MSRI Mathematical Circles Library

MCL 22

Mathematics: Rhyme and Reason is an exploration of the aesthetic value of mathematics and the culture of the mathematics community.

This book introduces budding mathematicians of all ages to mathematical ways of thinking through a series of chapters that mix episodes from the author's life with explanations of intriguing mathematical concepts and the stories of the mathematicians who discovered them. The chapters can be read independently, and most require only a background in basic high school algebra or geometry to appreciate the topics covered.

Part personal memoir, part appreciation of the poetry and humanity inherent in mathematics, this entertaining collection of stories, theorems, and reflections will be of interest to anyone curious about mathematics and the human beings who practice it.

In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession.

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MCL/22

For additional information and updates on this book, visit
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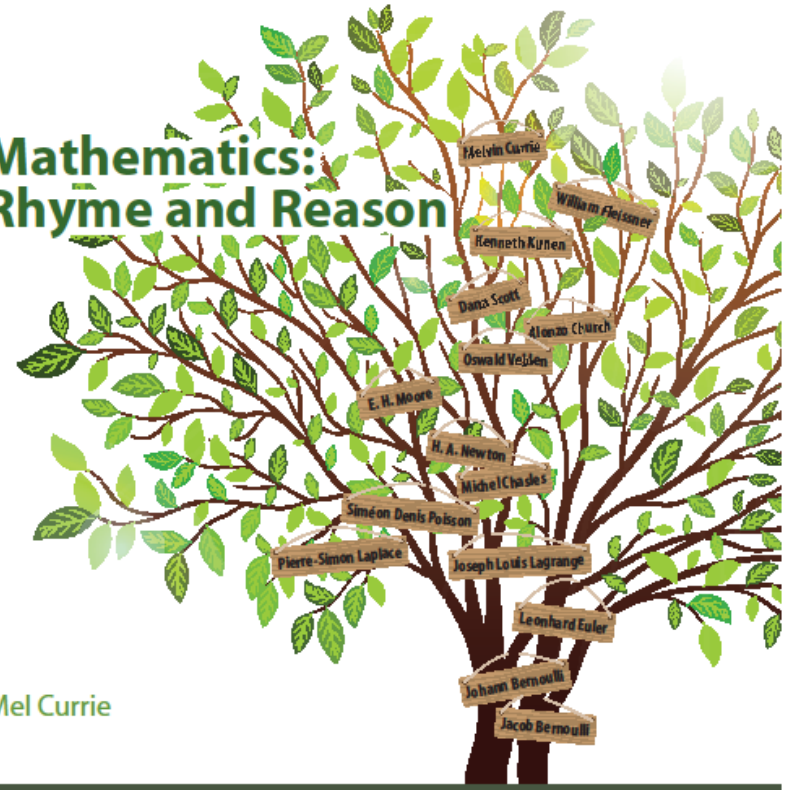
AMS www.ams.org

Mathematics: Rhyme and Reason Currie

MSRI • AMS

Mathematics: Rhyme and Reason



Mel Currie

MSRI Mathematical Sciences Research Institute | AMS American Mathematical Society

192 pages • Spine: 3/8" • 50lb paper • Softcover • 4-color Process (CMYK)

For an expanded version of this talk:

See my Public Lecture on the ICERM YouTube channel

"Euclid alone has looked on Beauty bare"

Edna St. Vincent Millay

Aesthetic Value

$$a_0 = 2$$

$$a_1 = 2\sqrt{2}$$

$$a_2 = 2^2\sqrt{2-\sqrt{2}}$$

$$a_3 = 2^3\sqrt{2-\sqrt{2+\sqrt{2}}}$$

$$a_4 = 2^4\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2}}}}$$

$$a_5 = 2^5\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}}$$

$$a_6 = 2^6\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}}}$$

$$a_0 = 2$$

$$a_1 = 2\sqrt{2} = 2.828427124746...$$

$$a_2 = 2^2\sqrt{2-\sqrt{2}} = 3.061467458920...$$

$$a_3 = 2^3\sqrt{2-\sqrt{2+\sqrt{2}}} = 3.121445152258...$$

$$a_4 = 2^4\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2}}}} = 3.136548490545...$$

$$a_5 = 2^5\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}} = 3.140331156954...$$

$$a_6 = 2^6\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}}} = 3.141277250932...$$

Reading

SCREAM!
Consider the sequence...
The Night Time is the Right Time.

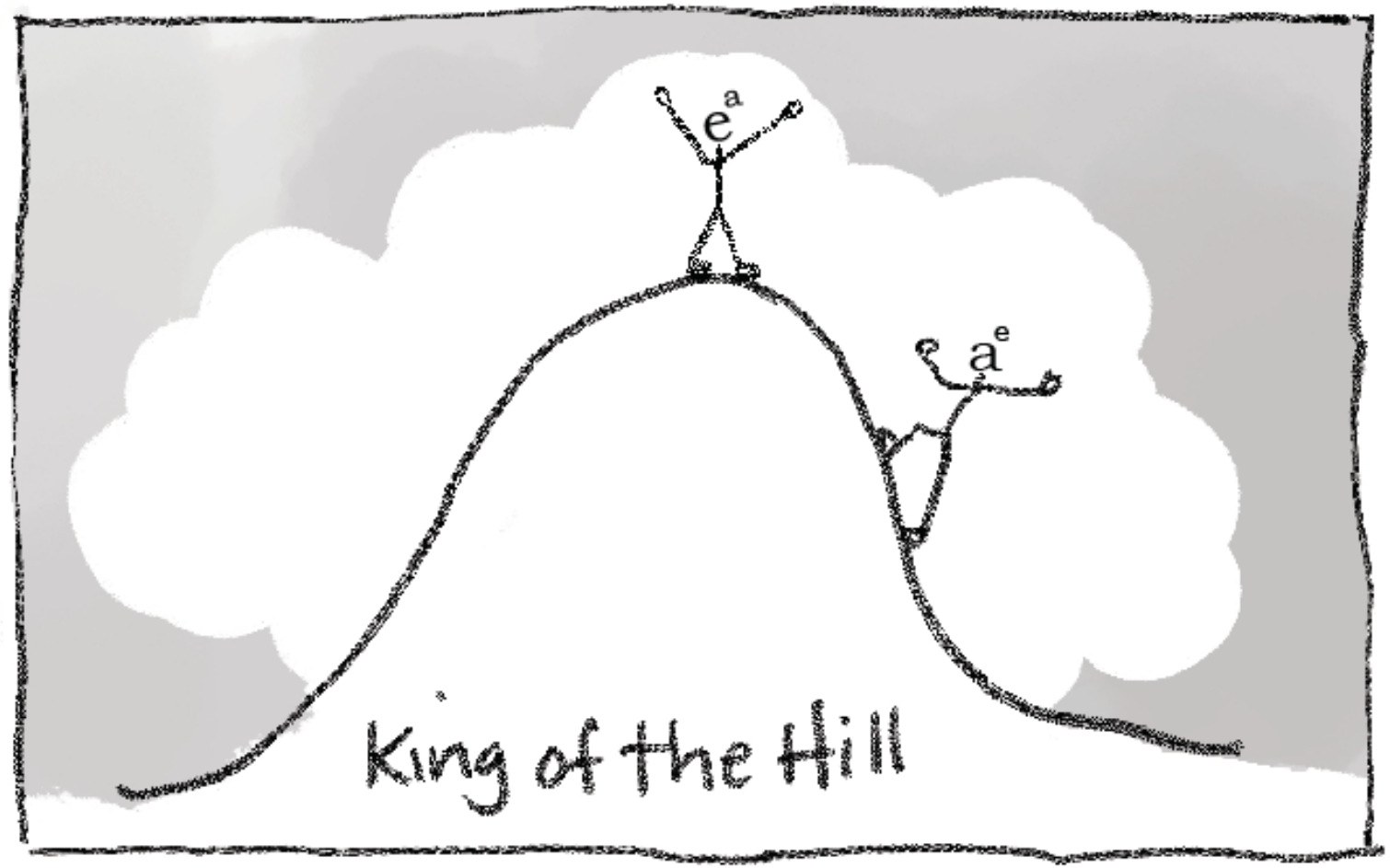
Proving it my way

Gandhi's Formula for the nth prime

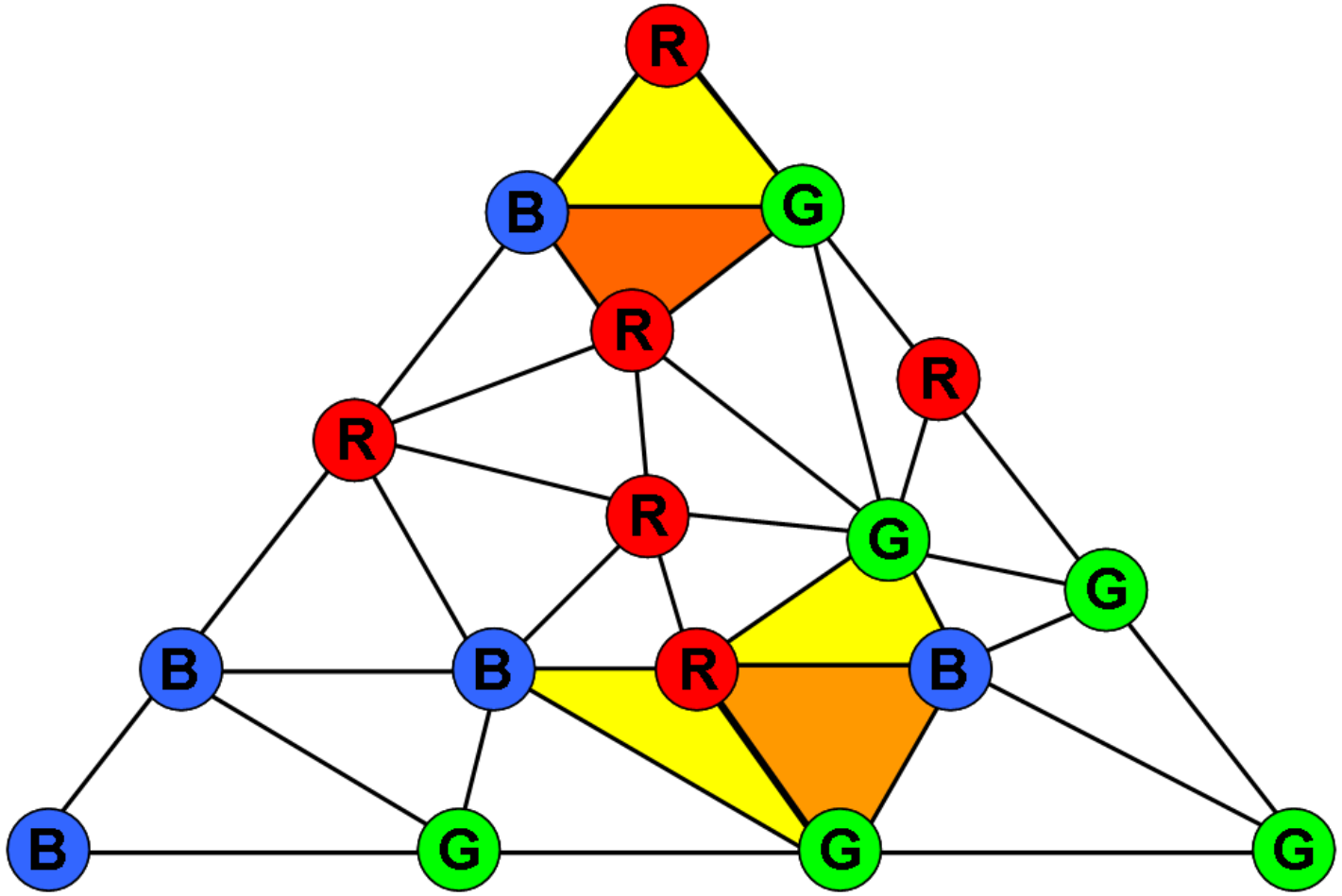
$$p_n = \left\lfloor 1 - \log_2 \left(-\frac{1}{2} + \sum_{d \mid Q_{n-1}} \frac{\mu(d)}{2^d - 1} \right) \right\rfloor$$

Why didn’t I know this?

Which is bigger, e^{π} or π^{e} ?

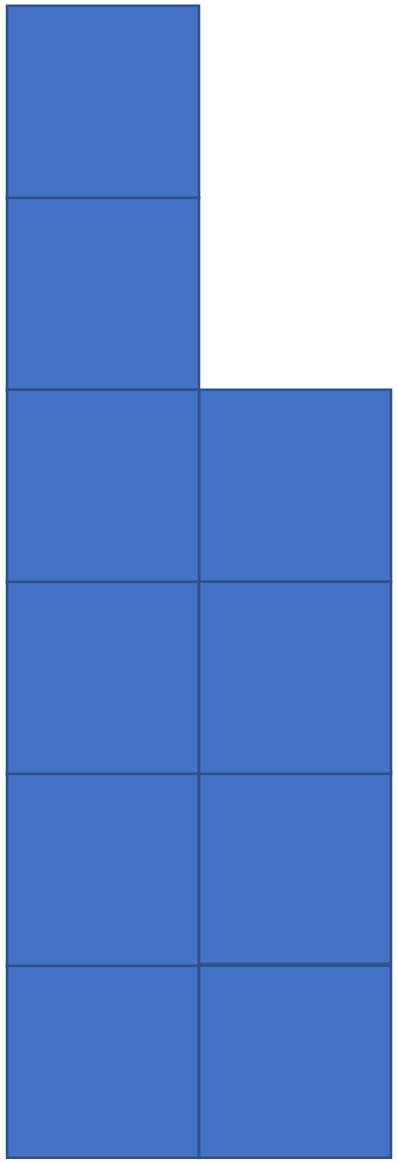

e a
a e
King of the Hill

Intrigue



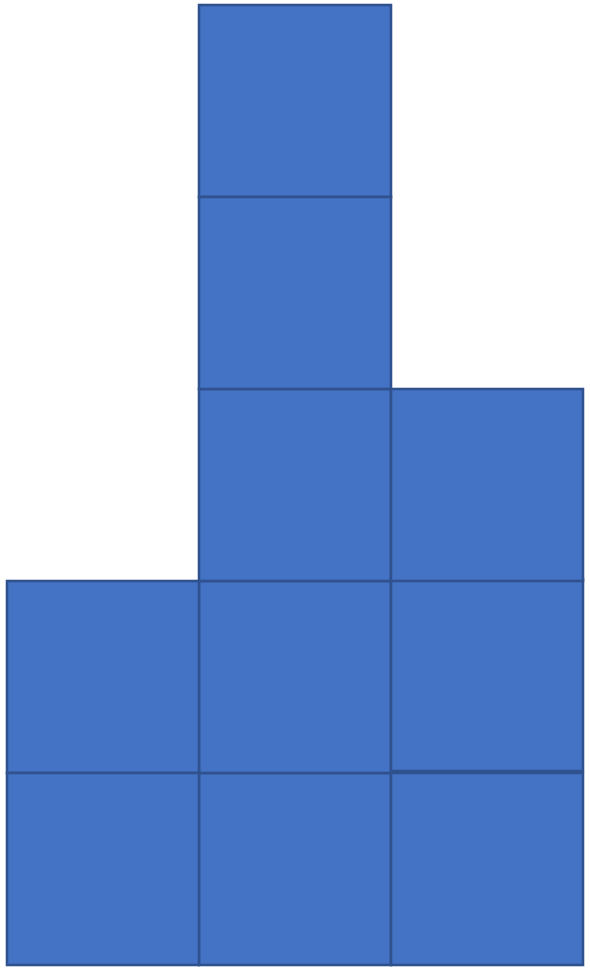
Sperner’s Lemma

Hidden Forces at Work

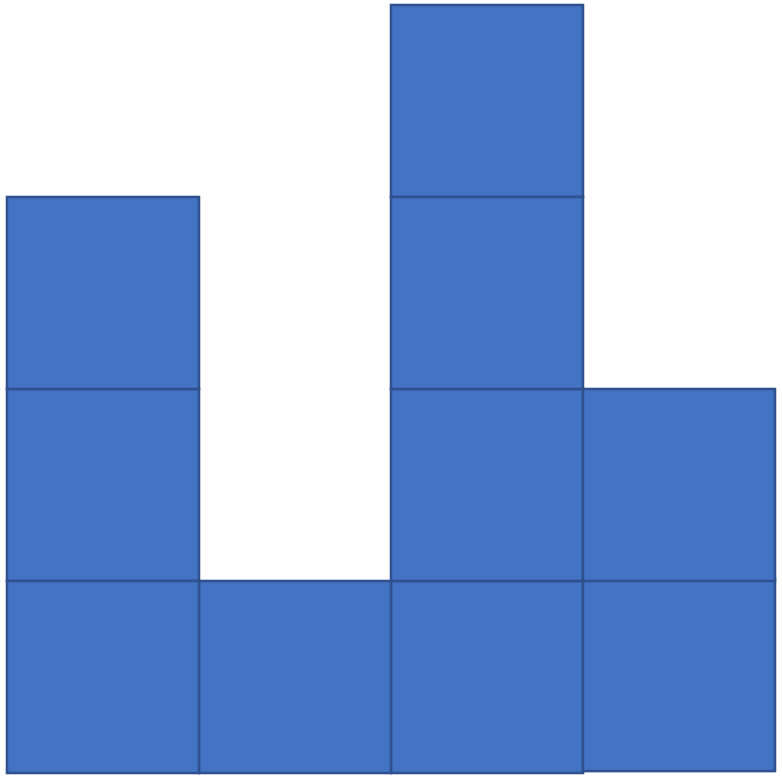


Bulgarian Solitaire

Iteration 1

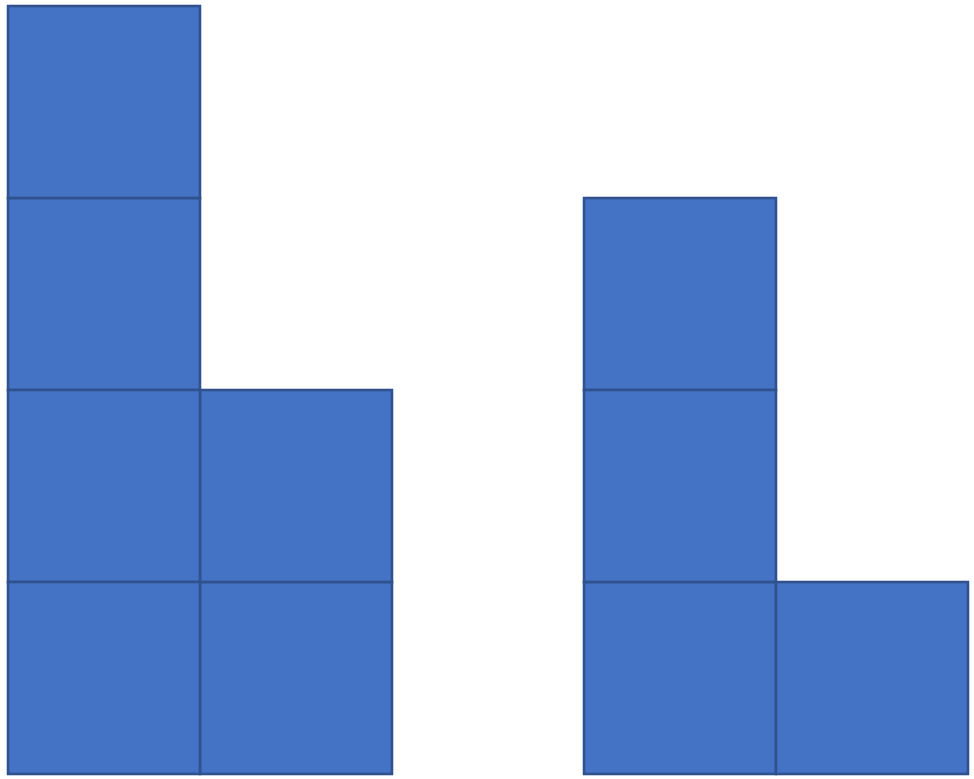


Iteration 2



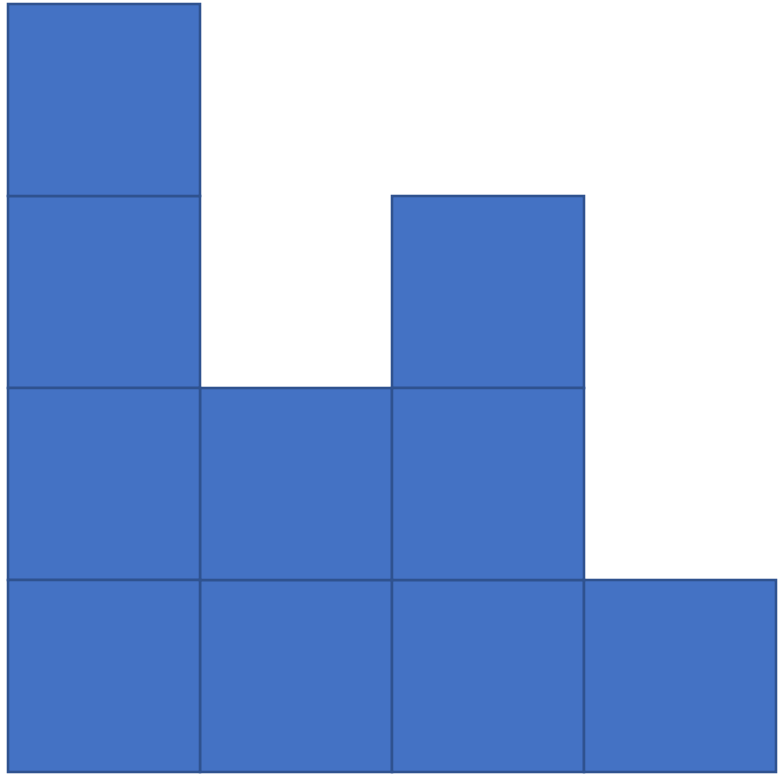
We have 1, 2, 3, 4,
but let’s keep going.

Iteration 3

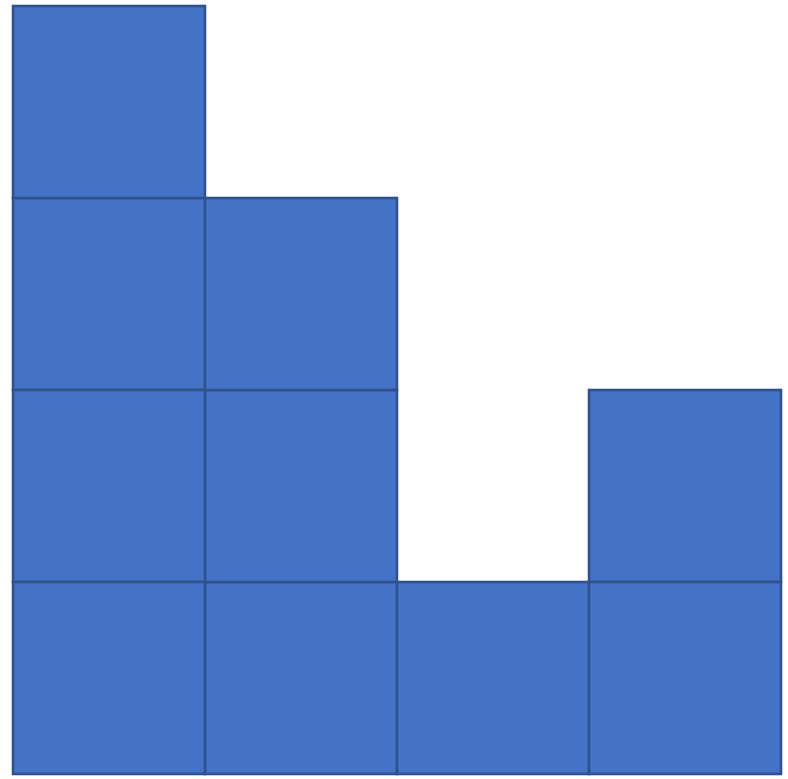


Look at that gap!

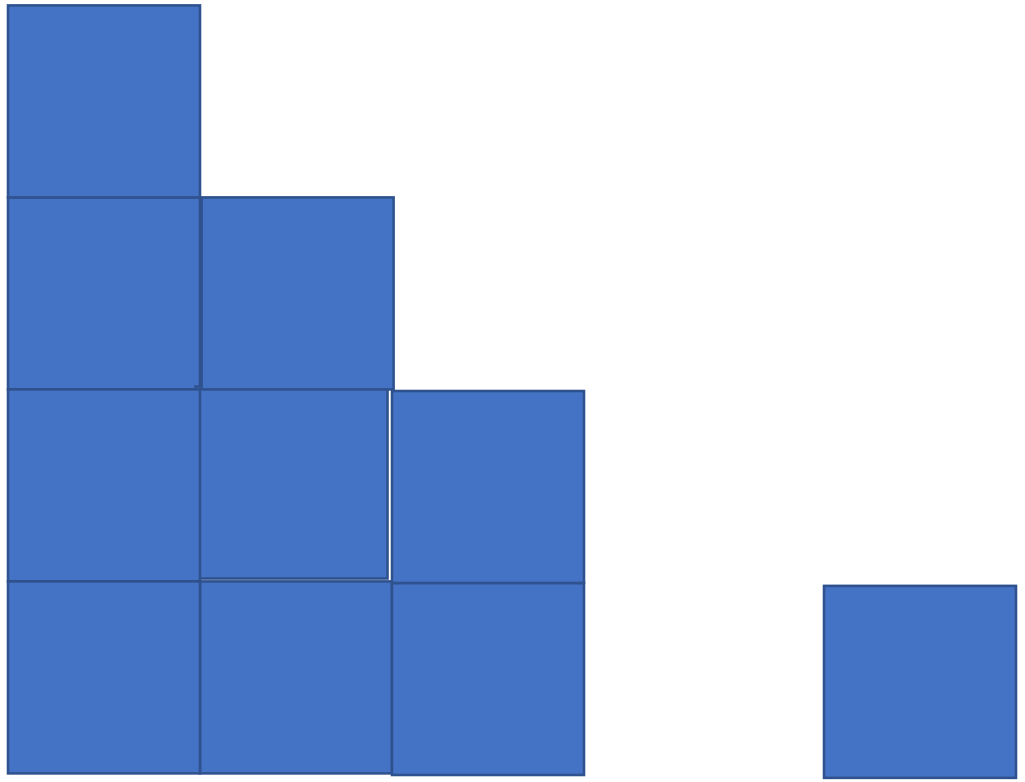
Still at iteration 3, but the gap has been closed



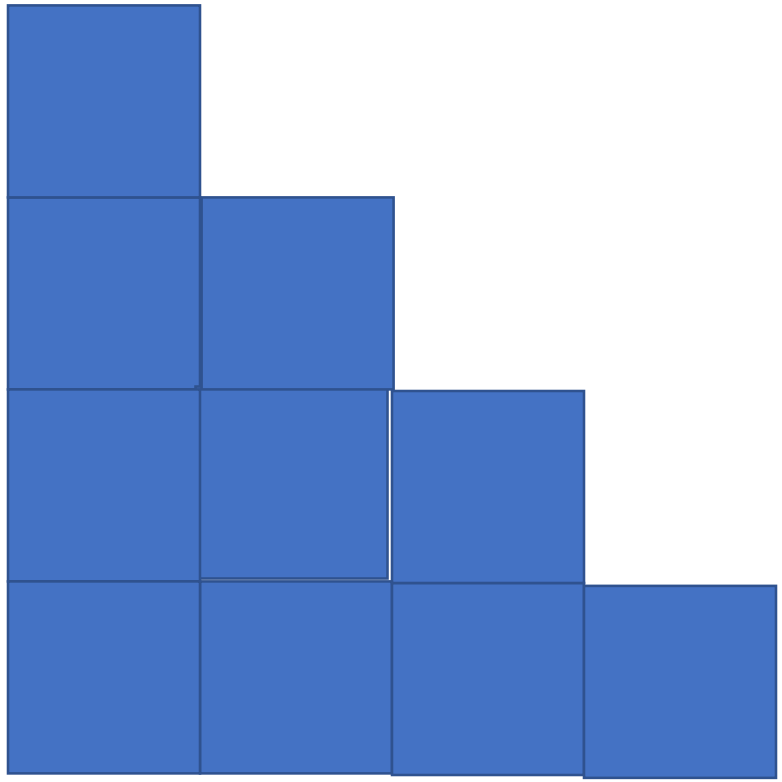
Iteration 4



Iteration 5



Iteration 5, after closing the gap



Relationships

With Donald Newman and Leo Flatto

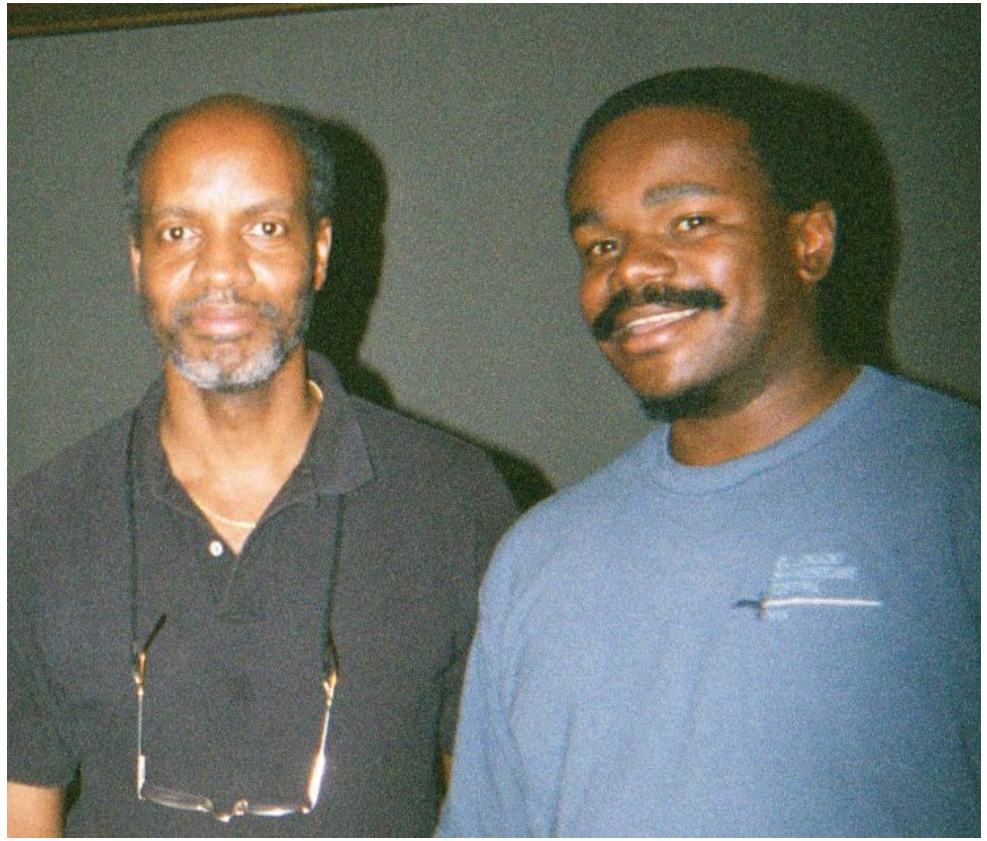
First Intern

Last Intern

Curries and Cordwells at State Department

Dean-Blackwell-Currie

Navajo Reservation – Math Circles



With Rudy Horne

Angela Grant

From the Sublime to the Ridiculous

$$\begin{bmatrix} 5 & 22 & 18 \\ 28 & 15 & 2 \\ 12 & 8 & 25 \end{bmatrix}$$

$$\begin{bmatrix} \text{five} & \text{twenty - two} & \text{eighteen} \\ \text{twenty - eight} & \text{fifteen} & \text{two} \\ \text{twelve} & \text{eight} & \text{twenty - five} \end{bmatrix}$$

$$\begin{bmatrix} 4 & 9 & 8 \\ 11 & 7 & 3 \\ 6 & 5 & 10 \end{bmatrix}.$$

- The Euler Line
- Four Points and Odd Distances
- Infinite Cardinals and the Existence of Transcendental Numbers
- Linear Programming
- Binet's Formula from A Generating Function
- Ramsey Number R(3,3)
- Bayes' Theorem and the Monty Hall Problem
- Dissertation: Trials, Tribulations, Triumph
- The Derivative of $f(x) = x^2$ without Taking a Limit
- And more…

Any Questions?

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