MAA Contributed Paper Sessions
Joint Mathematics Meetings
January 4 – 7, 2017
Atlanta, Georgia

CONTRIBUTED PAPER SESSIONS WITH THEMES

1. Assessment in Distance Learning Environments
Wednesday afternoon
Organizers: Miriam Harris-Botzum, Lehigh Carbon Community College; William O. Martin, North Dakota State University; Sarah Cook, Washburn University; and Semra Kilic-Bahi, Colby-Sawyer College
Description: As academic institutions try to meet an increasing demand for online degrees, programs, and courses, the need to develop effective assessment methods and tools is becoming urgent. For this session, we invite presentations addressing any of the following topics: the learning outcome differences for online courses and face-to-face courses; assessment of collaborative learning in distance learning environments; the challenges and opportunities distance learning environments present in terms of assessment; effective assessment instruments and methods for online degree programs/courses.
Sponsor: MAA Assessment Committee

2. The Creation and Implementation of Effective Homework Assignments
Saturday morning
Organizers: Sarah Greenwald, Appalachian State University, and Judy Holdener, Kenyon College
Description: With the use of online homework on the rise, many faculty members are concerned that online systems inevitably place less emphasis on the development of the students' writing and in some cases critical thinking skills. Additionally, faculty struggle with the reality that the internet supplies students with free and easy access to many if not all solutions to homework problems in undergraduate math textbooks. In this session we hope to focus attention on the question "What makes a homework assignment in mathematics effective?" while addressing ways in which we might implement such effective assignments in our own classrooms. We especially encourage presentations that provide concrete examples of effective homework design with attention given to how the presented examples achieved the presenter's desired learning goal(s). We welcome examples of all types of homework assignments from across the undergraduate mathematics curriculum, including online and traditional "paper-and-pencil" homework. Finally, we encourage presenters to discuss ways in which they were able to implement effective homework to overcome the challenges of student access to solutions and the limited time instructors have for grading. Papers from this session may be considered for a special issue of PRIMUS.
Sponsor: Problems, Resources, and Issues in Undergraduate Mathematics Studies (PRIMUS)

3. Cryptology for Undergraduates

Wednesday morning

Organizers: Robert Lewand, Goucher College; Joshua Holden, Rose-Hulman Institute of Technology; and Chris Christensen, Northern Kentucky University

Description: Cryptology courses are now a part of the undergraduate mathematics curriculum. For mathematics majors, cryptology fits into the curriculum in much the same way that number theory does. In addition, cryptology is appearing as a topic in mathematics courses for non-majors, as it is a hook to interest these students in mathematics. This contributed paper session solicits presentations of cryptologic topics that would be of interest to faculty who teach undergraduate cryptology courses or presentations of cryptologic topics that could be used in undergraduate courses. Presentations that describe classroom experiences and that report on their outcomes are invited.

4. The Advancement of Open Educational Resources

Saturday morning

Organizers: Benjamin Atchison, Framingham State University, and Jeremy Russell, The College of New Jersey

Description: This session will showcase the increasing popularity of open educational resources (OER) in mathematics and statistics. Examples may include, but are not limited to, the development or adoption of open source or open access course texts and related materials, the creation and/or implementation of course technological enhancements, such as instructional apps and video tutorials, and experiences with the inclusion of low or no-cost homework platforms or mathematics software systems in a particular course. Presenters should attempt to address the effectiveness (formally or informally assessed) of the adoption of such resources in their courses. Preference will be awarded to presentations from community college and four-year undergraduate institutions.

5. Discrete Mathematics in the Undergraduate Curriculum - Ideas and Innovations for Teaching

Saturday afternoon

Organizers: John S. Caughman, Portland State University; Elise Lockwood, Oregon State University; and Art Duval, University of Texas El Paso

Description: Discrete mathematics offers many accessible points of entry for students to engage in deep mathematical thinking. This is particularly true of counting problems, which have rich applications across mathematics as well as in allied fields such as probability and computer science. However, there is much evidence in the research literature that students struggle with discrete topics, and notably with counting problems. The aim of this session is for researchers and teachers to share ideas for how to improve the teaching and learning of discrete math at all undergraduate levels. We hope to facilitate communication between math education researchers and those who teach these topics. We welcome scholarly presentations that speak to pedagogical aspects of discrete mathematics, which may include, but are not limited to: research on student thinking about combinatorial ideas, research demonstrating effective instructional strategies, innovative

classroom activities or pedagogical interventions applied to combinatorics, or philosophies toward teaching discrete mathematics.

6. Do Mathematicians Really Need Philosophy?

Saturday afternoon

Organizers: Bonnie Gold, Monmouth University, and Carl Behrens, Alexandria VA

Description: Nobel physicist Steven Weinberg famously declared that philosophers were useful to him only to defend him from other philosophers. Weinberg was complaining mostly about logical positivists, who don't seem to deal with mathematics much. But the philosophy of mathematics is a battleground for a number of warring schools, most prominently Platonists and constructivists. Does a practicing mathematician have to choose which school to join? Philosophical questions have been shown to have a huge positive effect in the teaching of mathematics, but need they come up during the development of a new branch of mathematics? Philosophy of mathematics has recently seen a movement toward "pluralism": let's accept everyone's philosophies, no matter how contradictory they may be. Is that a useful trend? Is it just a futile attempt to sweep a problem under the rug? This session will give a forum for views from all sides of the issue, whether from the perspective of doing mathematical research, teaching mathematics, or more general philosophical fruitfulness. Other topics on the philosophy of mathematics will be considered as time allows.

Sponsor: POM SIGMAA

7. Humanistic Mathematics

Thursday afternoon

Organizers: Eric S. Marland, Appalachian State University, and Gizem Karaali, Pomona College

Description: The phrase "Humanistic mathematics,'' coined about thirty years ago, awakens many different connotations in those who hear it. As a scholarly perspective, humanistic mathematics describes an approach to mathematics that views it as a human endeavor and focuses on the paths of inquiry that study its aesthetic, cultural, historical, literary, pedagogical, philosophical, psychological, and sociological aspects. As a pedagogical stance, humanistic mathematics explores and builds on the relationship of mathematics with its nontraditional partners in the humanities, the fine arts, and social sciences, providing additional perspective for the role of mathematics in a liberal arts education. Submissions on all humanistic aspects of mathematics are invited. We are especially looking for submissions that will stimulate discussion and further inquiry related to collegiate mathematics in the first two years. Submissions should be aimed at a broad mathematical audience. **Sponsors:** MAA Committee on Curriculum Renewal Across the First Two Years (CRAFTY) and the Journal of Humanistic Mathematics.

8. Humor and Mathematics

Friday morning

Organizers: Debra K. Borkovitz, Wheelock College; Gizem Karaali, Pomona College; Semra Kilic-Bahi, Colby-Sawyer College; Cesar Martínez-Garza, Penn State Berks

Description: According to John Allen Paulos, both mathematics and humor are forms of intellectual play; logic, pattern, rules and structure are essential to both humor and mathematics. Humor is also a powerful teaching tool. This session will showcase scholarship that explores the broad spectrum of the relationship between mathematics and humor. We welcome submissions that focus on strategies for using humor in the classroom, analyses of the mathematics of jokes, discussions of ways humor helps mathematicians work together, and investigations of how negative humor about mathematics in the popular culture influences students' perceptions of the subject.

9. Incorporating Big Data Ideas in the Mathematics and Statistics Classroom
Thursday afternoon
Organizers: Sue Schou, Idaho State University; Stacey Hancock, Montana State University; and Patti Frazer Lock, St. Lawrence University
Description: The term "Big Data" is everywhere in the media and many available jobs for mathematics and statistics majors require experience working with big or "biggish" data. This session invites both mathematics and statistics instructors to share examples of how they include big data concepts in their courses. Presentations should include discussion of concepts related to big data, how the presenter incorporated these concepts into course work, in which course they were included, and how they fit with typical course topics. Evidence that the inclusion of large data topics has aided students in their future career paths is welcome.
Sponsor: SIGMAA on Statistics Education

10. Innovative and Effective Ways to Teach Linear Algebra
Friday morning
Organizers: Megan Wawro, Virginia Tech; Gil Strang, MIT; and David Strong, Pepperdine University
Description: Linear algebra is one of the most interesting and useful areas of mathematics, because of its beautiful and multifaceted theory, as well as the enormous importance it plays in understanding and solving many real world problems. Consequently, many valuable and creative ways to teach its rich theory and its many applications are continually being developed and refined. This session will serve as a forum in which to share and discuss new or improved teaching ideas and approaches. These innovative and effective ways to teach linear algebra include, but are not necessarily limited to: (1) hands-on, in-class demos; (2) effective use of technology, such as Matlab, Maple, Mathematica or Flash; (3) interesting and enlightening connections between ideas that arise in linear algebra and ideas in other mathematical branches; (4) interesting and compelling examples and problems involving particular ideas being taught; (5) comparing and contrasting visual (geometric) and more abstract (algebraic) explanations of specific ideas; (6) other novel and useful approaches or pedagogical tools.

11. Innovative Strategies to Inspire & Prepare Potential STEM Majors Who Are Not Yet Ready for Calculus
Thursday afternoon

Organizers: Rebecca Hartzler, Seattle Central College; Suzanne I. Doree, Augsburg College; Frank Savina, University of Texas at Austin; and Michael Oehrtman, Oklahoma State University

Description: Many students enter college interested in science, technology, engineering, and mathematics (STEM) but then switch to non-STEM majors. Retaining STEM-interested students in STEM fields depends in part on student's experience in mathematics, especially for students who enter college not yet ready for calculus. Many colleges and universities are experimenting with new or renewed curricula to support the success of underprepared students interested in STEM. This session highlights novel, research-based methods for teaching precalculus content that show evidence of success. Presentations may illustrate new approaches to content, successful pedagogy, or engaging activities. Talks may describe successful implementation of innovative precalculus courses, integrated precalculus/calculus, pre-calculus pathways for students interested in STEM, or other alternatives. Examples of student support, peer tutoring, advising, or placement structures are also appropriate, particularly those proven successful with students from traditionally underrepresented groups in STEM. Talks on effective strategies to assess student learning or other outcomes in precalculus are also welcome. Faculty from two-year colleges are especially encouraged to present.

Sponsor: MAA Committee on Curriculum Renewal Across the First Two Years (CRAFTY)

12. Innovative Teaching through Recreational Mathematics

Wednesday morning

Organizers: Matthew Jura, Manhattan College; Tyler Markkanen, Springfield College; and Oscar Levin, University of Northern Colorado

Description: Puzzles, games and mathematical magic tricks can illustrate some of the amusing ways mathematics can be used in everyday life. These recreational uses of mathematics often conceal deep content and so can be used to introduce topics throughout the undergraduate curriculum. In this session we invite presentations sharing innovative uses of recreational mathematics which illustrate and illuminate non-recreational topics in math, demonstrating deeper mathematical concepts. Talks should present ways in which fun math projects can be incorporated into lessons or activities, and ideally include an evaluation of the projects or evidence that they were successful; live demonstrations are welcome. Applications to both developmental mathematics courses and those for majors are encouraged.

13. Inquiry-Based Teaching and Learning

Friday afternoon

Organizers: Brian P. Katz, Augustana College; Judith Covington, Louisiana State University in Shreveport; Theron Hitchman, University of Northern Iowa; Angie Hodge, University of Nebraska Omaha; Alison Marr, Southwestern University; and Victor Piercey, Ferris State University

Description: The goal of Inquiry-Based Learning (IBL) is to transform students from consumers to producers of mathematics. Inquiry-based methods aim to help students develop a deep understanding of mathematical concepts and the processes of doing

mathematics by putting those students in direct contact with mathematical phenomena, questions, and communities. Within this context, IBL methods exhibit great variety. Activities can take place in single class meetings and span entire curricula for students of any age; students can be guided to re-invent mathematical concepts, to explore definitions and observe patterns, to justify core results, and to take the lead in asking new questions. There is a growing body of evidence that IBL methods are effective and important for teaching mathematics and for fostering positive attitudes toward the subject. This session invites scholarly presentations on the use of inquiry-based methods for teaching and learning. We especially invite presentations that include successful IBL activities or assignments, that support observations about student outcomes with evidence, or that could help instructors who are new to IBL to try new methods.
Sponsor: SIGMAA IBL

14. Integrating Research into the Undergraduate Classroom
Thursday morning
Organizers: Timothy B. Flowers, Indiana University of Pennsylvania, and Shannon R. Lockard, Bridgewater State University
Description: Undergraduate Research is a high-impact practice that inspires student learning, builds crucial skills, boosts retention and graduation rates, and particularly benefits underrepresented and at-risk students. While students often engage in undergraduate research outside of the classroom, incorporating research projects into the classroom can bring this impactful experience to even more students. This session will focus on incorporating research into the undergraduate classroom, from introductory to upper level mathematics courses. Presentations may describe a particular research project or activity, faculty experiences in mentoring undergraduate research in the classroom, or student experiences and feedback. All talks should emphasize why the project(s) being discussed is considered undergraduate research rather than a typical assignment. Participants are encouraged to share the impact on the students involved if possible.

15. Intertwining Mathematics with Social Justice in the Classroom
Saturday morning
Organizers: Joanna Wares, University of Richmond; Carl Yerger, Davidson College; Zeynep Teymuroglu, Rollins College; and Catherine Buell, Fitchburg State University
Description: Many students are unaware that mathematics can be used to inspire social change. How can we teach mathematics in ways that are socially and culturally relevant to our students who live and learn in diverse communities? What are the advantages of using social justice topics to deepen our students' understanding of mathematical concepts? Speakers in our session will address these questions by presenting 1) materials directly related to combining mathematics and social justice in the classroom, the curriculum, and/or in pedagogical approaches or 2) by presenting classroom experiences which have made higher ed mathematics culturally and socially relevant for students today. Papers from the session may be considered for a special issue of PRIMUS on the mathematics for social justice.
Sponsor: Problems, Resources, and Issues in Undergraduate Mathematics Studies (PRIMUS)

16. Mathematical Technology in the Calculus Classroom
Thursday morning
Organizers: Joel Kilty and Alex M. McAllister, Centre College
Description: The modern calculus classroom often employs technology to enrich the learning process and to help bring the ideas to life. Many types of mathematical software and physical platforms are available to instructors and they can be deployed in a myriad of different ways. However, many instructors have questions about how best to utilize technology and which software best suits their needs. This session invites academic instructors to share their pedagogical perspectives on technology choices for their Calculus classroom, how they effectively incorporate technology to increase student understanding, and a candid assessment of both the advantages and disadvantages of their choices.

17. Mathematics and the Arts
Wednesday morning
Organizer: Douglas Norton, Villanova University
Description: This session invites participation by those involved in research, creative exploration, or pedagogical innovation in the increasingly active area of intersection between Mathematics and the Arts. Whether you are an artist who incorporates mathematical themes in your work, a mathematician who considers the aesthetic aspects of your mathematical interests, an instructor who broadens the definitions of mathematical and artistic instruction by blurring the boundaries between the two, or an active participant in these areas without accepting the restrictions of this categorization, we invite you to share your experiences with others who have either newfound or long-standing similar interests.
Sponsor: SIGMAA on Mathematics and the Arts.

18. Mathematics and Sports
Wednesday afternoon
Organizers: Drew Pasteur, College of Wooster, and John David, Virginia Military Institute
Description: The expanding availability of play-by-play statistics and video-based spatial data, for professional and some collegiate sports, is leading to innovative kinds of research, using techniques from various areas of the mathematical sciences. By modeling the outcome distributions in certain situations, researchers can develop new metrics for player or team performance in various aspects of a sport, comparing actual results to expected values. Such work often has implications for strategic game management and personnel evaluation. Classic areas of study, such as tournament design, ranking methodology, forecasting future performance, insight into rare or record events, and physics-based analysis, also remain of interest. This session will include both presentations of original research and expository talks; topics related to the use of sports applications in curriculum are welcome. With a broad audience in mind, all talks are requested to be accessible to mathematics majors. Undergraduates and their mentors are particularly encouraged to submit abstracts for consideration.

19. Mathematics Experiences and Projects in Business, Industry, and Government
Friday morning
Organizers: Allen Butler, Daniel H. Wagner Associates, Inc.,
Description: The MAA Business, Industry and Government Special Interest Group (BIG SIGMAA) provides resources and a forum for mathematicians working in Business, Industry and Government (BIG) to help advance the mathematics profession by making connections, building partnerships, and sharing ideas. BIG SIGMAA consists of mathematicians in BIG as well as faculty and students in academia who are working on BIG problems. Mathematicians, including those in academia, with BIG experience are invited to present papers or discuss projects involving the application of mathematics to BIG problems. The goal of this contributed paper session is to provide a venue for mathematicians with experience in business, industry, and government to share projects and mathematical ideas in this regard. Anyone interested in learning more about BIG practitioners, projects, and issues, will find this session of interest.
Sponsor: BIG SIGMAA

20. Meaningful Modeling in the First Two Years of College
Thursday morning
Organizers: Stuart Boersma, Central Washington University, and Jason Douma, University of Sioux Falls
Description: Most major mathematical organizations, including the MAA in its 2015 CUPM Curriculum Guide, have encouraged programs to incorporate modeling at all levels of the mathematics curriculum, including the first two years of undergraduate coursework. There are good reasons to include modeling experiences in the first two years. These opportunities allow students majoring in mathematics to gain experience with an important (and often challenging) approach to problem-solving that will benefit them later in their coursework and careers, and all students—regardless of major—may find that they appreciate the role and value of mathematics more deeply by applying it to meaningful situations. This session welcomes papers that describe substantive mathematical modeling experiences for students who would typically be in their first two years as an undergraduate student, including (but not limited to) courses for non-majors and courses that do not have calculus as a prerequisite. Ideally, papers should also evaluate the effectiveness of the approach being taken.
Sponsors: MAA Mathematics Across the Disciplines (MAD) Subcommittee and the MAA Curriculum Renewal Across the First Two Years (CRAFTY) Subcommittee

21. Methods of Engaging Math Learners with Physical Impairments
Thursday afternoon
Organizers: Rebekah Gilbert and Steven Schluchter, George Mason University
Description: Before the start of the semester, you find out that a blind student is registered for your class, and you are responsible for making mathematics accessible. None of your previous training or experience has prepared you for the challenges ahead, and there do not seem to be many resources available. The purpose of this session is to collect the knowledge on this subject and disseminate teaching and learning strategies for helping students who have physical impairments (blindness, deafness, mobility impairments, etc.).

We seek presentations that treat problems and solutions arising from these situations, which include, but are not limited to, efforts in Universal Design. We encourage talks that describe innovative ways to use technology to help math students with physical impairments. Large and small case studies are welcome. All talks should be scholarly in nature.

22. Modern Data Sets for the Intro Statistics Classroom and Beyond
Friday afternoon
Organizers: Sue Schou, Idaho State University; Stacey Hancock, Montana State University; and Patti Frazer Lock, St. Lawrence University
Description: The newly revised 2016 Guidelines for Assessment and Instruction in Statistics Education (GAISE) report continues to encourage the use of real data sets and active learning in statistics courses. This session focuses on recent, relevant, real data and its use in enhancing student engagement in statistics and data science classrooms at all levels. Presentations should discuss innovative use of modern, recent data, beyond those found in statistics education repositories, in teaching statistics as well as how the activity with the data enhances student learning. A wide variety of data sources are encouraged including those from health care, finance, politics, social justice, sports, etc. All presentations should provide participants with either the data set or the data source and a take away on how to incorporate its use in a statistics class.
Sponsor: SIGMAA on Statistics Education

23. PIC Math and preparing students for nonacademic careers
Saturday morning
Organizers: Suzanne Weekes, Worcester Polytechnic Institute; Michael Dorff, Brigham Young University; and Elly Farnell, Kenyon College
Description: PIC Math (Preparation for Industrial Careers in Mathematical Sciences) is an NSF-funded program of the MAA and SIAM that prepares students in mathematics and statistics to succeed in careers in nonacademic careers. The program has prepared materials and videos for a semester-long course in which students learn skills and work on research problems from industry. This session will have speakers talk about their experience in PIC Math or similar programs. Topics could include how to organize a semester course centered on solving research problems from industry, how to prepare students for nonacademic careers, how to initiate contact with local industries to get research problems, how to develop internship opportunities for students, and examples of specific research problems from industry students could work on and how they could be solved.
Sponsors: MAA BIG committee, BIG SIGMAA, and SIAM.

24. Preparing Pre-service and In-service Teachers to Support the Common Core State Standards Assessments
Friday afternoon
Organizers: Bonnie Gold, Monmouth University; Karen Morgan, New Jersey City University; and Gulden Karakok, University of Northern Colorado
Description: States are starting to implement the assessments for the Common Core State Standards for Mathematics. Many teachers feel the need for additional support to teach

mathematics in ways that adequately prepare their students for these assessments. This session seeks reports of mathematics faculty experiences with their departments' implementation of the CCSS mathematics standards with a focus on the requirements of new assessments. We invite contributed papers describing efforts, including evidence of their impact, that(a) Investigate how well their math education candidates are prepared with the knowledge and skills necessary to help their students meet the CCSS for mathematics content and practices;(b) Partner with K-12 educators to focus on the implications related to the assessments (such as PARCC and Smarter Balanced) being used;(c) Develop in-service offerings to better prepare current teachers to effectively instruct in ways consonant with the CCSS-M; or(d) Discuss changes mathematics departments have made to their programs implementing the CCSS and assessments for the mathematical education of teachers.

25. Preserving and Writing the History of Mathematics Departments
Friday morning
Organizers: Toke Knudsen, SUNY Oneonta, and Lawrence D'Antonio, Ramapo College
Description: Many mathematics departments at US colleges and universities have long and interesting histories, including the presence of notable faculty members. However, these histories are often not well known. This session intends to highlight work that has been done on local departments; in particular, for the MAA centennial, work on the sections was undertaken, which led to work being done on local departments. The presentations are meant not only to showcase the work that has been done, but also to highlight how to best proceed in order to document a department's history. As such, the session is meant to provide inspiration for researching and writing the history of mathematics departments.
Sponsor: HOM SIGMAA

26. Proofs and Mathematical Reasoning in the First Two Years of College
Thursday morning
Organizers: Dean Gooch, Santa Rosa Junior College; Chris Oehrlein, Oklahoma City Community College; and Joanne Peeples, El Paso Community College
Description: As more students begin their college education at a two-year college before transferring to a Bachelor's degree program, it is increasingly important to ensure that students choosing to major in mathematics are adequately prepared for the rigor of advanced mathematics courses. In particular, they will need to read, comprehend and write proofs. Most standard calculus sequences do not or cannot provide the needed preparation because they must serve a significantly diverse set of majors. Therefore many Bachelor degree programs in mathematics require an "Introduction to Proofs" style course that mathematics majors must take. This kind of course is not currently offered in most two-year college mathematics programs. We invite faculty from two and four-year institutions to share: 1. Introduction to Proofs and Mathematical Reasoning courses for students who have had a year of calculus and intend to take upper division mathematics courses; 2. Methods of integrating the teaching and practice of proof-writing for mathematics majors into standard first and second-year mathematics courses; or 3. Collaborative efforts

between two and four-year institutions to create or facilitate transfer of Introduction to Proof and Mathematical Reasoning courses or course equivalents.
Sponsor: MAA Committee on Two-Year Colleges

27. Research in Undergraduate Mathematics Education (RUME)
Thursday morning and afternoon
Organizers: Karen Keene, North Carolina State University, and Megan Wawro, Virginia Tech
Description: This session presents research reports on undergraduate mathematics education. The session will feature research in a number of mathematical areas including calculus, linear algebra, advanced calculus, abstract algebra, and mathematical proof. The goals of this session are to foster high quality research in undergraduate mathematics education, to disseminate well designed educational studies to the greater mathematics community, and to transform theoretical work into practical consequences in college mathematics. Examples of such types of research include rigorous and scientific studies about students' mathematical cognition and reasoning, teaching practice in inquiry-oriented mathematics classrooms, design of research-based curricular materials, and professional development of mathematics teachers, with intention to support and advance college students' mathematical thinking and activities. The presentation should report results of completed research that builds on the existing literature in mathematics education and employs contemporary educational theories of the teaching and learning of mathematics. The research should use well established or innovative methodologies (e.g., design experiment, classroom teaching experiment, and clinical interview, with rigorous analytic methods) as they pertain to the study of undergraduate mathematics education. We also welcome preliminary reports on research projects in early stages of development or execution.
Sponsor: SIGMAA RUME

28. Revitalizing Complex Analysis
Friday morning
Organizers: Russell W. Howell, Westmont College, and Paul Zorn, St. Olaf College
Description: Papers at this session should be scholarly in nature, and collectively address a wide-range of questions: What are the essential components of an undergraduate complex analysis class from mathematical and scientific standpoints? What technologies seem to be promising? What pedagogical ideas have borne fruit? What interesting projects have worked well for student investigation? In general, what innovative approaches might be suggested in teaching the subject? Presentations that include evidence of success or failure in the classroom are preferred.

29. The Scholarship of Teaching and Learning in Collegiate Mathematics
Wednesday morning and afternoon
Organizers: Jacqueline Dewar, Loyola Marymount University; Thomas Banchoff, Brown University; Curtis Bennett, Loyola Marymount University; Pam Crawford, Jacksonville University; and Edwin Herman, University of Wisconsin-Stevens Point

Description: In the scholarship of teaching and learning, faculty bring disciplinary knowledge to bear on questions of teaching and learning and systematically gather evidence to support their conclusions. Work in this area includes investigations of the effectiveness of pedagogical methods, assignments, or technology, as well as inquiries into student understanding. The goals of this session are to: (1) feature scholarly work focused on the teaching of postsecondary mathematics, (2) provide a venue for teaching mathematicians to make public their scholarly investigations into teaching/learning and (3) highlight evidence-based arguments for the value of teaching innovations or in support of new insights into student learning. Appropriate for this session are preliminary or final reports of post-secondary classroom-based investigations of teaching methods, student learning difficulties, curricular assessment, or insights into student (mis)understandings. Abstracts should have a clearly stated question that was or is under investigation and should indicate the type of evidence that has been gathered and will be presented. For example, papers might reference the following types of evidence: student work, participation or retention data, pre/post tests, interviews, surveys, think-alouds, etc.

30. Successful Implementation of Innovative Models for Developmental and General Education Mathematics
Thursday afternoon
Organizers: Christopher Oehrlein, Oklahoma City Community College; Phil Mahler, Middlesex Community College; Tom Hagedorn, The College of New Jersey; and Christina H. Lee, Oxford College of Emory University
Description: The need for basic statistical knowledge and quantitative skills for more students has put a focus on math preparation curricula in the first two-years of college. However, poor success rates in math prerequisite sequences, especially developmental mathematics, have come under national scrutiny. Because of this spotlight on introductory-level mathematics, efficient pathways to meet academic goals have been sought by many in the mathematics community and demanded by many boards and state legislatures. Presentations are invited on successful implementation of nationally known acceleration efforts, innovative curricula, co-requisite course or lab models, paired courses, mentoring programs, and support or bridge courses that are effective and efficient in getting students to and through gateway mathematics courses. The session also invites presentations on changes in developmental mathematics courses that have increased success rates in subsequent courses, such as calculus. Presentations should summarize the changes made, and include a report with specific evidence of the effect on student learning and success.
Sponsor: MAA Committee on Two-Year Colleges

31. Teaching Abstract Algebra: Topics and Techniques
Wednesday afternoon
Organizers: Kristi Meyer, Wisconsin Lutheran College, and Jessie Lenarz, St. Catherine University
Description: Abstract algebra is a core component of the mathematics curriculum. It is often one of the more theoretical courses taken by undergraduate students, making it challenging for students who are not familiar or comfortable with this level of abstraction. In this session, we invite papers and scholarly presentations which share and

discuss innovative ideas and approaches to improve the teaching and learning of abstract algebra at the undergraduate or beginning graduate level. These innovative approaches may include, but are not limited to, inquiry-based learning, mathematical writing, integration of technology, projects, and alternative methods of assessment. Reports on student outcomes and the effectiveness of the approaches presented are encouraged.

32. The Teaching and Learning of Undergraduate Ordinary Differential Equations
Friday
Organizers: Christopher S. Goodrich, Creighton Preparatory School, and Beverly H. West, Cornell University
Description: The teaching of undergraduate Ordinary Differential Equations (ODEs) provides a unique way to introduce students to the beauty and applicative power of the calculus. ODEs are also rich with aesthetically pleasing theory, which often can be successfully communicated visually and explored numerically. This session will feature talks that describe innovative teaching in the ODEs course as well as the description of either projects or pedagogy that can be used to engage students in their study of ODEs. Successful contributions could include but are not limited to:
(1) innovative ways of teaching standard topics in the ODEs course;
(2) strategies for teaching both differential equations and linear algebra simultaneously;
(3) the inclusion of technology in the ODEs course; and
(4) descriptions of applications or nonstandard topics and how such topics can lead to student engagement and interest.
In addition, contributors should include some discussion of the success of their methods, such as in what ways the activity or method under discussion has improved student learning, retention, or interest in the differential equations course.
Sponsor: The Community of Ordinary Differential Equations Educators (CODEE).

33. Trends in Undergraduate Mathematical Biology Education
Friday afternoon
Organizers: Timothy D. Comar, Benedictine University, and Daniel Hrozencik, Chicago State University
Description: Several recent reports emphasize that aspects of biological research are becoming more quantitative. Consequently, life science students, including pre-med students, should be introduced to a greater array of mathematical, statistical, and computational techniques and to the integration of mathematics and biological content at the undergraduate level. Mathematics majors also benefit from coursework at the intersection of mathematics and biology because there are interesting, approachable research problems, and mathematics students need to be trained to collaborate with scientists in other disciplines, particularly biology. Topics may include scholarly work addressing the issues related to the design of effective biomathematics course content, courses and curricula, the integration of biology into mathematics courses, student recruitment efforts, the gearing of content toward pre-med students, undergraduate research projects, effective use of technology in biomathematics courses, preparation for graduate work in biomathematics and computational biology or for medical careers, and assessment issues.

Sponsor: SIGMAA on Mathematical and Computational Biology

34. Unexpected Topics for a Math Circle
Friday morning
Organizers: Robert M. Klein, Ohio University, and Philip Yasskin, Texas A&M University
Description: While many math circle session topics have become well used and well known, presenters will share session topics that focus on areas, fields, or contexts not typical in math circles. Topics might include art, scientific applications, literature, or other surprising contexts.
Sponsor: SIGMAA MCST

35. Women in Mathematics
Saturday afternoon
Organizers: Semra Kilic-Bahi, Colby-Sawyer College; Meghan De Witt, St. Thomas Aquinas College; and Kim Roth, Juniata College
Description: As women remain underrepresented in the mathematical sciences and STEM workforce, intentional efforts need to be continued to close the gender disparity. For this session, we invite presentations that focus on: programs that target, recruit, and retain women and girls in the study of mathematical sciences; the engagement of women and girls in mathematics through extracurricular activities and outreach efforts; course materials developed specifically to emphasize the contribution of women in mathematics and STEM related fields; and effective mentoring programs that support women throughout their academic and professional experiences.

GENERAL CONTRIBUTED PAPER SESSIONS
Wednesday, Thursday, Friday, and Saturday, morning and afternoon
Organizers: Emelie Kenney, Siena College; Kimberly Presser, Shippensburg University; and Melvin Royer, Indiana Wesleyan University
Description: The MAA's General Contributed Paper Session accepts contributions in all areas of mathematics, curriculum, and pedagogy. Talks are classified as follows.
- Assessment
- History or Philosophy of Mathematics
- Interdisciplinary Topics in Mathematics
- Mathematics and Technology
- Mentoring ***CANCELLED***
- Modeling and Applications
- Outreach
- Teaching and Learning Developmental Mathematics
- Teaching and Learning Introductory Mathematics
- Teaching and Learning Calculus
- Teaching and Learning Advanced Mathematics
- Algebra
- Analysis
- Applied Mathematics

- ◦ Geometry
- ◦ Graph Theory
- ◦ Linear Algebra
- ◦ Logic and Foundations
- ◦ Number Theory
- ◦ Probability and Statistics
- ◦ Topology
- ◦ Other