

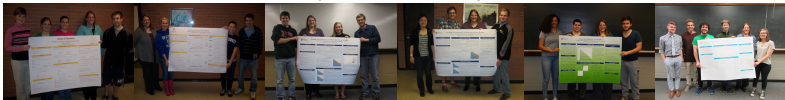
Engaging Students in Undergraduate Research: The Role of Effective Advising

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Project NExT panel
Mathfest
August 1, 2018

My experience

- ▶ 37 students over 10 years
- ▶ 6 academic year projects (teams of 3-5)



- ▶ 2 summer projects with local students



- ▶ 6 REU projects (teams of 3 external students)



- ▶ REU site director since 2011 (3 NSF grants)

Characteristics of Good Problems

- ▶ limited amount of prerequisite background
- ▶ students can study examples and use computers
- ▶ multiple layers of varying difficulty
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How many permutations avoiding the patterns

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have k peaks?

Really at least 30 problems in 1!

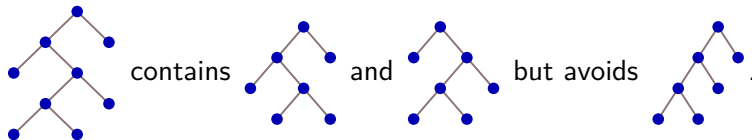
Finding Problems

- ▶ Go to conference talks or read papers.

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- ▶ Take a topic you like and change a variable.

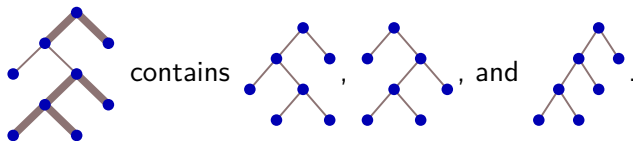
Example:



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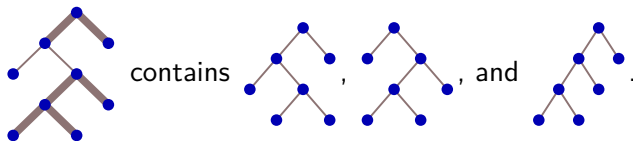
Example:



Finding Problems

- ▶ Go to conference talks or read papers.
- ▶ Take a topic you like and change a variable.
- ▶ Computer exploration.

Example:



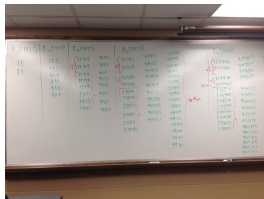
Research Meeting Strategy

- ▶ Everyone gets a turn at the board.

[illegible]

Research Meeting Strategy

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$F_1(1010)$	$F_2(1010)$	$F_3(1010)$	$F_4(1010)$	$F_5(1010)$	$F_6(1010)$	$F_7(1010)$	$F_8(1010)$
11	11.5	11.50	995	0.185	995	0.185	995
21	11.5	11.50	995	0.185	995	0.185	995
31	11.5	11.50	995	0.185	995	0.185	995
41	11.5	11.50	995	0.185	995	0.185	995
51	11.5	11.50	995	0.185	995	0.185	995
61	11.5	11.50	995	0.185	995	0.185	995
71	11.5	11.50	995	0.185	995	0.185	995
81	11.5	11.50	995	0.185	995	0.185	995
91	11.5	11.50	995	0.185	995	0.185	995
101	11.5	11.50	995	0.185	995	0.185	995
111	11.5	11.50	995	0.185	995	0.185	995
121	11.5	11.50	995	0.185	995	0.185	995
131	11.5	11.50	995	0.185	995	0.185	995
141	11.5	11.50	995	0.185	995	0.185	995
151	11.5	11.50	995	0.185	995	0.185	995
161	11.5	11.50	995	0.185	995	0.185	995
171	11.5	11.50	995	0.185	995	0.185	995
181	11.5	11.50	995	0.185	995	0.185	995
191	11.5	11.50	995	0.185	995	0.185	995
201	11.5	11.50	995	0.185	995	0.185	995
211	11.5	11.50	995	0.185	995	0.185	995
221	11.5	11.50	995	0.185	995	0.185	995
231	11.5	11.50	995	0.185	995	0.185	995
241	11.5	11.50	995	0.185	995	0.185	995
251	11.5	11.50	995	0.185	995	0.185	995
261	11.5	11.50	995	0.185	995	0.185	995
271	11.5	11.50	995	0.185	995	0.185	995
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351	11.5	11.50	995	0.185	995	0.185	995
361	11.5	11.50	995	0.185	995	0.185	995
371	11.5	11.50	995	0.185	995	0.185	995
381	11.5	11.50	995	0.185	995	0.185	995
391	11.5	11.50	995	0.185	995	0.185	995
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421	11.5	11.50	995	0.185	995	0.185	995
431	11.5	11.50	995	0.185	995	0.185	995
441	11.5	11.50	995	0.185	995	0.185	995
451	11.5	11.50	995	0.185	995	0.185	995
461	11.5	11.50	995	0.185	995	0.185	995
471	11.5	11.50	995	0.185	995	0.185	995
481	11.5	11.50	995	0.185	995	0.185	995
491	11.5	11.50	995	0.185	995	0.185	995
501	11.5	11.50	995	0.185	995	0.185	995

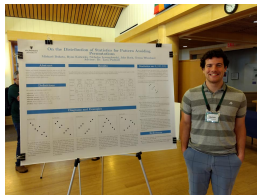


- ▶ Feedback.

Results

- Every team produces a talk and/or poster.

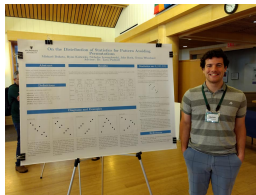
on campus,
MAA section meeting,
JMM,
International Conference
on Permutation Patterns



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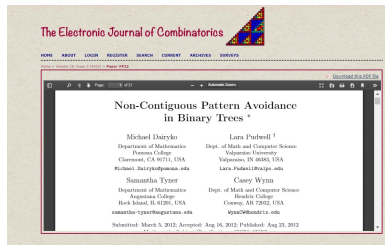
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- ▶ Every team writes a paper.

internal report,
Involve,
ISRN Combinatorics,
Journal of Integer Sequences,
DMTCS,
Electronic Journal of
Combinatorics



Challenges

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(never what you expect...)

Rewards

- ▶ Sharing a passion for mathematics
- ▶ Going beyond the curriculum
- ▶ Gaining a new perspective
- ▶ Getting (re)energized
- ▶ Keeping a research routine
- ▶ Building mentoring relationships



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What makes a successful project?
(*Not every project is publishable.*)



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What makes a successful project?

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What did the student gain from their work?

More resources?

Coming soon! (2019?) from MAA/AMS/CUR:

A Mathematician's Practical Guide to Mentoring Undergraduate Research

by Michael Dorff, Allison Henrich, and Lara Pudwell

- ▶ Why undergraduate research?
- ▶ A beginner's guide *
- ▶ Choosing problems
- ▶ Choosing students and managing group dynamics
- ▶ Communicating results
- ▶ Finding funding
- ▶ Summer REU programs
- ▶ Assessment
- ▶ Future directions

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* Michael Dorff, Allison Henrich, and Lara Pudwell, Successfully Mentoring Undergraduates in Research: A How To Guide for Mathematicians, *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies* **27.3** (2017), 320–336.