Reimagining Mathematical Experiences for Students in Introductory Courses

Brendan Kelly

20 Million Students

nces.ed.gov

Math Students

	Mathematics Departments				Statistics Departments				Two-Year College Mathematics Programs			
Course level	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
Mathematics courses												
Precollege level	219	201	209	253	--	--	--	--	763	965	1150	782
Introductory level (including Precalculus)	723	706	863	1000	--	--	--	--	274	321	368	445
Calculus level	570	587	748	807	--	--	--	--	106	108	138	152
Advanced level	102	112	150	154	--	--	--	--	0	0	0	0
Other (2-year)	--	--	--	--	--	--	--	--	130	187	231	259
Total Mathematics courses	1614	1607	1971	2213	--	--	--	--	1273	1580	1887	1639
Probability and Statistics courses												
Introductory level	136	148	231	253	54	54	81	94	74	117	137	280
Upper level	35	34	32	60	20	24	27	50	0	0	0	0
Total Probability and Statistics courses	171	182	262	313	74	78	108	144	74	117	137	280
Computer Science courses [1]												
Lower level	90	44	56	45	1	2	--	--	39	--	--	--
Middle level	17	8	12	16	0	0	--	--	0	--	--	--
Upper level	16	5	10	6	0	0	--	--	0	--	--	--
Total Computer Science courses [1]	123	57	77	68	1	2	--	--	39	--	--	--
Grand Total	1908	1845	2310	2594	75	80	108	144	1386	1697	2024	1918

CBMS

Math Students

	Mathematics Departments				Statistics Departments				Two-Year College Mathematics Programs			
Course level	2000	2005	2010	2015	2000	2005	2010	2015	2000	2005	2010	2015
Mathematics courses												
Precollege level	219	201	209	253	--	--	--	--	763	965	1150	782
Introductory level (including Precalculus)	723	706	863	1000	--	--	--	--	274	321	368	445
Calculus level	570	587	748	807	--	--	--	--	106	108	138	152
Advanced level	102	112	150	154	--	--	--	--	0	0	0	0
Other (2-year)	--	--	--	--	--	--	--	--	130	187	231	259
Total Mathematics courses	1614	1607	1971	2213	--	--	--	--	1273	1580	1887	1639
Probability and Statistics courses												
Introductory level	136	148	231	253	54	54	81	94	74	117	137	280
Upper level	35	34	32	60	20	24	27	50	0	0	0	0
Total Probability and Statistics courses	171	182	262	313	74	78	108	144	74	117	137	280
Computer Science courses [1]												
Lower level	90	44	56	45	1	2	--	--	39	--	--	--
Middle level	17	8	12	16	0	0	--	--	0	--	--	--
Upper level	16	5	10	6	0	0	--	--	0	--	--	--
Total Computer Science courses [1]	123	57	77	68	1	2	--	--	39	--	--	--
Grand Total	1908	1845	2310	2594	75	80	108	144	1386	1697	2024	1918

CBMS

Major	Graduates 2020
Business	387,851
Health professions and related programs	257,282
Social sciences and history	161,164
Engineering	128,332
Biological and biomedical sciences	126,590
Psychology	119,968
Computer and information sciences and support services	97,047
Visual and performing arts	92,332
Communication, journalism, and related programs	91,752
Education	85,057
Homeland security, law enforcement, and firefighting	57,044
Multi/interdisciplinary studies	55,022
Parks, recreation, leisure, fitness, and kinesiology	53,749

NCES

What experiences should students have in an introductory math course?

Comments

Subject 1

This subject is arcane, even hated, is torturous for many, irrelevant to most and yet requires of all. It's largely unused in other activities or decision-making except as a critical yardstick of achievement and ability.

Conrad Wolfram - Math(s) Fix

Subject 2

This is a subject that's one of the most revered human endeavors, the lynchpin of human progress in the last 50 years and now a way to extreme fame and fortune. It underlies science, social media, and self-driving cars while inserting itself into decisions on our governance, indeed decisions on almost everything.

Math

This subject is arcane, even hated, is torturous for many, irrelevant to most and yet requires of all. It's largely unused in other activities or decision-making except as a critical yardstick of achievement and ability.

Conrad Wolfram - Math(s) Fix

Math

This is a subject that's one of the most revered human endeavors, the lynchpin of human progress in the last 50 years and now a way to extreme fame and fortune. It underlies science, social media, and self-driving cars while inserting itself into decisions on our governance, indeed decisions on almost everything.

Math 1.0

This subject is arcane, even hated, is torturous for many, irrelevant to most and yet requires of all. It's largely unused in other activities or decision-making except as a critical yardstick of achievement and ability.

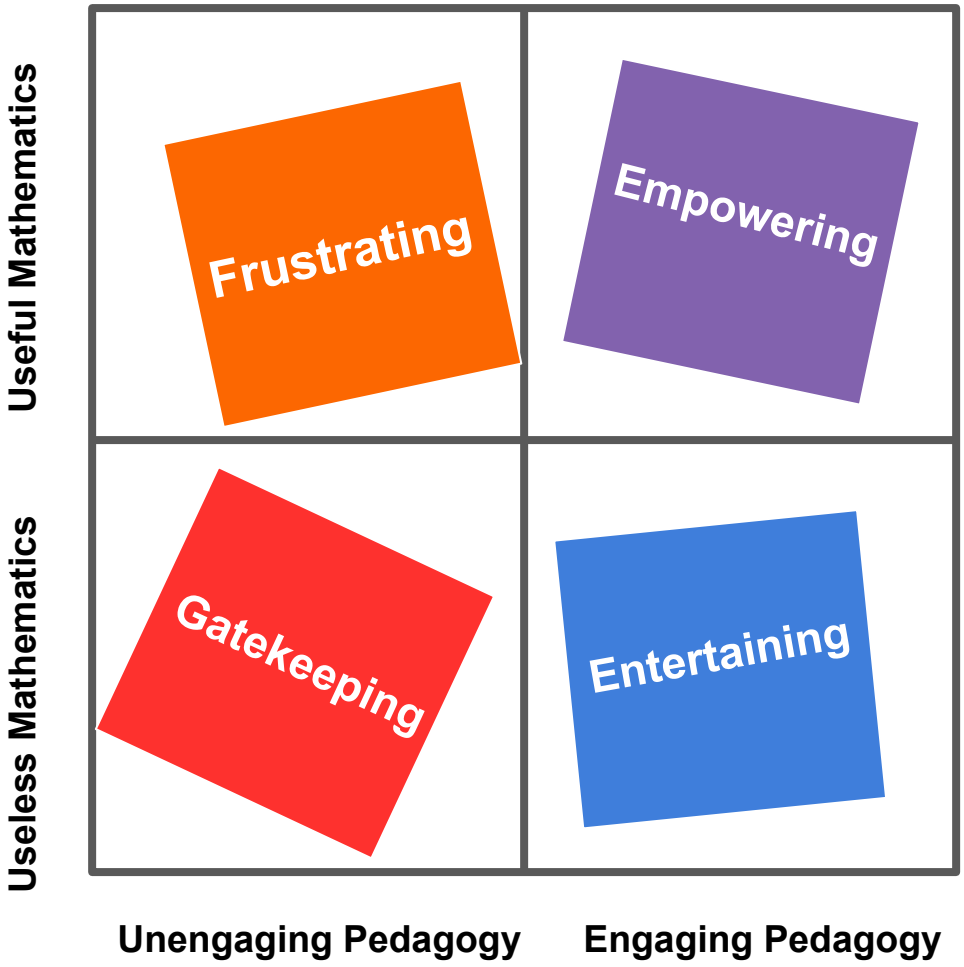
Conrad Wolfram - Math(s) Fix

Math 2.0

This is a subject that's one of the most revered human endeavors, the lynchpin of human progress in the last 50 years and now a way to extreme fame and fortune. It underlies science, social media, and self-driving cars while inserting itself into decisions on our governance, indeed decisions on almost everything.

The status quo is unacceptable.

MAA - Common Vision


Useful Mathematics
Useless Mathematics
Frustrating
Empowering
Gatekeeping
Entertaining
Unengaging Pedagogy
Engaging Pedagogy

Engage students in a meaningful and positive intellectual experience.

Increase quantitative and logical reasoning abilities needed for informed citizenship and in the workplace.

Strengthen quantitative and mathematical abilities that will be useful to students in other disciplines.

Improve every student's ability to communicate quantitative ideas orally and in writing.

Encourage students to take at least one additional course in the mathematical sciences.

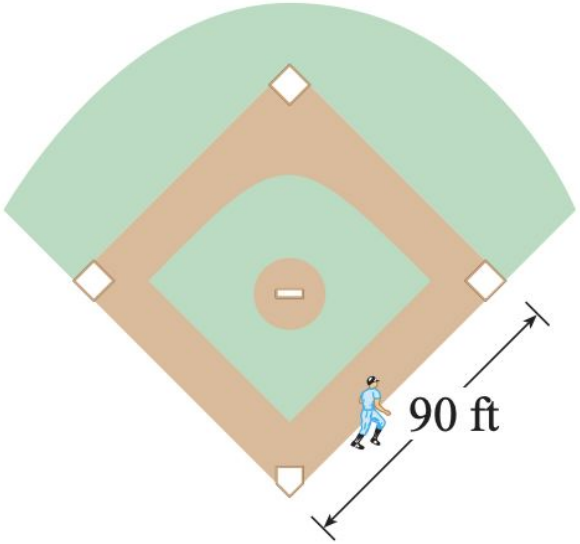
MAA CUPM

Problems that only appear in math books.

18. A baseball diamond is a square with side 90 ft. A batter hits the ball and runs toward first base with a speed of 24 ft/s.

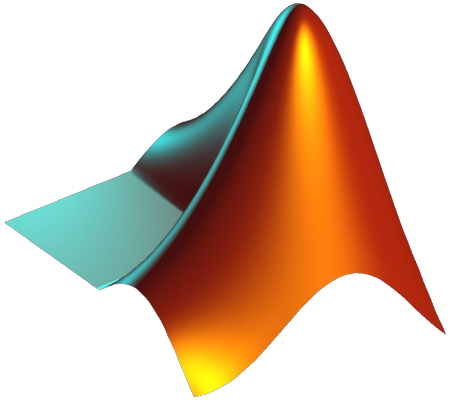
(a) At what rate is his distance from second base decreasing when he is halfway to first base?

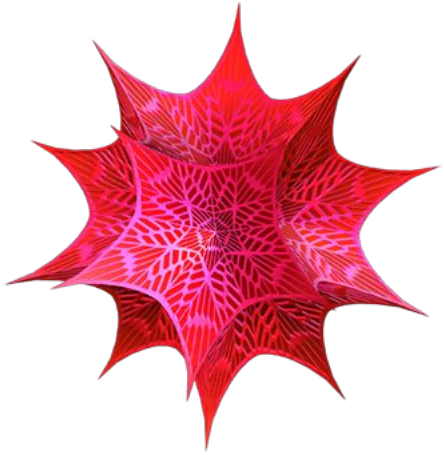
(b) At what rate is his distance from third base increasing at the same moment?



Computers are under utilized.


R





Mathematics

Applications

Mathematics

Applications

Mathematics

Applications

Math Qa

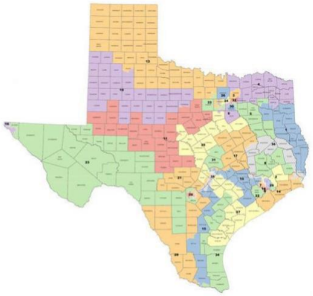
Brendan Kelly, Jeff Gittleman, Arielle Bernhardt, Nick Kelly, Simone Lewis, and James Wolfe


R

Evaluating Teachers

TESLA

Electric Vehicles



Redistricting

Pricing Strategy

Income Inequality

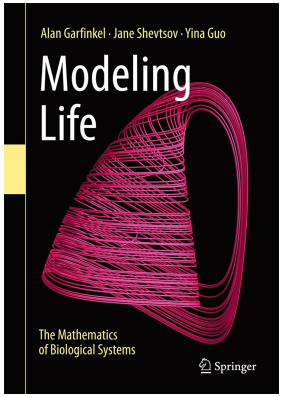
Team Dynamics

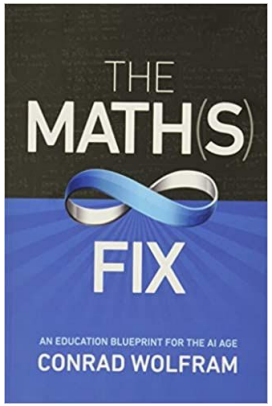
In what ways do you think your experiences in this course will benefit you in the future?

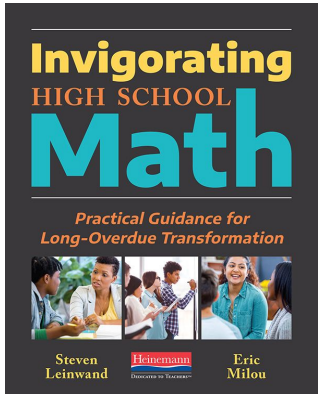
Student Responses

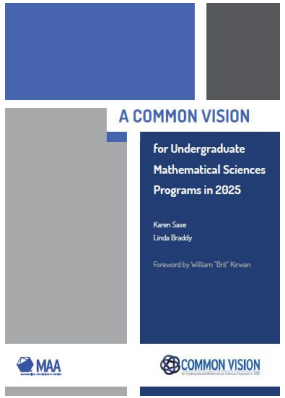
THANK YOU

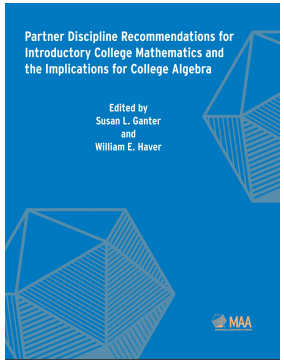
Brendan Kelly
kelly@math.harvard.edu

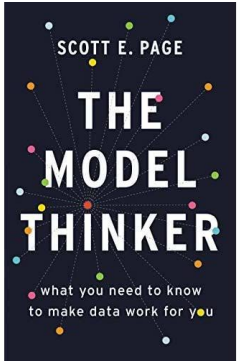

Alan Garfinkel · Jane Shevtsov · Yina Guo
Modeling Life
The Mathematics of Biological Systems
Springer


THE MATH(S) FIX
AN EDUCATION BLUEPRINT FOR THE AI AGE
CONRAD WOLFRAM


Invigorating HIGH SCHOOL Math
Practical Guidance for Long-Overdue Transformation
Steven Leinwand
Heinemann
Eric Milou


A COMMON VISION
for Undergraduate Mathematical Sciences Programs in 2025
Karen Saxe
Linda Braddy
Foreword by William "Brit" Kirwan
MAA
COMMON VISION


Partner Discipline Recommendations for Introductory College Mathematics and the Implications for College Algebra
Edited by
Susan L. Ganter
and
William E. Haver
MAA


SCOTT E. PAGE
THE MODEL THINKER
what you need to know to make data work for you