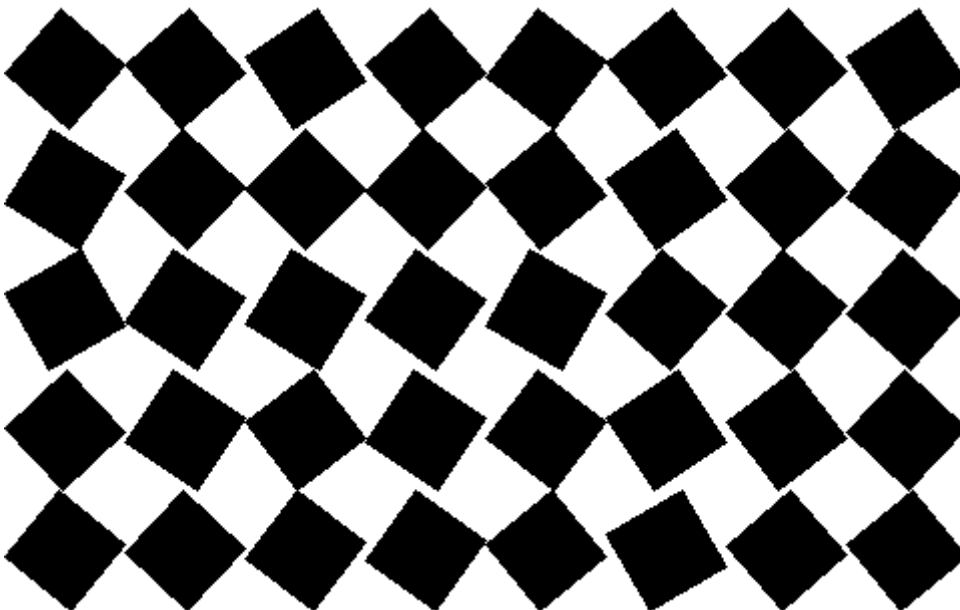

Figure 2

Activity 4. Collapsed squares

An ordinary square is a very beautiful and useful shape. It is very common in plenty of graphical projects and renowned paintings. See Josepf Albers "Homage to the square". But sometimes we would prefer extraordinary squares like, for example, a collapsed square – a square with collapsed sides.

Figure 1

Problem 1

Define **COLLAPSEDSQUARE:SIDE** procedure of drawing a square with collapsed sides. Each of the four sides should be collapsed more or less at random.

Hint

To draw the unusual collapsed squares you may need an unusual **EXTRAFD** command, which moves the turtle a given number of steps forward just like an ordinary **FD** however the turtle does not move along a straight line but along an arch determined by a given **:CHORD** and **:ANGLE** .

extrafd 200 60   extrafd 200 90

Figure 2

Problem 2

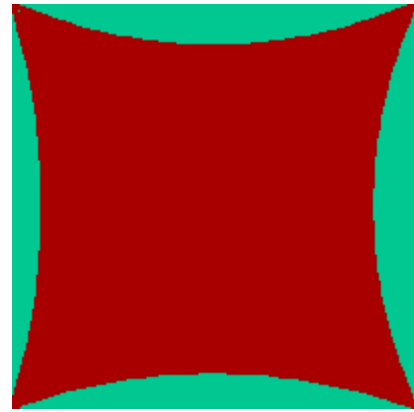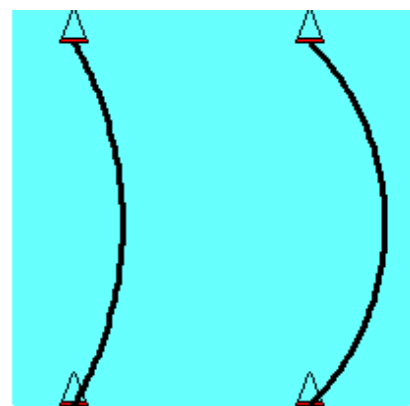Define **COLSQUARES :N :SIDE** procedure of drawing a given number of concentric collapsed squares.

Figure 3

Activity 5. Skewed circles and artificial daises

The theme of concentric congruent figures can be developed endlessly. Some of such pictures, even very simple ones, have a surprisingly powerful impact. In the following exercise we offer you three variations on this theme.

Problem 1

Define a procedure which draws n concentric skewed circles, like in Figure 1.

Problem 2

Define **DAISY :N :SIZE** procedure, which draws an artificial flower with 12 petals build of :N concentric filled polygons, like in Figure 2.

Problem 3

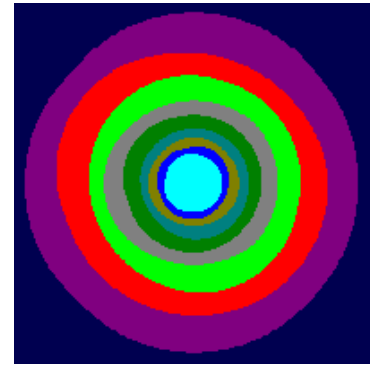Define a procedure which draws a black & white version of daises, like in Figure 3.

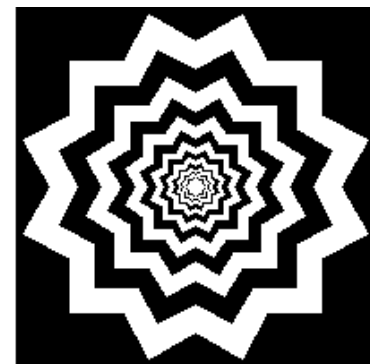
Figure 1

Figure 2

Figure 3

Activity 6. Squares with concentric rings

The Russian painter Wassily Kandinsky (1866-1944) ranked among artist whose work changed the history of art in the early years of the 20 century, is regarded as one of the originators of abstract expressionism. In both his paintings and his theoretical writings he influenced modern styles. Born in Moscow he spend many years of his life in Germany, where he became a leader in the influential Blaue Reiter movement and one of the influential teacher at the Bauhaus school in Weimar. *Colour Study – Squares with Concentric Rings* belongs (Figure 2) belongs to his most recognized and often reproduced paintings.

Figure 1

Figure 2

Problem

Define **RINGS** procedure (it is up to you how many parameters it should have) which draws a variety of Kandinsky style squares with concentric rings**.**

Activity 7. Fife white squares

This very simple but impressive pattern (Fig. 1) comes from the XIX-th century album on the Islamic art.

Problem 1

Define a procedure which draws 5 white squares on a red background, like in Figure 1.

Problem 2

Modify the procedure which draws 5 white squares on a red background, in such a way that orientation of white square depends on the additional parameter **:ANGLE**. If the **:ANGLE** equals to 30 the result should look like in Figure 1.

Problem 3

Try other colors, like in Figure 2.

Problem 4

Try other modifications to get more complex and interesting pictures, like in Figures 3 and 4.
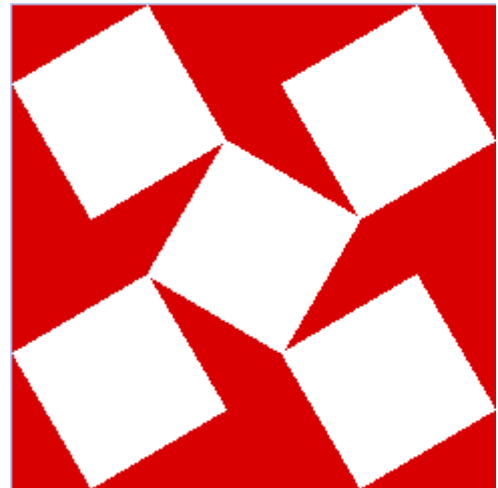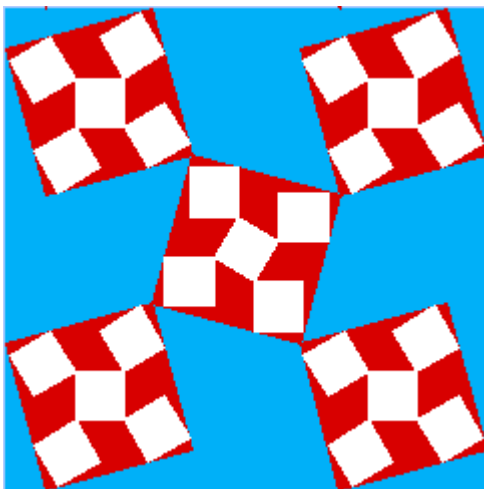

Figure 1

Figure 2

Figure 3

Figure 4

Activity 8. EC Logo

You certainly know the European Community Logo – 12 yellow stars shining on the blue navy background (Fig. 2).

Problem 1

Define **STAR :r** procedure which draws a pentagonal yellow star inscribed in the dark blue filled circle with the given radius **:R,** like in Figure 1.

.

Figure 1

Problem 2

Define **ECLOGO** procedure which draws logo of the European Community.

Figure 2

Activity 9. What can you see when you stand on your head?

Have a look at Figure 1. It represents a fragment of tile floor in the hall of the Natural Science Museum in London (where the dinosaurs live).
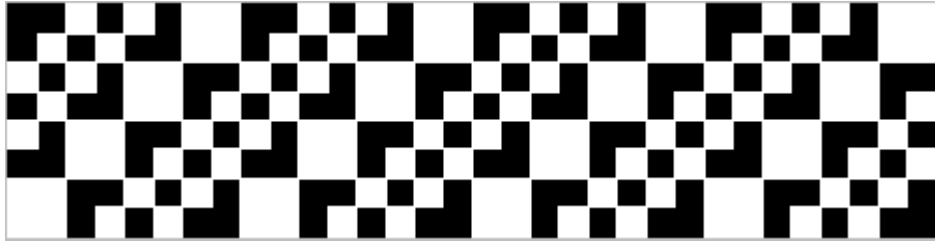

Figure 1

What can you see in this picture?

You may answer that this is a long narrow white rectangle with a pattern made up from two kinds of black tiles: square ones and L-shaped ones.

But you could also answer that you see a long narrow black rectangle with a pattern made up from two kinds of white squares: small squares and two times bigger ones.

Each of the two ways of looking at the pattern determines a different way of solving the problem of writing a procedure which draws the floor pattern shown in Figure 44.

Problem

Try to write such a procedure, adopting both view points in turn. Which one is more convenient for you?

Activity 10. Whirling huts

What can you call the array of forms in Figure 24? We called it "***whirling huts***". This title contains an insight which can give a clue for solving Problem 1.

Problem 1

Write a WHIRLHUT proce-dure which creates in the screen a picture of an arrangement of whirling huts. You must decide yourself how many parameters it will have and what will be their functions.

Try to come up with several different ways of solving this problem.
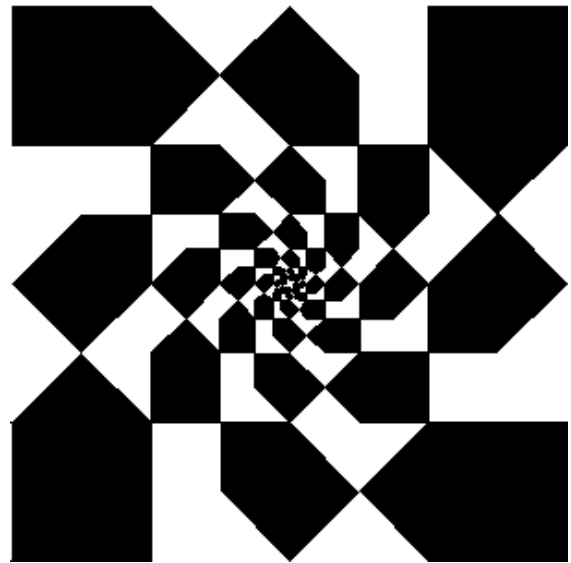

Figure 1

Problem 2

Write a procedure which creates various colourful versions of whirling huts, like the ones in Figure 2 for example:
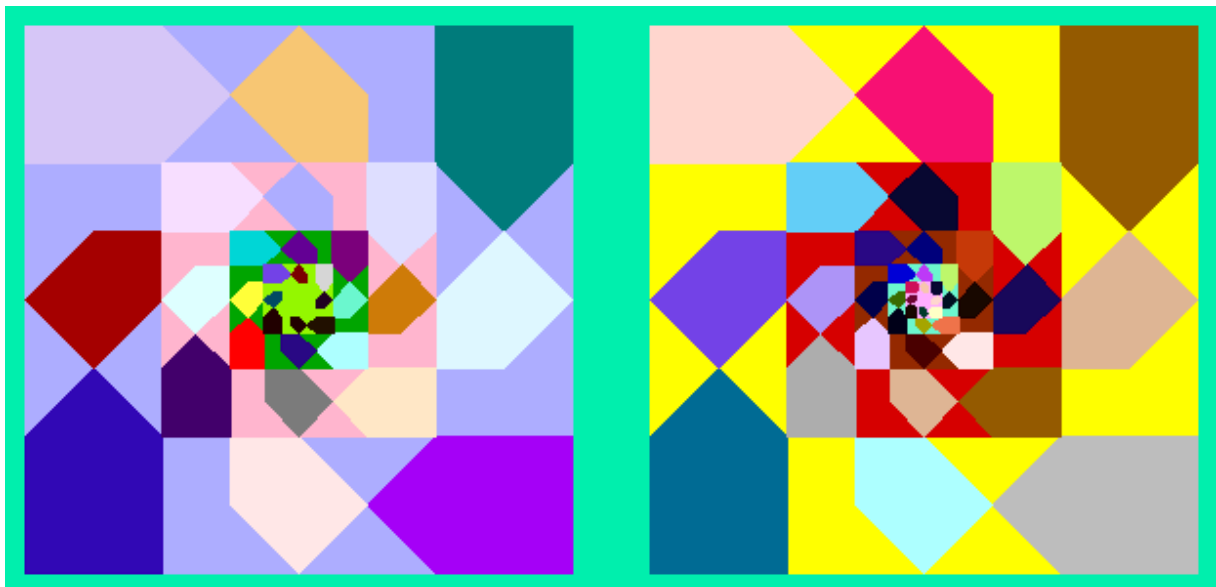

Figure 2

Activity 11. Whirling Triangles

Figure 1 shows another picture from the book GEOMETRIC PATTERNS, while Figures 2- 5 show its digested versions.
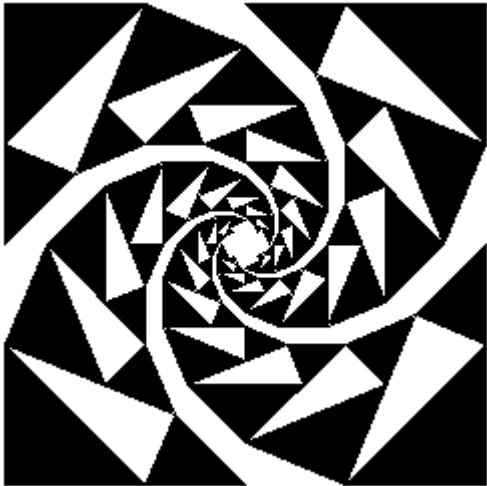
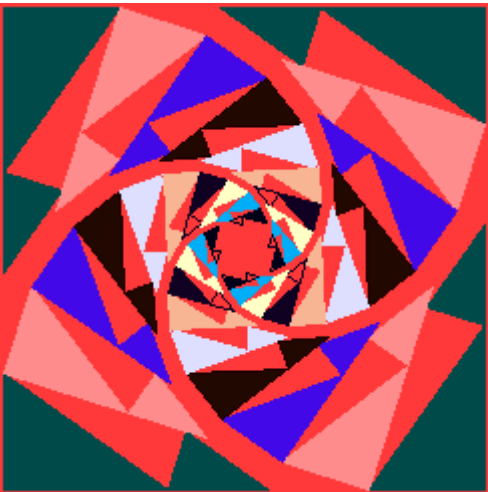**Problem 1**

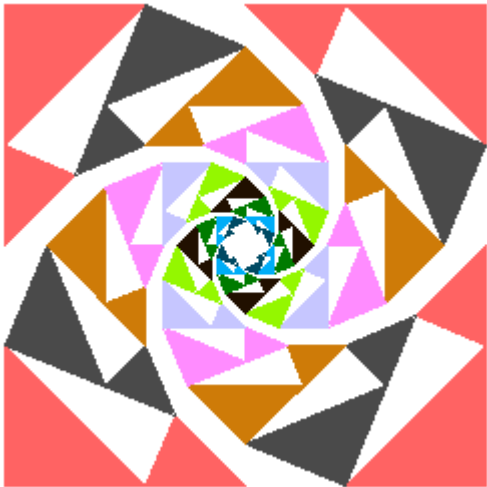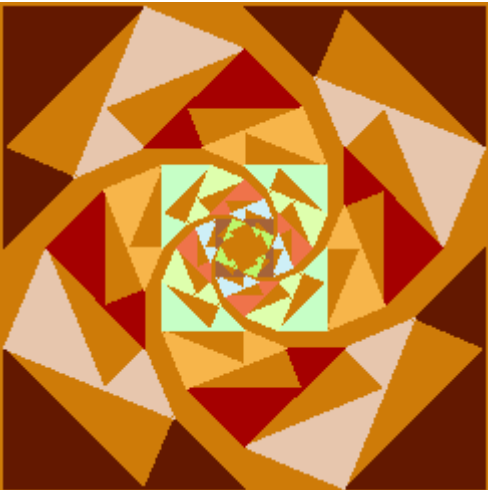Define procedures generating such pictures.

Figure 1

Figure 2

Figure 3

Figure 4

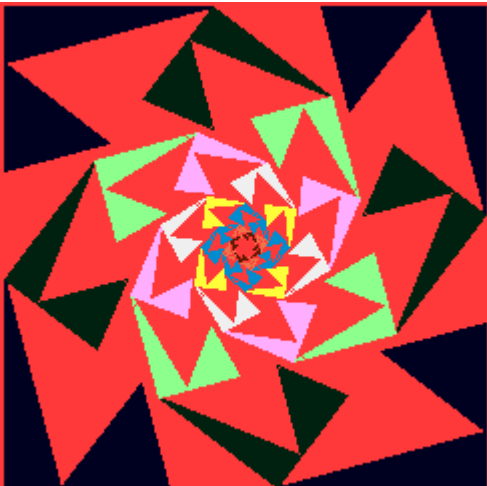Figure 5

Activity 12: One more whirl

This time our starting point is the pattern shown in Figure 39 (the last of the pictures from the GEOMETRIC PATTERNS book in this paper). If we slightly increase deltoids in the corners, it will result in a greater coherence of the image, see Figure 39. The arrangement of shapes in the pictures will seem less scattered. However the task of defining a procedure drawing such a layout may prove a bit more difficult.
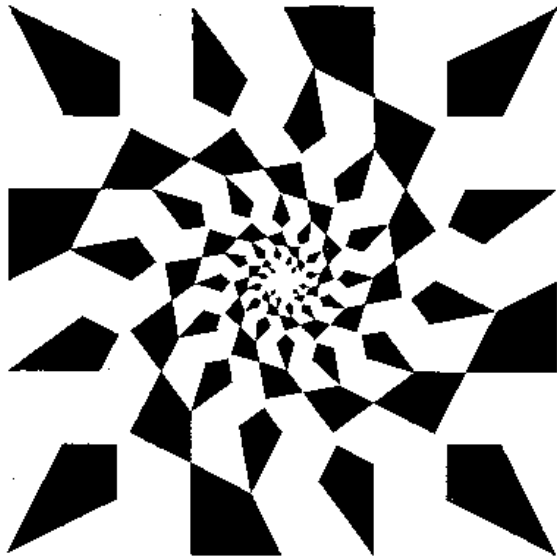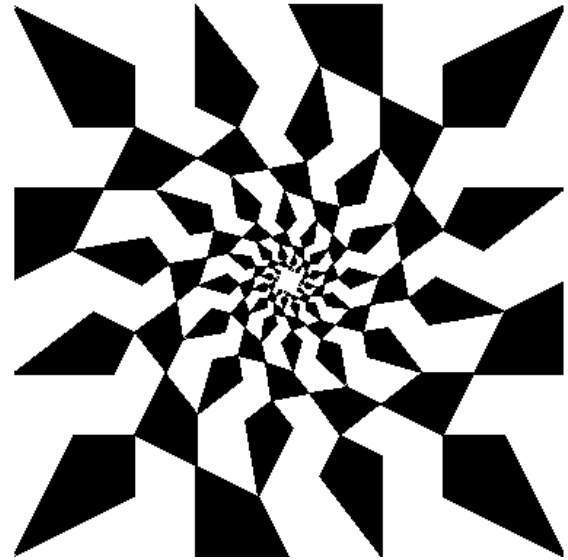

Figure 1

Figure 2

Problem

Define procedures which draw patterns of whirling black and white shapes like in Figures 1 and 2 as well as coloured ones like in Figures 3 and 4.
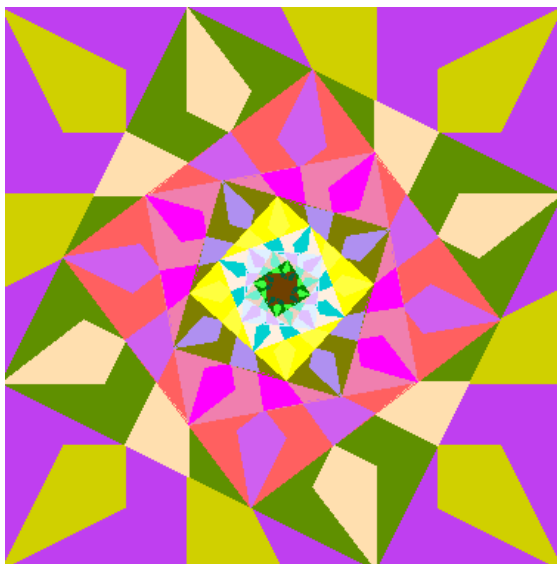
Figure 3
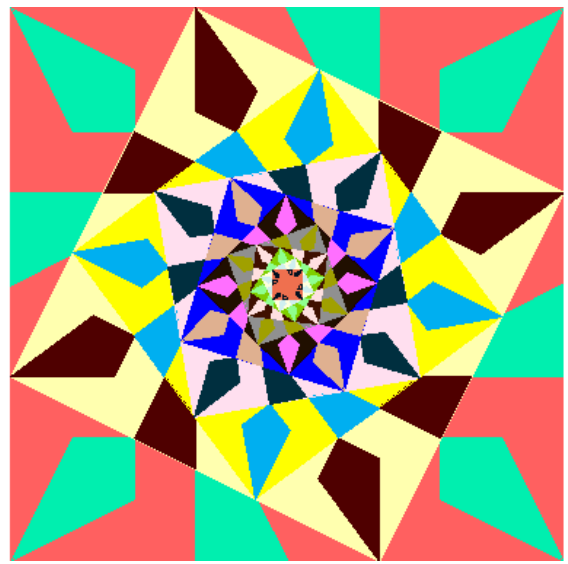
Figure 4

Activity 13. Seeing it in another way

Do you remember 2 different ways of seeing the picture of tile floor in the hall of the Natural Science Museum in London (Figure ??) or 3 different ways of seeing the picture of *whirling huts* (Figure ??). Have a look at the figure 1 and try to see it in as many different ways as possible.
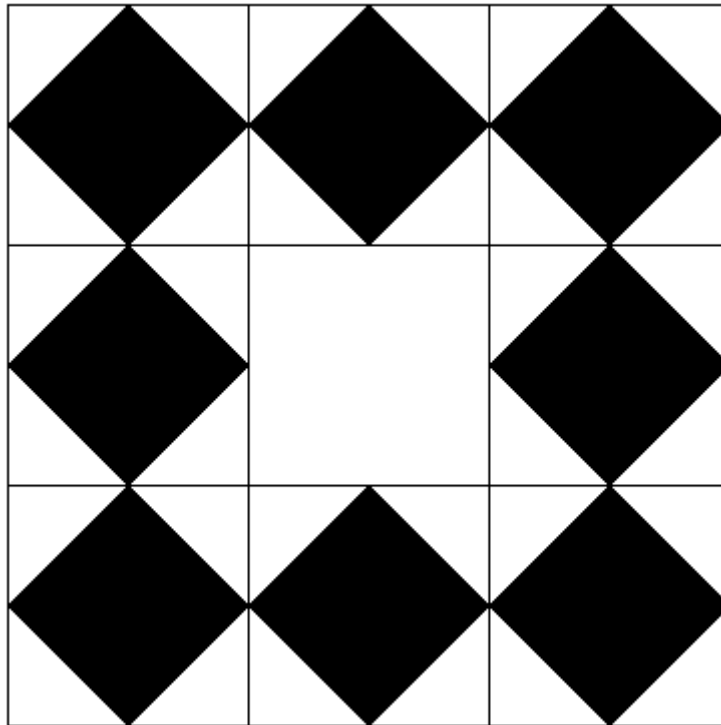
Figure 1

Problem

Define as many as you can different procedure of drawing the picture in Figure 1.

Activity 14. Colorful crosses scattered inside a blue square
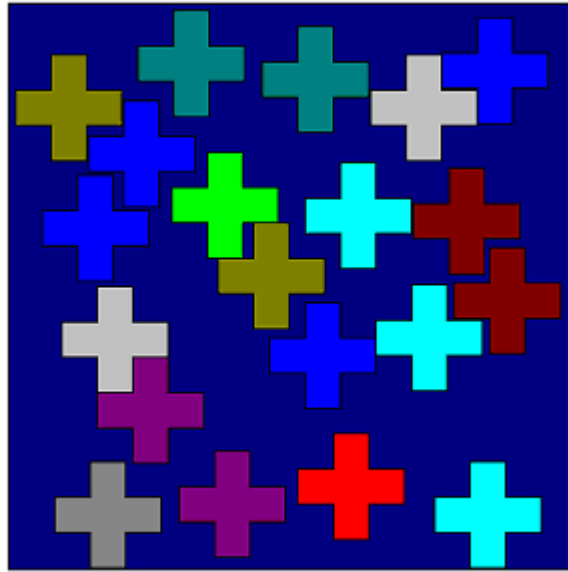
Figure 1

Problem

Figure 1 depicts a design made of a number of identical colorful crosses scattered at random inside a navy blue square. Develop a procedure which produces a similar random design fulfilling the following constraints.

- The number of crosses should be random between 3 and 16.
- The colour of each cross should be chosen by random.
- The side of a square should be 16 times longer than a side of a cross.
- Crosses must not overlap but they can be tangent–see figure 1.

Activity 15. Art informel

So far we were interested mainly in geometric abstraction. We created abstract pictures made of polygons and circles. After being involved in this kind of activity for a longer time you may miss something wholly other –less strict and formal and more loose and natural.Can we create this kind of abstract painting with a computer? Let us try. Look at the figure 1. this picture is the result of the random procedure named INFORMEL. Art informel means art without form. It was opposite of geometri abstraction.

```
TO INFORMEL :BRIGTHNESS
    PAGE1'SETSIZE [200 1000 ]
    SETBGCOLOUR [15 6 76]
    REPEAT 200 [BLUE_SCRAWL]
    REPEAT 1000 [SPOT]
    REPEAT 100 [COL_SCRAWL]
END

TO BLUE_SCRAWL
    SETPENCOLOUR ( SE RANDOM 55 20 + RANDOM 30 100 + RANDOM 156 )
    SETPENWIDTH 1 + RANDOM 15 ARC RANDOM 20 RANDOM 20 RANDOM 15
    SETPENWIDTH PENWIDTH + 2 FD 0
    RT RANDOM 360 FD RANDOM 50 RT RANDOM 360
END

TO SPOT
    PU SETPOS [-100 -550] + RANDOM [200 1100] PD
    SETPENCOLOUR ( SE RANDOM 76 RANDOM 100 156 + RANDOM 100 )
    SETPENWIDTH 1 + RANDOM 8 DOT
    END

TO COL_SCRAWL
    SETPENCOLOUR ( SE RANDOM :BRIGTHNESS 20 + RANDOM :BRIGTHNESS 20 +
    RANDOM :BRIGTHNESS )
    SETPENWIDTH 1 + RANDOM 15 ARC RANDOM 20 RANDOM 20 RANDOM 15
    SETPENWIDTH PENWIDTH + 2 FD 0
    RT RANDOM 360 FD RANDOM 50 RT RANDOM 360
END

TO ARC :N :SIDE :ANGLE
REPEAT :N [FD :SIDE RT :ANGLE]
END
```

Problem 1

Modify INFORMEL procedure to get different interesting pictures. You can change the background colour, the number of colorful spots and scrawls the saturation of their colour, to add other elements to the picture.

Problem 2

You can get interesting results by joining together two, three or more results of INFORMEL procedure like red triptych inn the Figure 2. Try it.
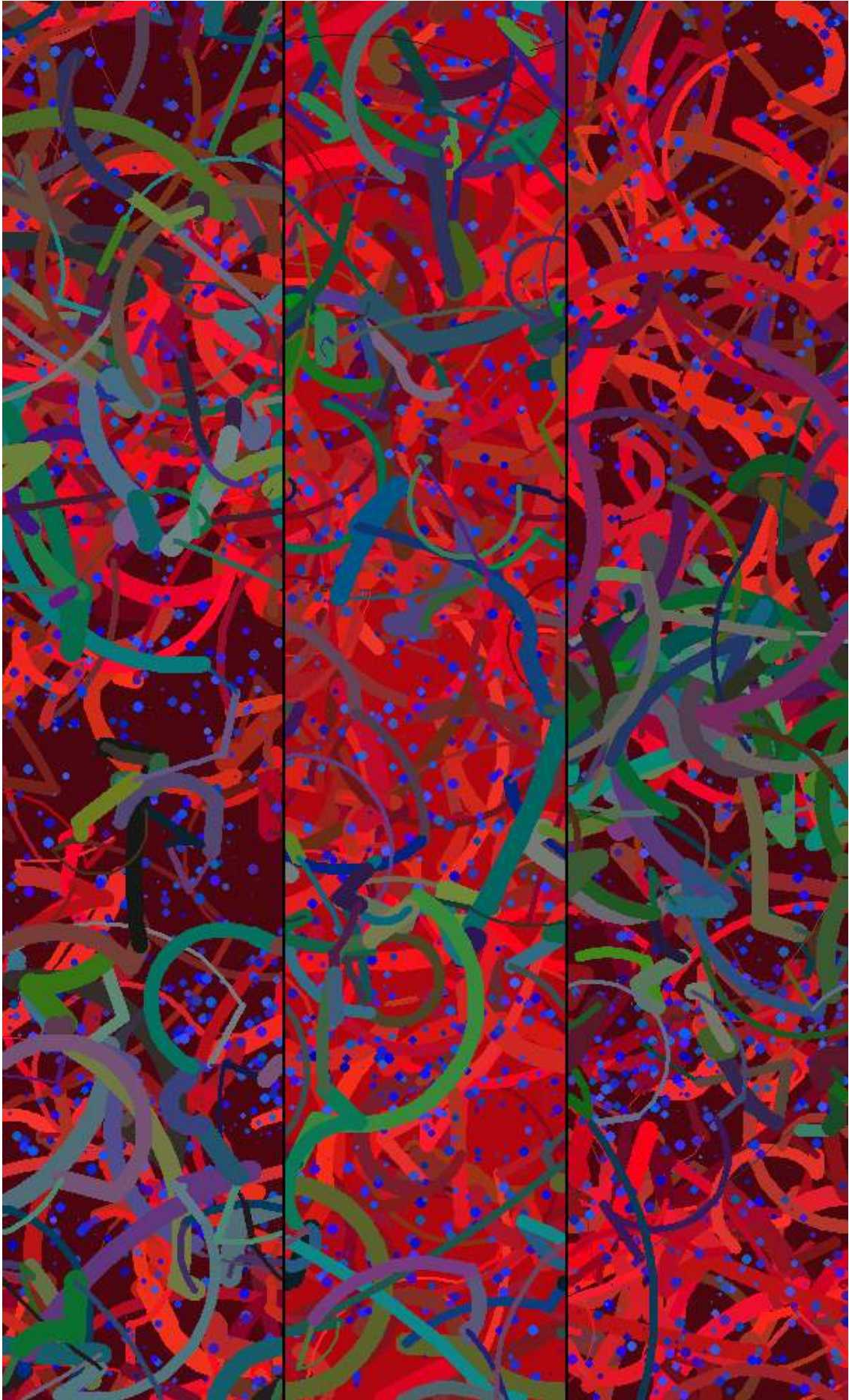

Figure 1

Figure 2

Activity 16. Adding new elements to your INFORMEL art

What kind of new elements did you add to you pictures in Informel style? Using a **FLOURISH** procedure you can get random shapes k like in the Figure 1

```
TO FLOURISH :N :PENW SIDE :ANGLE
 SETPC ANY SETPW :PENW + RANDOM 12
 FLOUR :N :SIDE :ANGLE
END

TO FLOUR :N SIDE :ANGLE
 IF :N = 0 [SETPW :PENW SETPC ANY STOP]
 FD :SIDE RT :ANGLE
 FLOUR :N - 1 :SIDE :ANGLE - 1 + RANDOM 3
 LT :ANGLE BK :SIDE
END
```
        Try it
?FLOURISH 30 + RANDOM 91 1 + RANDOM 11 1 + RANDOM 5 -1 + RANDOM 5

Figure 1

You can use the **FLOURISH** procedure to draw any number of similar random shapes in the same place to get more complicated and wild shapes. Try the following commands:

?CS PU BK 150 PD
?REPEAT 5 + RANDOM 31 [FLOURISH 30 + RANDOM 91 1 + RANDOM 11 1 + RANDOM 5 -1 + RANDOM 5]

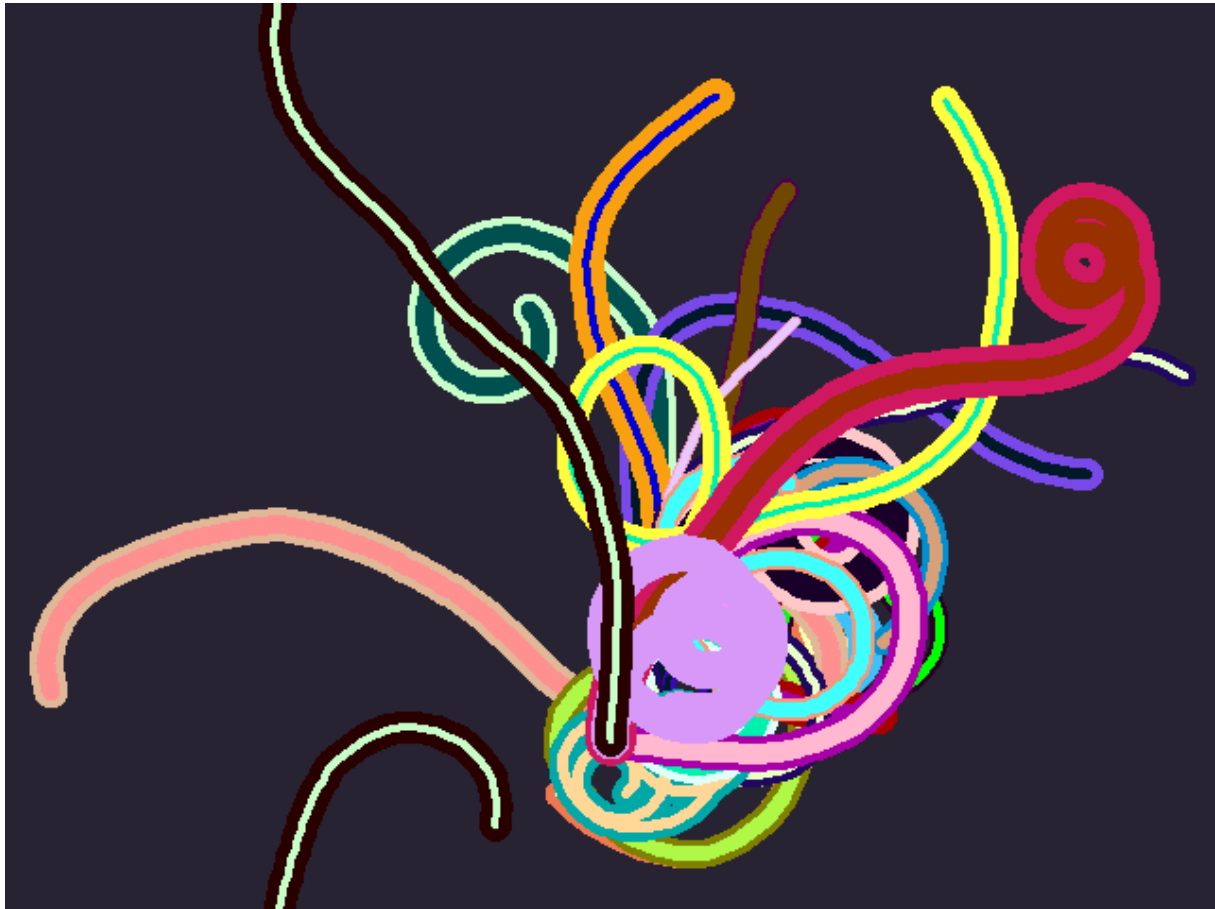You should get something similar to the Figure 2

Figure 2

Please experiment a bit exchanging the range of random parameters of the **FLOURISH** procedure. You can modify the procedure or use it your version of the **INFORMEL** procedure

The following **DUOFLOURISH** procedure is only one of infinite number of possible modifications of the **FLOURISH** procedure.

```
TO DUOFLOURISH :N :PENW :SIDE :ANGLE
 SETPC ANY SETPW :PENW + 2 + RANDOM 15
 DUOFLOUR :N :SIDE :ANGLE
END

TO DUOFLOUR :N :SIDE :ANGLE
 IF :N = 0 [LT 90 REPEAT 5 [FLOURISH 15 + RANDOM 30 3 3 3 RT 45] LT 135 SETPC ANY STOP]
 FD :SIDE RT :ANGLE
 DUOFLOUR :N - 1 :SIDE :ANGLE - 1 + RANDOM 3
 LT :ANGLE BK :SIDE
END
```

Try to see it in action. If you write

?DUOFLOURISH FLOURISH 30 + RANDOM 91 1 + RANDOM 11 1 + RANDOM 5 -1 + RANDOM 5

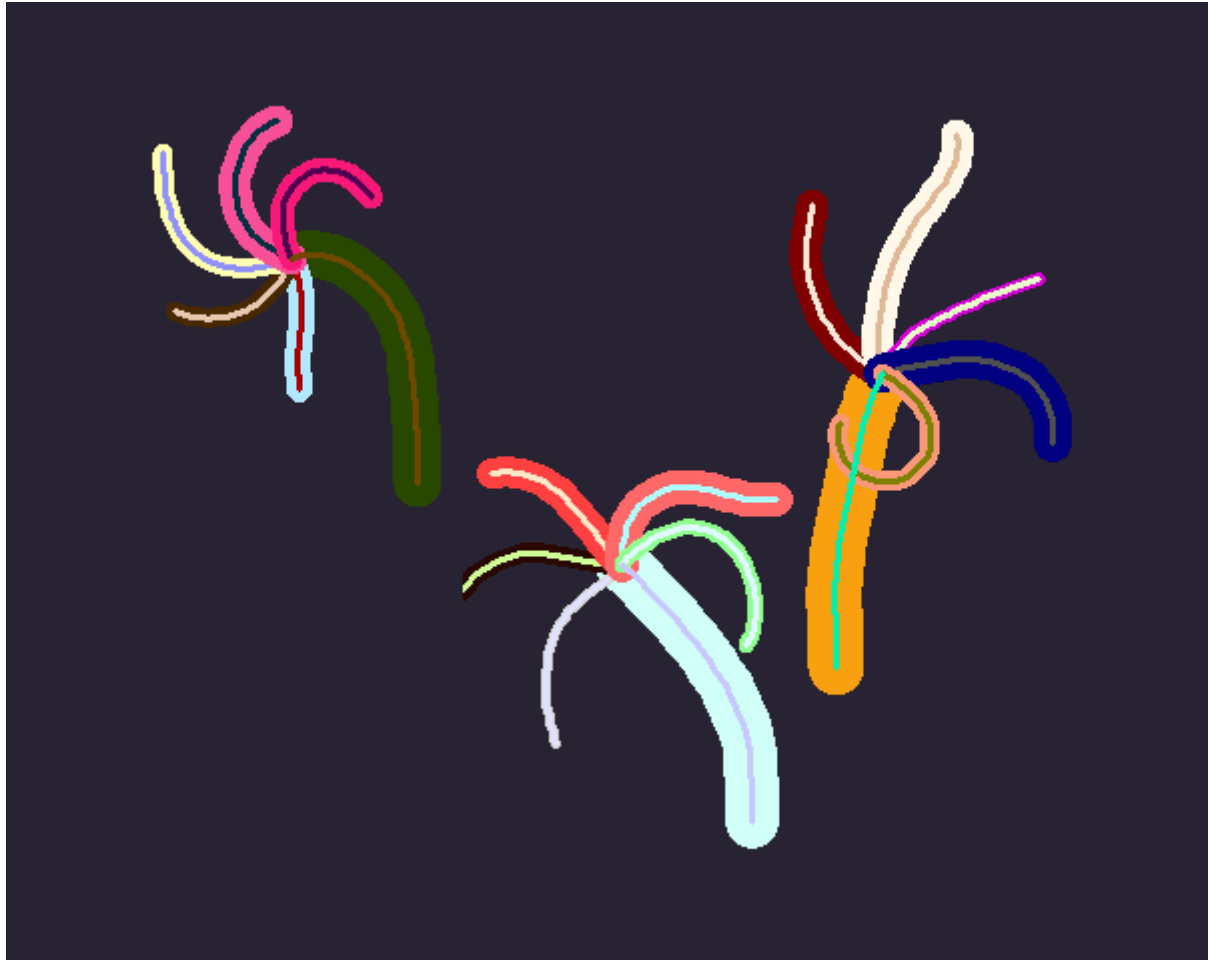you should get organic treelike shapes similar to the ones in Figure 3:

Figure 3

To check usefulness of the **DUOFLOURISH** procedure we will use it in a new version of the **INFORMEL** procedure which creates random pictures in the Informel art style.

```
    TO INFORMEL2
 SETBGCOLOUR [50 45 75]
 REPEAT 5 + RANDOM 11 [ PU SETPOS [-250 -150] + RANDOM [501 151] PD  DUOFLOURISH 20 + RANDOM 21 3 +
RANDOM 15 5 -3 + RANDOM 7 ]
 END
```

You can see three different examples of the random results of the **INFORMEL2** procedure on Figures 4,5 and 6 Do you like them?

Figure 4

Figure 5

Figure 6

Problem

Invent as many modifications of and procedures as you wish. Use them in your own versions of **INFORMEL** procedure.