

# Math Enrichment

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John Heffernan

# Rationale

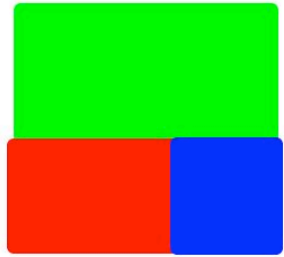
- \* Challenge and develop all students
- \* Purchased curriculum mostly teaches to middle
- \* Develop an excitement for rich (hard) mathematics

# 4 Color Map Problem

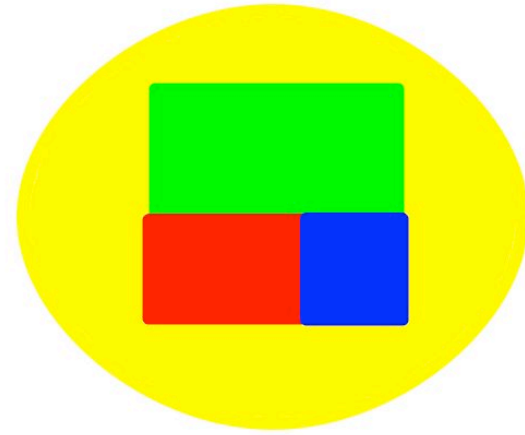
- \* Over 100 years old
- \* What is the least amount of colors needed to color any arbitrary map such that no two neighbors share the same edge?

# Map Coloring Lesson

- \* Draw constrained 2 color map
- \* Provide simple examples of 3 and 4 color maps
- \* Try and find a simple 5 color example



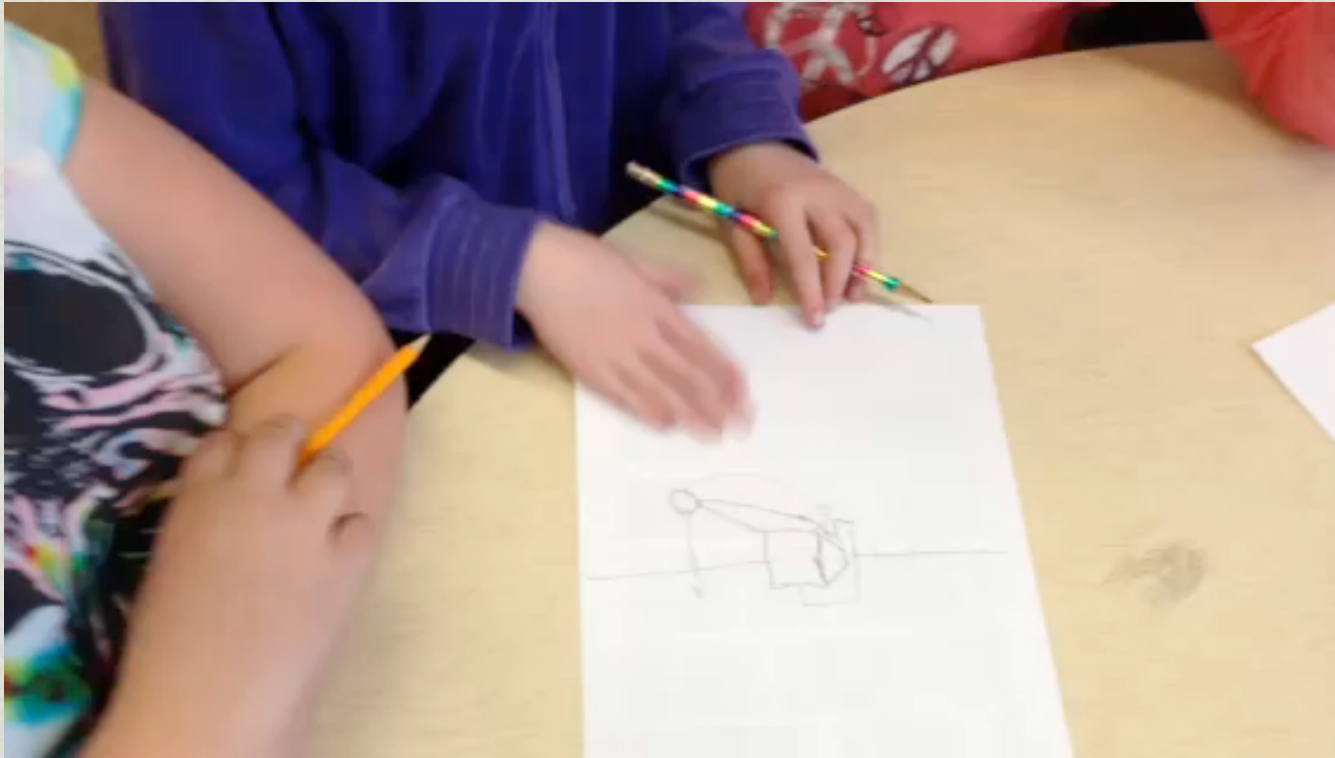
**3 Color Map**



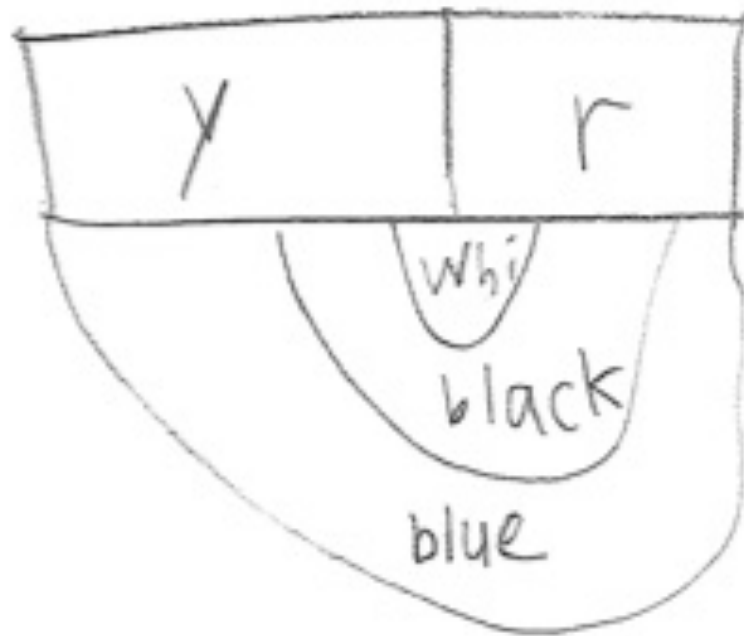
**4 Color Map**



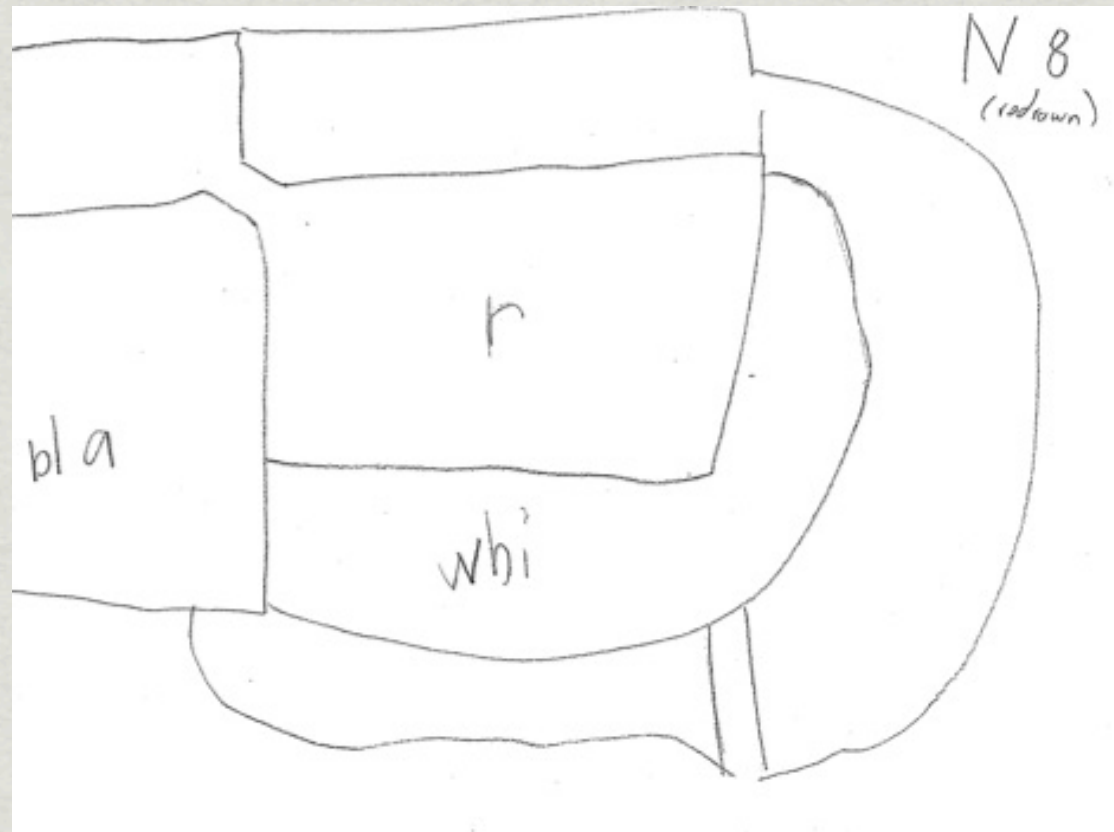
# Movie



# Early 5 Color Attempt



# Intermediate 5 Color Attempt



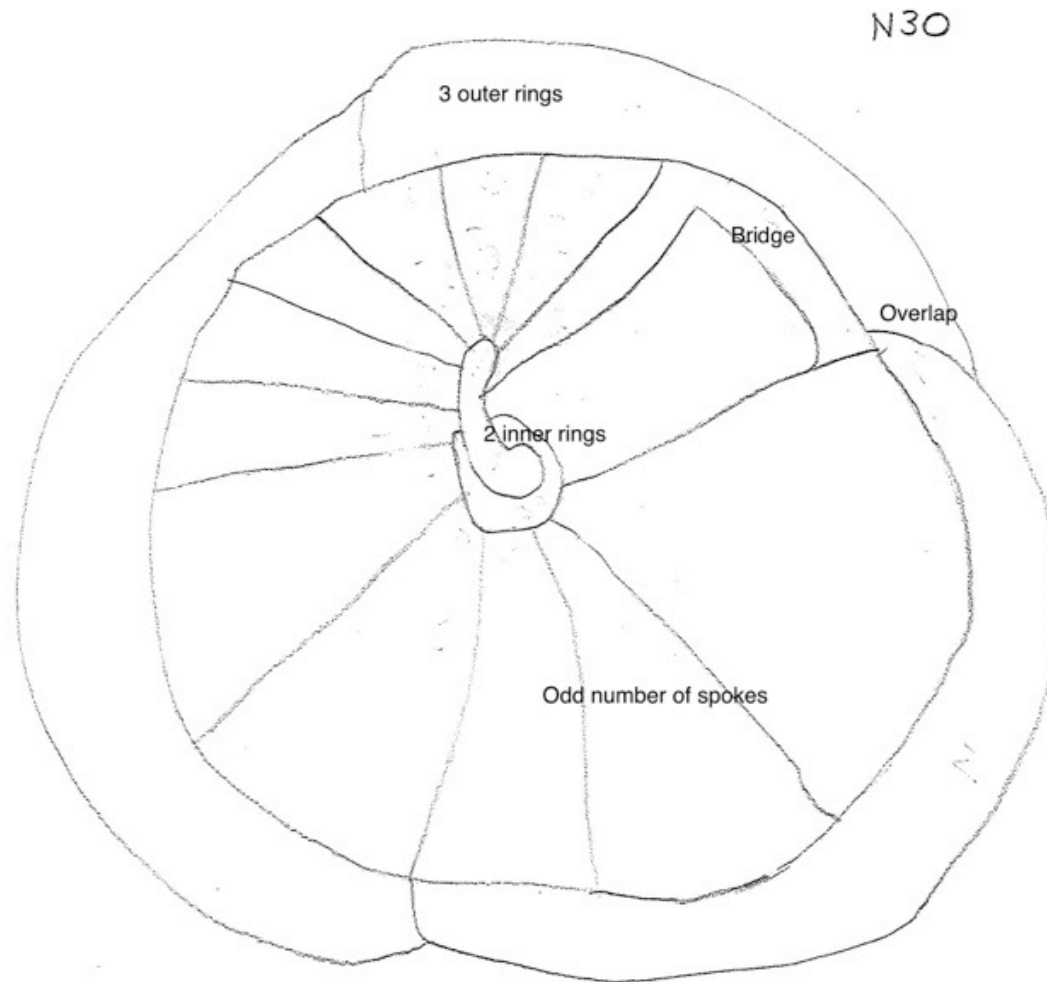


# Intermediate (2)

## S4 – Spoked Wheel/Outer Rings

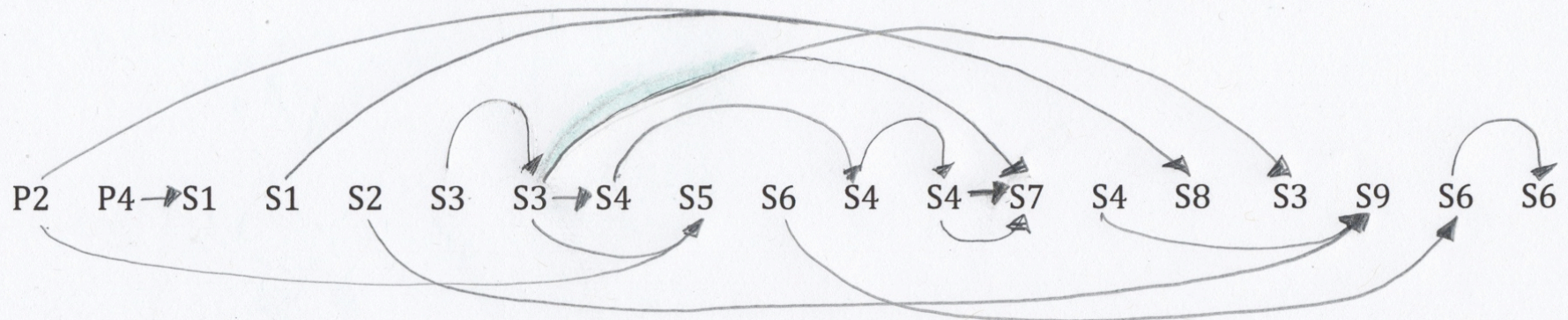


# Final 5 Color Attempt





# Results - Progression of Drawings



# Number Systems

- \* What if you encountered a race of aliens who had 2, 8, or 16 fingers instead of 10. How would they count?



# Number Systems Tasks

- \* Fill in numbers on chart (A to F in hex)
- \* Add
- \* Subtract
- \* Convert from decimal to base x
- \* Convert from base x to decimal
- \* <http://www.mathsisfun.com/numbers/convert-base.php>

# Different Number Systems

- \* Deep extension of place value
- \* Conversion algorithms a good challenge
- \* Write a converter program (very hard)

# The Sieve of Eratosthenes

- \* How to quickly find prime numbers
- \* Use 100's chart to replicate sieve technique
- \* Describe algorithm (note largest number needed)
- \* Write program

# The Sieve of Eratosthenes

- \* Lots of rich questions for prime numbers
- \* Is there a pattern?
- \* What is the density of prime numbers by ranges of numbers? Is there a pattern?
- \* Algorithms for finding prime numbers



# 4 4's Puzzle

- \* Using !, exponents, roots, +, -, \*, /, (), .
- \* Using exactly 4 4s, create each integer from 0 to 100 (or whatever)
- \* Example:  $4+4-4-4 = 0$
- \* [http://en.wikipedia.org/wiki/Four\\_fours](http://en.wikipedia.org/wiki/Four_fours)
- \* Can also do 5 5's or 6 6's

# Resources

- \* Looking into Project M3 Mentoring Mathematical Minds
- \* Computer Science Unplugged <http://csunplugged.org/>

# Materials

- \* Markers
- \* Scrap Paper
- \* Pencils
- \* Programming Calculator
- \* 4CT Lesson Plan
- \* Number Systems worksheets (find/check)
- \* 100s charts