

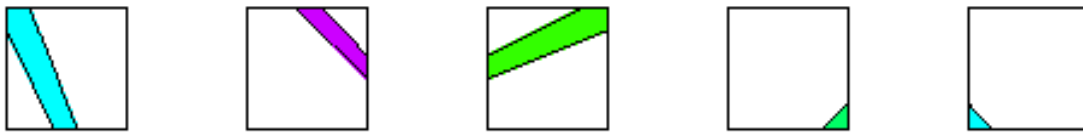
FINAL EXAM FALL 2005

ESCHER with POSTSCRIPT

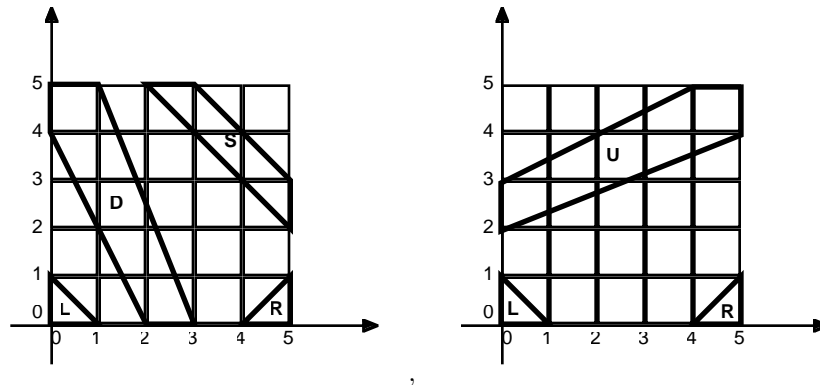
Your task here is to reproduce by means of preprogrammed `POSTSCRIPT` procedures some of the Escher tilings exhibited in page 3 of this handout. To begin you must start with a text editor where you have copied the contents of the file `"patterns"` which you can download from the class website. This done, you will find there five procedures:

`patD` , `patS` , `patU` , `patR` , `patL` ,

which respectively produce the patterns given below



The precise coordinates of the corners of these patterns are as indicated in the following figure.



Note that each of these patterns occupy a 50×50 square as programmed in the `POSTSCRIPT` file `"patterns."` The square around each of these patterns is given by the procedure `"square"` which is the first in the file `patterns`. Note further that each of these procedures takes a single input which will be the **Hue** value of the color with which the pattern will be displayed.

Next you will find four procedures

`BA` , `RBA` , `R2BA` , `R3BA`

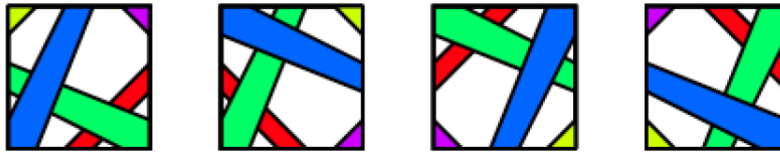
Which respectively will produce the four patterns given below. You will note that they are each obtained from the previous one by a 90° counterclockwise rotation.



Then you will find four procedures

SBA , SRBA , SR2BA , SR3BA

Which respectively will produce the four patterns given below. You will note that they are obtained from those given above by reflecting across the horizontal line that goes through their centers.



The next eight procedures are constructed in the same manner starting from a single pattern and then counterclockwise rotating it 90°, 180° and 270°. The remaining four are obtained again by reflecting the previous four across a horizontal line. The names of the first four of this second bunch are

FA , RFA , R2FA , R3FA

and they respectively produce the patterns



and the names of next four are

SFA , SRFA , SR2FA , SR3FA

These respectively produce the patterns

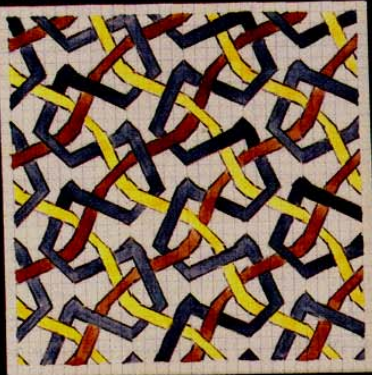


Note that each of these 16 procedures needs 5 input hue (color) values. In reproducing the Escher tilings you must chose the colors in a manner that the resulting “ribbons” are properly colored. To construct your final displays you may use these patterns in any way you wish. However, Esher himself gives you the “formula” for each of these tilings. These formulas simply tell you in which succession you must select the patterns to achieve the desired tiling.

Each of the symbols that Escher uses corresponds to one of our procedures. For your convenience, the correspondence is given by the following table.

1 → BA	2 → RBA	3 → R2BA	4 → R3BA
<u>1</u> → SBA	<u>2</u> → SRBA	<u>3</u> → SR2BA	<u>4</u> → SR3BA
1a → FA	2a → RFA	3a → R2FA	4a → R3FA
<u>1a</u> → SFA	<u>2a</u> → SRFA	<u>3a</u> → SR2FA	<u>4a</u> → SR3FA

These displays are portions of two pages copied from the remarkable book “*M. C. ESCHER, Visions of Symmetry*”, by Doris Schattschneider, W.H. Freeman and Co, New York

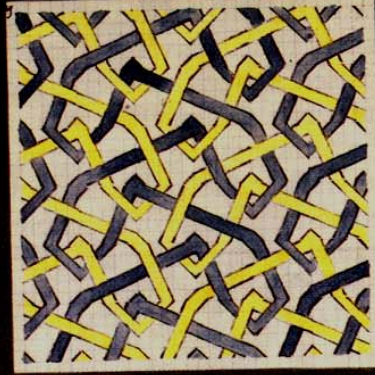


Six designs made with the “ribbon” blocks, mounted for display. Hand-printed with watercolor added, 150 × 150 mm (each design). The number scheme of each design appears in the margin.

1a 4a 1 4 1 4 1a 4a
 3a 2 3 2a 1 4 1a 4a
 1 4 1a 4a



1 2a 1a 2
 1a 1 1 2a 1a 2
 3a 3 1 2a 1a 2
 1 2a 1a 2



4a 1 3a 2
 4a 1 3a 2 1a 2 1 2
 4a 1 3a 2 3a 4a 3
 4a 1 3a 2