California Mathematics Council Community Colleges

CMC³ NEWSLETTER

The Eighteenth Annual Recreational Mathematics Conference at Lake Tahoe

Larry Green, Lake Tahoe Community College

CMC³ will host the 18th annual Recreational Mathematics Conference on Friday and Saturday, April 25 and April 26 this year. The conference will be held in Lake Tahoe's

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MontBleu Resort Casino and Spa which is located near the lake and has all the amenities including a salon and spa, arcade, shopping area, and of course plenty of table games and slots if you are feeling lucky. This conference is unique in that all the talks are recreational in nature focusing on applications and other mysteries of mathematics.

The conference begins at 7:30 PM on Friday, April 25th with an opening get-together. Then we will learn how to mathematically untie a knot and become the rulers of the world as Thomas Mattman from CSU Chico presents the keynote for the evening. On Saturday morning, the conference resumes with two sessions filled with more amazing uses, facts, and problems from mathematics. After a lunch break, we will be inspired by William Dunham who coming all the way from Princeton University to help us explore the letters written by Sir Isaac Newton that shed light on the most exciting times in the history of mathematics. Two more sessions on recreational mathematics will follow Dunham's talk. The grand finale of the conference will be this year's student keynote presenter. If you have a student who may be interested being this year's Tahoe Student Speaker, please encourage them to apply. The committee will be reviewing the applications on March 15. Students can apply online at: http://www.cmc3.org/conference/callForStudentProposal.html.

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Conference at Tahoe
(continued from front p. 1)

This year the CMC^3 foundation will be hosting a conference Gala on Friday Night, so be prepared for tasty morsels and a chance to help raise money for community college mathematics scholarships.

Conference registration is $100 for members, $60 for adjunct instructor members, and $125 for non-members, ($95 for adjunct non-members). Registration will include a meal voucher of $15 toward any of the hotel's eating establishments. Full-time students may register for the nominal fee of $5 which does not include the lunch voucher. For more information, contact your CMC^3 campus representative or Larry Green, Tahoe Conference Program Chair, at DrLarryGreen@gmail.com. For the latest information and details about the conference and for the registration form please visit the CMC^3 website at www.cmc3.org. Please consider joining us at this one-of-a-kind conference that brings people back each year to enjoy the wonders of mathematics and the beauty of Lake Tahoe.

President's Message

Mark Harbison, Sacramento City College

Greetings from the "City of Trees". Did you know that Sacramento has trees? We do. In fact, we have so many trees that we gave ourselves this nickname before anyone else in CA could call themselves the "City of Trees". Ha ha on everyone else!

This article is a request. CMC^3 needs your help recruiting the following for a few things.

Can you recruit an organized and motivated student to give a presentation in Tahoe 2014? Each year, we honor one student who will make a 30 minute keynote presentation on the mathematical research that the student has done. The student will receive a $500 scholarship and free conference registration. Interested students can apply by filling out the online form at www.cmc3.org/conference/ callForStudentProposal.html . (Please hurry! Proposal reviews are from March 15 to 22 only.)

Please note that Proposals for regular speakers are also available. You can make the program more interesting by sharing something near and dear to your heart that involves mathematics or statistics or education at two-year colleges. It's fun to have a variety of people from all over Northern CA provide talks for our conferences.

I also want to recruit new and regular members to attend both of our conferences. Surely, all of you know someone else who can benefit, but has not attended a CMC^3 conference recently. Why not bring them with you and share a room or a meal together? There should be more to being professional colleagues than just classes, office hours and meetings on-campus. What a great opportunity it is to share time together in scenic Monterey or Tahoe (while getting some good ideas for math class at the same time)!

The CMC^3 Board meetings are always open. Feel free to visit. We meet from 9 am to about noon about once per quarter. The next meetings will be

* Sunday, Apr. 27, 2014 at the MontBleu Hotel in South Tahoe, and
* Saturday, Sept. 20, 2014 at the extension campus of Sacramento City College in Davis, CA.

We are faculty **just like you** who enjoy working to maintain a community of professionals dedicated to improving the lives of our students. Feel free to contact me anytime for more details: harbism@scc.losrios.edu or c: 916-475-9461.

Please plan on attending the Tahoe conference on April 25-26, 2014 and the Monterey conference on December 5-6, 2014. Thank you for supporting CMC^3.

Mark Your Calendar:

Tahoe Recreational Math Conference

April 25-26, 2014

MontBleu Hotel and Spa

Fall Conference

Mark Harbison, Sacramento City College
Please save these dates for the 42nd Annual Fall Conference: Dec. 5 and 6, 2014.

Also note that CMC[3] is happy to work with the Hyatt Regency Monterey Hotel and Spa again. (Recall that the Portola Hotel gave away our exhibit & keynote rooms, so we had to move.)

The Hyatt is providing the same amenities now as they had last year:

* free self-parking
* free wireless internet in all guest rooms
* free wine tasting samples at the McIntyre Tasting Room located near the Main Lobby
* an in-room safe
* an in-room mini-refrigerator
* six tennis courts
* two swimming pools and two jacuzzi's
* the best-rated sports bar in Monterey county
* outdoor games like ping pong, shuffleboard and foosball.
* preferred tee times for the oldest-running golf course west of the Mississippi.

And in addition to these benefits, they are also now providing free transportation with a **shuttle** dedicated exclusively to CMC[3] guests. A 24-person van will run from the Hyatt to the downtown area of Monterey for 4 hours each night (starting at 9 pm on Friday and at 6 pm on Saturday). Meet at the south entrance of the Conference Center (upper level). We expect it will take no more than 20 minutes to wait for a ride for those who did not want to get a taxi or pay for parking downtown.

Please publicize this new service. About 40% of the 2013 Fall conference attendees expressed disappointment that the new location was so far from their favorite downtown restaurants, shops and wharf. It would be very sad if all of them gave up on CMC[3] without knowing how convenient it is now to get downtown and back safely after dinner, dancing, etc. Please give the shuttle a try.

You can count on CMC[3] enjoying the Hyatt at least until (including) 2017.
Please see http://cmc3.org/conference/future.html for future conference dates.

Brain Strain

Joe Conrad, Solano Community College

As you are probably aware, I was recently elected to have the privilege of being your president-elect for the next two years. With this new responsibility, I will be leaving my long-time position of editing the Brain Strain column. I looked over my files and found that the first problem that I submitted was in 1997. While there were a couple of years that the column did not appear and there were a couple when Dick Basinger assisted, I have been doing this for a long time and I think my problem bucket is about empty. I have enjoyed doing this and getting to know some of our good problem solvers and I look forward to serving you the next several years in the presidential progression. I also reach out to the problem solvers to invite you to consider continuing the column as editor. Please contact me or Jay Lehmann if you are interested.

Since I can't leave you without a problem, I will come full circle and repeat the first problem which appeared in fall of 1997: Prove that if $p(x)$ is a positive polynomial, i.e. $p(x) > 0$ for all x, then the polynomial formed by adding $p(x)$ and all its derivatives is also a positive polynomial. Enjoy!

The problem from the last issue was to prove that if a, b, c are odd integers, then the roots of $ax^2 + bx + c = 0$ cannot be rational. Solutions were received from Jim Mailhot, Kevin Olwell, Fred Teti and Paul Cripe. Some solutions used modular arithmetic, but Kevin's was short and sweet without it, so here is his proof: Suppose there is a rational root which in lowest terms is m/n. If we substitute it into the equation and clear the denominators, we get:

$$am^2 + bmn + cn^2 = 0.$$

Since m/n was in lowest terms, m and n can't both be even. If both are odd, then all three terms in the equation are odd and if just one is odd, then two terms in the equation are even and one is odd. In either case, the left side of the equation is odd and the right is even which, of course, can't happen, so no rational root can exist.

Thanks for all your participation over the years!

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Election Results

Mark Harbison, Sacramento City College

An election was held for CMC^3 officers in Fall, 2013 for two-year terms (Jan. 2014 to Dec. 2015). Paper ballots were counted by last year's past-president, Barbara Illowsky, and verified by the CMC^3 Foundation President, Debbie Van Sickle. The results are:

President-elect: Joseph Conrad
Treasurer: Rebecca Fouquette
Secretary: Tracey Jackson
At-large: Katia Fuchs
At-large: Dean Gooch
At-large: Steve Blasberg
At-large: Greg Daubenmire

Note that other board members are appointed (not elected), in accordance with the CMC^3 By-Laws and Constitution. http://cmc3.org/news/CMC3BylawsAndConstitutionApproved.pdf

Thank you to all CMC^3 members who voted. Democracy is good.

First Annual CMC³ Foundation

2014 Gala Reception

Friday, April 25 9:00 p.m.*
MontBleu Resort Casino and Spa

great food, alcoholic and
non-alcoholic beverages,
and desserts

$15 suggested donation

all proceeds to benefit the Foundation Scholarship Program

* after the keynote speaker, room to be announced

What's Happening at Fresno City College

Brett Herren

Five years ago Fresno City College received a large STEM grant from the US Department of Education for 2008-2011. We invested in the following: counseling, peer and faculty mentoring, tutoring, supplemental instruction, and the purchase of new equipment. The results during the period for the Math/Science/Engineering division included a 74% rise in AS degrees awarded and a 37% climb in the number of transfers to 4 year institutions.

Three of our faculty members have been involved with the Central California Community Colleges Committed to Change (C-6) consortium. These faculty have written curriculum and assisted in the development of programs which aim to bridge the gap created by the lack of basic skills (math and English) for many of our students.

Fresno City College has one of the highest populations of low-income students in the state. Therefore, we are involved with several programs designed to assist and inspire these students. For the past 9 years, the math department has been part of the "Bridge" program, which is a learning community for emancipated former foster youth. In addition, for the past 4 years, the department has been a part of the "Network Scholars" – a learning community for first generation, first semester college students who test in to developmental math and English courses. Finally, for the past 2 years, we have taught classes for the "Camino Learning Community" – a cohort with the goal of increasing success and pass rates of incoming Latino students.

Over the past 3 years Fresno City College has had 4 full time math instructors retire, and we have been able to replace all 4 positions with new full time instructors. We are a large department, and have remained steady for the last 7 years at 22 full time faculty.

Promoting Success in Algebra

Rosemarie Bezerra-Nader, Fresno City College

A pre algebra class at Fresno City College (FCC) is significantly increasing success rates in introductory algebra. A recent 5- year study of 9,418 students indicated those who successfully completed the FCC pre algebra class averaged a 75% passing rate when they took introductory algebra; this rate is 25% higher than it is for other algebra students.

The five limited topics in this class are usually found evenly distributed within a traditional algebra class. These topics are: equations, inequalities, word problems, factoring, and graphing. (The word problems emphasize direct translations and rates.) Direct connections are made to arithmetic so students realize concepts are the same even though they look different in algebra. Many instructors emphasize the idea that math is a language as they draw overt parallels between the structure of math and other languages.

The content of FCC's pre algebra class provides students with a "refuge of familiarity." This familiarity has reduced the common feeling that beginning algebra is a nonstop bombardment of seemingly endless amounts of material that are unrelated to other topics in algebra, to other subjects, and to life itself.

The two textbooks used are *The Bridge Between Arithmetic and Algebra* published by Kendall Hunt Publishing and *Integrated Arithmetic and Basic Algebra* published by Pearson Publishing.

FCC's pre algebra curriculum content and the subsequent success rates in introductory algebra have been consistent since the course began about 15 years ago as a single special studies class.

For more information email:
rosemarie.bezerra-nader@fresnocitycollege.edu
phone: (559) 442-4600, ext. 8410

What's Happening at Mendocino College

Leslie Banta

The math department at Mendocino College has successfully enhanced and grown its program considerably over the past two years. As a relatively small school with only 5 full time faculty members, we have been able to increase offerings of transfer level math courses at our main campus and have also seen an increase in courses offered at our two rural satellite campuses. As a result, we plan to add two full time faculty members - one for the main campus and one for our smaller centers - in the coming year.

This year, Mendocino College welcomed Arturo Reyes as our new Superintendent/ President. Reyes recently asked one of our full time faculty members to attend a conference for Hispanic Serving Institutions (HIS) to hear about issues of equity and best practices in effective instruction. Our math department faculty members work closely with the College

Assistance Migrant Program (CAMP) and MESA program to offer guidance and support for our students, tutors, and workshop leaders. We expect that the ideas acquired at the conference will lead to additional support services and

approaches that will be beneficial for all of our students.

As part of our department's commitment to restructuring developmental math courses, we have asked one full time faculty member to review these classes. Jason Edington is currently focusing on

ways that we might improve persistence rates in our developmental math program and will be attending the National Summit on Developmental Mathematics prior to the AMATYC conference. Like many community colleges, we see a large percentage of our students enrolling in remedial courses and spending a good deal of time trying to get to a transfer level course. Attending the HSI conference resulted in additional insight regarding the design and benefits of accelerated courses. As you may know, accelerated courses shorten the sequence of the math curriculum, reduce opportunities for students to drop out of the sequence, are a more cost-effective pathway than the traditional developmental sequence, and offer students additional support. At Mendocino College we are considering an Algebra for Statistics course that would shorten the sequence for remedial students planning to take Statistics. We are also considering a combined Basic Math/Pre-Algebra course and a combined Elementary/Intermediate Algebra course. As a smaller college, part of the challenge of implementing these courses is the

ability to offer them alongside the traditional sequence for STEM majors.

Esteemed Math Professor Deborah White hosts a weekly math contest for our students. The competition features reasoning activities and she offers a small prize to the winners. Her contests are highly anticipated by a number of students and are often under discussion in our MESA and Learning Centers. Contest problems can be found at http://faculty.mendocino.edu/Home/dwhite/default.aspx. In addition, White volunteers as a coach with a local middle school math team.

Mendocino College hosts the American Mathematics Contest (8/10/12) series of math competitions for local students in middle and high school. Leslie Banta organizes the competitions and regularly meets with local math teachers of grades eight through twelve to promote our programs. She also serves as the North Coast Beginning Teachers Program (BTSA) support provider for area high school math teachers. Upcoming activities include facilitating Strengthening Mathematics Instruction workshops for teachers of Algebra I and higher level math courses, and accompanying Eisenhower Fellowship students as they present their work in Washington, D.C.

Our faculty is involved in outreach programs for high school students with recent activities that include a summer Adelante program which served over 80 migrant students, an after school tutoring/college success bridge program at a local high school with approximately 50 migrant students who plan to attend Mendocino College, and Math Institutes in both summer and winter which serve over 100 students (from both college and high school).

At Mendocino College, we are fortunate to have full time math faculty who are involved in several aspects of college leadership and

What's Happening at Monterey Peninsula College

Lynn Iwamoto

The Monterey Peninsula College math department has been blessed with new hires and remodeled offices and classrooms. The first happening was the inclusion of the math department into the Business and Computer Science building. This gave the Math Learning Center a new space with lots of whiteboard space, computer room, large tutoring area and two smaller private areas. The remodel of that building also gave the department three much needed classrooms, two offices, and one workroom.

The second happening is the hiring of four new faculty members in the last two academic years: John Cristobal, Joel Pickering, Luke Spence, and Andy Washburn. Three positions were replacement positions for three retirees and the fourth was an amazing new position. The three retirements were Robert Donovan, Gail Bartow, and Ed Migliore, PhD. We are now a department of 11 full-time faculty and 19 part-time faculty. As the financial picture improves, we are hoping to continue to increase our numbers of full-time faculty.

The last happening was the year-long remodel of the Physical Sciences Building, which houses astronomy, chemistry, earth sciences, engineering, mathematics, and physics. The building was gutted down to the studs. Essentially, we moved into a new building with reconfigured office spaces, classrooms, labs, and storage at the end of this summer. Each classroom is now fitted with up-to-date technology such as computers and document cameras. As the division is slowly getting settled during the busy fall semester, the math department is providing a variety of instructional styles to 59 sections of math. Fifty-two sections are on-ground sections where 46 are taught on the Monterey campus and 6 are offered at the Marina Educational Center. We offer 3 online courses and 4 online review/prep courses.

The Common Core Standards, BOARS, and Community College Mathematics Curriculum

*Katia Fuchs, City College of San Francisco
and Larry Green, Lake Tahoe Community College*

There has been a lot of concern throughout our community college mathematics departments about the fact that the California K-12 system has implemented the common core standards which constitute a major change to the curriculum in mathematics taught at our public elementary, middle, and high schools. Since most of our students take math courses that are at a level just below or far below transfer level, will we be expected to similarly completely redesign our courses to match the common core standards?

The CMC[3] board decided to take the lead and gather information about this by attending workshops on this topic and contacting the chair of the University of California Board of Admissions & Relations with Schools (BOARS), which is the group in charge of policy decisions regarding transfer from California Community Colleges to the UCs. We came out of this fact-finding mission better informed and more confident that an opportunity is opening up for mathematics departments to find ways to help our students move successfully through their mathematics journey.

In case you are not familiar with the common core standards, they are the national curriculum that most states have adopted. In mathematics, the list of topics has been dramatically shortened from what the past state standards were. A resource that provides a detailed list can be found at: http://www.corestandards.org/Math. The philosophy of the common core is that mathematics should focus more on critical thinking than getting through a list of topics that is so long that students end up having only an inch deep understanding of the underlying concepts.

George Johnson, the chair of BOARS, has made it clear that if we are happy with the curriculum that we currently use for our intermediate algebra classes then our current intermediate algebra course will still serve as an acceptable prerequisite for our transfer level mathematics classes. On the other hand, if a community college mathematics department decides that the common core equivalent intermediate algebra course is better for their local population of students then that college can adopt the new standards course and it will be acceptable as the prerequisite for transfer level mathematics courses. The main point that he wants to get across is that either option is fine with BOARS and that the decision is a local one. He does want to encourage us all to at least look at the common core intermediate algebra course curriculum so that we can make an informed decision on how to best serve our students. He also emphasized that intermediate algebra, whether the older course or the new common core course, will be the only course that BOARS will need listed as a prerequisite for transfer level math courses. If our trusted curriculum committees approve the intermediate algebra course, then BOARS will honor their decision. They will not delve deeper into lower courses such as pre-algebra or beginning algebra. BOARS will also honor any common core intermediate algebra course taken and passed with a "C" or higher at a high school as acceptable for satisfying the transfer level mathematics prerequisite.

As part of the exploration of this topic, CMC[3] sent a representative to the "Conversations about Acceleration III: Mathematics and Design: workshop hosted by El Camino College and Acceleration in Context (AIC). We learned that, in addition to BOARS leaving the decision about Intermediate Algebra curriculum in the hands of

the community college, they are also emphasizing that, thus far, determining equivalence to Intermediate Algebra remains at the discretion of local curriculum committees. This issue is relevant to the discussion on alternative and accelerated pathways to statistics. BOARS is supportive of alternative pathways to statistics, but does have concerns about the way it has been implemented. Although BOARS has not yet made any formal agreements to accept these alternatives, they are planning to review several of the alternative statistics this spring and hope to identify at least one that is transferrable that we can use as a model. CMC[3] will continue to stay abreast of developments regarding accelerated and alternative pathways. While CMC[3] has taken no position either for or against these pathways, we continue to serve as information-gatherers and encourage discussion among our members!

While our recent communications with BOARS leave us reassured that implementation of the common core standards into our Intermediate Algebra Curriculum remains at the discretion of local colleges, there are still many unanswered questions. California has passed a law to adopt a common statewide community college assessment for mathematics, but will that assessment be based on the current curriculum or on the common core standards? When will there be common core oriented textbooks and software available for adult college students? How will community college mathematics faculty find professional development opportunities that will teach us best practices for teaching the common core mathematics curriculum to our students? Stay tuned! CMC[3] will be continuing to inform its members as information and opportunities appear.

Remembering Pat Boyle (1935-2013)

Michael Eurgubian, Santa Rosa Junior College

Pat Boyle, one of CMC[3]'s founding members and long time colleague and friend to many of us, passed away peacefully on December 26, 2013. Pat was born in Sioux City, Iowa in 1935 and grew up in the Bay Area. He graduated in 1953 from Bellarmine College Preparatory in San Jose, CA where he met Theresa Cirner who would be the love of his life. After high school, Pat joined the army and served in Germany where he was joined with Theresa and married in 1956. After his service to our country, Pat graduated from San Jose State University in 1960. He went on to earn his M.A. from Bowling Green State University in 1969.

Pat taught at numerous locations in the South Bay: James Lick High School (1960-68), Piedmont Hills High School (1968-71), San Jose City College (1963-71), and University of Santa Clara (1967). In 1971 he relocated his family to Sebastopol, CA when he joined the Mathematics Department at Santa Rosa Junior College. He taught at Santa Rosa Junior college until his retirement in 2000.

Beyond his long commitment to CMC[3], serving as one of our first presidents, Pat was active in Sonoma County Mathematics Council (SCMC), Santa Clara Valley Mathematics Association (SCVMA), National Council of Teachers of Mathematics (NCTM), and the Santa Clara County Joint Council of Science and Mathematics. He was a well known and beloved speaker, contributing to countless mathematics education conferences.

Pat was a published author with Brooks/Cole Publishing Co., Harper & Row, and Creative Publications, producing numerous creative math publications as well as a series of math text books with his longtime friend and colleague, Karl Smith.

Intermediate Algebra: Articulation, BOARS, and the Common Core State Standards

Wade Ellis, Jr., West Valley College (retired)

The articulation agreements between California community colleges and Californian public universities with regard to intermediate algebra are producing confusion and anxiety among community college mathematics faculty. There are at least three reasons:

1. The Statway program of the Carnegie Foundation for the Advancement of Teaching is designed to provide students with an opportunity to complete lower division mathematics requirements (including the requirement for intermediate algebra) of California public universities in one academic year. Community college faculty members here in California are developing several similar mathematics courses. The California universities and the California community colleges are in the process of creating articulation agreements for these courses.
2. The University of California Board of Admissions & Relations with Schools (BOARS) is involved in this articulation process and is also addressing the implications of the statewide adoption of the Common Core State Standards for Mathematics (CCSSM) that includes the CCSSM Practices (pursuant to SB X5 1) by the California State Board of Education (SBE) .
3. There is ongoing work by California community college mathematics faculty to create, test and adopt courses intended to improve student performance and

success in developmental mathematics courses, especially intermediate algebra. The intermediate algebra portions of these courses are in the ongoing articulation process between the California community colleges and California public universities.

The good news is that BOARS appears to have decided that the current community college intermediate algebra course is acceptable for transfer students in September 2014 and will be so for the foreseeable future. Also, Statway has been approved by the California State University System and has strong support at the University of California System. The more nuanced news is that BOARS may believe that the CCSSM will impact the mathematics requirements of the University of California System; and, therefore, may "allow" (but not require) new types of intermediate algebra courses that are more closely aligned with the CCSSM's content standards that have somewhat less content than the current articulated community college intermediate algebra courses.

These new "allowable" courses will have to have some triangle trigonometry content but little or no conic section or logarithm content. It is not clear what part of or at what depth the CCSSM Practices should be reflected in such courses. Although geometry is part of the middle school and high school CCSSM, our students will not be required to take a geometry course at community colleges if they have successfully passed such a course in high school.

The transfer requirements of our students can be satisfied in several ways with diminished emphasis on some topics in intermediate algebra. The question is what are the intellectual needs of our students in mathematics if they are to be community college graduates or graduates of our illustrious university systems? What are these intellectual requirements in the 21st century, how can we provide learning environments where they can be met, and how can we insure that they have been met?

The following article was originally printed in the ASCCC Rostrum, June 2013.

Alternatives to Traditional Intermediate Algebra
Guest Opinion by Ian Walton

Ian received a Ph.D. in mathematics from U.C. Santa Cruz and then taught mathematics at Mission College for thirty- three years. He was ASCCC President when the associate degree graduation competency was increased to Intermediate Algebra in 2006. He was a member of the ICAS Subcommittee that wrote the 2010 Mathematics Competencies document.

In the December 2012 Rostrum, ASCCC Executive Committee members Beth Smith and Phil Smith (no relation) wrote about issues raised by Fall 2012 Plenary Session resolutions regarding specific developmental mathematics projects. In this article I explore additional related issues and argue that the current University of California (UC) and California State University (CSU) practice regarding Intermediate Algebra as a prerequisite for transfer level mathematics courses is anomalous, and prevents students from taking alternative preparation courses that could be beneficial for the many who do not intend to be STEM (Science, Technology, Engineering, Mathematics) majors. One solution would be to agree that the transfer status of a mathematics course is determined solely by the level and content of that course and not by any prerequisite. A better solution would be for the academic senates of UC, CSU and the Community Colleges to create a process whereby alternative courses can be examined and approved as acceptable prerequisites for transfer level mathematics courses.

Background

Currently four distinct conversation strands exist regarding mathematical preparation, all with different premises and conclusions, but in some way converging on Intermediate Algebra.

Strand 1 – Common Core

Common Core is a national K-12 conversation but has the potential for significant impact on higher education in general and the community colleges in particular. Several years ago, projects such as Achieve and the American Diploma Project asked the question "what mathematics skills are necessary in order for K-12 graduates to achieve success in higher education or in 'high-skill, high-wage' occupations." The summary answer was that both colleges and employers felt that "intermediate algebra" was necessary. The subsequent powerful national political coalition of Common Core has since moved to implement this answer. But three significant problems with this brief conclusion can be summarized as follows:

a. A close reading of the Common Core standards reveals a careful description of broader mathematical practices and critical thinking with the level and rigor of intermediate algebra but a more diverse content base. Incorrectly narrow summary interpretations of the standards seem to claim that Common Core validates the traditional (300-year-old) intermediate algebra topic list in its entirety[2].

b. Despite curriculum descriptions in Common Core, we do not yet know how the changes will actually impact K-12 practice until the assessment instruments are complete. Three independent implementations of testing are currently under development [Smarter Balanced, PARCC (Partnership for Assessment of Readiness of College and Careers) and GED (General Educational Development Testing)]. They each seem to be encountering practical difficulties in

testing wider mathematical thinking versus rote learning[3].

c. Common Core documentation also involves a statistical research problem. The methodology section of the 2004 American Diploma Project foundational paper *Ready or Not* includes the statement "the ETS study found that 84% of those who currently hold highly paid professional jobs had taken Algebra II." The paper does not provide any additional evidence that the specific topics contained in Algebra II are what led to that success – correlation without causation. In all likelihood the success stories had taken traditional intermediate algebra because they had not been offered any alternative.

Strand 2 – California Community College Associate Degree Requirements

The 2006 Title 5 regulations on associate degrees call for "a mathematics course at the level of the course typically known as Intermediate Algebra (either Intermediate Algebra or another mathematics course at the same level, with the same rigor and with Elementary Algebra as a prerequisite, approved locally)." This language was deliberately designed to make it clear that courses with content different from the traditional topic list are acceptable. Indeed the Academic Senate, in seeking to pass those regulations, promised the Board of Governors that it would actively promote and support alternative courses in California colleges. Much of the Basic Skills Initiative attempted to implement the concept that alternatives were not only acceptable but desirable. The regulations also contained language that permitted the local curriculum committee to approve courses taught by departments other than the math department in order to meet the graduation competency.

Strand 3 – Alternative Pathways

A variety of state and national projects are currently seeking to improve the student success rate for the mathematics basic skills pipeline. These projects encourage students to succeed in transfer level mathematics courses by utilizing a non-traditional preparation pathway (Carnegie, Quantway, Statway, Statpath and a variety of accelerated prerequisite courses). One of these projects was the subject of the Fall 2012 Plenary Session resolutions. In particular, several projects and colleges have evidence demonstrating that students can succeed in the traditional transfer level general statistics course without mastering all the topics of a traditional intermediate algebra course[4]. Moreover, if one were to use content review to validate a prerequisite of intermediate algebra for statistics, many of those traditional algebra topics would never be identified as necessary for success in statistics. Undoubtedly some of those "unnecessary" topics are useful for general mathematical maturity, but there are significant questions about the validity of the prerequisite and the way it is currently used by UC and CSU.

Strand 4 – UC and CSU Entrance Requirements

UC and CSU policy – in particular CSU Executive Order 1065 (formerly 1033), which contains the language "courses in subarea B4 shall have an explicit intermediate algebra prerequisite" is being used for a purpose different than success in the subsequent mathematics course. Prior to Executive Order 1033, language allowed campus discretion for alternative courses but that language was eliminated in 2008. The effect of current policy is that students intending to transfer to CSU or UC cannot participate in any of the alternative courses with the same level and rigor as intermediate algebra, but different content – either those described in Strand 2 that were deliberately created by the community colleges for their new graduation

requirements or in projects such as those described in Strand 3 that demonstrate successful preparation for transfer courses.

Conclusions for the Academic Senate and the California Mathematics Council, Community Colleges

The wide range of conversations demonstrates that a strong case can be made for the exploration and implementation of alternative preparations for transfer level math courses that differ from the content of the traditional intermediate algebra course. The Academic Senate should be leading the policy area of this exploration and the California Mathematics Council, Community Colleges (CMC[3]) should be leading the discussion of suitable alternative course content.

Some of the reasons that lead to this conclusion are as follows:

- We certainly cannot argue that the current structure works well. The failure rate of students in the developmental math pipeline should be unacceptable to everyone;

- At present any exploration of alternatives is effectively blocked by UC and CSU General Education Breadth transfer policy. This situation amounts to the use of intermediate algebra as an entrance filter to four year university rather than as a validated prerequisite;

- This blockage has been amply demonstrated by colleges that created alternative courses to satisfy the graduation requirement (such as non-transfer liberal arts math or vocational embedded algebra) only to see them cancelled due to low enrollment because students did not want to rule out the possibility of future enrollment in a transfer level math class;

- Discussion at the Academic Senate Fall 2012 Plenary Session indicated clear interest in determining the viability of alternatives. Unfortunately the specific resolutions seemed to call for endorsement of one specific approach which is not an appropriate action for the Senate;

- Almost simultaneously, in the Academic Senate's C-ID public vetting process for the general statistics course, an unusually high number (over thirty) of respondents requested an alternative prerequisite. These requests could not be accommodated because of the CSU/UC regulations described in Strand 4;

- In a December 2012 breakout at the CMC[3] North conference in Monterey, attendees were surveyed regarding the necessity of traditional intermediate algebra topics for success in three areas: STEM major, 4 year non-STEM major, high-skill, high-wage, non 4 year (results available on request)[5]. A large number of participating math instructors identified many of the traditional algebra topics as unnecessary for the latter two categories of students and then identified several alternative topics that would be more useful - largely from geometry, trigonometry, logic or statistics. It would be valuable if CMC[3] were to conduct a similar survey on a larger scale. At present community colleges cannot successfully offer such an alternative content course because of the CSU/UC regulations described in Strand 4;

- The Academic Senate has an inescapable moral and professional commitment to facilitate alternatives given the very public pledges that it made during the adoption of the new associate degree graduation competencies.

Recommendations

The California Mathematics Council, Community Colleges (CMC[3]) should conduct

The following poem was written by Diana Pugliaresi,
who is an English major at College of San Mateo.

THE ZAX AND HIS MATH.

LET ME TELL A STORY
OF A BOY AND HIS MATH.
HE WANTED TO BE GOOD,
EVEN WHEN IN THE BATH.

THE SIGNS AND NUMBERS
HE DIDN'T KNOW WHAT TO DO.
SO HE STARED AND HE STARED
UNTIL HIS FACE HAD TURNED BLUE.

HE ASKED HIS MOM,
HE ASKED HIS DAD.
THEY BOTH IGNORED HIM
OR THEY GOT MAD.

STARING AT HIS MATH WORK
ORDER OF OPERATIONS WAS THE TASK,
VERY DIFFICULT IT SEEMS
BUT WHOM SHOULD HE ASK?

"PARENTHESIS COMES FIRST."
COMMENTED THE ZAX.
THE BOY JUMPED FROM HIS SEAT,
HIGHEST TO THE MAX.

"OH DEAR BOY, I AM VERY SORRY,
I DID NOT MEAN TO FRIGHT.
I WANTED YOU TO SEE SOMETHING,
THAT MATH IS IN YOUR SIGHT.

MATH HOMEWORK!!!

From the inside out
That's how it should be.
Parentheses are always first
You should remember easily.

Exponents is multiplication,
Just a different style,
Times the base by itself,
Which you may for a while.

You'll multiply next
And order doesn't matter.
One times two or two times one,
The first equals the latter.

Division is after,
The opposite of multiply.
Split stuff into equal parts,
Like sharing a piece of pi.

From left to right
Do which ever comes first.
Times or divide,
This should be rehearsed.

Adding is next,
Like two plus two.
It's just counting,
Isn't it easy to do?

Parentheses
$()$

Exponents
x^2
$= x \cdot x$

Multiply
$= 1 \cdot 2$
$= 2 \cdot 1$

Divide
$3.14 \div 1 = 3.14$

Add
$2 + 2 = ?$

Subtraction is opposite,
With numbers that'll decline.
Less and less you'll have,
Like 3 from 12 is 9.

Subtract
12 - 3 = 9

Remember left to right
Do whichever comes first.
Add or subtract
Should also be rehearsed.

Math is fun
As you can see,
With directions
Followed easily."

The Zax finished his speech,
Then stood straight and tall,
"The order of operations,
Is finished, that is all."

The boy just stood and stared,
And a small smile appeared.
For he realized that math
Was nothing to fear.

And now that the numbers
Fill your big head,
It is time for you
To get to bed!

By: Diana Pugliaresi

Through the History Glass

J. B. Thoo, Yuba College, `jthoo@yccd.edu`

Berlinghoff and Gouvêa [1, p. 81] tell us that "Columbus discovered America more than two centuries before negatives [negative numbers] joined the society of numbers. They didn't become first-class citizens until the middle of the 19th century, about the time of the American Civil War." This is not to say that mathematicians did not know how to operate with negative numbers before then. Negative numbers were used in calculations before the 19th century, but mathematicians did not understand what they could mean in and of themselves; hence, negative answers to problems were not accepted.

When numbers were invented to count objects, it stood to reason that numbers were nonnegative; after all, what would it mean to have fewer than than zero objects? The ancient Greeks even distinguished between a counting number (discrete) and a magnitude (continuous), and even thought of line segments, areas, and volumes as different kinds of magnitudes. The Indians and Chinese, on the other hand, apparently had no trouble with the notion of negative numbers. The Indian mathematician Brahmagupta (598–670), for example, associated positive numbers with assets and negative numbers with debts [1].

The oldest known Chinese mathematics text is *Jiu zhang suan shu* or *Nine Chapters on Mathematical Procedures* by an unknown author that is believed to have been written during the late Qin (221–206 BC) or early Han (206 BC–AD 200) Dynasty. Unfortunately, there is no extant copy of the *Nine Chapters*; all that has survived is a compilation by Zhang Cang and Geng Shouchang (first century BC), to which was added an excellent commentary by Liu Hui (third century AD). According to Burton [2, p. 258], here we find negative numbers first used to carry out computations using Chinese rod numerals on a counting board. Black rods represent positive numbers and red rods represent negative numbers, and a vacant space on the counting board represents zero in that place value. Thus, for example,

$$\equiv \ \text{III} \qquad \overline{\text{IIII}} \qquad \text{is 4309}$$

and

$$\equiv \ \text{III} \qquad \overline{\text{IIII}} \qquad \text{is } -4309.$$

Oddly, even though Arabic mathematicians of the eighth century were instrumental in transmitting Indian mathematics to Europe at that time, including the Indian-Arabic number system that we use today, Arabic mathematicians such as the prominent al-Khwārizmī (ca. 780–850) did not consider negative numbers in their work. (Remember that the Indians routinely used negative numbers, treating them as debts.) This may have stemmed from their following the ancient Greek tradition of justifying their results geometrically. Take al-Khwārizmī's seminal work, *al-jabr wa'l muqābala*, from which was derived the word *algebra*, for instance. In it al-Khwārizmī instructs his readers how to solve quadratic equations. However, whereas we have one formula to solve $ax^2 + bx + c = 0$, where a, b, and c may be any real numbers, al-Khwārizmī considers five different cases so that a, b, and c are not negative [3], and provides a seemingly different formula to solve each case, each with its own geometric justification. Al-Khwārizmī describes the "different" quadratic equations as

- squares equal to roots ($ax^2 = bx$);
- squares equal to numbers ($ax^2 = c$);
- squares and roots equal to numbers ($ax^2 + bx = c$);
- squares and numbers equal to roots ($ax^2 + c = bx$);
- roots and numbers equal to squares ($bx + c = ax^2$).

Several centuries later, Cardano (1501–1576), in his monumental work, *Ars magna* [4], in which he explains how to solve cubic equations, painstakingly avoids negative numbers as well. Thus, instead of providing one formula to solve $ax^3 + bx^2 + cx + d = 0$, Cardano considers thirteen different cases so that a, b, c, and d are not negative. Even Rene Descartes (1596–1650), in studying equations, would refer to positive solutions as "true" solutions and negative solutions as "false"; see [5], for example. It would be a few more centuries still before negative numbers would be fully accepted.

What finally turned the tide toward the full acceptance of negative numbers was the development of *abstract* algebra, beginning with Gauss, Galois, and Abel in the 19th century, that freed mathematicians from the "real" meaning of numbers [1].

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Previous columns are on the Web at `<http://ms.yccd.edu/history-glass.aspx>`.

References

[1] William P. Berlinghoff and Fernando Q. Gouvêa, *Math through the Ages: A Gentle History for Teachers and Others*, Oxton House Publishers, LLC, Farmington (2002).

[2] David M. Burton, *The History of Mathematics: An Introduction*, 7th ed., McGraw-Hill, New York (2011).

[3] J. Lennart Bergren, "Mathematics in medieval Islam." In Victor J. Katz, editor, *The Mathematics of Egypt, Mesopotamia, China, India, and Islam: A Sourcebook*, Princeton University Press, Princeton (2007).

[4] Girolamo Cardano, *The Rules of Algebra (Ars magna)*, translated and edited by T. Richard Witmer, Dover Publications, Inc., Mineola (2007).

[5] Rene Descartes, *The Geometry of Rene Descartes*, Cosimo Classics [Science], Cosimo, Inc., New York (2007).

Mendocino College
(continued from p. 9)

shared governance. Deborah White was the first President of the Mendocino College Federation of Teachers (MCFT); Roger Ahders serves on MCFT's executive committee; Jason Edington serves on the Academic Senate and will be attending the plenary session; and Aeron Ives is part of the Student Learning Outcome team and the advisor for the student Chess/Scrabble club. We have two faculty members attending this year's AMATYC conference, a current and a former Project ACCESS fellow (Banta and Edington).

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Pat Boyle
(continued from p. 11)

He penned many articles over his years in the profession and published in School Science and Mathematics and the Bulletin of the California Mathematics Council.

In addition to his love of education, Pat loved travel, trains, wine, baseball, and spending time with his family. He built and ran HO model trains and was active in many model railroading associations. Pat is survived by his wife of 58 years, Theresa, five children, twelve grandchildren, and four great grandchildren.

Pat has enriched the lives of thousands of students at all levels over many generations. He was a friend, inspiration, and mentor not just to his colleagues at Santa Rosa Junior College, but countless others in the mathematics education community. Pat most recently served CMC³ by participating in the oral history project video, in which he reminisced with other luminaries on the founding and early days of our organization.

Watch a video with Pat and CMC's other co-founders discussing our organization's beginnings at http://cmc3.org/resource.html .

CMC³ Foundation Report

Debbie Van Sickle, Foundation President,
Sacramento City College

Scholarships

During the 2012-2013 year the CMC³ Foundation awarded a total of $ 5,600 in scholarships to students attending 14 of our member colleges. The names of the students, chosen by the faculty at each college based on guidelines we provided, can be found in last summer's edition of the CMC³ newsletter. We also awarded $500 to the winner of our Tahoe student speaker competition and a total of $100 to the winners of our Monterey Poster Session (Thanks to generous gifts from Debra Landre and an anonymous donor.)

For the 2013-2014 year we will be making major changes to our scholarship program. Starting this year, every math student at our member colleges will be eligible to compete for one of our scholarships. In the past, awards were made to students at only a fraction of our colleges on a four year rotating basis. Under the old program the most talented students were often out of luck if the year they would have been eligible to win an award did not happen to fall in a year we gave a scholarship to a student at that particular college. From now on all CMC³ faculty members will be able to nominate every highly qualified student attending their college. Each year we will choose the best of these students to be awarded a $3000, $2000, or $1000 scholarship. In the coming weeks we will be sending out an email to the entire membership (remember that all members of CMC³ are automatically members of the CMC³ Foundation) providing details regarding eligibility and including everything needed for a CMC³ member to nominate students for one of our awards.

Fundraising

CMC³ scholarships are only made possible because of the generosity of our members, our vendors and other contributors.

I am happy to announce a new addition to our fundraising efforts for 2014. Our first annual Gala Reception will be held after the Friday night keynote speaker at the Tahoe conference. See our flyer elsewhere in the newsletter for details.

This year at the Monterey conference we raised a total of $2,800 with about $400 coming from direct donations, $1000 from merchandise sales, and $1400 from the sale of raffle tickets. Our raffle is successful because of generous prize donations from our vendors (including Pearson, Cengage and XYZ) and from our members and friends.

The CMC³ Foundation is a nonprofit charitable organization under section 501(c)3 of the Internal Revenue Code. Contributions are tax deductible to the extent allowable under federal law (as long as no goods or services are provided in exchange for the donation). Our Tax Identification Number is 94-3227552. Cash donations can be made in three ways:

- At the time you register for either conference (There is a box to check on the registration form. Please use a separate check, but mail it in the same envelope as your registration form.)
- In person at one of our conferences
- By mailing a check to our treasurer Rebecca Fouquette at Email me at 595 Gettysburg Dr, San Jose CA, 95123.

The CMC³ Foundation Board of Directors

I would like to thank and say a sad good bye to the members of the CMC³ Foundation Board of Directors who finished their terms of office at the end of 2013. A huge thank you to Barbara Illowsky (De Anza College, past president of CMC³), Hsiao Wang (Sacramento City College), and Bic Ha Dovan (Santa Rosa Junior College) for

all their hard work and dedication over the last two years. This year they ran the Monterey Conference without me so that I could be with my family in Southern California after the birth of my grandson a few days before the conference. It was a lot to ask and I am forever in their debt.   I also cannot ever express enough gratitude to Rebecca Fouquette (De Anza College) who will continue her invaluable work as our treasurer. It is hard for me to believe she does all she does for us while also serving as the treasurer for the regular CMC[3] board as well.   We also wish to welcome our newest board member as Susanna Gunther (Solano College, CMC[3] Past President) joins us for a two year term. Two additional board members will be appointed soon.

Algebra Alternatives
(continued from p. 15)

a formal conversation with its membership to explore and identify appropriate alternative content to the traditional intermediate algebra topic list. A hidden assumption exists that only the traditional 300-year old topic list can provide mathematical rigor. But both the Common Core mathematical practices and Intersegmental Committee of Academic Senates (ICAS) approaches to mathematics stress the need for integrated, thoughtful use of mathematics in critical thinking and problem solving. Furthermore project evidence already includes courses where students demonstrate success in rigorous alternatives and subsequent success in traditional math transfer courses.

Simultaneously the Academic Senate for California Community Colleges should work with its four year partners to acknowledge the need for and value of alternative content in the mathematical preparation of many university bound students, especially non-STEM majors. This conversation should lead to implementation with the expeditious creation of a mechanism to permit approval of an alternative array of courses that are accepted as prerequisites to transfer level math courses.

We owe it to our students to provide alternative pathways to the successful application of mathematics in their lives and careers.

Math Nerd Musings
Jay Lehmann, College of San Mateo

Last issue of the newsletter I revealed many of the challenges I had as an instructor in my first fifteen or so years of teaching. That was an easy article to write. It feels pretty safe for me to confess to my failings. But to write about my successes in my subsequent ten years? Monumentally harder. Who am I to purport best practices of teaching? Teaching is an art form that one can't spell out in a straightforward algorithm; it's like riding a bronco. The moment you get cocky, thinking you've got it all figured out, your students will send you hurtling to the hard-packed dirt. To be sure, my more recent teaching endeavors are pockmarked with spells of awkward explanations and moments where I'm pretty sure I'm delivering the most boring lecture on this planet. Just last week I delivered an explanation of compound interest that was so poorly handled it makes me shudder every time I think about it.

Nonetheless, I have learned certain teaching moves that have paid major dividends with my students. I wish I could say that I sorted these things out during periods of calm reflection and then executed them with confidence. But more times than not, I simply came up with options and flung them against the wall and observed what stuck. And in dire situations I

invented new strategies during the crossfire of the classroom and somehow came across something that really clicked.

Take my intermediate algebra class, early last semester. They'd been working on a collaborative activity, and I was desperately trying to get their attention. The class had been hard to manage in previous collaborative activities but this time they seemed on the verge of flat-out ignoring my requests to quiet down. When they finally did, I found myself channeling what I would perceive some tough guy like Jack Nicholson would say: "You might think that as I struggle to get your attention that you've got the control, but you're wrong. *I've* got the control. How often do you think I'm going to reach for teamwork if it's this hard to get your attention?" In my mind this was akin to Jack Nicholson blasting Tom Cruise in the movie *A Few Good Men,* saying, "You can't handle the truth!"

The whole class became completely still. In that moment, I knew I'd won. I could tell that my students understood that the way they behaved would impact how I went about teaching them. The more responsibly they acted, the more freedom I would grant them. This momentary interaction went far beyond the implications of collaborative learning. From that point on, the maturity of the class went up a quantum leap. So much was communicated in that moment. My students realized that they mattered. They realized that I wasn't oblivious to their presence. That I cared about their success.

Even much later in the semester, class dynamics continued to go really well. But the funny thing is that one day when it was a little harder to get teams' attention, a student blurted out, "You've got the power." There was a beat of silence and then a chorus of students said, "No, he's got the *control*." The whole class broke up into laughter, me included. But the point was clear. I had made an impression on the class, and it was paying off throughout the semester.

I realize that what I'm sharing with you doesn't translate logically. After all, how could one Jack Nicholson riff have such a strong impact with my students? But that's how it is with human interaction: so much can be communicated, often without words.

For some of you, this is obvious. But I'm not writing this piece for you. I'm writing it for the rest of us specialists where human interaction

> **In that moment, I knew I'd won. I could tell that my students understood that the way they behaved would impact how I went about teaching them.**

is a huge mystery. It's also messy. Students' emotional mathematical baggage factors as much into the endeavor of learning as my explanations and their efforts at solving problems.

So what can we glean from my inspired blurting out, "I've got the control?" Well, for one thing, teaching is an art form. That it pays to build a playbook of moves to handle various situations, but there will always be new curveballs thrown at us. That it can help to stay light on our toes and sometimes it's worth the risk of getting honest. That sometimes showing students our commitment and care for them can wake them up, maybe even challenge them to reach for their highest good.

Calendar

March 20-23, 2014 26th Annual International Conference on Technology in Collegiate Mathematics (ICTCM), San Antonio, TX. Contact: Joanne Foster (800) 472-6288 or (207) 676-8688, email: joanne.foster@pearson.com

April 4-6, 2014: 47th NYSMATYC Annual Conference, Treadway Inn, Owego, NY. Contact: Russ Penner. Website: www.nysmatyc.org

April 9-12, 2014 NCTM 92nd Annual Meeting, New Orleans, LA. Contact: NCTM Office (703) 620-9840, email: annlmtg@nctm.org

April 25-26, 2014: CMC³ 18th Annual Recreational Mathematics Conference, MontBleu Resort Casino and Spa, South Lake Tahoe, NV. Contact: Dr Larry Green. Website: www.cmc3.org

May 8-10, 2014: Washington Community College Math Conference (WCCMC), Wenatchee, WA. Website: www.wamatyc.info

July 1-5, 2014 International Conference on Technology in Mathematics Education (TIME-2014), Krems, Austria. Contact: Peter Baumgartner, +43 (0)2732 893-2350, email: peter.baugartner@domau-uni.ac.at

July 13-18, 2014 International Conference on Teaching Statistics (ICOTS-9), Northern Arizona University, Flagstaff, AZ. Contact: Roxy Peck, rpeck@calpoly.edu

November 13-16, 2014,; 40th Annual AMATYC Conference, Nashville, TN. Contact: AMATYC Office, amatyc@amatyc.org.

December 5and 6, 2014; 42nd Annual CMC³ Conference, Hyatt Regency Monterey Hotel and Spa, Monterey, CA. Contact: Joe Conrad. (707) 864-7000 x4372, Joseph.Conrad@solano.edu

Jay Lehmann

Editor

CMC³ Newsletter

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