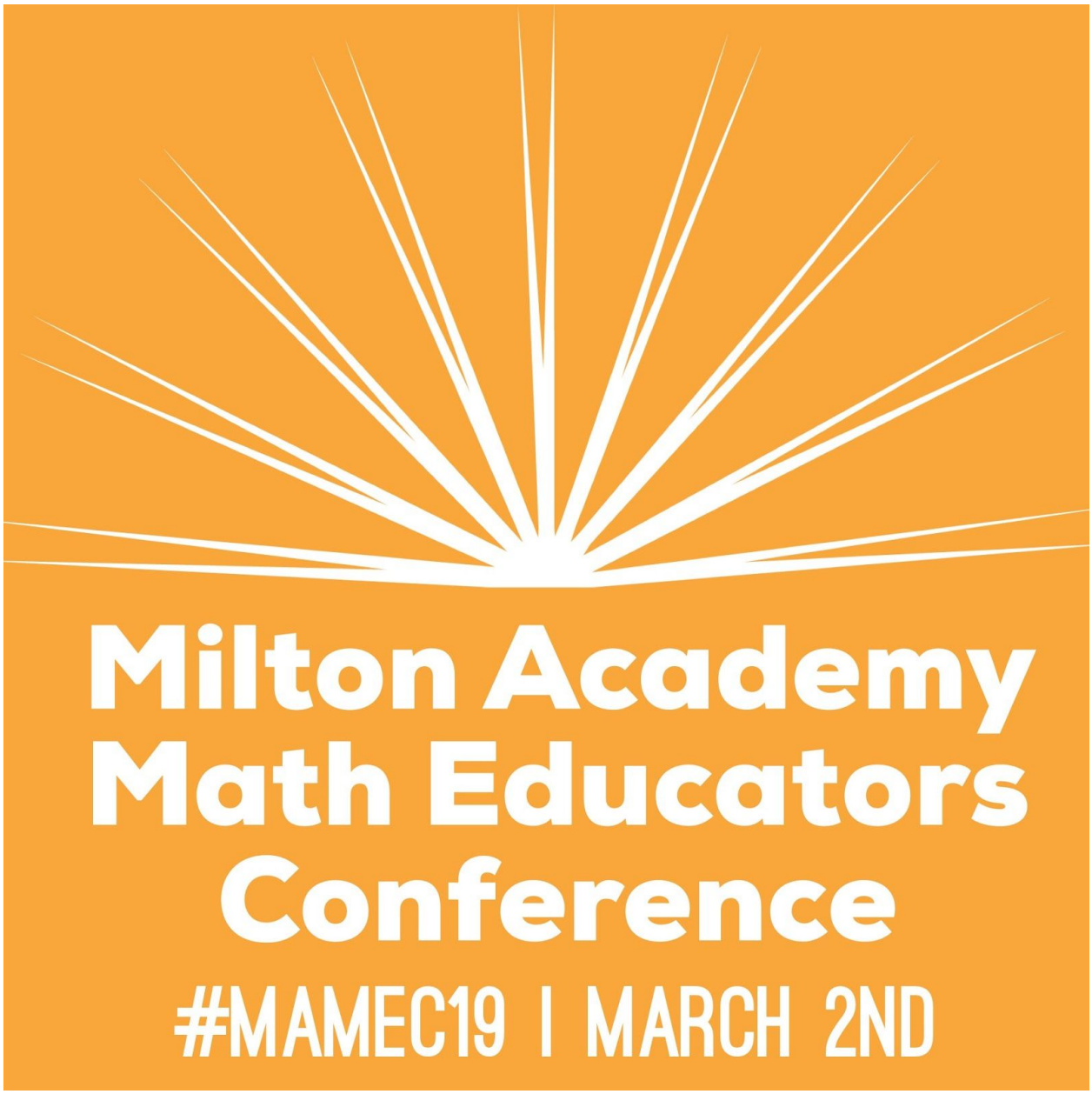

Milton Academy Math Educators Conference

8:30-9:30 am: Keynote Address: Making Connections Across Math Education's Changing Landscape
Keynote Speaker: Carl Oliver
Now is the most interesting time to be a math teacher, and it is likely to keep getting better. Computing power has shifted our focus from computation towards mathematical sense-making and reasoning. The internet has opened new avenues for teachers to grow their practice. It's never been more important to be a math teacher, nor more fun. Please bring your devices as you will be encouraged to share on Twitter. (Wigg)

Carl Oliver is an Assistant Principal at City-As-School High School in New York City where he oversees the math department, teaches a class, and manages programming for the school. He has spent over 15 years in schools beginning with his undergraduate work at Michigan State followed by graduate work at Harvard Graduate School of Education and 10 years as a teacher in New York City. He is active on Twitter (@carloliwitter), as he is a former member of the Global Math Department board, and also a coordinator of the #MathPhoto17 summer photo challenge. He has spoken frequently at NCTM conferences and is currently serving on the NCTM Publishing committee. He will share his thoughts with us and also lead some small group sessions after his talk.

One Hour Sessions with Carl Oliver

Block I: 9:45-10:55 am

One hour informal question and answer session with Carl Oliver. What did you notice about the keynote? What are you wondering? Stop by anytime to share your thoughts and reflect on the ideas shared in the keynote session. (Room 212)

Block II: 11:15 am - 12:25 pm

Challenge Accepted! Use Project-Based Learning to Finally Explore Social Justice in Algebra Class Good projects combine 21st-century skills and rich mathematics, but they can also explore ideas of social justice. Learn how to explore history, inequality, and current events while kids make mathematical models, think critically, and develop mathematical practices. Bring your ideas and we'll start creating new projects. (Room 212)

Breakout Sessions

Block I 9:45-10:55 am

9:45-10:05 am

Removing Roadblocks on the Road to Equitable Math Classes

All teachers endeavor to use instructional strategies that help all students engage with the learning objectives of the course. But sometimes seemingly sound ideas can create inequities in students' access to the material. This session will identify common instructional strategies that can create roadblocks for students and identify ways to remove these obstacles so that all students can keep moving forward.

Focus: Grades 6-8

Nancy Anderson, Milton Academy (Room 102)

My top three digital platforms
Come learn about my three favorite digital platforms! All free!
Quizizz: Super fun game can be played solo or competitive
Edpuzzle: Hold students to being accountable
Edulastic: Digital assessment platform
Focus: Grades 6-12
Victoria Miles, Middleboro High School (Room 110)

Math of Social Justice
This spring, for the second time, Concord Academy is running a course entitled "The Math of Social Justice". The class uses various mathematical techniques to analyze social justice issues. In addition to descriptive statistics and measures of inequality, we apply regressions to affirmative action, matrix models to income mobility, dynamical systems to residential segregation, probability to profiling, and game theory to perceptions of fairness. We also do a unit on the math of elections.
Focus: Grades 6-12
Mark Engerman, Concord Academy (Room 114)

Teaching Calculus-Based Statistics
An AP Statistics course is a great option for many students, but some of the statistical facts are simply handed to students, since the mathematics behind those skills requires calculus. For students who enjoy math and have already studied integral calculus, a calculus-based statistics course can give them a more rigorous introduction to statistics and a good way to apply their calculus skills at the same time. This presentation will examine a one-semester course of this type that has been taught successfully several times already. We'll look at the topics covered, the specific background skills required of students, and how to navigate some of the challenges inherent in such a course.
Focus: Grades 9-12
George Larivee, Concord Academy (Room 207)

<u>10:10-10:30 am</u>
Teaching Students the Mathematics of Finance K-12
As we all strive to make the math that we teach relevant to our students, learning how to pay off debt is an invaluable skill. We will share some of the ways I ask my students to investigate financial models using spreadsheets, as well as ways to incorporate finance at other levels.
Focus: Grades K-12
Susan Karp and Nancy McCuen, Milton Academy (Room 102)

Launching an Interdisciplinary Course
Next year I hope to offer a half course (2 meetings per week all year) exploring math/art connections. My initial syllabus relies on providing a foundation for explorations in the fall, and branching out to allow students individual exploration time in the spring. In our time together I plan to present an early version of the syllabus as well as activities students might do and hear from attendees about similar endeavors.
Focus: Grades 9-12
Anne Kaufman, Milton Academy (Room 110)

The No-To-Yes Project: Conquering Common Algebraic Errors That Drive Us All Crazy!
Why is so hard to convince students that (a+b)/a ≠ b!? The No-to-Yes project helps students stop making such common, persistent algebraic errors, like random cancelling of algebraic fractions, failing to distribute the negative, or distributing exponents over addition. Students first take a pre-test to identify which types of errors they make. For each type of error, students log into a Canvas course to watch a video and take a practice quiz. The videos leverage research on conceptual change theory, refutation text, and process mnemonics to change deeply rooted misconceptions. After they've practiced online, they then complete short paper slips in class, practicing daily until they earn a "Yes!" A post-test measures gains and identifies where students need to do more work. While targeted at Algebra 2 or Geometry students, the categories could be customized for other classes.
Focus: Grades 6-12
Susan Zielinski, St. Paul's School (Room 114)

Pushing limits: Polynomials in Precalculus
How should we 'differentiate' our teaching of Polynomials in Precalculus from Algebra and Calculus? What opportunities exist to get the most bang for our buck? Polynomials are a natural extension from Linear functions to generalize slope, and investigating slope of Polynomials also provides motivation for the study of Rational Functions. The Factor Theorem proves that the difference quotient of a Polynomial will always reduce, revealing the possibility of algebraically computing the instantaneous slope, which equates to finding the y-value of the hole of the difference quotient. Long Division is used to compute this quotient. These ideas provide a natural segue to the study of roots of Polynomials, where irrational numbers arise. By studying irrational numbers as sequences of rational numbers, we reinforce the concept of convergence. Finally, in drawing an analogy to Power Series, as sequences of Polynomials, we can represent Exponential and Sinusoidal functions, two major topics in Precalculus.
Focus: Grades 9-12
Michael Kassatly, Milton Academy (Room 207)
Note: This is a double session and runs from 10:10-10:55 am.

10:35-10:55 am

Play With Your Math

How can we get our students (and colleagues) to play with their math? We take problems that we love, and we adapt them so that everyone (and anyone) can play. We design posters and handouts that hook you visually and explain the problem in just enough words. The problems that we've picked require trying, struggling, failing, adjusting, and trying again until, finally, a discovery is made. In this session, participants will be briefly introduced to Play With Your Math problems and then try one themselves.

Focus: Grades 6-12

Joey Kelly, Dearborn STEM Academy (Room 102)

Fun Desmos Activities for Algebra 2

This session shares fun, classroom-ready, hands-on Desmos activities designed to teach a variety of Algebra 2 concepts. Demonstrations will provide fast-paced executive overviews of activities for learning transformation of functions, piecewise functions, systems of inequalities, and forms of quadratics. These activities will have students navigating the streets of Boston, creating artwork, and applying basic concepts of programming. Also included are activity extensions for honors-level Algebra 2 that apply advanced Desmos features. Links to classroom handouts, teacher prompts/solutions, and related Desmos links will be provided at this session. Demonstrations also include an overview of the teacher version of Desmos.

Focus: Grades 9-12

Michael Glazner, St. Paul's School (Room 110)

The Fascinating World Between 0 and 1

Teaching probability with calculus means that much of my world exists between 0 and 1. More and more I seem to approach all sorts of problems with rand (0,1) and am often surprised by the result. Join me if you are drawn to questions like: Why are there three times more obtuse triangles than acute? If you break a unit stick in three pieces what is the probability that a triangle can be made? What is the probability that the sum of *n* random numbers between 0 and 1 will stay within this interval?

Focus: Grades 9-12

Martha Jacobsen, Milton Academy (Room 114)

Block II 11:15 am - 12:25 pm

11:15-11:35 am

Seating Arrangements / Classroom Layout for Group Work

One goal of group work is to hear other voices and ideas. What happens if those voices never change? I notice that my students usually sit in the same place each day and I

wanted to change that. I will describe the approach I took, share some feedback from my students, and lead a discussion about what the rest of you are trying. I'm also interested in hearing from you about the physical space and furniture that you find enables great classroom dynamics.

Focus: Grades 6-12

Peter Kahn, Milton Academy (Room 102)

Improving teacher collaboration by hosting your own LaTeX server

In this presentation, I will introduce LaTeX, a typesetting language for producing beautiful mathematical content that is increasingly being used by researchers, academic, and programming developers. The Loomis Chaffee Department hosts its own instance of ShareLaTeX to promote collaboration and development of new material. I will give a brief overview of how another department might set up their own environment as well as how to overcome some of the challenges that come with users learning to use LaTeX. Not only is this not as scary as it sounds, but this can provide a user friendly environment for those who aren't familiar with LaTeX to learn while improving your department's collaboration.

Focus: Grades 9-12

Hudson Harper, Loomis Chaffee School (Room 110)

What's Going On In This Graph?

What's Going On In This Graph? is a free, online weekly feature of the New York Times and the American Statistical Association. We'll notice and wonder about archive graphs. No statistics background is needed.

Focus: Grades 6-12

Sharon Hessney, New York Times, American Statistical Association (Room 114)

Offering a Second Year Statistics Course

Interested in what a second year course in statistics could look like? In this presentation, I will provide an overview for our new course in Advanced Statistics. This course is designed for students who have already completed a full-year statistics course and can be taken concurrently with calculus. The major topics include multiple regression (including inference and variable selection), one-way and multi-factor ANOVA, non-parametric methods, and logistic regression. The course emphasizes hands-on exploration and we use RStudio for analysis.

Focus: Grades 9-12

Patrick Owens, Milton Academy (Room 207)

11:40-12

Assessing Concepts and Skills: A Model of Communication and Reflection

Ever heard the complaint, "the questions on the test didn't look like the ones on the homework?" This presentation seeks to provide a way to balance conceptual and procedural questions on assessments. We will discuss how to assess students' conceptual understandings of material through collaborative assessments and reflection exercises.

Focus: Grades 6-12

Stephen Sacchetti and Julia Rowny, Perkins School (Room 102)

The Shift to Competency Based Education (CBE) and How It Can Impact Mathematics Instruction and Assessment

Keene High School is in the process of moving towards CBE. As a member of the driving committee, I have helped lead my department through this work for the past two years. This is beginning to affect how we assess our students, and therefore how we instruct them. This talk will go through the details of our process, our progress, and things we have learned along the way.

Focus: Grades K-12

Kaitlyn Taft, Keene High School (Room 110)

Note: This is a double session and runs from 11:40-12:25 pm.

Math Golf - A Game for Formative Assessments

An invention born to assess the skills of new students (of varying mathematical backgrounds) on the first day of classes, Math Golf combines my loves of sports, math and teaching. The game has evolved into a useful formative assessment tool, both in previewing and reviewing ideas, in a low-stakes, collaborative, mildly-competitive setting. Adaptable to suit a wide range of topics, ages and abilities, it is a game I now use multiple times every year with most classes. The goal of this presentation is to share the idea and my experiences using it, and to encourage others to adapt and use it as they see fit.

Focus: Grades 6-12

Philip Robson, Milton Academy (Room 114)

Teaching Discrete Fourier Transform in Precalculus

Discrete Fourier Transform (DFT) is one of the most important formulas in computer science. Every time you open an JPEG image file, a MP3 sound file, a MPEG movie file, you are using some version of this transform. In fact, the entire streaming music, internet radio and digital tv industry relies on the DFT. Fortunately, the mathematics behind is both beautiful and accessible. In this talk, we discuss the DFT and how to incorporate it in a Precalculus or AP Computer Science curriculum.

Focus: Grades 9-12

Long Nguyen, Boston Latin School (Room 207)

Note: This is a double session and runs from 11:40-12:25 pm.

12:05-12:25 pm

Mastery Grading for Growth Mindset

"You may have to fight a battle more than once to win it." This sentiment and others like it adorn many classrooms walls. Where is the proof that we teachers believe it and how can we convince students to believe it too? We have to create structures that enable students to have a second or third shot at mastery. One way is through mastery or standards-based grading. I will share my assessment practices, talk about why I made the shift, discuss implementation nuts-and-bolts, and highlight shortcomings and pitfalls.

Focus: Grades 6-12

Lisa Soltani, Michael Driscoll School, Brookline, MA (Room 102)

Transformations: An Algebraic View

At first glance, transformations of toolkit functions appear straight-forward: shift up, down, left and right, but the complexity increases dramatically as multiple reflections, stretches and compressions are applied. Some students 'see' the transformations and can count lattice points. Here is an algebraic method of multiple transformations that can work for any and all students - regardless of whether we are moving from image to pre-image or the converse.

Focus: Grades 9-12

Hal Pratt, Milton Academy (Room 207)

LUNCH 12:25-1:15 pm in Robert Saltonstall Gymnasium

Block III 1:15-2:25 pm

1:15-1:35 pm

Mentoring Teachers

Milton Academy has been developing a mentor program for teachers new to the school. The two-year partnership allows each new hire to observe classes, be observed and more. I will share some of my experiences as a mentor for math teachers (as well as teachers in other disciplines) about what I have learned and how the process has helped my mentees.

Focus: Grades K-12

Becky McCormick, Milton Academy (Room 102)

Ignite Talk: Math Should Be More Than a Measuring Stick
What gets lost when we focus on outcomes only versus enjoyment - math is subject full of joy and our ever present focus on assessments and outcomes can prevent students from fun and joyful experiences that come from learning about and playing with math. I will give a 5-minute Ignite talk and then open up conversation about the ideas shared.
Focus: Grades K-12
Carl Oliver, City-As-School High School (Room 110)

Does NBC's Blindspot Have One?
Come hear how I used an episode of the television show, Blindspot, to motivate the Trigonometry Unit in Algebra 2. Specifically, we will consider the ambiguous case in triangle trigonometry.
Focus: Grades 9-12
Jeanne Jacobs, Milton Academy (Room 207)

Calculus and Applied Economics - "Opting In" in the Math Department
This course is in its second year and allows for choice in our math curriculum - students opt in based on interest; this course runs parallel to other calculus offerings. A farmer can only produce two commodities, baskets of apples, A, and bushels of barley, B. What questions can we ask, what are the implications of the situation, how can we analyze this using Calculus? No prior experience in either field is required, come check it out!
Focus: Grades 9-12
Peter Kahn, Milton Academy (Room 207)

1:40-2 pm

A Conversation About DeTracking and Heterogeneous Classes
This is a discussion-based session on detracking and heterogeneous classes. Participants will share about their current departmental practice and then we will discuss strategies, pitfalls, and resources.
Focus: Grades K-12
Vanessa Cohen, Milton Academy (Room 102)
Note: This is a double session and runs from 1:40-2:25 pm.

Building Relationships in the Classroom
Many people assert that teaching is about relationships. After many years in the high school classroom, I see the teacher-student relationship as foundational to all that I do with my students. I will share some of the ways I strive to build connections with each person in my class, and why I think taking that time matters.
Focus: Grades K-12
Heather Sugrue, Milton Academy (Room 110)

Bringing Graph Theory into Our Classrooms
Graph Theory is chock full of accessible puzzles and problems for our students. In the 2019-20 school year, I will be offering an elective course in Graph Theory at Milton Academy aimed at the typical Algebra II or PreCalculus student. This talk will explore a sample lesson for that class which covers the famous Seven Bridges of Konigsberg Problem and the generalizations Euler found from working on that problem. I will also provide several other examples of accessible Graph Theory puzzles that are suitable for students of nearly all ages to play with!
Focus: Grades K-12
Tori Lockwood, Milton Academy (Room 114)
Note: This is a double session and runs from 1:40-2:25 pm.

Going backwards: Starting with Integration in Calculus
A traditional calculus course begins with derivatives but what happens if you start with integration? By beginning with a discussion of the definite integral, we come to the Fundamental Theorem more quickly and students then see the connection between differentiation and integration, the two big ideas in calculus.
Focus: Grades 9-12
Jackie Bonenfant, Milton Academy (Room 207)

2:05-2:25 pm
Math 'Taboo': A Game
Bring the popular description game 'Taboo' into the math classroom. For different levels and courses, this game is versatile and a lot of fun!
Focus: Grades 6-12
Phil Robson, Milton Academy (Room 110)

One Problem That Transcends Multiple Courses
How do we make decisions based on seemingly 'accurate' tests? Why do we throw out so much 'safe' blood? Why do tests for Lyme Disease (often?) come up negative when people have the disease? We will explore a hypothetical test for a mythical defect called *Geekism Nervosa* from a variety of perspectives, from middle school through statistics, calculus and social studies, to provide a forum to discuss how probability crops up in our society.
Focus: Grades 6-12
Gregg Reilly, Milton Academy (Room 207)

2:30-2:45 pm
Open time in the lobby of Pritzker – ask follow-up questions of available presenters, debrief with others, and plan ways to continue conversations begun today.
