

Mathematical Sciences Colloquium

Dr. Jennifer Quinn

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Tuesday, September 21, 3:30 p.m.

J.R. Howard Hall, Room 254

Combinatorialization of Linear Recurrences through Weighted Tilings

Binet's formula for the n th Fibonacci number,

$$F_n = \frac{1}{\sqrt{5}} \left(\frac{1 + \sqrt{5}}{2} \right)^n - \frac{1}{\sqrt{5}} \left(\frac{1 - \sqrt{5}}{2} \right)^n,$$

is a classic example of a closed form solution for a homogenous linear recurrence with constant coefficients. Proofs range from matrix diagonalization to generating functions to strong induction. Could there possibly be a better way? A more visual approach? A combinatorial method?

This talk introduces a combinatorial model using weighted tiles. Coupled with a sign reversing involution, Binet's formula becomes a direct consequence of counting exceptions. But better still, the weightings generalize to find solutions for any homogeneous linear recurrences with constant coefficients.

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