



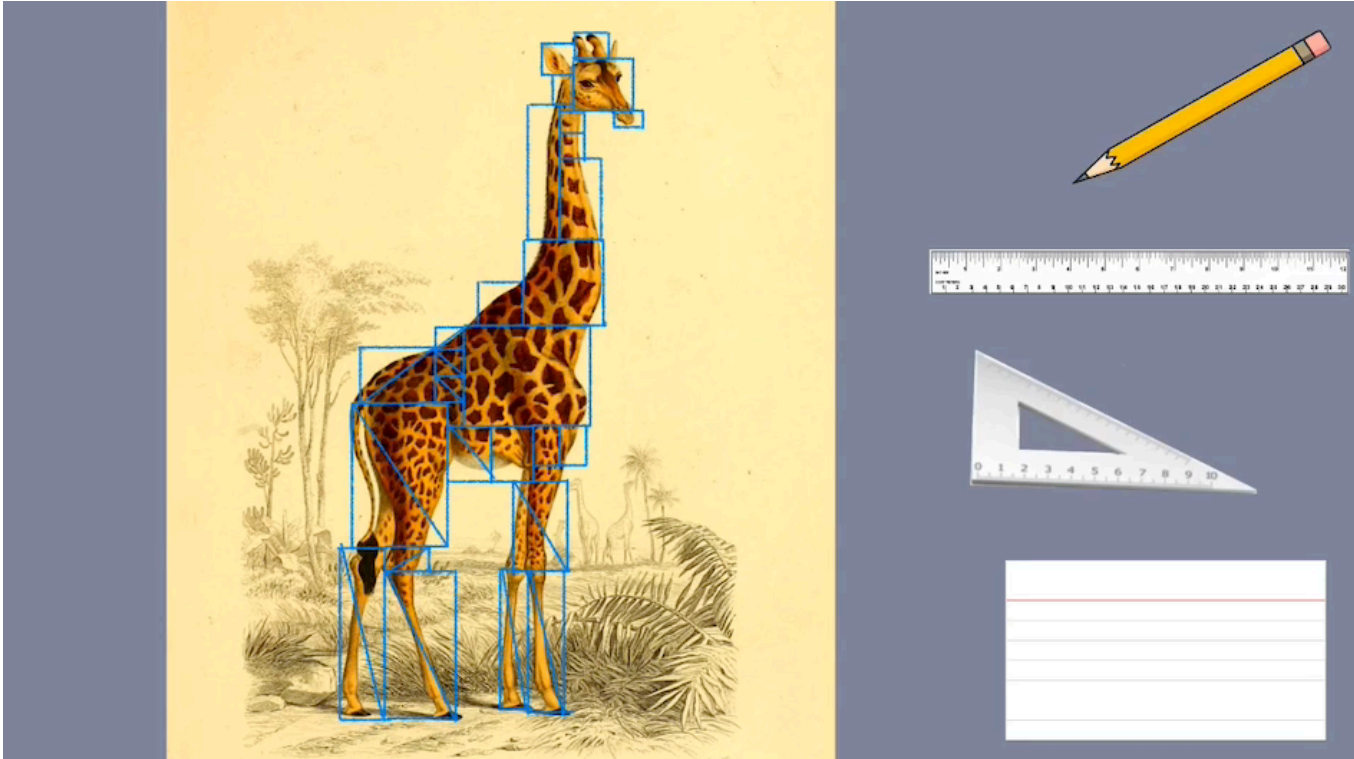
collaborations: teachers and artists

# **The Pythagorean Filter**

**An artistic application of  
the Pythagorean theorem**

**By Leo Francisco**

**Click here for a video tutorial:**



# Description

- In this activity, students apply knowledge of rectangles, squares, and right triangles to create designs based on a reference image.**

# Materials

- **Drawing paper**
- **Regular pencils, colored pencils, markers, and/or crayons**
- **Rulers, right triangles, and/or index cards**
- **Reference image**
- **Vellum (semi-transparent) or tracing paper**

# Warm-Up

- **Students use straight-edge makers (rulers, right triangles, and/or index cards) to practice drawing rectangles and squares and dividing each into equal right triangles.**

# Step 1

- Students draw horizontal and vertical lines to fill their page with many rectangles, making sure each shape isn't too small (too difficult to divide in half with a diagonal line). Rectangles (including squares) can be placed, like blocks, next to, or on top/below each other, but not with overlapping lines.

# Step 2

- **Once rectangles are complete, students use straight-line-making tool to divide each rectangle into two equal right triangles.**

# Step 3

- **Using up to four different colors, students color triangles making sure most, if not all rectangles are now shown as composed of two equal shapes of different colors.**



# Goals

- **Practice geometric drawing skills**
- **Use of straight edges**
- **Making vertical, horizontal, and diagonal lines**

# Filtered Illustration

- **Students apply a hand-drawn “filter” over a selected reference image, beginning with rectangles that are divided into right triangles.**
- **Analyzing a selected reference image of their choice, students simplify its form by drawing multiple rectangles over it, using techniques practiced in the warm-up.**

# Step 1

- **Students analyze a reference image of their choice, noticing bigger foundational shapes and smaller details.**

# Step 2

- **Using techniques practiced in the warm-up, students simplify their subject's form by drawing multiple rectangles over it, with larger rectangles for larger foundational shapes and smaller ones for finer details.**
- **Rectangles may be drawn on a printout of reference or on a sheet (tracing or vellum paper) placed above the reference image.**

# Step 3

- **Students divide rectangles into even halves, resulting in two equal right triangles per rectangle.**

# Step 4

- **Selecting three to four colors that match and/or contrast with their subjects, students color the triangles of their geometrically simplified design.**

# Goals

- **Refining visual perception skills**
- **Identifying foundational shapes in different subjects**
- **Recognizing similar foundational structures in numerous subjects**
- **For example: dogs, cats, wolves, and horses have similar body types**

# Possibilities

- **A series of illustrations, using process described above**
- **Same subject/same reference image, starting with fewer foundational rectangles (ex: 5), and progressing to more and more (9 and 17).**
- **This would serve as an analogy to the concept of visual resolution. Less foundational rectangles = less detail, less resolution. With a greater number of rectangles, more details are possible.**



- Using different subjects/references, an artist can experiment with using more, less, or equal numbers of foundational rectangles for varying degrees of abstraction.**
- An alternate version of this project can be done with transformations**
- Repeated foundational shape can be rotated, reflected, and resized**
- The shape can feature specific design, so transformations can be recognized**

# Reflection

- **What is the hypotenuse of a right triangle? How can you calculate its length?**
- **Without directly measuring them, calculate the length of four different hypotenuses in your artwork.**
- **Calculate the area of selected rectangles and triangles.**
- **Why did you select the colors you used?**
- **If you were to redo this project using a different repeated shape (not rectangles), what shape would you use and why?**

# Standards

- **Common Core Mathematics:  
6.G.A.1, 6.G.A.4**
- **CA VAPA Visual Arts: 6.VA:Cr2.1,  
6.VA:Pr5, 6.VA:Re9**