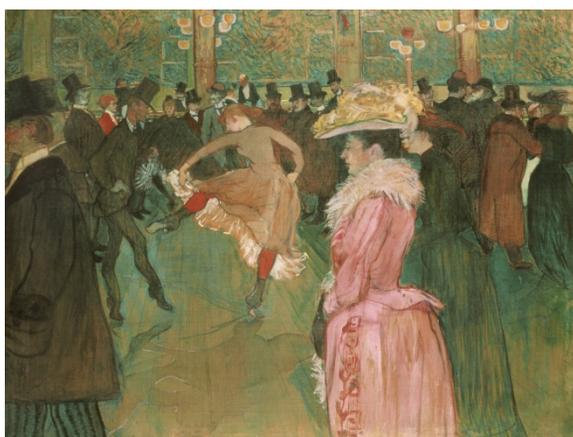


ART AND THE GOLDEN RECTANGLE

The golden rectangle is a geometric concept found in many aspects of the natural world as well as in architecture, art, and popular culture, that consists of proportions that have been long considered visually and psychologically pleasing. This lesson is designed to be integrated into a geometry curriculum addressing the mathematical and aesthetic qualities of basic shapes, and of their use in society and nature.



At the Moulin Rouge: The Dance, 1890
Henri de Toulouse-Lautrec, French
Oil on canvas
45 1/2 x 59 inches (115.6 x 149.9 cm)
The Henry P. McIlhenny Collection in memory of
Frances P. McIlhenny, 1986
1986-26-32

Curricular Areas

Mathematics – Geometry, Patterns

Grade Level

For grades 6–7

Common Core Academic Standards

- [CCSS.Math.Content.6.RP.A.1](#)
- [CCSS.Math.Content.7.RP.A.2b](#)
- [CCSS.Math.Content.7.G.A.2](#)

Pennsylvania Academic Standards for Art

- 9.4: Aesthetic Response

Art Images Required

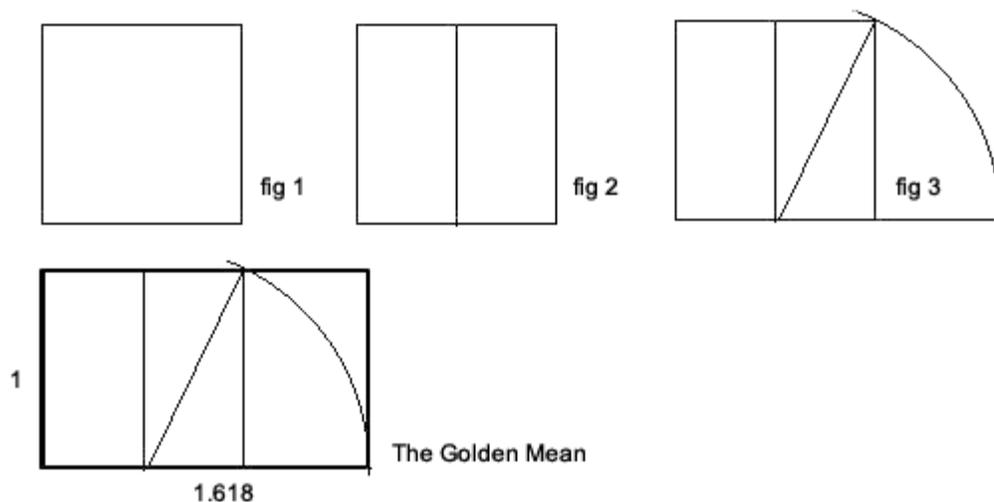
Click on the titles below to view high-resolution photographs on the Philadelphia Museum of Art website. Images that are available in the ARTstor Digital Library are indicated by an ID number or search phrase. Entering that number or phrase into the ARTstor search bar will direct you to the corresponding image in that database.

- [Choir Screen from the Chapel of the Château of Pagny, France](#), 1536–38, French
ARTstor search: PMA 1930-1-84a–d
- [Sugar Cane](#), 1931, by Diego Rivera
ARTstor search: 1943-46-2
- [At the Moulin Rouge: The Dance](#), 1890, by Henri de Toulouse-Lautrec
ARTstor search: 1986-26-32
- [Breaking Home Ties](#), 1890, by Thomas Hovenden,
ARTstor search: 1942-60-1

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Lesson Process

1. Review the idea of the golden mean with the class. (NOTE: You can find extensive information on the ratio provided by Middlebury Community College in Vermont at <http://community.middlebury.edu/~harris/Humanities/TheGoldenMean.html>.)
2. Before examining ways in which the golden rectangle is used in art it is necessary to know how to create one. Instruct students on how to draw a golden rectangle using a piece of paper, a pencil, a ruler, and a compass with the four-step process described below.
 - o Begin by drawing a square.
 - o Extend the top and bottom lines of the square to the right.
 - o Place the needle of the compass at the midpoint of the square's baseline and draw an arc from the upper-right corner of the square down to where it crosses over the extended baseline. Use this point as the new corner of the rectangle
 - o Complete the rectangle by drawing a vertical line connecting the extended baselines. This is a golden rectangle.



3. View the *Choir Screen from the Chapel of the Château of Pagny*. Have students locate examples of rectangles in this decorative work. How can they tell whether the shapes are actually golden rectangles?
 - o Print and distribute copies of the *Choir Screen* to the class. Instruct students to find a rectangular shape and trace it with a pencil. Using the shorter side of the rectangle as one side of a square, have students draw a square inside the rectangle. Follow the steps listed above to see whether the rectangle fits the dimensions of a golden rectangle. (OPTION: There is an algebraic formula for a golden rectangle that can also be used to make this determination. See **Extension**.)
 - o You may bring in other examples of architectural objects, many of which will reveal examples of golden rectangles.

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4. View Diego Rivera's *Sugar Cane*. Examine the composition of the mural, noting its shape and looking specifically for rectangles. Where can they be found? (NOTE: The front balcony of the building where the man is reclining on the hammock.)
 - o Observe where the mural can be divided into sections. (NOTE: Use the two girls on the left or the young man in the foreground on the right as a point of reference.) Follow the same steps as above to see if these sections are also golden rectangles.
 - o Look for other rectangles in Rivera's mural. (NOTE: Measuring shapes within the composition of a painting is not as exact as the shapes in architecture, so students should see if the shape is approximately a golden rectangle.)
5. Why would an artist use a golden rectangle when designing a choir screen? Why would a painter use a golden rectangle when organizing the general composition of a mural?

Assessment

1. Golden rectangles can be found all around us—in design, advertising, and of course, art. Find several examples and organize these into a mini-portfolio. The portfolio can include magazine clippings, drawings, print-outs of digital photos, etc. In all cases, use a colored marker to draw the rectangles you see.
2. Find additional information explaining why the golden rectangle is so aesthetically pleasing. Compile this research into an essay that explains this effect in a way your classmates can understand.

Enrichment

1. View *At the Moulin Rouge: The Dance* by Henri de Toulouse-Lautrec. Follow the same process as above to discover golden rectangles in the painting.
2. Look at *Breaking Home Ties* by Thomas Hovenden, using the same process as above.
3. The golden rectangle can be represented mathematically by describing the ratio of one side to the other, indicated by the following ratio: or approximately 1:1.618. Use this ratio to create a golden rectangle and also to check to see if other rectangles discovered in art and architecture fit the proper ratio.