CREATIVITY, WRITING AND MATHEMATICS
THE FANCYPANTS STRIP PATTERN PORTFOLIO

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Objectives of the Project

- Specific to this project
  - Deepen the student's understanding of strip patterns

- Overall to <u>my</u> Liberal Arts Math Course
  - To engage students in mathematics beyond algebra and arithmetic
  - To attempt to convince non-mathematicians that mathematics is a creative endeavor (with logical underpinnings)
  - To have students communicate the mathematics they learned in a manner for the general audience

Problems with Strip Patterns

◦ Students (through homework and exams) were able to identify the types of symmetries in a given pattern

◦ Asked something similar to "Give a pattern that **only** contains glide reflection."
  ◦ Substandard responses (< 50% correct)
  ◦ Most contained all symmetries (pmm2)

◦ Discussed after exam and students were perplexed as to how to create

FancyPants Portfolio

◦ Overview of project:

◦ After going through the strip patterns, students have 1 ½ to 2 weeks to create a "professional" portfolio (prior to the exam)

◦ Students must create each of the seven strip patterns using their own unique motifs

◦ Each motif must be presented in two ways:

◦ A 4 in. x 4 in. square centered on the page with all necessary details

◦ A separate page with the motif repeated four times (in less detail is acceptable)

◦ The page with the repeated motif must also include an explanation why the motif satisfies the stated pattern (e.g. why does the stated motif only have translation)

◦ Students must create an explanation of the crystallography scheme to someone not familiar with the topic

Other Notes

- Students may use any tools available to create the motifs (i.e. hand-drawn or computer created)
  - I do not introduce the students to the various software that exists that does this…and they haven't looked for it.

- Because of the "professional" use of the portfolio, quality and imagination of the motifs and grammar in the explanations make up 20% of the portfolio
  - Quality and imagination are subjective, but I believe I'm fairly lenient

Difficulties with the Portfolio

- Procrastination

- Resistance
  - "This isn't Math!"
  - "I can't draw!" or "I'm not an art major!"

- Clarity of project instructions

- "One motif to rule them all!"

Positive Reponses to Portfolio

- "This isn't math…is it?"

- "I am an art major."

- "This wasn't as easy as I thought."

Review of Objectives

◦ Specific to this project
  ◦ Deepen the student's understanding of strip patterns
    ◦ **Exam success (on the relevant question) went to <u>> 70% </u>with most classes exceeding 80%, check!**

◦ Overall to <u>my</u> Liberal Arts Math Course
  ◦ To engage students in mathematics beyond algebra and arithmetic
    ◦ **Due to subject matter, check!**
  ◦ To attempt to convince non-mathematicians that mathematics is a creative endeavor (with logical underpinnings)
    ◦ **Though some students resist learning, students <u>appreciate</u> the mathematics (more later)**
  ◦ To have students communicate the mathematics they learned in a manner for the general audience
    ◦ **Writing mathematics is something that is <u>not natural </u>to our students, but they show <u>growth</u> in this area.**
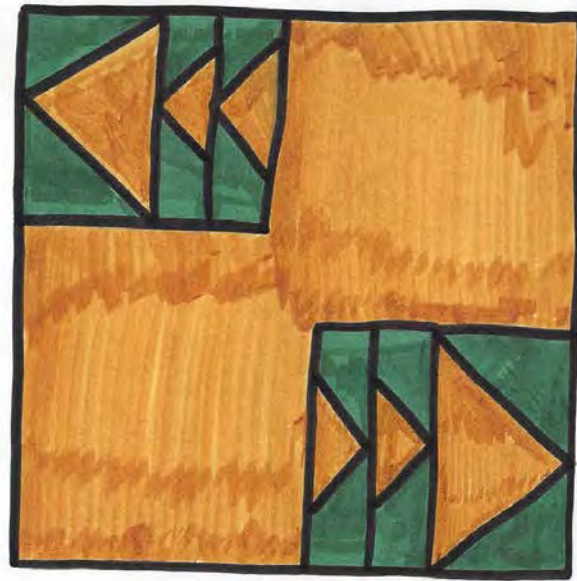
This strip pattern has rotational symmetry, and vertical and glide reflection. It has rotational because it can turn itself about and be the same. It has vertical (cut going up and down) reflection because the colors match up and the little crosses and the cross/arrow figure line up perfectly. There is glide reflection, but no horizontal, because the motif moves over and reflects the blue down to the bottom and the purple moves to the top. There is no horizontal reflection because the purple and blue crosses would be on top of each other.
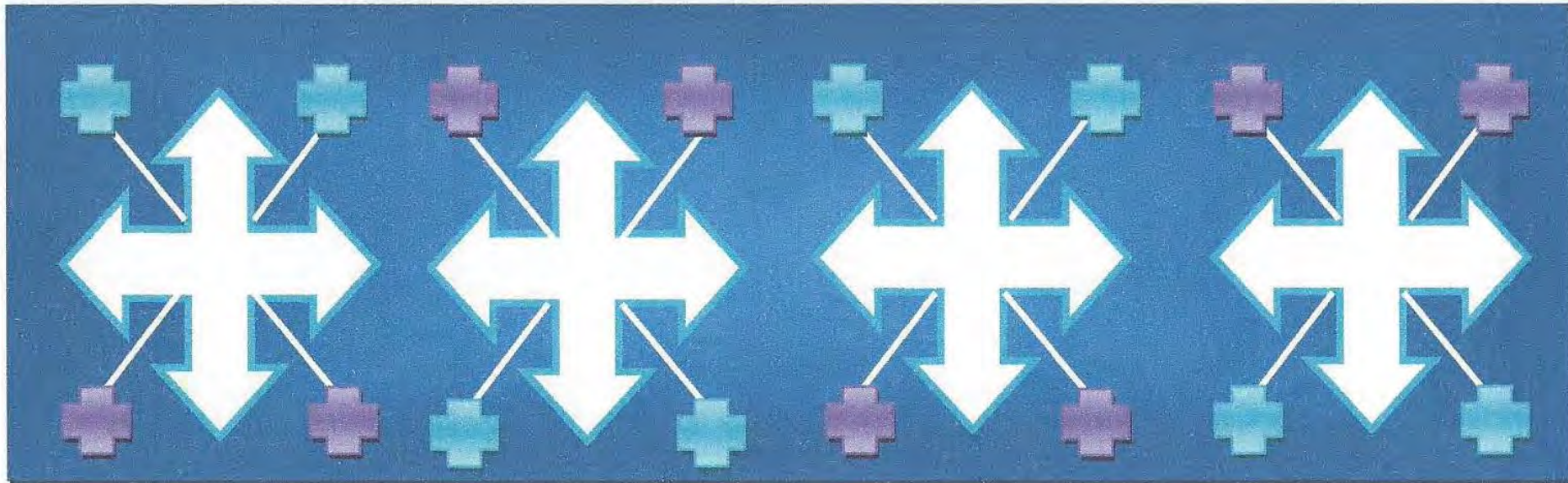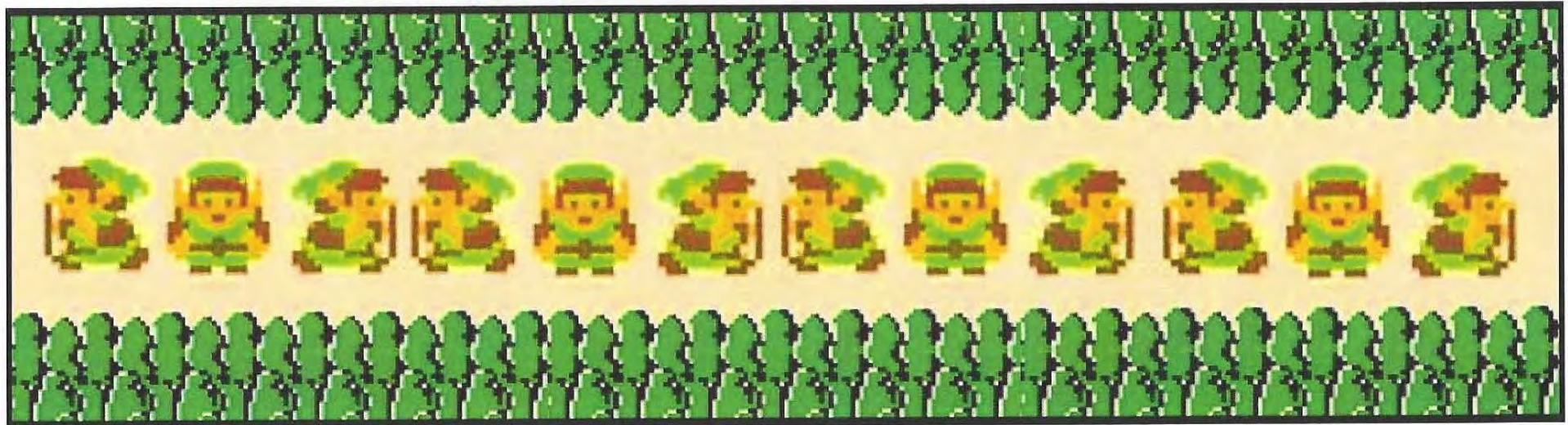
Translation, Vertical Reflection, & Rotation

Does not have:

* Horizontal reflection because the motif cannot be divided by a horizontal line and look the same on the top and the bottom due to the triangles pointing opposite directions

* Glide reflection because within the motif the lines are not reflected in the correct direction

Pattern #5 (pm11)

This pattern contains a vertical line of reflection.

The next strip pattern has four symmetries. These are the translation, glide reflection, vertical reflection, and 180 degree rotation. The only symmetry this pattern does not have is horizontal reflection. To fit into this particular pattern the motif much be exactly the same when cut by an up and down line through the middle, which is the vertical reflection. Also it must match exactly if turned in a half circle, 180 degree rotation. It must also be able to slide over and reflect over a horizontal line, glide reflection. And last it must repeat itself which is the translation.
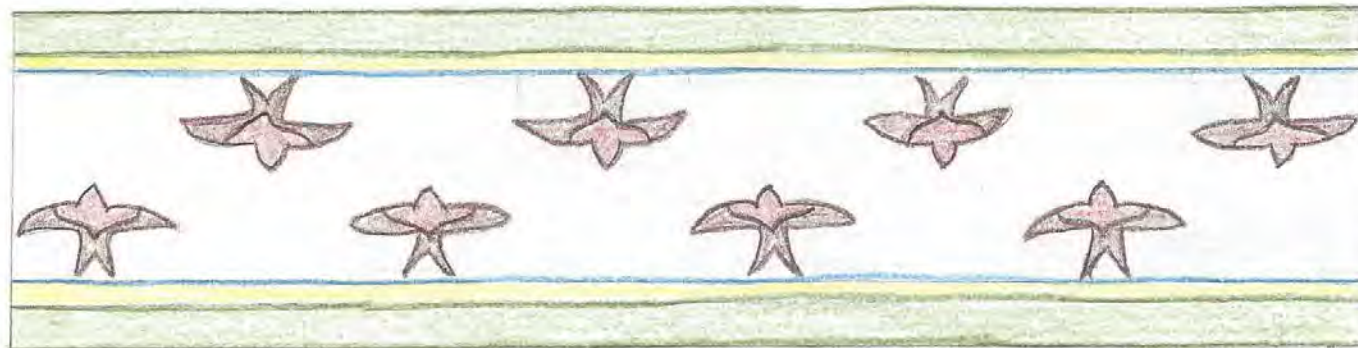
A Final Anecdote

◦ Student's email…

"You've ruined me!

Everywhere I go and let my mind wander, I still see "MATH". I go to the grocery store or a map and I try to find the quickest path. I went to the Home Depot to pick up some stuff and saw the borders. All I thought of was the symmetries I saw!

Thank you!!!"

◦ Note: This email was sent **over a year** after taking the class ☺