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**Saturday, July 18, 2015**

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**Sat. 7:30 – 8:15 AM**

**REGISTRATION**

**CONTINENTAL BREAKFAST & EXHIBITS**

**Room: Lincoln Lobby**

**Sat. 8:15 – 9:00 AM**

**Welcome and Orientation**

**Room: Chapel**

**Sat. 9:00 – 10:00 AM**

**Keynote Session**

**Room: Chapel**

**“The Ethics of Using CAS in Today's Classrooms”**

*Zalman Usiskin, The University of Chicago (professor emeritus), Chicago, IL*

The use of computer algebra systems (CAS) in the classrooms of today raises ethical questions. Is it ethical for some students to have CAS while others don't? Is it ethical to teach students to use CAS on tasks they should be able to do in their heads or easily with paper and pencil? Is it ethical for a student to use CAS without telling the teacher? Is it ethical not to teach some paper-and-pencil algorithms because the task can be done with CAS even though students might later have to know the paper-and-pencil algorithms on a high-stakes test such as those for the Common Core or college entrance?

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**Sat. 10:10 – 11:10 AM**

**Lecture/Demonstration**

**Room: Gauss**

**“CAS as a Platform for Dynamic Feedback and Assessment”**

*Stephen Arnold, Compass Learning Technologies, Kiama, NSW, Australia*

Think for a moment about the primary ways in which CAS tends to be used in secondary classrooms: verification of results, manipulation, exploration. But rarely do we see it used as a platform for feedback and assessment, in which student results and responses are dynamically checked and validated by the powerful CAS engine. This session presents such an approach, using TI-Nspire and Lua to demonstrate the possibilities for both formative and summative assessment across a variety of mathematical levels and topics.

**Sat. 10:10 – 11:10 AM**

**Workshop**

**Room: Lovelace**

**“Using CAS in Middle School Math”**

*Michelle Bonds, Bald Knob Schools, Bald Knob, AR*

In this session you will get a chance to work with TI-Nspire CAS handhelds and learn how to use this technology effectively in 5-8 grade classrooms. Example activities will be shared, and you will have the chance to create your own. No experience necessary.

**Sat. 10:10 – 11:10 AM**

**Workshop**

**Room: Ramanujan**

**“CAS on the TI-Nspire: It's Not Just For Your Top Students”**

**Ray Klein, T<sup>3</sup> Instructor, Glen Ellyn, IL**

CAS is seen by some mathematics educators as a tool only to be used by the Honors level students. I believe that CAS can and should be used with all students, especially those who are experiencing difficulty with mathematics. I believe that CAS should be used in all mathematics courses so that ALL STUDENTS can learn more mathematics. Come and see how this approach was implemented in my former high school and see some of the results that happily surprised us.

**Sat. 10:10 – 11:10 AM**

**Lecture/Demonstration**

**Room: Euler**

**“CAS Activities That Integrate Algebra and Geometry Using Handhelds, iPad App or Software”**

**Tom Reardon, Youngstown State University, Poland, OH**

This is a cool way to learn ... and teach: have your students investigate a geometry activity – hands-on, interactively, self-paced; then have them test and generate their hypotheses; and then have them prove their results using coordinate algebra with CAS to assist. They are still doing the thinking, the logic, the investigating, the problem solving; but let CAS assist them to do the difficult mathematics. Also have your students develop and prove the distance from a point to a line formula. Lots of great mathematics is in these activities, along with some surprising but fascinating results.

**Sat. 10:10 – 11:10 AM**

**Workshop**

**Room: Turing**

**“Using CAS in the Sciences to Promote the Use of CAS in Mathematics”**

**David Young, Fayetteville Public Schools, Fayetteville, AR**

Since the power of CAS is being used in the sciences quite freely and effectively, it would be nice if our math teachers could see what we are doing. If they could see some examples of the power of CAS in the science class, we believe that more math folks would use CAS in their instruction. Come see some examples and join in the discussion.

**Sat. 10:10 – 11:10 AM**

**Lecture/Demonstration**

**Room: Waits**

**“Dynamic CAS - Symbols, Sliders, and Spreadsheets”**

**Thomas Dick, Oregon State University, Corvallis, OR**

For purely symbolic computations, Computer Algebra Systems are often viewed as black boxes, spitting out the final results of those onerous symbolic tasks delegated to them. New worlds open up when a CAS is dynamically linked to structures that we usually associate with only numerical computations (spreadsheets) or graphical parameter controls (sliders).

**Sat. 11:10 AM – 11:50 AM**

**LUNCH**

**Room: Cafeteria**

**Sat. 11:55 AM – 12:55 PM**

**Lecture/Demonstration**

**Room: Waits**

**“CAS Indispensable in All Learning Phases – The Experimental, the Exactifying and the Application Phase”**

**Helmut Heugl**, *ACDCA, Stockerau, AUSTRIA*

If we discuss the role of CAS, we have to consider the goals of mathematics education and investigations about thinking processes and learning activities. I will try to prove my thesis with examples of our CAS classes for the three phases of the learning process and will show the meaning of the white box/black box principle for learning algebra.

**Sat. 11:55 AM – 12:55 PM**

**Lecture/Demonstration**

**Room: Lovelace**

**“Maplets: Helping Students Prepare for Calculus”**

**Douglas Meade**, *University of South Carolina, Columbia, SC*

Maplets for Calculus is an award-winning collection of 201 "maplets" (applets written with Maple CAS) on many topics, including precalculus and calculus. Each maplet is designed for use by students and teachers in class, in a lab, or at home. In this talk the demonstrations will focus on the maplets most appropriate for new college students who need to review (and improve) skills such as factoring, translations of graphs, and trigonometric functions.

**Sat. 11:55 AM – 12:55 PM**

**Workshop**

**Room: Turing**

**“Amazing Systems of Linear Equations”**

**Peter Flynn**, *Texas Instruments Educational Technology Consultant, AUSTRALIA*

It is important to highlight links and connections between mathematical ideas. In this workshop, participants will use CAS to explore patterns in systems of linear equations involving the Fibonacci sequence. If time permits, we will briefly look at systems of linear equations involving other well-known sequences.

**Sat. 11:55 AM – 12:55 PM**

**Lecture/Demonstration**

**Room: Euler**

**“Using CAS for Development of Geometry Proofs”**

**Irina Lyublinskaya**, *CUNY College of Staten Island, Staten Island, NY*

Teaching reasoning and proof in high school geometry is one of the challenging tasks that we face today. Can CAS help us with this task? In this presentation the presenter will share sets of problems that use symbolic geometry software that can be used to develop students' proof skills.

**Sat. 11:55 AM – 12:55 PM**

**Workshop**

**Room: Gauss**

**“Kilts and CAS in Statistics”**

**Nevil Hopley**, *George Watson's College, Edinburgh, SCOTLAND*

The topic of Statistics is renowned for being mainly about analyzing and displaying numbers. This session will look at the ways that CAS can support and explain many statistical results and techniques that we use without a second thought. It will cover topics that are typically included in Statistics courses up to AP Calculus and IB Maths Higher Level. We will also debate whether using CAS in Statistics should be called Castistics or Stacastics!

**Sat. 11:55 AM – 12:55 PM**

**Workshop**

**Room: Ramanujan**

**“Working Through an 'Nspiring' Mathematics Task”**

**Donald Porzio**, *Illinois Mathematics and Science Academy, Aurora, IL*

Participants will slowly and carefully work through one rich secondary school mathematics task using the TI-Nspire CAS calculator to better understand how the calculator can or might be used to explore, or even generate, other rich tasks. Time will also be spent discussing connections between the Common Core and the task.

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**Sat. 1:05 - 2:05 PM**

**Lecture/Demonstration**

**Room: Gauss**

**“Using CAS to Integrate Computer Science and Mathematics”**

**Al Cuoco**, *Education Development Center, Waltham, MA*

The habits of mind used by mathematicians are closely aligned with those of computer scientists, and the capability for modeling mathematical phenomena in a computational medium (especially a CAS) helps students develop these common habits much more effectively and with greater depth than if the disciplines are treated separately. We'll look at some examples of this synergy.

**Sat. 1:05 - 2:05 PM**

**Workshop**

**Room: Lovelace**

**“Exploring Roots for Better Understanding”**

**Nathan Austin**, *Casio Curriculum and Online Training Manager, Portland, OR*

Using CAS to allow for streamlined manipulation of binomials and trinomials, we will investigate patterns of behavior of coefficients as we expand binomial products. This will allow students to develop the typical rules and connect these rules to the graph of the given equation.

**Sat. 1:05 - 2:05 PM**

**Workshop**

**Room: Ramanujan**

**“CAS with Algebra - Literal Equations, Distributive Property, and Adding Variables”**

**Sean Bird**, *Covenant Christian High School, Indianapolis, IN*

This workshop will encourage exploring and student confidence with ready to use activities on the TI-Nspire CAS. These activities will be shared on <https://sites.google.com/site/tinspiregroup/cas> along with other resources. Also learn about limitations and new capabilities to help students tackle literal equations or formula. See how the computer algebra system built into TI-Nspire Navigator can be leveraged.

**Sat. 1:05 - 2:05 PM**

**Workshop**

**Room: Turing**

**“Using CAS to Foster Independent Student Learners”**

**Patsy Fagan**, *Drake University (retired), Des Moines, IA*

Student success in Common Core based Algebra I and Algebra II rests on a deep understanding of variable, expression and equation, and the meaning of equivalence for expressions and equations. I will demonstrate an active learning approach to promoting student understanding of these notions using TI-Nspire applets. Special attention will be given to the kinds of learning environments and inquiry questions that promote students' critical thinking and sense making. Computer Algebra is used in evaluating student responses entered when using the applets.

**Sat. 1:05 - 2:05 PM**

**Lecture/Demonstration**

**Room: Waits**

**“A Geometry Teacher Meets The Correlation Coefficient”**

**Steve Phelps, *Madeira High School, Cincinnati, OH***

What happens when a long-time Geometry teacher explores the Correlation Coefficient? THIS is what happens. Join us as we explore the geometry of the correlation coefficient and discover an unexpected conic!

**Sat. 1:05 - 2:05 PM**

**Lecture/Demonstration**

**Room: Euler**

**“Powerful Student Proofs from CAS-Enhanced Classrooms”**

**Chris Harrow, *Hawken School, Cleveland, OH***

This session outlines proofs established by two students from a CAS-enhanced precalculus class. The first involves a surprising transformation connection in a polar graph of a limaçon. The second establishes an unexpected relationship between the behavior of foci in ellipses and hyperbolas. Time permitting, I will share a third example involving a famous historical calculus result “rediscovered” centuries later by a curious student’s exploration in a CAS-enhanced classroom. While these proofs are beyond typical precalculus courses, the point of the session is to show how the presence of CAS can significantly enhance the abilities of ALL students to explore and create mathematics on their own.

**Sat. 2:05 – 2:20 PM**

**SNACK**

**Room: Lincoln Lobby**

**Sat. 2:20 - 3:20 PM**

**Lecture/Demonstration**

**Room: Waits**

**“Creating, Revising, and Re-envisioning Mathematical Tasks to Engage Students in Common Core Mathematical Practices”**

**M. Kathleen Heid, *The Pennsylvania State University, University Park, PA***

CAS (symbolic/graphical/numeric) offers promise for addressing CCSS mathematical practices standards. This session presents, characterizes, and offers principles on the use of CAS to create, revise, and re-envision mathematical tasks that engage students in addressing the CCSS algebra and functions standards while enhancing students' experience with mathematical practices such as looking for and making use of structure, constructing viable multirepresentational arguments, and reasoning abstractly.

**Sat. 2:20 - 3:20 PM**

**Room: Ramanujan**

**“To CAS, or Not to CAS?”**

**Heidi Rudolph, *Orange High School, Pepper Pike, OH***

When is it appropriate to use CAS in instruction? As a developmental tool, the CAS instruction can enhance the learning for students. We will “zero” in on several CAS features and how it looks to have students use them in a discovery setting for learning a new concept. We will experience a variety of activities and CAS commands that students will be able to use effectively in your class immediately.

**Sat. 2:20 - 3:20 PM**

**Discussion**

**Room: Turing**

**“CAS vs. CCSS-M”**

**Michael Buescher**, *Hathaway Brown School, Cleveland, OH*

Neither the PARCC nor the Smarter Balanced assessments for the Common Core State Standards allow the use of CAS at any grade level. But that doesn't mean CAS isn't a useful classroom tool. Explore and discuss ways to incorporate CAS through the Standards for Mathematical Practice and specific content areas.

**Sat. 2:20 - 3:20 PM**

**Lecture/Demonstration**

**Room: Lovelace**

**“CAS + Dynamic Mathematics Software = A Winning Combination”**

**Michael Todd Edwards**, *Miami University, Oxford, OH*

NCTM's Principles to Actions (NCTM, 2014) note that high quality teaching is marked by instruction that "incorporate(s) mathematical tools and technology as an everyday part of the mathematics classroom." In this interactive, hands-on session, participants engage in tasks that support NCTM's vision of technology use. Specifically, they explore (and create) tasks with dynamic mathematics software and CAS that support the goals of NCTM's Principles to Actions document.

**Sat. 2:20 - 3:20 PM**

**Lecture/Demonstration**

**Room: Euler**

**“LinReg Exposed!”**

**John Hanna**, *T<sup>3</sup> Instructor, Hopatcong, NJ*

With the help of CAS we can "easily" demonstrate the algebra underneath the Least Squares Method of linear regression. No experience necessary and no calculus, either!

**Sat. 2:20 - 3:20 PM**

**Lecture/Demonstration**

**Room: Gauss**

**“Ready, Set, CAS!”**

**Deborah Horowitz and Aaron Brandt**, *Hawken School, Cleveland, OH*

New to CAS? Let's get you started and inspired! Learn how quick and easy it is to implement this lesson-enhancing tool in your classroom. Accelerate your CAS learning curve through tips, tricks, and lessons learned by two experienced teachers who utilized CAS for the first time this past school year in Algebra I/II and Precalculus courses.

**Sat. 3:20 – 3:30 PM**

**BOARD BUSES**

**Lincoln Lobby**



**Sun. 8:30 - 9:30 AM**

**Workshop**

**Room: Lovelace**

**“CAS Explorations in Algebra That Help Prepare Students for Precalculus”**

**Ken Collins**, *Charlotte Latin School, Charlotte, NC*

We will share calculator explorations we have used with the TI-Nspire CAS in Algebra II; their goal is to help deepen student understanding of Algebra topics in preparation for Precalculus. I will provide classroom ready handouts.

**Sun. 8:30 - 9:30 AM**

**Discussion**

**Room: Turing**

**“Modeling Teachable Moments”**

**John Ashurst**, *T<sup>3</sup> Instructor, Harlan, KY*

This session is about CAS fitting a particular role within the framework of a classroom lesson that begins with exploration, followed by generalization via CAS. After each example, participants will be engaged in a discussion of the merits of CAS in the lesson.

**Sun. 9:45 - 10:45 AM**

**Lecture/Demonstration**

**Room: Gauss**

**“Targeting Model Modeling Tasks: Enhancing Mathematical Practices with CAS”**

**Rose Mary Zbiek**, *The Pennsylvania State University, University Park, PA*

Mathematical tasks appear in many places. Some tasks engage students with mathematical models or mathematical modeling. The goal for this session is to feature tasks in which CAS is used to enrich mathematical modeling experiences, and therefore to push our students and us. We start with easily found typical tasks and expand them to help students become better modelers. The session highlights how typical tasks blended with mathematical inquiry and reflective questions enrich mathematical practices in general and mathematical modeling in particular in a CAS setting.

**Sun. 9:45 - 10:45 AM**

**Workshop**

**Room: Ramanujan**

**“Using CAS as Building Blocks for Beginning Algebra Concepts”**

**Lynda Ferneyhough**, *T<sup>3</sup> Instructor, Ontario, CANADA*

We will use the TI-Nspire CAS for introductory lessons with beginning Algebraic concepts. Some pre-established files and activities will be used to take the participant through lessons and quizzes as a student. Some lesson files will be developed together. We will discuss why you should use CAS even if it is not allowed on state tests.

**Sun. 9:45 - 10:45 AM**

**Workshop**

**Room: Euler**

**“CAS in Middle School – Developing Algebraic Thinking”**

**Irina Lyublinskaya**, *CUNY College of Staten Island, Staten Island, NY*

CAS is a great tool for development of conceptual understanding of patterns, relationships, and algebraic thinking, all-important elements of Common Core Standards. Take back activities for working with algebraic expressions and equations that will help your students to develop the thinking and reasoning processes they need for success in algebra.

**Sun. 9:45 - 10:45 AM**

**Lecture/Demonstration**

**Room: Lovelace**

**“Common Factoring Misconceptions... and When They're RIGHT”**

**Mike Reiners**, *Christ's Household of Faith School, St Paul, MN*

We'll explore some common student misconceptions related to factoring of polynomials, such as the infamous "Seven Product Property" and "Sumthing With Two Squares", proving exactly when they are RIGHT. This type of exploration can be incredibly valuable, revealing a lot of deep mathematics; but it is often desirable to accelerate to the meaningful results using the power of CAS.

**Sun. 9:45 - 10:45 AM**

**Lecture/Demonstration**

**Room: Waits**

**“CAS Enabled Student Mathematical Modeling Projects”**

**Philip Todd**, *Saltire Software, Tigard, OR*

We describe research projects undertaken by 10th and 11th grade students during 8 week internships at Saltire Software. Projects addressed real life problems in the design of solar cookers, used Geometry Expressions to help mathematize the problems, and used CAS to solve it. Geometry Expressions was then used to interpret the mathematical solution.

**Sun. 9:45 - 10:45 AM**

**Workshop**

**Room: Turing**

**“Delving Deeper with CAS”**

**Peter Flynn**, *Texas Instruments Educational Technology Consultant, AUSTRALIA*

In this workshop, participants will use CAS to explore a topic that would otherwise be inaccessible to students, namely, the locus of extreme points of polynomial functions.

**Sun. 11:00 AM - 12:00 PM                      Lecture/Demonstration                      Room: Waits**

**“Enhancing High School Mathematics for All Using Computer Algebra”**

**Gregory Foley, *Ohio University, Athens, OH***

Computer algebra is often limited to honors or AP courses. Computer algebra can and should be used to enhance the learning experience for all students. Come see some examples of this vision of CAS for all high school students.

**Sun. 11:00 AM - 12:00 PM                      Lecture/Demonstration                      Room: Turing**

**“Using TI-Nspire Algebra Applets in Common Core Based Courses”**

**Wade Ellis, *West Valley College (retired), Saratoga, CA***

Student success in Common Core based Algebra I and Algebra II rests on a deep understanding of the notions of variable, expression and equation, and of the meaning of equivalence for expressions and for equations. This presentation will demonstrate an active learning approach to promote student understanding of these notions using TI-Nspire applets. Special attention will be given to the kinds of learning environments and inquiry questions that promote students’ critical thinking and sense making. Computer Algebra is used in evaluating student responses entered when using the applets.

**Sun. 11:00 AM- 12:00 PM                      Workshop                      Room: Ramanujan**

**“Six Distinct Uses for CAS in the Curriculum”**

**Fred Ferneyhough, *T<sup>3</sup> Instructor, Ontario, CANADA***

Through twenty years of teaching with CAS, my students identified six distinct uses for CAS. All of the examples that will be presented are taken from classroom examples.

**Sun. 11:00 AM - 12:00 PM                      Lecture/Demonstration                      Room: Lovelace**

**“Theorems for Cubic Polynomial Functions and Their Graphs”**

**John Diehl, *Hinsdale Central High School (retired), Hinsdale, IL***

This demonstration session will use graphing, CAS, and some Calculus to develop theorems related to interesting questions about cubic polynomial functions and their graphs. The exploration will include: the shapes for the graph, transformations, extreme points, and the inflection point.

**Sun. 11:00 AM - 12:00 PM**

**Workshop**

**Room: Euler**

**“Three Rich Problems Ripe For CAS Technology”**

**Jay Schiffman, *Rowan University, Philadelphia, PA***

Over the years, I have had the pleasure of viewing a number of outstanding sessions by distinguished mathematics educators. Three rich problems that engage students and are ripe for CAS technology were presented by Jim Rubillo, former Executive Director of the NCTM, and Jim Matthews, a Professor of Mathematics at Siena College in Loudonville, NY. A version of these problems encompass the fields of calculus, discrete mathematics, and a course for preservice teachers. This workshop will engage participants in these rich problems and illustrate the role of TI N-Spire CAS technology in helping to delve more deeply into the mathematics.

**Sun. 11:00 AM - 12:00 PM**

**Workshop**

**Room: Gauss**

**“Kilts and CAS Extended”**

**Nevil Hopley, *George Watson's College, Edinburgh, SCOTLAND***

This session will look at blending CAS functionality with short functions and programs in order to create helpful, extra tools designed to be used by students. The talk will cover how to convert from decimal time, list all the factor pairs for single term expressions, and check partial fraction constructions. In addition, toolkits that help students learn how to solve inequalities and simultaneous equations will be shared. Come and see how teaching with CAS can be taken to the next level!

**Sun. 12:15 - 1:00 PM**

**CLOSING and LUNCH**

**Room: Cafeteria**

**Sun. 12:30-1:00 PM**

**BOARD BUSES FOR HOTEL**

**Lincoln Lobby**