

Math

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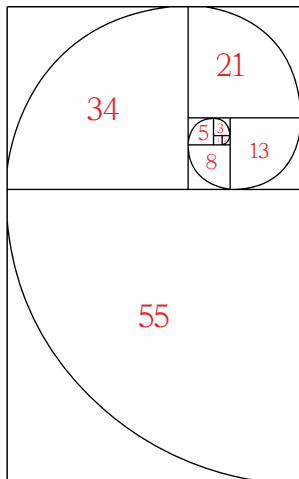
Art



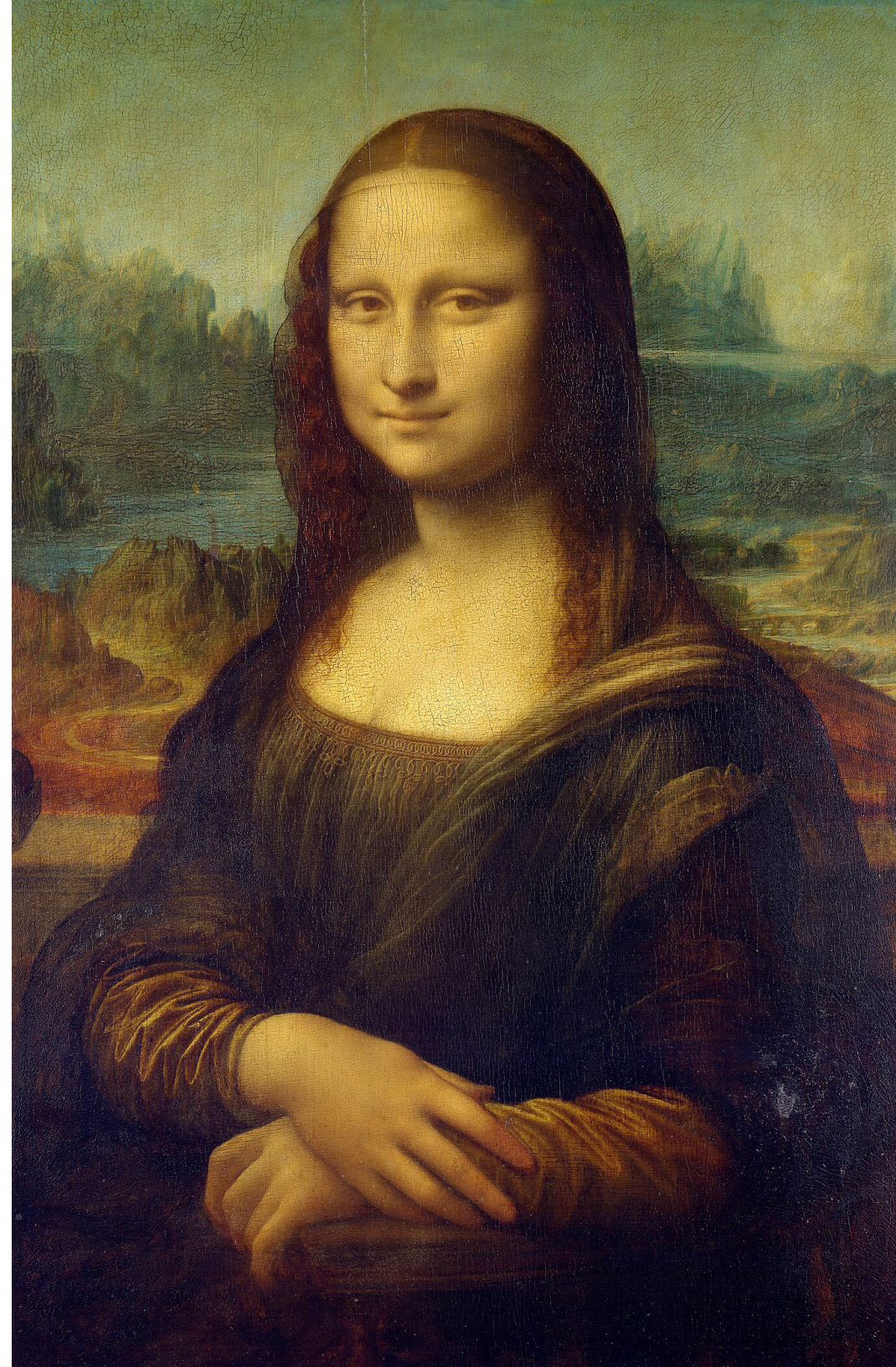
The Fibonacci Master

LEONARDO DA VINCI

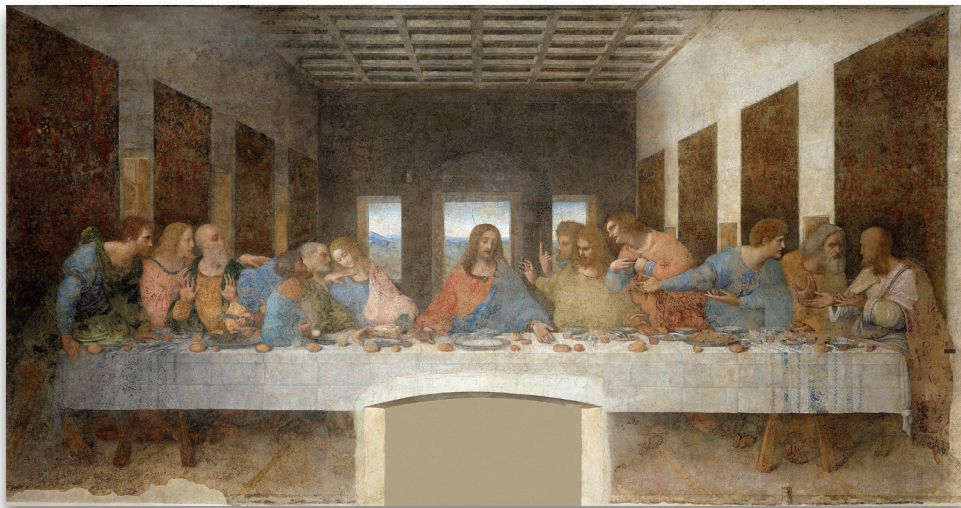
About	Leonardo da Vinci was a Renaissance genius who integrated art with science to create masterpieces that exhibit mathematical principles. His fascination with the Fibonacci sequence and the golden ratio brought a profound sense of harmony and proportion to his artworks.
Famous Works	• The Last Supper uses perspective to draw the viewer's attention to the central figure of Christ. • Vitruvian Man demonstrates the perfect proportions of the human body using the principles of the golden ratio.
Quote	"The noblest pleasure is the joy of understanding."
Mathematical Concept	The Fibonacci Sequence and Golden Ratio



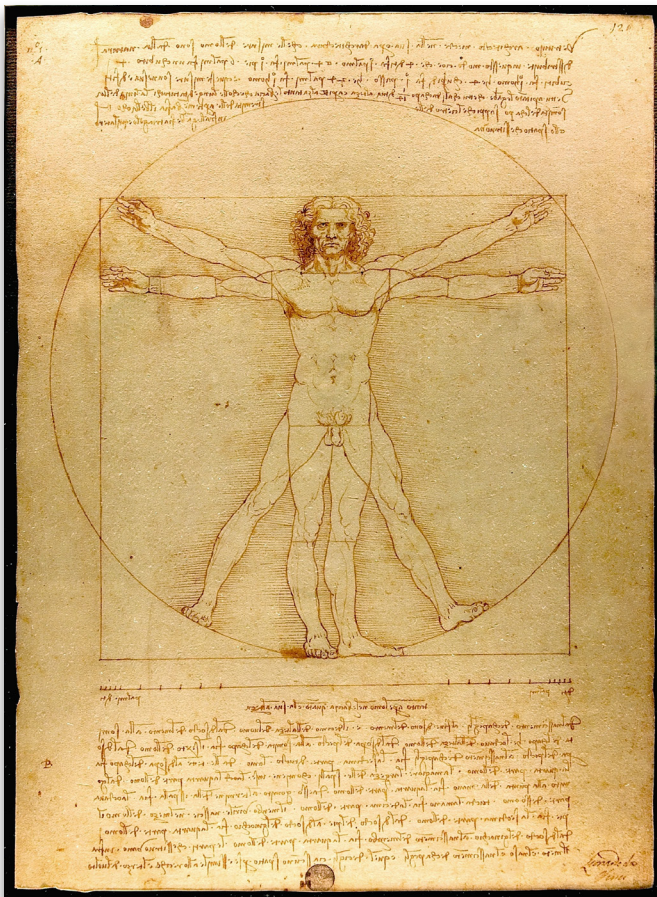
The Fibonacci sequence is a set of numbers where each number is the sum of the two preceding ones (e.g., 0, 1, 1, 2, 3, 5, 8, ...). This sequence appears in many natural forms, including the arrangement of seeds in a pinecone. The golden ratio, approximately 1.618, is thought to be the most aesthetically pleasing proportion and is found in both nature and art.



→ **Mona Lisa** (c. 1503–1519)



↑ *The Last Supper* (c. 1495-1498)



←
Vitruvian Man
(c. 1492)

Activity

FIBONACCI PINECONE EXPLORATION



Objective: Discover the Fibonacci sequence by observing a pinecone.

Materials: A pinecone, drawing paper, colored pencils or crayons.

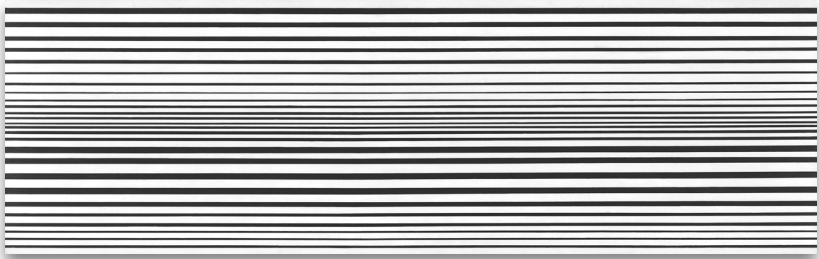
Steps:

1. **Observe the Pinecone:** Hold the pinecone in your hand and look at how the scales (seeds) are arranged. You'll notice they form spiral patterns.
2. **Simple Sketching:** Draw the pinecone on your paper. Don't worry about detailed accuracy; just try to capture the overall spiral pattern.
3. **Color the Spirals:** Use a different color for each spiral you see. This will help you and others see the patterns more clearly.
4. **Count the Spirals:** Count how many spirals go in one direction and how many go in the opposite direction. They usually match numbers in the Fibonacci sequence.
5. **Reflect and Discuss:** Talk about what you noticed. How many spirals did you count? Did the numbers match any in the Fibonacci sequence? Discuss why this pattern might be useful for the pinecone (e.g., helps in packing seeds efficiently).

Pioneer of Optical Art

BRIDGET RILEY

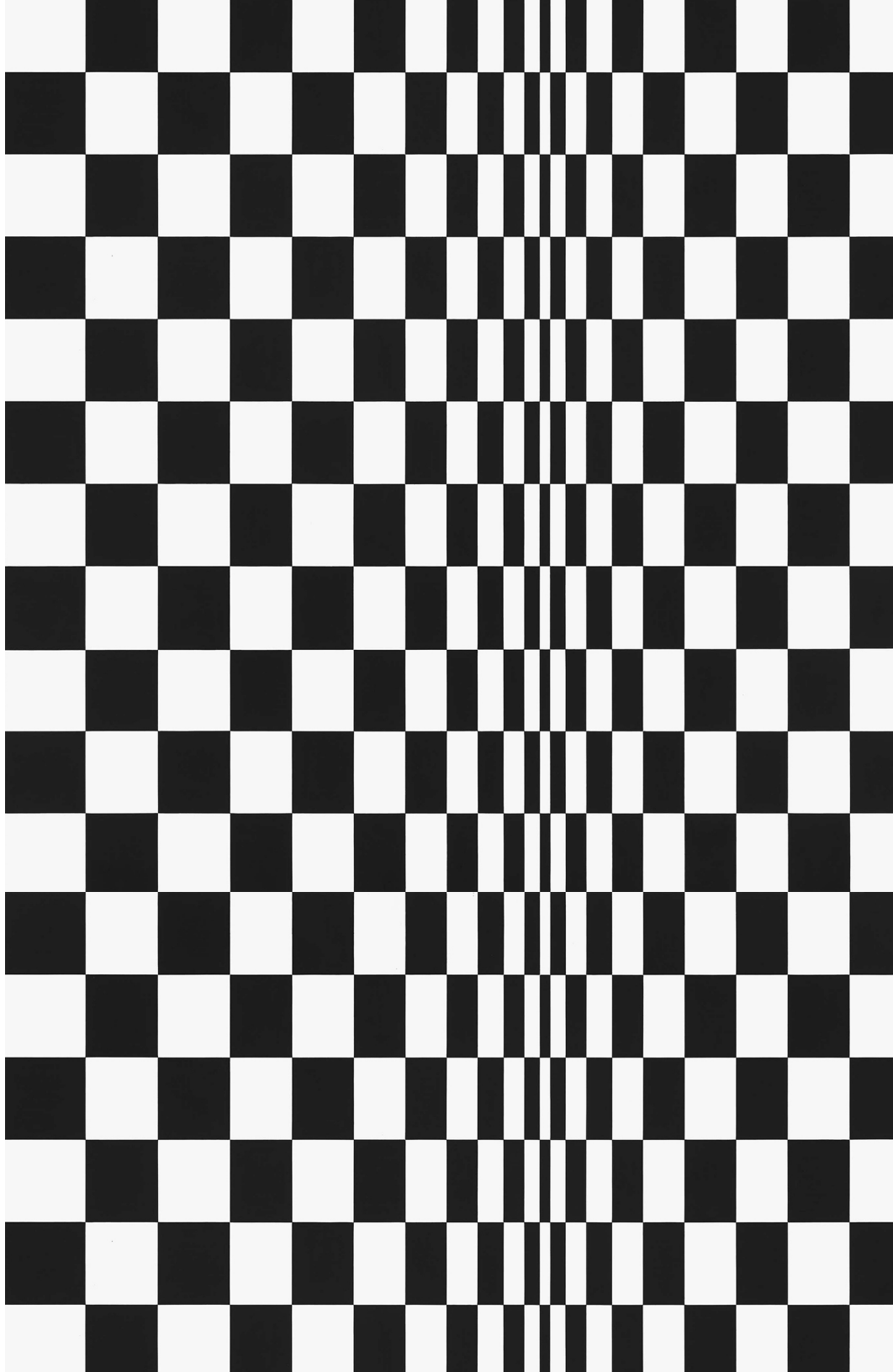
About	Bridget Riley is an English painter known for her distinctive, vibrant works that create intense visual effects using optical illusions. Her paintings often consist of simple geometric shapes such as lines and circles, which are arranged in complex patterns that evoke a sense of movement and color vibration.
Famous Works	• Movement in Squares uses a sequence of squares that appear to distort and create a three-dimensional effect. • Fall employs a series of vertical lines that warp and curve, challenging the viewer's perception of space.
Quote	<i>"The eye can be made to travel over the surface in a way parallel to the way it moves over nature."</i>
Mathematical Concept	Optical Illusions and Visual Perception

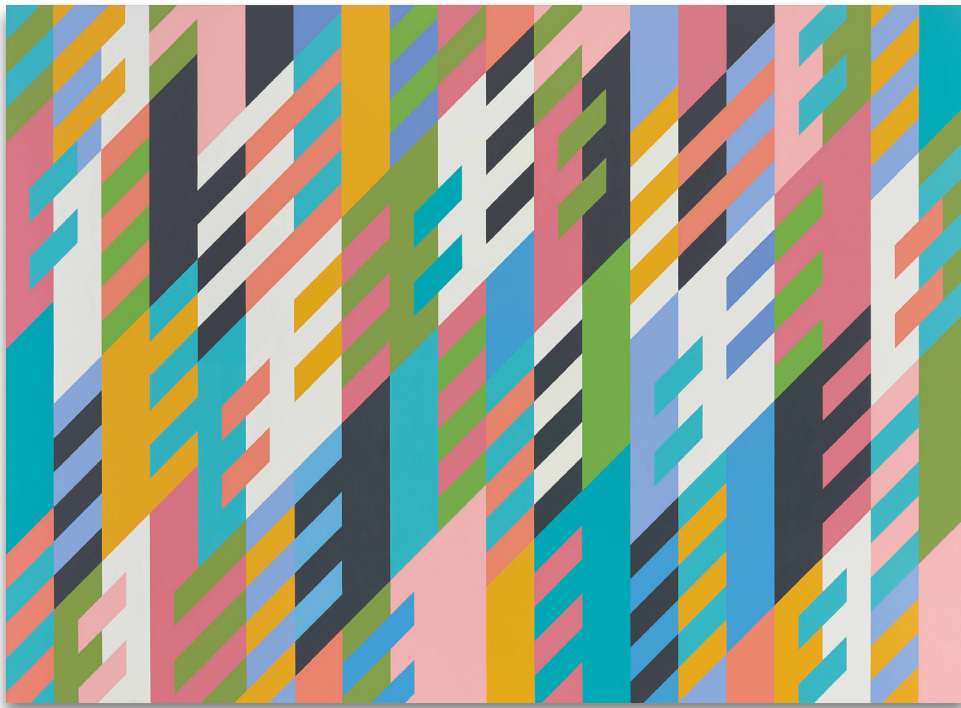


↑ **Horizontal Vibration** (1961)

Riley's artworks explore visual perception through precise arrangements of shapes and colors, manipulating the viewer's eyes into seeing motion and depth where there is none. These effects are grounded in the study of human visual perception, particularly how the eye and brain respond to contrasting colors and patterns.

→ **Movement in Squares** (1961)





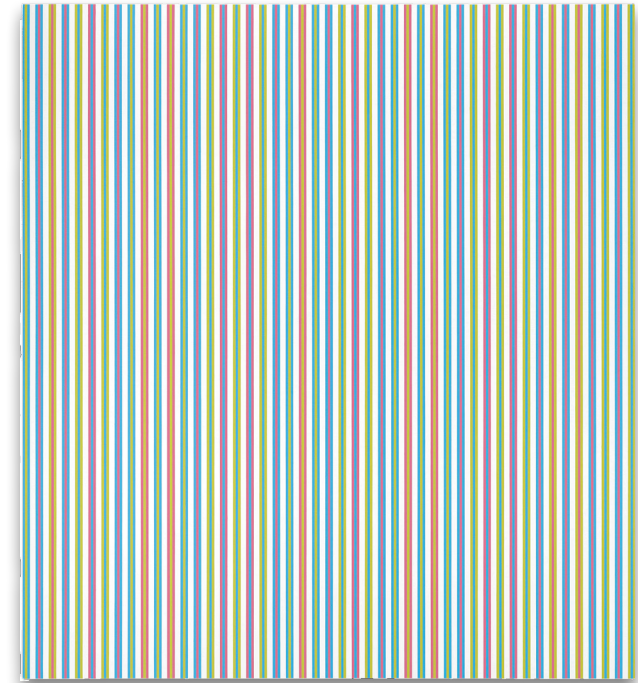
↑ *New Day* (1988)



← *Blaze 4* (1964)

Activity

RILEY OPTICAL ILLUSION ART



→ *Elysium* (2003/1973)

Objective: Create an artwork that uses geometric patterns to create an optical illusion.

Materials: Graph paper, black marker, colored markers or pencils.

Steps:

1. **Draw Geometric Patterns:** On your graph paper, draw a series of straight or wavy lines close together. Adjust the spacing gradually to create the illusion of depth or movement.
2. **Add Color:** Use contrasting colors to enhance the optical illusion. Alternate colors between different lines or patterns.
3. **Observe and Reflect:** View your artwork from different angles and distances. Notice how the colors and patterns affect your perception.
4. **Discuss:** Reflect on how the arrangement of simple geometric shapes can manipulate visual perception. Discuss the principles of optical illusions and how they can be used in real-world applications like camouflage or in art to convey motion and depth.

Surrealist Visionary

SALVADOR DALÍ

About	Salvador Dalí was a Spanish surrealist painter known for his striking and bizarre images. Dalí's work often incorporates classical and mathematical themes, including geometric forms and optical illusions.
Famous Works	• The Persistence of Memory features melting clocks in a surreal landscape, challenging the viewer's conventional perceptions of reality. • Sacrament of the Last Supper constructs the scene within a perfect dodecahedron, emphasizing geometry and perspective.
Quote	<i>"The only difference between me and a madman is that I am not mad."</i>
Mathematical Concept	Hyperbolic Geometry and Perspective



Galatea of the Spheres (1952)

Dalí's works often explore complex mathematical concepts such as hyperbolic geometry and distorted perspectives to create unusual, dream-like scenes that defy logical interpretation.

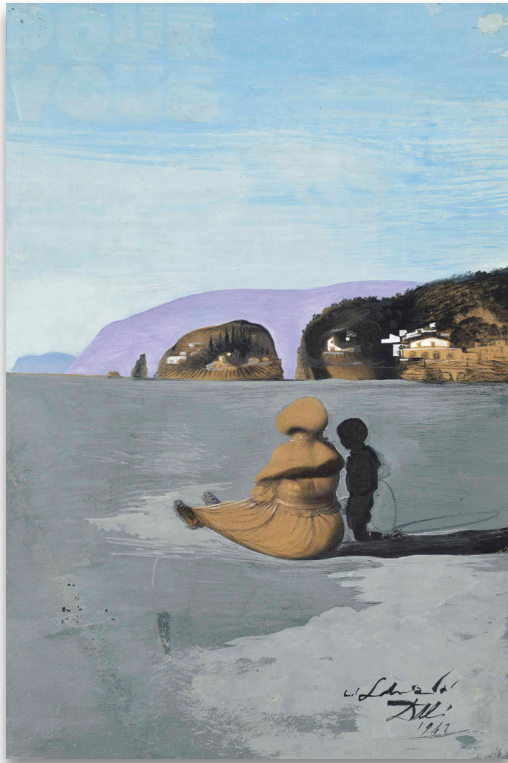


Apparatus and Hand (1927)





↑ *The Persistence of Memory* (1931)



← *Adolescence* (1941)

Activity

DALÍ INSPIRED PERSPECTIVE ART

→ *The Disintegration of the Persistence of Memory* (1954)



Objective: Create a drawing that uses distorted perspective to evoke a surreal feeling.

Materials: Paper, pencils, ruler.

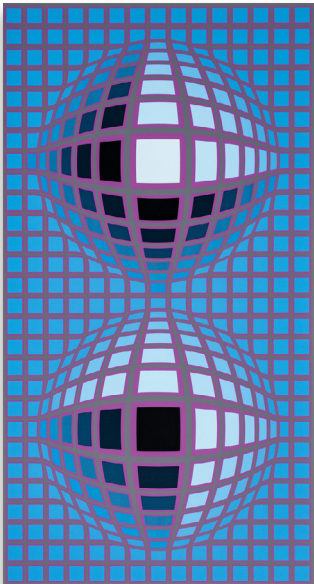
Steps:

1. **Sketch Basic Shapes:** Draw simple geometric shapes such as cubes and spheres.
2. **Distort the Perspective:** Alter the angles and lines of your shapes to distort their perspective, making them appear elongated or curved unnaturally.
3. **Add Surreal Elements:** Incorporate surreal details, like clocks or eyes, into your shapes to enhance the dream-like quality.
4. **Reflect and Discuss:** Analyze how altering perspectives can change the emotional impact of the artwork. Discuss how Dalí might use mathematical concepts to enhance the narrative and visual impact of his paintings.

Father of Op-Art

VICTOR VASARELY

About	Victor Vasarely was a Hungarian-French artist credited with the founding of the Op-art movement. His work focuses on creating optical illusions through the precise use of geometric shapes and interacting colors.
Famous Works	• Zebra is one of his earliest works using optical illusions, where two zebras are intertwined, their stripes forming a mesmerizing pattern. • Vega-Nor utilizes geometric shapes and shading to create the illusion of a three-dimensional sphere.
Quote	"Every form is a base for color, every color is the attribute of a form."
Mathematical Concept	Geometry and Optical Illusions

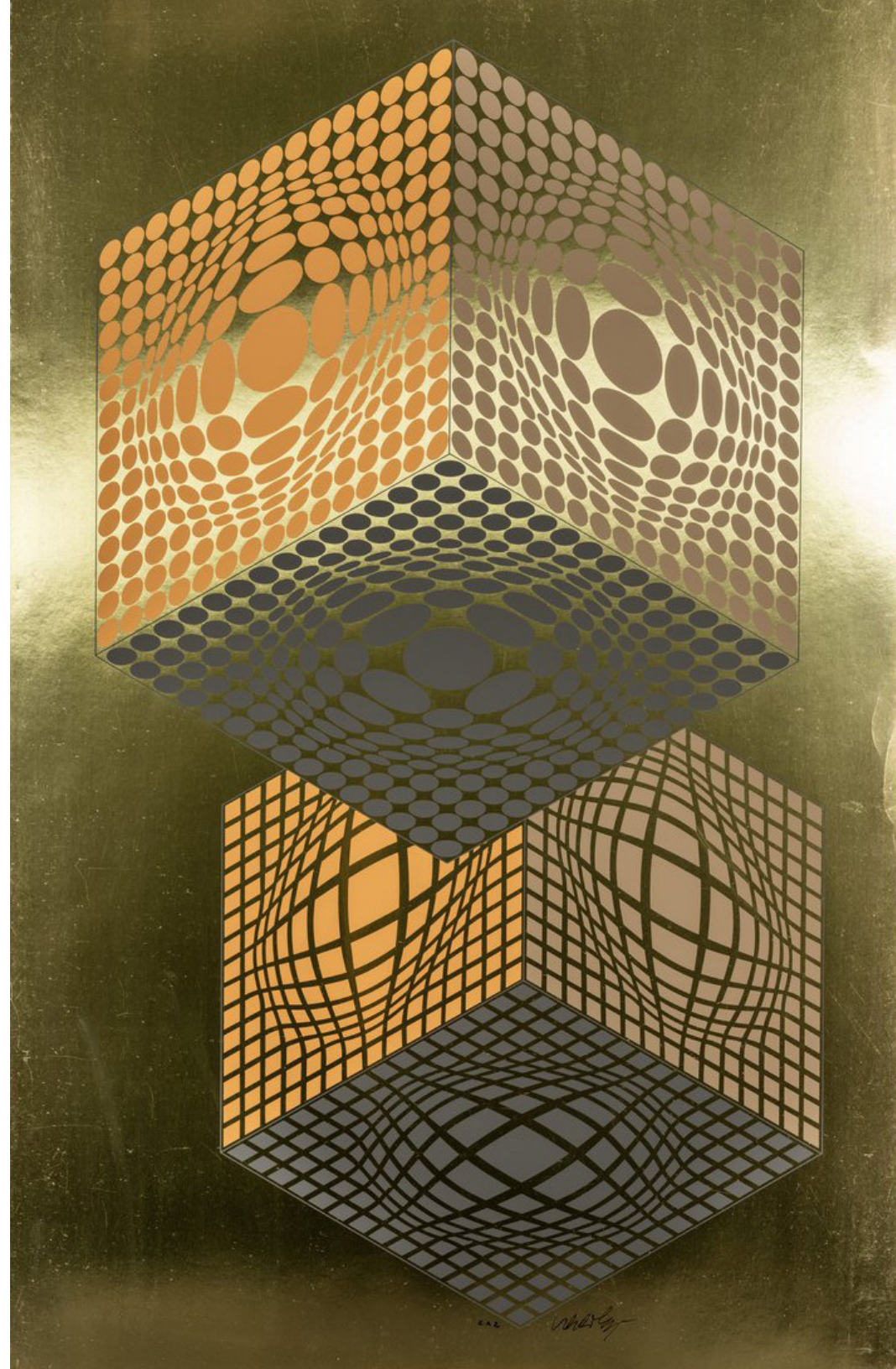


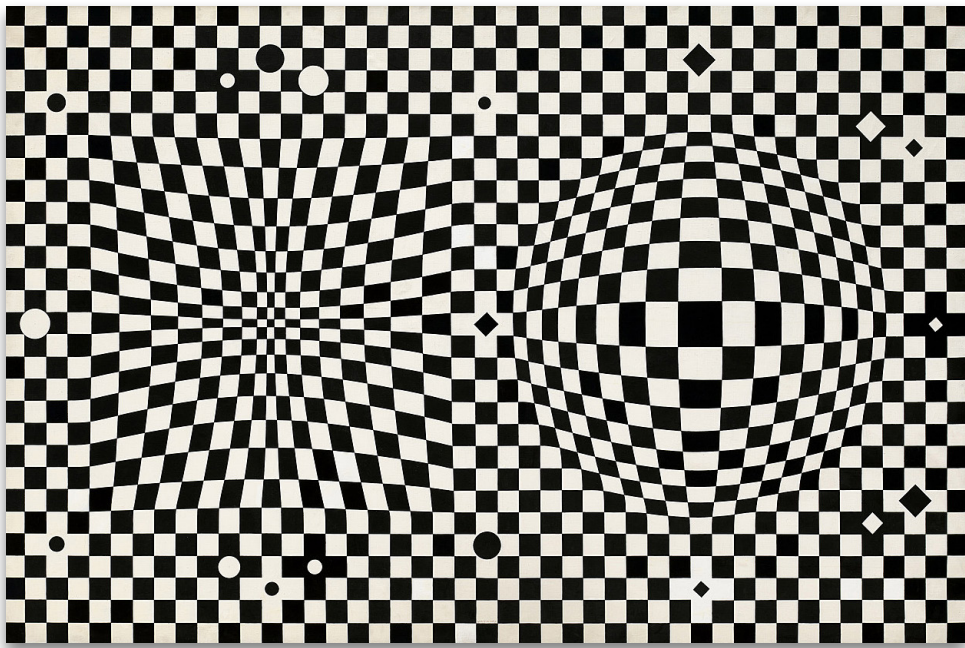
Kardoe (1975)

Vasarely's artworks utilize complex geometric arrangements and color theories to create illusions that the flat paintings are three-dimensional. His use of precise geometric shapes and the interactions between colors explore the concepts of perspective and dimension in art.



Vega Kocka (1973)

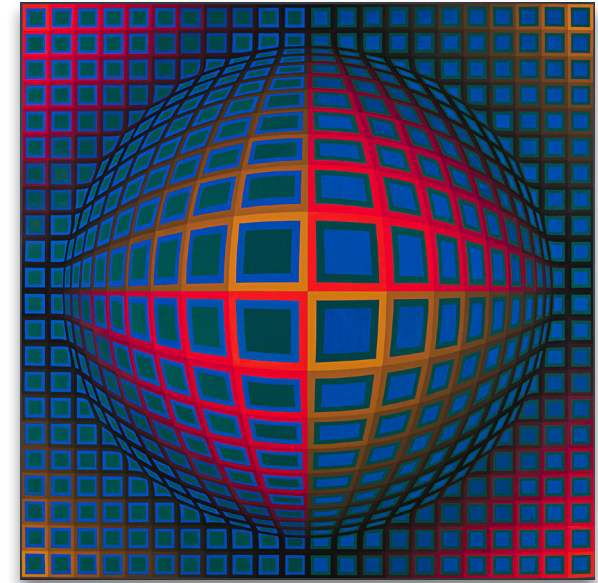




↑ *VEGA III* (1957-1959)

Activity

VASARELY-STYLE GEOMETRIC ILLUSION



→
Vega-Nor (1969)



↑ *Zebra* (1938)

Objective: Craft an artwork that uses geometric shapes to form an optical illusion.

Materials: Cardstock, rulers, colored pencils.

Steps:

1. **Plan Your Design:** Sketch a grid on the cardstock. Choose a simple geometric shape, like a square or hexagon.
2. **Create Depth:** Draw multiple layers of the shape, altering their size and shading to create the illusion of depth.
3. **Color the Shapes:** Use contrasting colors to enhance the three-dimensional effect.
4. **Reflect and Discuss:** Observe how geometric precision and color interaction can trick the eye. Discuss the scientific and artistic principles behind optical illusions and how they can be applied in different contexts.

Abstract Composition

WASSILY KANDINSKY

About	Wassily Kandinsky, a pioneer of abstract art, believed that colors and shapes could communicate deeper spiritual truths. He explored the psychological impact of color and the relationship between visual art and music, often describing his works as visual symphonies.
Famous Works	• Composition VIII features geometric forms with dynamic, contrasting colors that evoke a sense of musical harmony. • On White II demonstrates how different shapes and colors can interact to create visual tension and balance.
Quote	"Color is a power which directly influences the soul."
Mathematical Concept	Geometric Abstraction and Color Theory



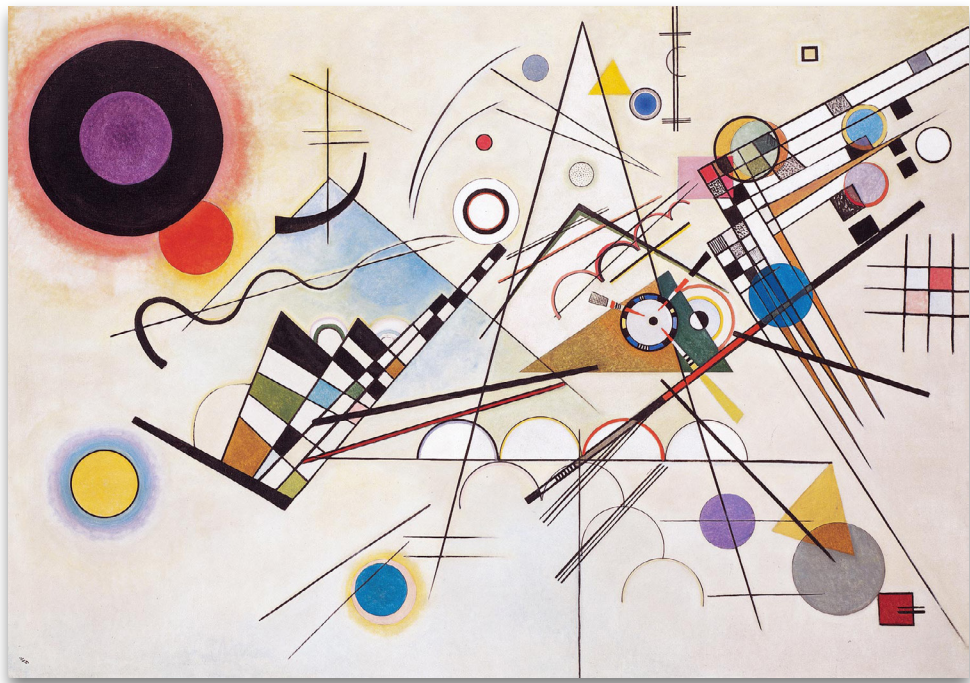
On White II (1923)

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Sky Blue (1940)





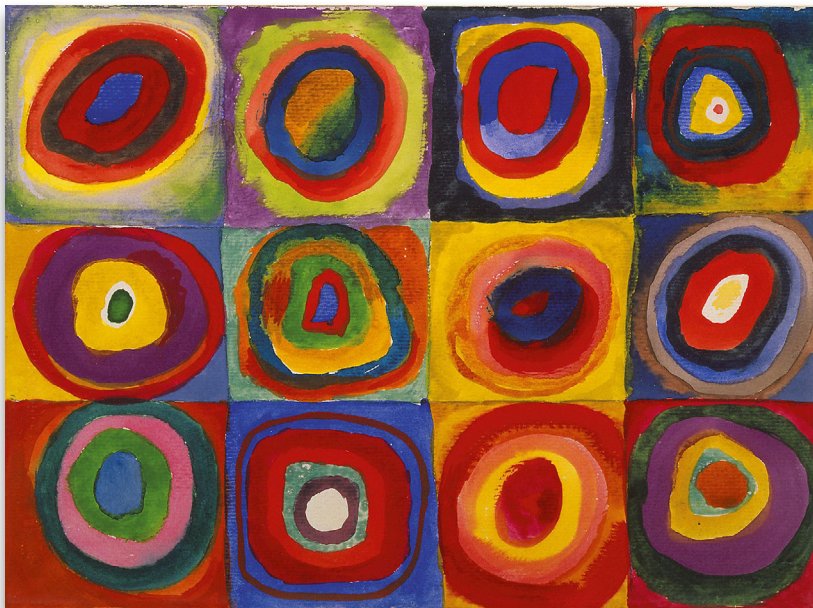
↑ *Composition VIII* (1923)

Activity

KANDINSKY GEOMETRIC ART



→ *Several Circles* (1926)



↑ *Color Study. Squares with Concentric Circles* (1913)

Objective: Create a piece of abstract art using geometric shapes and color to convey emotion.

Materials: Construction paper, scissors, glue, colored pencils or markers.

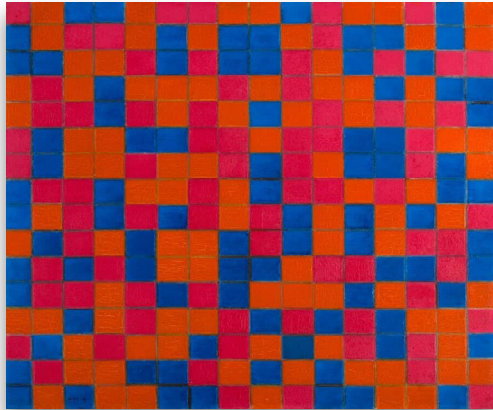
Steps:

1. **Cut Geometric Shapes:** From construction paper, cut various geometric shapes like circles, squares, and triangles.
2. **Arrange Your Composition:** On a blank sheet, arrange your shapes into an abstract composition. Experiment with overlapping and layering.
3. **Add Color:** Color your shapes using pencils or markers, choosing colors that reflect the emotions you wish to convey.
4. **Reflect and Discuss:** Consider how the arrangement and color choices impact the viewer's emotional response. Discuss Kandinsky's belief in the spiritual and emotional power of abstract forms.

Simplified Beauty

PIET MONDRIAN

About	Piet Mondrian, known for his role in the De Stijl art movement, created artworks that reduced forms to their basic geometric essence and used primary colors to create spatial balance and purity.
Famous Works	• Broadway Boogie Woogie captures the rhythm of the streets of New York through a grid of yellow, red, and blue squares. • Tableau I shows Mondrian's iconic style of using grids of black lines with rectangles of primary colors.
Quote	"Art is higher than reality and has no direct relation to reality."
Mathematical Concept	The Golden Ratio and Simplicity



Composition: Checkerboard, Dark Colors (1919)

Mondrian's artworks often utilize the golden ratio, applying it to a grid system to achieve visual harmony and balance through a seemingly simple yet profoundly precise mathematical approach.

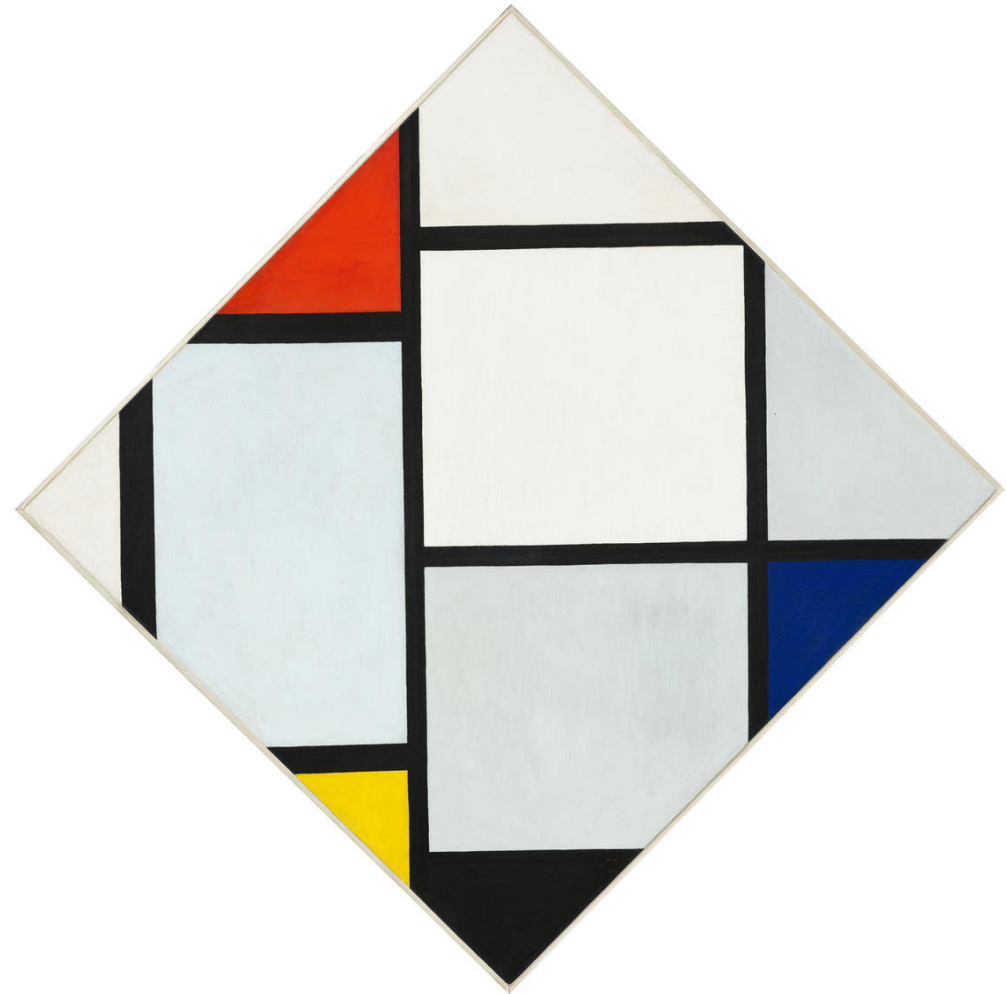
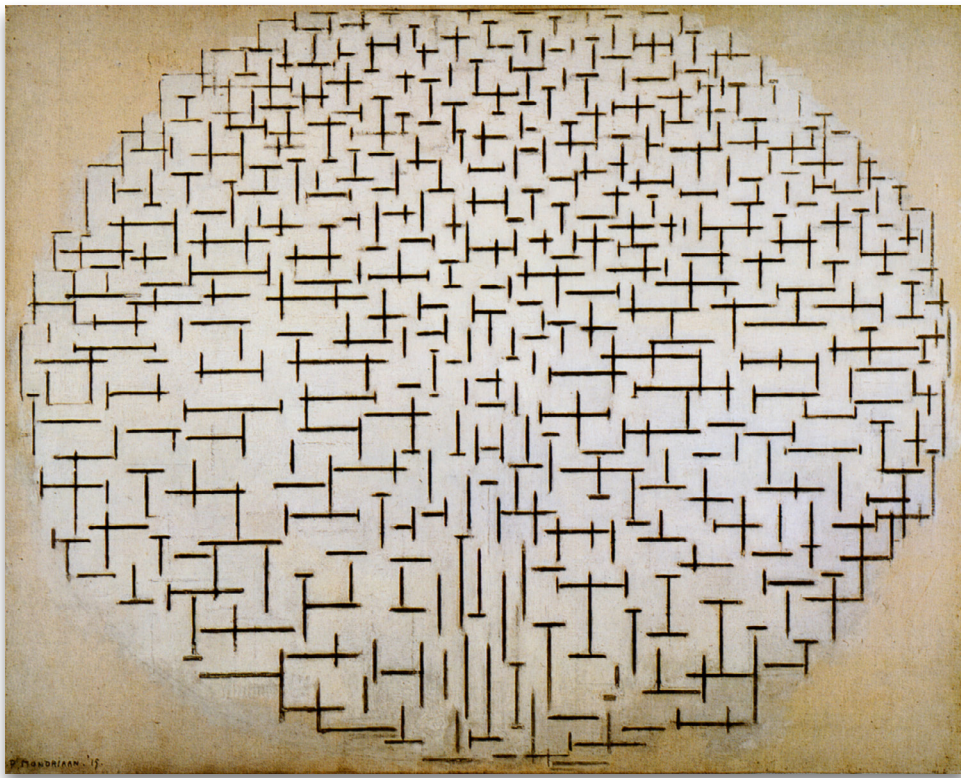
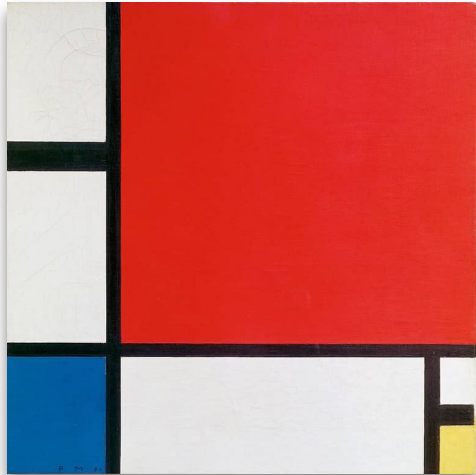


Tableau No. IV; Lozenge Composition with Red, Gray, Blue, Yellow, and Black (1925)



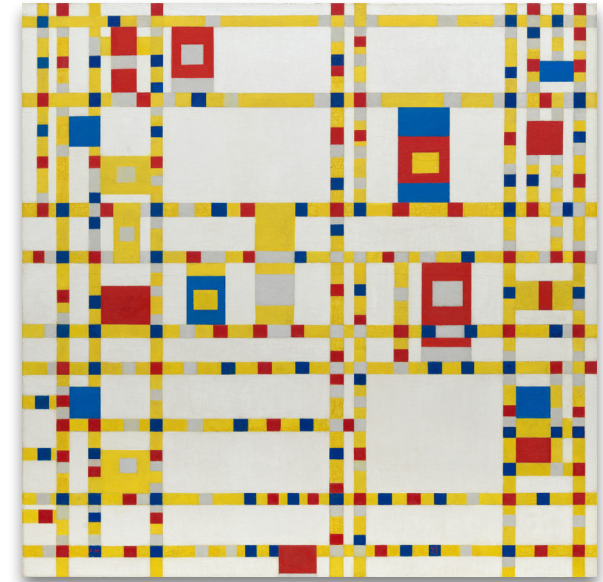
↑ *Pier and Ocean (Composition No. 10)* (1915)



← *Composition II in Red, Blue, and Yellow* (1930)

Activity

MONDRIAN INSPIRED PAPER COLLAGE



→ *Broadway Boogie Woogie* (1942)

Objective: Create a collage inspired by Mondrian's grid-based artwork using primary colors.

Materials: White paper, red, yellow, and blue colored paper, black ribbon or paper strips, glue.

Steps:

1. **Prepare Your Grid:** On a large sheet of white paper, lay out black paper strips to form a grid.
2. **Fill in Colors:** Cut squares and rectangles from your colored papers and glue them within the compartments of the grid, following Mondrian's practice of using primary colors.
3. **Reflect and Discuss:** Explore how the simplicity of the grid and limited color palette can produce a visually striking composition. Discuss the principles of the golden ratio and how they apply to Mondrian's work.

Natural Forms

GEORGIA O'KEEFFE

About	Georgia O'Keeffe is best known for her paintings of enlarged flowers, New York skyscrapers, and New Mexico landscapes. Her work emphasizes simplicity and purity of form, often exploring the intrinsic beauty of her subjects through magnification and abstraction.
Famous Works	• Red Poppy is a stunning example of her floral paintings, where she magnifies the flower to fill the entire canvas, focusing on its vivid colors and forms. • Ram's Head, White Hollyhock-Hills shows her skill in capturing the essence of the American landscape with bold simplicity.
Quote	<i>"To see takes time, like to have a friend takes time."</i>
Mathematical Concept	Scale and Proportion

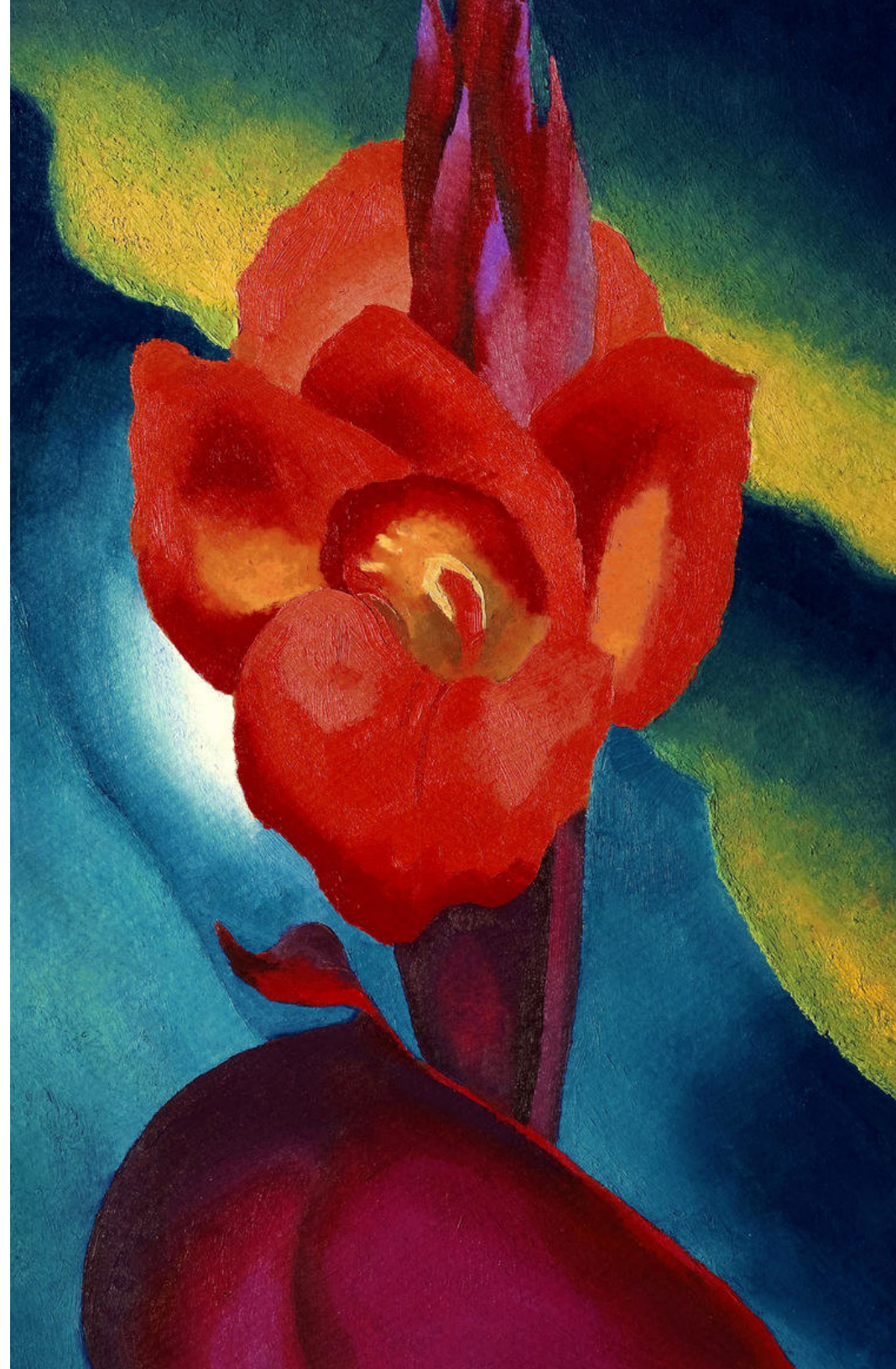


Manhattan (1932)

O'Keeffe's art often explores scale and proportion by magnifying small details to fill large canvases, challenging viewers' usual perceptions and encouraging a deeper look at the familiar.



Red Canna (1919)





↑ *Ram's Head, White Hollyhock-Hills* (1935)



↑ *Red Poppy* (1927)

Activity

O'KEEFFE INSPIRED FLORAL PAINTING



↑ *Hibiscus with Plumeria* (1939)

Objective: Paint a close-up floral portrait that explores scale and abstraction.

Materials: Canvas or large paper, acrylic or watercolor paints, brushes.

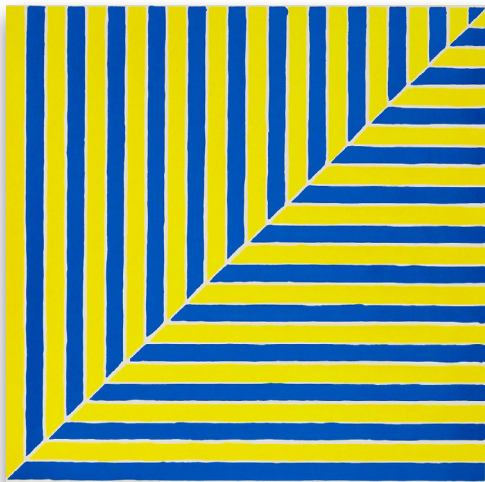
Steps:

1. **Choose a Flower:** Select a flower and study its details closely.
2. **Sketch and Paint:** Draw the flower on your canvas, filling the space to magnify its features. Paint using bold, vibrant colors.
3. **Reflect and Discuss:** Consider how altering the scale changes the perception of the object. Discuss how Georgia O'Keeffe might use magnification to make ordinary subjects appear extraordinary.

Radical Abstraction

FRANK STELLA

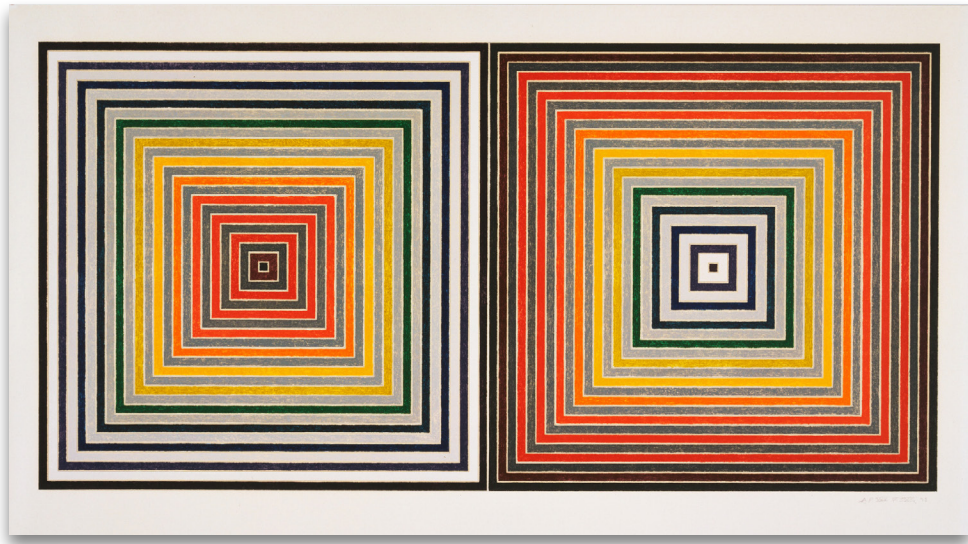
About	Frank Stella, an American painter, sculptor, and printmaker, is noted for his work in the areas of minimalism and post-painterly abstraction. Stella's artworks are known for their non-representational forms, structured patterns, and bright colors.
Famous Works	• Harran II part of his Protractor series, which features colorful concentric circles. • Black Paintings which use repetitive patterns of stripes to explore visual rhythm and structure.
Quote	"What you see is what you see."
Mathematical Concept	Minimalism and Iteration



Untitled (Rabat) (1964)

Stella's use of minimalistic designs and iterative patterns draws heavily on mathematical concepts, particularly in the systematic repetition and arrangement of shapes to explore form and space.

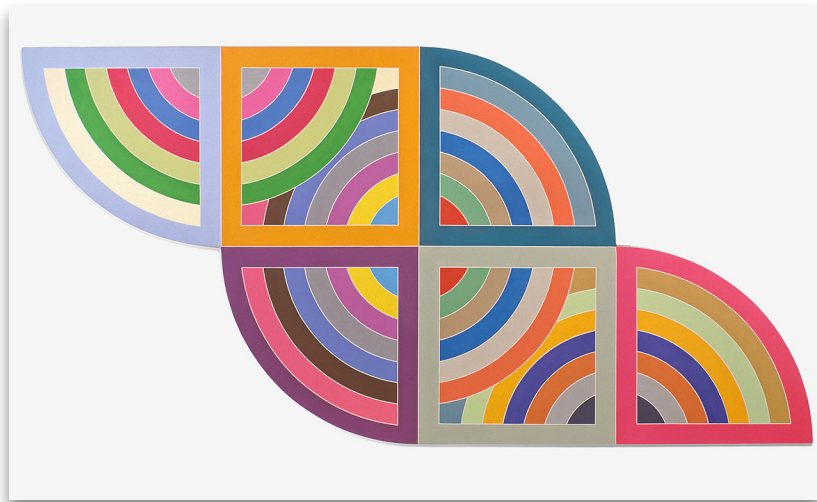
→ *Die Fahne hoch!* (1959)



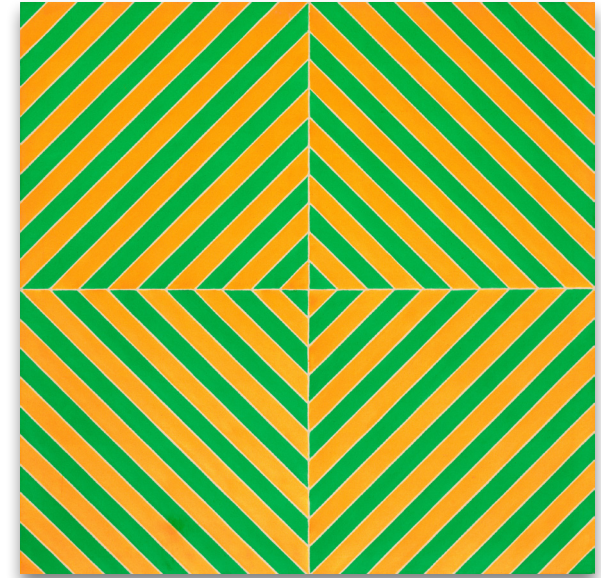
↑ *Double Gray Scramble* (1973)

Activity

STELLA STYLE MINIMALIST ART



↑ *Harran II* (1967)



Fez (2) (1964) →

Objective: Create a minimalist artwork inspired by Frank Stella's geometric patterns.

Materials: Cardstock, tape, acrylic paints, ruler.

Steps:

1. **Design Your Pattern:** Using a ruler, draw geometric patterns such as stripes, squares, or circles on your cardstock.
2. **Mask and Paint:** Use tape to mask areas to remain unpainted or to create sharp lines. Apply bright, bold colors to the unmasked areas.
3. **Reflect and Discuss:** Observe the impact of repetitive patterns and minimalistic design on visual perception. Discuss how Stella's approach to minimalism and abstraction reflects or defies traditional mathematical beauty in art.



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