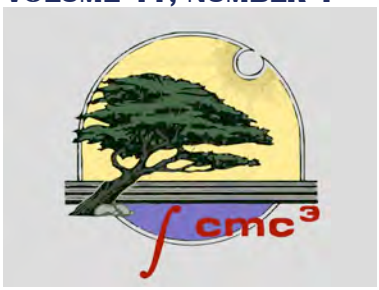
VOLUME 41, NUMBER 1 SPRING 2012



California Mathematics Council Community Colleges

CMC³ NEWSLETTER

The Sixteenth Annual Recreational Mathematics Conference at Lake Tahoe

By Larry Green, Lake Tahoe Community College

CMC³ will host the 16th annual Recreational Mathematics Conference on April 27 and April 28 this year. The conference will be held in Lake Tahoe's 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 6:30 PM on Friday, April 27th with an opening celebration. Then we will enjoy tales of math history presented by Shirley Gray from CSU Los Angeles. 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 feel like dancing as Robert Mathews from Yuba College presents a hip and lively talk on the connections between music and mathematics. Two more sessions on recreational mathematics will follow Mathews' talk. The grand finale of the conference will be this year's student keynote presenter. The conference will conclude with the traditional celebration and door prize raffle.

Conference registration costs $75 for members, $25 for adjunct instructor members, and $100 for non-members, ($50 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

(see "Recreational Math Conference" on p. 2)

Table of Contents

Executive Board & Special Committees

Volume 41, Number 1 Spring 2012

CMC³ Newsletter is the official newsletter of the California Mathematics Council, Community Colleges, and is published three times a year--in the spring, summer, and fall.

Recreational Math Conference

(continued from front cover)

the nominal fee of $5 which does not include the lunch voucher.

For more information, contact your department chair, CMC³ campus representative, Michael Eurgubian (Conference Co-Chair) at meurgubian@SantaRosa.edu, or Larry Green (Tahoe Conference Co-Chair) at DrLarryGreen@gmail.com. For the latest information and details about the conference and for the registration form, please visit the CMC³ website at www.cmc3.org. This is a one-of-a-kind conference that brings people back each year to enjoy the wonders of mathematics and the beauty of Lake Tahoe.

Meet Your New President: Not Always a Math Teacher

Susanna Gunther, Solano College

Hello and Best Wishes for 2012! It is very exciting to be CMC^3's newest President! Taking the place of Barbara Illowsky, and before her Larry Green, gives me the feeling that I have impossibly big shoes to fill, but I will do my best to serve our group well, and am genuinely happy to help CMC^3 in any way I can. Please let me tell those of you who don't know me a little bit about myself.

I have an unusual background for a CMC^3 President. After finishing my Master's degree at UC Davis, I completed a Doctorate in Optometry at UC Berkeley. (I think this makes Rob Knight the CMC^3 member with a background most resembling my own, as he was once a podiatrist many years ago.) For almost ten years I worked as an adjunct professor (and freeway flyer) as well as a part-time optometrist! Completing my taxes at the end of the year was a complex task, as I was employed at over five different locations pursuing two careers, and working both as an employee and as an independent contractor each year. While I sometimes miss the variety and complexity this double life entailed, overall I find my current situation far more fulfilling.

In 2001, I decided to simplify my professional life and chose teaching mathematics full-time as my career path. After a short time trying high school teaching in Davis, I was happy to get a tenure-track position at Solano College in the spring of 2003. Since then, I have concentrated my energy in my teaching as well as serving on the Academic Senate at Solano College (on which I am currently the Vice President), the CMC^3 Board (for which I have served as the Award's Chair, then the Monterey Conference Chair and President-Elect, and now President). I have also been involved in Basic Skills Education, first associated with the Basic Skills Initiative as a trainer, and then at my college as both a Basic Skills Mathematics Coordinator followed by taking the position of school-wide Basic Skills Coordinator for a while.

While I love mathematics as well as teaching, it is the concept of helping and empowering others which most motivates me and excites me about my career. Those who know me well recognize that I am a strong supporter of people, programs, organizations and ideas I believe in. This can lead me to become involved in controversy at times, but it has also served me well as far as living a very full and enjoyable life.

Most recently it is my personal life which has been most amazing. In September of 2011, I got married to my wonderful husband, Nick. In addition to being a great guy, he is another mathematician, and has presented in two CMC^3 conferences, although this is not how we met. You may have heard him talk last year at either Monterey or Tahoe! We look forward to seeing you at conferences this year, and please feel free to introduce yourself to us and let me know if there is anything I can do for you as CMC^3 President. My email address is susannaelizabeth2020@gmail.com and my phone number is 530-848-8808.

2011 Monterey Conference

Susanne Gunther, President

It seems funny that I am the one who will write this particular article. Sure, I was at the Monterey Conference in the fall. I even chaired the conference, so it made perfect sense for me to let everyone know what to expect at the conference in the article I wrote for our last newsletter.

The truth is, however, that the conference chair does not attend any of the talks at the conference, other than of course the two keynote talks. As conference chair, one needs to put out any unexpected fires, or at least be available should any arise. So, there is no time for attending session speakers' talks.

I can comment firsthand about the keynote talks. On Friday night, Wade Ellis gave a heartfelt presentation about mathematics he has learned as a community college instructor throughout the years. I am sure there were portions of this talk which all of us could relate to. Watching Wade speak is always a pleasure, and having him as our Friday night keynote was a wonderful way to start off our conference.

Our Saturday keynote speaker, Jo Boaler, gave a talk very different from any CMC^3 talk I had ever been to. For one thing, it involved no mathematics to speak of. It was entirely about teaching math, and her experiences while researching those who teach math. I found it very engrossing, and an interesting perspective, although for those of you who were disappointed with the lack of "real math" in the talk, I will admit that as much as I liked this talk as a refreshing alternative, when some of us on the board were discussing whom to have as a keynote next year, we clearly favor a return to a more mathematical oriented talk after this one, rather than having two math-ed-related talks two years in a row. So, our fall conference this year was quite enjoyable but was a bit of an unusual one, at least as far as the keynotes were concerned.

As far as the session talks are concerned, I can only relay the comments which I heard, as well as about the presenters more generally. First of all, considering the California budget, we did quite well attendance-wise. We were only down very slightly from last year's numbers, and those who attended appeared to genuinely enjoy themselves. The talks were all well reviewed, and it appeared that there was a reasonable representation of different topics, as the attendees distributed themselves relatively evenly during each session slot.

The remainder of this article will consist of information from personal experience with certain speakers as well as information that attendees let me know at the conference concerning some of the specific talks and speakers during the sessions at the 2011 Monterey Conference.

Ian Walton's presentation on State and national projects was particularly well received. Truthfully, I would probably enjoy listening to Ian Walton reading a phone book, as he definitely has the best accent of anyone at our conference, in my opinion. Attendees of his presentation felt that Ian did a wonderful job of informing them about different programs happening around the State. CMC$^{3^3}$ is fortunate to have such a talented and informed presenter willing to give this type of "state of the state" and/or "what's new in CA" address to our members, and this will probably be a recurring presentation at Monterey as it was quite popular.

The second speaker session included a talk by Lalu Simcik from Cabrillo College,

entitled "*Bubbles for Pre-Calculus and Beyond"*. His audience enjoyed this talk quite a bit. Certainly the subject matter is more creative, as apparently is the presenter. At a publisher's dinner later Saturday evening, my husband and I were fortunate to converse with Lalu and we found him intriguing. He is both a dancer and a rapper in addition to being a math professor, and was very interesting to talk with.

Another session presentation which got a lot of folks talking was during the last session of the day. Michael Eurgubian spoke about his sabbatical project. He is surveying faculty at many of the California community colleges and has found some interesting information related to how things are done at different colleges throughout the state. As this was just a talk about his preliminary results, and it was very well received, it is likely that CMC^3 will try to have Michael present again at a subsequent conference, so you may want to make sure to get to this future talk if you are interested.

Well, I will be happy not to be chairing the fall conference next year. Not that I didn't enjoy the experience, as it was mostly incredibly positive. It will just be fun to be able to enjoy and relax at our fantastic conference again next fall! I also want to thank many of you for all of your suggestions and support during the last two years as conference chair. This organization really is quite magical and we are very fortunate to consistently have two amazing conferences at Monterey and Tahoe every year. Of course, I realize it is much more than magic which makes these conferences work so well, but there are so many variables involved at each conference and so many motivated, positive, competent volunteers which help run and speak at these conferences each time, that it really does take on a sort of "continuing saga" of its own!

What's a Past President to Do?

Barbara Illowsky, De Anza College

Finally, I have the CMC^3 board position I have always wanted! I am now Past President!!! YAY! When I first joined the CMC^3 board in the last millennium, I naively thought that the past president was just a ceremonial position, maybe such as one given out of respect for an elderly person who can no longer truly lead but has been around for so long that no one wants to hurt his/her feelings, so a title is bestowed. At that time, I was in my thirties, and it seemed to me that the organization's leaders were those elderly folks in their fifties! A few of them were even talking about retirement. So, here I am, Past President, past fifty, and feeling oh-so NOT elderly. And I learned that the past president actually has board responsibilities (although the first one in the next paragraph I just made up). Here I go ….

THANK YOU, CMC^3 members, for allowing me to serve you as president for two years. It was really and truly a great joy. We have a fabulous organization. I have been quite fortunate to learn from previous presidents, boards and general members. The president often gets the credit when the conferences and other functions go well. However, almost everything CMC^3 accomplishes is the result of great group cooperation. Without a dedicated team, the organization would never function well.

Now that I am the immediate past president, I am still on the Board of CMC^3. In this position, I serve on the CMC^3 Foundation Board, the organization which raises funds to award scholarships for students. I will also chair the next

(see "Past President" on p. 18)

Distinguished Service, President's, and Special Awards

Barbara Illowsky, De Anza College

Each year, CMC^3 honors several people. Katia Fuch's article will discuss the Teaching Excellence Award. In this article, I am going to highlight three people and the awards they deservingly earned.

The Distinguished Service Award is CMC^3's highest award. This annual award is given to a past board member who has dedicated years of service in the CMC^3 organization. The current Board votes for the winner at the September board meeting. In December, Randy Taylor very deservingly received this award with a unanimous vote. Randy has been a mathematics instructor at Las Positas College for 22 years where he has been a mentor to new full-time and part-time Mathematics faculty. Prior to that, he taught part-time at West Valley, San Jose City, and Grossmont Colleges while working full-time in industry. He served on the CMC^3 Board for 17 years as President-Elect, President, Monterey Conference Speaker Coordinator, Past President, Foundation President, Membership Chair, and Scholarship Chair. He was also the Awards Chair. In addition to CMC^3, Randy is also a member of AMATYC, NCTM, and MAA. In AMATYC, he served as the West Vice President, a Foundation Board member, in the Technology in Mathematics Education Committee, the Education Committee, the Program Issues Committee, the Mathematics Excellence Award Committee, and the Nominating Committee. Randy was also a delegate to the AMATYC Delegate Assembly for 16 years.

At Las Positas College Randy has been the faculty advisor to the Alpha Gamma Sigma (AGS) Honor Society for 17 years. He founded the Las Positas College Math Club and the college's Mu Alpha Theta Mathematics Honor Society and has been the faculty advisor.. Randy has received both the Las Positas College Academic Senate's Teaching Excellence Award and their Outstanding Service Award. He is the recipient of the CMC^3 President's Award, the CMC^3 Teaching Excellence Award, the AMATYC Teaching Excellence Award, the Chabot-Las Positas Community College District Chancellor's Award, and the AGS Outstanding Advisor Award twice.

CMC^3 thanks Randy Taylor for his almost two decades of service to our organization!

The President's Award is an annual award given by the president to a current board member who has been particularly helpful over the past year. This year, I selected Larry Green of Lake Tahoe Community College to receive this award. Larry has been both my mentor in the president's position, and has also become a good friend. The past two years, Larry served CMC^3 in his official role as Past President, as well as taking on several other responsibilities. He was and is our web master. He streamlined the presenter and presider online applications. He has added features to the web site as needed. Larry was always available to me for guidance and assistance with the various questions I had and needs that came up. Larry has co-written grant applications that would bring funds to our colleges. I can count on Larry to take care of

(see " Distinguished Service" continued on page 18)

Greetings from AMATYC

Bruce Yoshiwara, West Vice President,

AMATYC is the only professional organization whose goal is the improvement of mathematics education in two-year colleges in the United States and Canada. If you are already a member, then you know of the many activities and resources that membership provides, such as free webinars, Traveling Workshops, Institutes, and networking through the various committees that discuss issues such as assessment, dual enrollment, placement and teacher prep. If you are not member, I invite you to join AMATYC to take advantage of these opportunities and to support the national professional organization designed for two-year college math faculty.

AMATYC's annual conference is its best known single activity. If you attended the 37th Annual Conference in Austin in November, you experienced the energy and excitement of joining hundreds of colleagues all eager to share ideas and expertise. The AMATYC Board and conference planning personnel continue to try to improve the conference experience. Instead of having a regional meeting during the early hours of Friday morning, it will be held during the lunch hour with a box lunch provided. Also, there will be an Ignite event on Friday evening sponsored by the Innovative Teaching and Learning Committee. If you don't know what an ignite event is, go to http://igniteshow.com/ and watch a few examples.

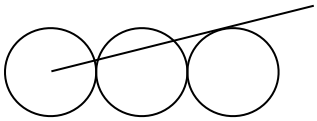
And mark your calendars for the 38th Annual AMATYC conference in

(see "AMATYC" continued on page 19)

Brain Strain

Joe Conrad, Solano College

Happy 2012! I hope you are enjoying your new classes and students. In any event, I have a something to relax your mind: a new problem! We have not done any geometry problems for awhile, so I thought I would change that. Suppose there are three circles with the same radius, *r*, and collinear centers as in the figure. A line is drawn from the center of one of the outer circles so that it is tangent to the other outer circle. If *A* and *B* are the points of intersection of the line with the inner circle, find the length of segment *AB*.



The problem from the last issue was: Determine all polynomials, $P(x)$ such that $P(x^2+1) = (P(x))^2 + 1$ and $P(0) = 0$. Solutions were submitted by Larry Green, Jim Mailhot, Paul Cripe and Fred Teti. Clearly, $P(x) = x$ satisfies the conditions. We prove that it is the only polynomial that works. We generate a sequence as follows. Let $x_0 = 0$ and $x_{n+1} = x_n^2 + 1$. The next few terms are 1, 2, 5, 26, and 677. An easy induction using the given condition shows that $P(x_n) = x_n$ for all n. Let $G(x) = P(x) - x$. Thus, $G(x_n) = 0$ for all n and so G is a polynomial with an infinite number of zeros. The only way this can happen is if $G(x) = 0$ for all x and so we have $P(x) = x$ for all x.

Enjoy the new problem and, as always, send solutions to:

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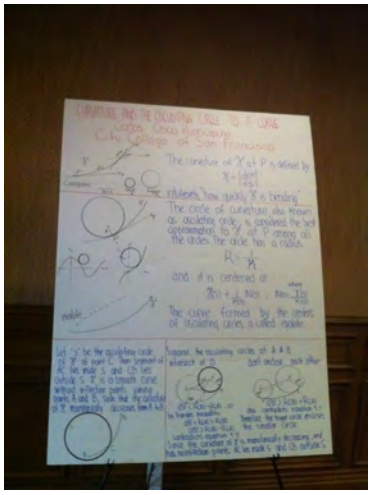
Fairfield, CA 94534
joseph.conrad@solano.edu

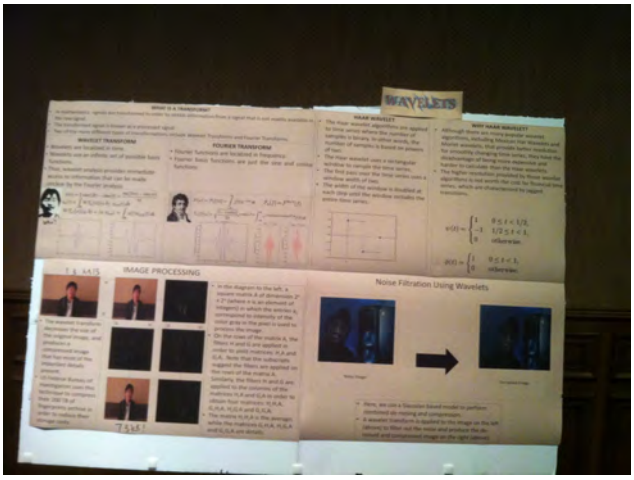
Poster Session Great Success

Rebecca Fouquette, Santa Rosa Junior College

This year's student poster session at our Monterey Conference drew interest from students at multiple colleges. We received a total of six



submissions with topics from Trigonometry to Newton's Laws to Mathematical Modeling. The posters were displayed in the foyer in front of the publisher's room and drew a steady stream of viewers between sessions.



The applicants were vying for first and second places, which this year included a cash prize. The judges, made up of members from a variety of colleges, evaluated each submission on student presentation, mathematical content, as well as overall appeal. The winners were Carlos Osco from San Francisco City College in first place and Michel Zoppas from San Francisco City College in second place. Prizes were awarded after the conference in the publisher's room.

For Monterey 2012 we are making some

changes. The student posters will be displayed in our keynote sessions instead of in the foyer. We

(see " Poster Session" continued on page 19)

What's Happening at West Hills College Lemoore

Frieda Ganter

The past decade has brought radical changes for West Hills College Lemoore (WHCL). Just over 10 years ago, we were teaching out of portable classrooms located on a five-acre space.

In 2000, landowners generously donated over 100 acres for a new campus. This marginal farmland evolved into a beautiful campus that opened in January of 2002. It now has thirty-four classrooms, nine of which are fully outfitted with computers. Our library is the most technologically advanced in Kings County. Classrooms are equipped with state of the art

overhead projection systems and internet access. The math department has our own math lab with forty computers and we recently received funding to build another lab. All of our math classes are web-enhanced classes and we offer many math classes fully online (except that students must come in for proctored exams).

We began our accreditation journey to become a stand-alone college (separate from our sister campus in Coalinga) in 2002. In 2006 we were granted accreditation, which was renewed for a full six year-term in 2010.

The Lemoore campus now serves over 6,000 students, including a rapidly expanding online program. Signature programs at WHCL include Culinary Arts, Nursing, Engineering and T.E.A.M. Teach. The math department serves all of these programs.

The engineering program started its first cohort in 2008-2009. The two-year program prepares our "Engineering Scholars" to transfer to a four-year institution, with free tuition and $600 a semester in books available to qualified students. The math department has expanded our offerings to serve these students. We now offer Calculus I and II every semester, and Calculus III, Differential Equations, and Linear Algebra every year. These students have injected a new degree of enthusiasm and rigor in our classes.

To serve other student populations, the department started offering Math 88 (Mathematics for Life), which is designed to give students an alternative to meet the new proficiency requirement for an AA.

The T.E.A.M. Teach program is designed as a support system for future teachers. It is now over 400 strong. Many of these students take our Liberal Arts Math sequence, designed for students seeking a multiple subject credential. But we also serve students who will go on to get a single subject credential in Mathematics.

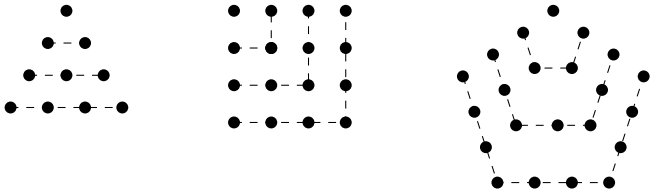
West Hills College now offers two degrees for math. The first degree is the Associate in Science Degree in Math for Transfer (AS-T) (kind of a long name, but we had no choice), which replaces our old math degree and is designed to meet the requirements of SB1440. In addition, we offer a new degree entitled "Liberal Arts with an Emphasis in Math and Science."

(see " West Hills College Lemoore" continued on page 19)

Through the History Glass

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

Figurate numbers or figured numbers are natural numbers that, when represented as dots, may be configured into geometrical shapes. For example, shown below are the fourth triangular number, square number, and pentagonal number. The dashed lines are called gnomons.[1]



The theory of figurate numbers apparently goes back to Pythagoras himself (ca. 585–500 BC). As Heath [1, p. 76] puts it,

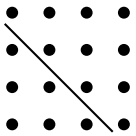
> It seems clear that the oldest Pythagoreans were acquainted with the formulation of triangular and square numbers by means of pebbles or dots[2]; and we judge from the account of Speusippus's book, *On the Pythagorean Numbers*, which was based on works of Philolaus, that the latter dealt with linear numbers, polygonal numbers, and plane and solid numbers of all sorts, as well as with the five regular solid figures.[3] The varieties of plane numbers (triangular, square, oblong, pentagonal, hexagonal, and so on), solid numbers (cube, pyramidal, &c.) are all discussed, with the methods of their formation, by Nicomachus[4] and Theon of Smyrna.[5]

Figurate numbers lead to some very nice summation formulas. Triangular numbers, for example, are the sum of the first n natural numbers, and square numbers are the sum of the first n *odd* natural numbers. Indeed, from the configuration of dots in square numbers, we readily obtain the formula

$$1+3+5+\cdots+(2n-1)=n^2.$$

According to Heath [1, p. 77] "All this was known to Pythagoras. The odd numbers successively added were called *gnomons*; this is clear from Aristotle's allusion to gnomons placed around 1 which now produce different figures every time (oblong figures, each dissimilar to the preceding one), now preserve one and the same figure (squares)[6]; that latter is the case with the gnomons now in question."

Another observation about square numbers is found in the theorem of Theon of Smyrna (fl. ca. AD 125) that any square number is composed of two successive triangular numbers.[7] For example, we see here that the fourth square number is composed of the third and fourth triangular numbers.



A rectangular number or oblong number is a number that, when represented as dots, may be configured as a rectangle. According to Heath [1,

[1] We usually think of a gnomon to be an L-shaped figure. Heath [1, pp. 78–79] tells us, however, that Euclid extended the meaning "[*Elements*] (II. Def. 2) to cover the figure similarly related to any parallelogram, instead of a square; it is defined as made up of 'any one whatever of the parallelograms about the diameter (diagonal) with the two complements'." He goes on to say, "Later still . . . Heron of Alexandria defines a *gnomon* in general as that which, when added to anything, number or figure, makes the whole similar to that to which it is added [Heron, Def. 58 (Heron, vol. iv, Heib., p. 225)]."

[2] Cf. Arist. *Metaph*. N. 5, 1092 b 12.

[3] *Theol. Ar*. (Ast), p. 61.

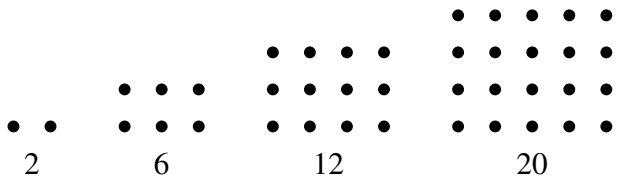
[4] Nicom. i. 7–11, 13–16, 17.

[5] Theon of Smyrna, pp. 26–42.

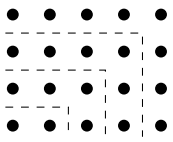
[6] Arist. *Phys*, iii. 4, 203 a 13–15.

[7] Heath [1, footnote on p. 83] cites Theon of Smyrna, p. 41. 3–8.

p. 82], after Pythagoras, or the earliest Pythagoreans, had discovered the sum of the first n natural numbers in triangular numbers, and the sum of the first n odd natural numbers in square numbers, "it cannot be doubted that in the like manner they summed the series of even numbers ... and discovered accordingly that the sum of any number of successive terms of the series beginning with 2 was an 'oblong' number (*eteromekes*), with 'sides' or factors differing by 1." The first four such rectangular numbers are shown below.



Notice that if we break up a rectangular number into gnomons, we see that a rectangular number is the sum of the first n *even* natural numbers.

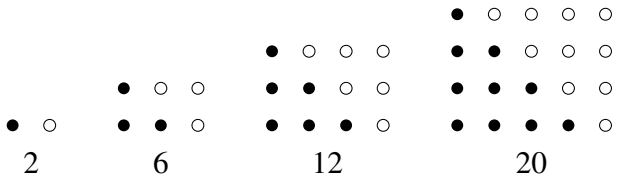


Indeed, from the configuration of dots, we readily obtain the formula

$$2+4+6+\cdots+2n = n(n+1).$$

Additionally, Heath says, "It is to be noted that the word *eteromekes* ('oblong') is in Theon of Smyrna and Nicomachus limited to numbers which are the product of two factors differing by unity, while they apply the term *promekes* ('prolate', as it were) to numbers which are the product of factors differeing by two or more (Theon makes *promekes* include *eteromekes*). In Plato and Aristotle *eteromekes* has the wider sense of any non-square number with two unequal factors."

Heath claims that the Pythagoreans "would also see that the oblong number [with factors differing by one] is double of a triangular number." We illustrate this below, where each of the first four rectangular numbers is composed of two copies of the same triangular number (one using dots and an identical one using circles).



Hence, we find that

$$2\times(1+2+3+\cdots+n) = n(n+1),$$

and thereby obtain the familiar formula

$$1+2+3+\cdots+n = \frac{n(n+1)}{2}.$$

Heath [1, pp. 76–77] tells us that Pythagoras probably discovered this formula precisely by considering triangular numbers. He relates that "[t]he particular triangle which has 4 for its side is mentioned in a story of Pythagoras by Lucian. Pythagoras told some one to count. He said 1, 2, 3, 4, whereon Pythagoras interrupted, 'Do you see? What you take for 4 is 10, a perfect triangle, and our oath'.[8] This connects the knowledge of triangular numbers with true Pythagorean ideas."

———————◇———————

Previous columns are on the Web at <http://ms.yccd.edu/~jb2/histglass.html>.

References

[1] Sir Thomas Heath, *A History of Greek Mathematics, Volume* 1*, From Thales to Euclid*, Dover Publications, Inc., New York (1981).

[2] Steven J. Schlicker, "Numbers simultaneously polygonal and centered polygonal," *Math. Mag.*, 84:5 (2011), pp. 339–350.

[8] Lucian, Βίων πράσις, 4.

Respice Finem, or the Preparation Students Need for Elementary Stats

Ken Bull, College of San Mateo

An article by Lawrence Summers published in the NY Times entitled "What you (Really) Need to Know"[2] was sent to members of the Statistics Education Section of the American Statistical Association. The article is Summers' take on the likely direction of university education, and one of his points (his sixth) is that "courses of study will place much more emphasis on the analysis of data" something that apparently caught the attention of the sender. Along the same lines, the McKinsey Global Institute argues that the world is not ready for the explosion of data routinely collected – what is now called "big data. " By 2018, according to McKinsey, the USA alone will have a deficit of 140,000 to 190,000 people with the necessary skills and aptitude to analyze data.[3]

ASA Stat Ed section members are probably well aware of these trends, and CMC[3] members will have seen the popularity of Introductory Statistics at their colleges, reflecting the demand by four-year institutions for students to have taken statistics. Statistics and data analysis courses are likely to grow more popular, either because of reasons advanced above, or because statistics – "thinking through the meaning of numbers in context"-- is a good thing to do, or because research ("the chase") is fun, and part of the fun involves data analysis.

In any case, many community colleges have increased the number of stats sections. Also, some college departments have attempted to streamline the entry into the stats course, since it is one of the most popular transfer courses, and it is thought that the number of steps to get to this course is too great. It is argued that the prerequisite of Intermediate Algebra may not serve statistics well, since there are many things in the prerequisite courses that stats students do not really need. Manipulating rational and radical expressions or the ability to factorize quadratic expressions are cited as examples of skills not needed for stats. So, the obvious question: what topics or skills or aptitudes *are* really needed for doing well in stats? I have my own (somewhat long) short list, but near or at the top of my (long) short list is the ability to solve "word problems."

In a way, the students seem to agree; they say – indeed, complain – that statistics is all word problems. What they see is that the "problems" are expressed in language and they have to translate the language into the right thing to do. It turns out that the students are in good company. Although he was not thinking about Introductory Statistics, George Pólya wrote:[4]

> I hope I shall shock a few people in asserting that the most important single task of mathematical instruction in the secondary schools is to teach the setting up of equations to solve word problems. Yet there is a strong argument in favor of this opinion.
>
> In solving a word problem by setting up equations, the student *translates* a real situation into mathematical terms: he has the opportunity to experience that mathematics concepts may be related to realities, but such relations must be carefully worked out. Here is the first opportunity afforded by the curriculum for this basic experience. The first opportunity may also be the last for the student who will not use mathematics in his profession.

Pólya goes on to consider those who *will* use mathematics, such as engineers, and notes that for engineers especially, their main use of

mathematics will be to set up problems in mathematical form – to translate. Our university curriculum is now saying (through its graduation requirements) that a great many graduates should be familiar at least with the process of translation as it occurs in data analysis. The process is not quite the same as "setting up" equations, but a key element remains: *translation* from a question at hand to a something expressed in mathematical language and then back again. For statistics in particular we should take heed that the translation goes two ways: from the context into the appropriate analysis and after that analysis has been done, translation back into the context of the problem, or "interpretation." Let us take the second translation, the "back translation" first, because it is the easier of the two translation directions.

First off, students *should* have to do this kind of interpretation; a statistics course that involves only tasks such as "find the mean, the variance and the standard deviation of . . ." or " find the Five Number Summary for these data and make a boxplot" or "use a *t* test to test the hypothesis that . . . ",without at the end requiring students to say something about the meaning of the calculations in the context of the question, is a course that is missing the point. Especially now that hand calculation is unnecessary for actual data analysis, to stop at hand-calculator-aided calculation without interpretation stops short of the goal of the course. (Hand calculation may be a useful exercise for some students as an aide to understanding how a formula works – but not for data analysis or the meaning of the analysis.)

What preparation can students have for this kind of interpretation before they come to statistics? A start is for students to state the answers to word problems in the context of the problem. The answer is *not* 42; rather the answer is "Rosalind was 42 years old when Amy was 16" or "the northbound train will crash into the southbound train in 42 minutes" or "it will be necessary to invest 42 thousand dollars now to yield 43 thousand dollars in ten years time . . . " to give a timely example. At the very least, the answers should be 42 years old, 42 minutes, $42,000. It could be argued that a task more directly applicable to statistics is interpreting the slope for linear equations in application problems. The interpretations that students should be required to make in a statistics course are both more complicated and more subtle – sometimes having to deal with weighing the evidence – but at least putting the results of mathematical calculations into words in previous courses is a start.

Translating in the opposite direction—from the question expressed in language to the statistics procedure – is both more difficult for students, but also more the focus of most kinds of word problems that students encounter before Introductory Statistics. The ways doing word problems connect to the kinds of translations necessary for statistics may be complex, but as a start consider this student-teacher exchange example recorded in a power point presentation by Alan Schoenfeld.[5] The word problem given was:

A dragonfly, the fastest insect, can fly a distance of 50 feet in about 2 seconds. How long will it take for the dragonfly to fly 375 feet?

Here is the exchange, less than 1/5 of a second after reading the problem, according to Schoenfeld:

S: So, first I'll divide 375 with 50, and then – wait. Or, I will multiply 50, no wait, now what? This is dividing 5 times what can get 8?

T: So you're thinking divide. . .

S: I'm not understanding. Do you look at 5 times the number first or is it the big number this is 50 into it first?

T: Well let's see, what are the quantities we're looking at here?

And what are you trying to find out?

S: (Couldn't say what the goal was:) Trying to find out how many seconds the dragonfly can fly in 375 feet . . . wait . . . How many seconds How many seconds will it take it to fly 375 feet?

In tutoring students I believe that I have had very similar exchanges. These exchanges are characterized by haste (as here) on the part of the student, and that haste in turn probably stems from the idea that most (if not all) math problems should be able to be solved in less than a minute, since that is what is required in tests. The idea that math problems must and should be solved quickly is fostered by the way we test, but it works against the careful reading necessary for understanding word problems, and (I would argue) also necessary for success in Introductory Statistics. The teacher in the exchange above is trying to get the student to focus by asking the well-known question: *What is the unknown?* -- phrased here as "what are you trying to find out?" This, of course, is part of one of Pólya's famous problem solving steps set out in *How to Solve It*.[6] The Latin title *respice finem* comes from one of Pólya's elaborations on this theme of looking at the unknown, and means "look at the end" in the sense of goal or aim.[7] Do not get distracted. Focus. Statistics students need to heed this advice, as of course do trig students solving identities.

One of the most difficult kinds of things for students to do in Introductory Statistics in my experience is the following task. We begin with a statistical question and some data, and then ask, with a short list of possible answers: "Which of these procedures should be used to answer the question?" The question is even harder without the short list provided. But either way, this is a legitimate question (in my view) for an Introductory Statistics course. To actually get software (even a calculator) to actually carry out the procedure is a relatively easy task of plugging in the correct numbers in the right places. The answer of "what should I tell my software to do" requires that the student understand the goal and the context. In short, it requires that the student "understand the problem," in Pólyan terms. *Respice finem*.

How does one prepare students for this kind of understanding? This kind of understanding requires careful reading at some point. The careful reading may come after a cursory reading, but at some point the student has to determine what kinds of variables are involved (quantitative, categorical), what kind of question is being posed (descriptive, inferential), and then of the various options available, what will get the job done, and what cannot (because conditions are not met).

You may question whether the translation tasks from language to mathematical expression are similar for algebra and for statistics. Whereas in algebra (it can be argued) the easy part is the identification of the type of problem, and the hard part is setting up equations using the information in the problem, in statistics the difficult part is assessing what sort of task we want to embark upon, and the setting up of equations is relatively easy. However, embedded in the translation process in algebra and statistics are important similarities. One of the first stumbling blocks for algebra students is the question "What is the unknown?" "What am I trying to find?" Very often we find students studying algebra trying to set up equations without clearly defining what "*x*" is, what the variable or variables are. Is *x* a quantity (and what quantity, especially if here is a *y)*, a rate, or what? I would argue that the same kind of decision or discernment process faces the statistics student: "What is the question?" "Are we trying to estimate a proportion, or a mean, or can we (should we) answer our question with a hypothesis test? And the decision has to be made on the basis of what is written in language. Indeed, for many of the kinds of traditional problems encountered in algebra courses, I would argue that the mistakes in setting up equations stem largely from not being

clear about what the unknowns are. Students by misreading the language of relationships can make mistakes in setting up equations, but students studying statistics need to understand much of the same language ("greater than", "at least …) The language involved in solving algebraic word problems may be simpler than the language used in statistics, but given that algebra is a prerequisite to statistics, it should be.

Some of my colleagues teaching statistics (as well as calculus) fret that because word problems are hard for students, the critical thinking skills and especially the experience evaluating the meaning of language in mathematical terms are being short-changed – teachers avoid teaching word problems, or use strategies that avoid the critical assessment of the language. Texts or instructors who try to streamline the procedure (by making the word problems into algorithms) so that the goal is simply to solve "this kind" of problem probably are not giving enough preparation for Introductory Statistics. No, the preparation has to require the student to grapple with the language. Traditional algebra word problems may be easy to categorize especially when one section is devoted to one kind of problem and another to another type of problem; what happens if they are all mixed together?

Will doing typical Intermediate Algebra word problems actually help? Will doing "authentic" word problems help? My contention is that the experience will help if the problems are challenging enough so that students actually have to spend time on them, working through the language, and are given the time and help to do this.

I hope that what I have written provokes some objections. You may object to my apparent vision of statistics that has the twin goals for students being able to first, interpret data analysis in words, and secondly, to jump between the formulation of statistical questions and the techniques that we typically teach in Introductory Statistics. (Indeed I would go farther with a third goal, and say that part of the course should be to at least start to evaluate analyses done by others.) You may well think that it is sufficient (and more realistic) that students gain a familiarity with the various procedures, and show this be being able to work them through. Or, you may object that my treatment of statistics is not mathematical enough.

It may also be that this piece may provoke some thought amongst those attempting to put together "pre-Stat" equivalents to what is now Intermediate Algebra. Whether this should be done at all requires an expanded discussion dealing with (for example) issues of accreditation as well as the implications of "tracking" especially given that a high proportion of students are undecided on their academic career direction. The discussion here is rather more modest. It is saying that to prepare students for success in statistics, it is necessary that they know how to read critically in a mathematical context. If there is an alternative to word problems to giving students this preparation, let us hear of it. My own perhaps unwarranted worry is that a pre-Stat course will end up just transferring a part (the simpler part?) of the present Introductory Statistics course down a level. I think that I would hope for something more challenging. It is well to remember Pólya's advice: *respice finem*.

[1] See http://www.nytimes.com/2012/01/22/education/edlife/the-21st-century-education.html?_r=1&_r

[2] See http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/Big_data_The_next_frontier_for_innovation)

[3] Pólya, George, *Mathematical Discovery: On Understanding, Learning and Teaching Problem Solving* Bronx, NY: Ishi Press International, 1961 (Ishi printing: 2009): 59. The short section is entitled "Why word problems?"

(see "Respice Finem" continued on page 18)

Meet your 2012 and 2013 CMC[3] and CMC[3] Foundation Boards!

Susanne Gunther, President

On January 1st the new CMC[3] and CMC[3] Foundation Boards took office. Each position carries a two-year term until December 31st, 2013. Let me introduce some new and not-so-new members.

Barbara Illowsky is now our Past-President. This means, among other things, that she continues to be available to the rest of the board and the rest of our membership as advisor-in-chief and as the most fun board member to drink wine with at a conference. (I know I am not the only one of us who thinks this!) Barbara teaches at De Anza College.

Our new President-Elect and Fall Conference Chair is Mark Harbison. He has been the Business Liaison for the board since 2004, so he is in a great position to work as Monterey conference chair for the next two years, as he knows many of our members as well as most of the publishing reps already. He is also an extraordinarily good dart player, or at least that has been my experience!

Here's a CMC[3] board and CMC[3] Foundation board trivia question. Which two colleges have the distinction of having the most board members teaching at them?

If you guessed Santa Rosa Junior College and Sacramento City College, then you were correct!

Santa Rosa Junior College employs a fabulous four board members, all but one of whom are now board veterans, as they have held their positions previously. These folks are Mike Eurgubian, our Tahoe Speaker Chair and Monterey AV Specialist, Tracy Jackson, our adjunct advocate and campus reps coordinator, and our treasurer, Rebecca Fouquette. The new board member from Santa Rosa Junior College is Bic Dovan, who has joined the Foundation board for her first term.

Sacramento City College is where another fabulous four board members work. These include our new President-Elect and Fall Conference Chair, Mark Harbison. Randy Robertson, who is taking the place of Business Liaison previously held by Mark Harbison, is also from Sacramento City College. Debra Van Sickle will be starting in her new position as CMC[3] Foundation President this year, after serving on the Foundation board for two terms. Also from Sac City is Hsiao Wang, who will be joining the Foundation board this year.

Greg Daubenmire is continuing as the CMC[3] board secretary. He generously hosted the fall meeting for the board at Las Positas College. Jay Lehman, who most of us know either as an accomplished author or as the one who runs the estimation walk/run event every year at our Monterey Conference, is also continuing as our newsletter editor. He teaches at College of San Mateo.

The three liaison positions on the CMC[3] board are Wade Ellis, our MAA Liaison from West Valley College, Jenny Freidenreich, our

CMC Liaison from Diablo Valley College, and Marcella Laddon, our AMATYC Liaison from Cabrillo College. All of these folks are continuing in their positions. Wade Ellis also works as our Monterey Speaker Chair, and usually can also be found as the announcer for the Foundation post-conference events.

Larry Green will be chairing the spring conference in Tahoe this year. Larry lives and works in the Tahoe area, as well as serving as our web page coordinator. Last I knew, Larry Green was also serving on the school board, heading at least one large statewide grant, teaching full time, skiing or walking miles to and from work every day, while still finding the energy to be incredibly pleasant on a constant basis and to answer any email sent to him, usually within 48 seconds! I have joked to others that it is amazing how both Larry Green and Barbara Illowsky from our board both seem to live on a planet with 36-hour days!

Katia Fuchs is continuing as the Awards Chair. She works at San Francisco City College. Rob Knight will also be continuing as the Monterey Hotel Chair. He teaches at Evergreen Valley College.

From Solano College, Joe Conrad will be continuing as the membership chair. Susanna Gunther, the new CMC^3 President, also teaches at Solano College.

De Anza College/Fremont Union High School District Articulation Lunch

Barbara Illowsky, De Anza College

On Friday, January 13, 2012, the mathematics department chairs from the five high schools in the FUHSD, along with the district mathematics liaison, two high school assistant principals, and members of De Anza College's Mathematics Department met to discuss students' mathematics transition from high school to community college. So far as anyone attending remembers (and I have been at De Anza since 1989), this was the first such meeting ever. It won't be the last!

The main purpose of the meeting was a meet and greet so that we could set future agenda items to collaborate on. However, there were a few additional topics for this first meeting. First, a large percent of the students complete Algebra II or higher in high school, but place into developmental mathematics at De Anza. Second, the students who complete the pre-calculus classes in the high school rarely go directly into first term of calculus. Finally, students who complete AP (Advanced Placement) Calculus BC with a score of 3 or higher are unaware and disappointed that they still need to take the third quarter of calculus when they arrive at De Anza.

We discussed possible solutions to the first two issues. Students who stop their formal high school mathematics courses after Algebra II generally do not take a math course during their senior year of high school. Those students often have weak algebra skills to begin with and then may forget those skills during their senior year. One solution is to develop and offer a post-algebra II, but not pre-calculus, class for such

(see "Articulation Lunch" continued on page 20)

Teaching Excellence Award

Ekaterina Fuchs, City College of San Francisco

The teaching excellence award is given to faculty who are nominated and chosen by their peers. Every year a different group of colleges is eligible to nominate someone; the group is a rotating one, and colleges will come up more frequently if they have a larger CMC^3 membership. Once a faculty member has won the award, they cannot win it again.

Here are this year's winners:

Paul Cripe, from Modesto Junior College
Paul has been teaching at Modesto Junior College in some form since 1984. He teaches both pre-collegiate and advance level classes with the same emphasis on high standards and student success. He is also a master chess player!

Kevin Olwell, from San Joaquin Delta College
Kevin has been at San Joaquin Delta College since 1994, and is well liked by his colleagues and students!

Jerry Rompa, from College of the Siskiyous
Jerry has been at the College of the Siskiyous since 1990. Prior to teaching there he spent time at the Oregon Institute of Technology in Klamath Falls, Oregon.

Hazel Ross, from Monterey Peninsula College
Hazel was not available to pick up the award, and had a colleague pick it up for her.

Distinguished Service

(continued from p. 6)

tasks immediately, when needed, and to always go above and beyond what the organization needs.

Thank you, Larry, for being there for me as President of CMC^3!

This year, CMC^3 gave a special award to a non-CMC^3 member. Jane Ellis, wife of Wade Ellis, has been a CMC^3 volunteer for 30 years. She has not only attended 30 Monterey conferences, but she has helped out at almost every one of them and the Tahoe conferences. Jane stuffs packets, works the registration

Past President

(continued from p. 5)

election, including recruiting YOU to run for a position. I will remain part of the Monterey conference committee, but without the stress of having the main responsibility. Mostly, my position assists President Susanna Gunther with all the items I should have already educated her about, but forgot to do so. Here's to the best

Respice Finem

(continued from p. 15)

4 Schoenfeld, Alan H, "Why are word problems so darned hard?" downloaded 1 Feb 2012 from http://www.msri.org/web/msri/site-search by searching for "Schoenfeld" or "word problems." The date and venue of the presentation are not given.

5 Pólya, George, *How to Solve It* New York, Anchor Books Edition, 1957.

6 Pólya, George, *How to Solve It* New York, Anchor Books Edition, 1957, page 123.

AMATYC

(continued from p. 7)

Anaheim October 31 – November 3, 2013. The local events coordinator is Carol Murphy (San Diego Miramar College), who will be assisted by the Anaheim conference local arrangement committee:, Miriam Castroconde (Irvine Valley College), Bob Crise (Crafton Hills College), Patty George (Cerritos College), Mark Greenhalgh (Fullerton College), Hoat Lee (San Diego City College), Tammi Marshall (Cuyamaca College), Art Nitta (San Antonio College), Sally Van den Berg (Barstow College), Sherri Wilson (Crafton Hills College), and Rich Zucker (Irvine Valley College).

One of AMATYC's proudest projects is ACCCESS (Advancing Community College Careers: Education, Scholarship, and Service), a mentoring and professional development initiative for two-year college mathematics faculty. The project's goal is to provide experiences that will help new faculty become more effective teachers and active members of the broader mathematical community. Applications for Cohort 9 for 2012-2013 will be accepted in spring of 2012. Check www.amatyc.org in February for more details.

Poster Session

(continued from p. 8)

hope this gives our students even more visibility. We will also present the winning posters during the awards segment of the lunch meeting.

If you are interested in learning more about how to have your student submit a poster for next year or being a judge, please contact me at rfouquette@santarosa.edu. Poster submissions for Monterey 2012 will be accepted starting in September.

West Hills College Lemoore

(continued from p. 9)

Our counseling staff is dedicated to placing students in the appropriate math classes. This has been a difficult issue. Last year the school hired an independent consultant to help us analyze the effectiveness of our placement assessments. The consultant has worked with the math department and counselors to adjust both our placement tests and the cut scores. Only time will tell if this is going to be effective or if more tweaking is called for (we have even discussed writing our own placement tests). We recently started posting practice placements tests online to help students prepare for proper placement (especially after a summer away from math). The counseling department has also implemented "early alert" warnings and "Lunch and Learn" activities to help boost our success and retention rates.

Student Learning outcomes are finally becoming the norm here. We have assessed the outcomes in all of our math classes at least once, and we are in the process of "closing the loop." This has been a long journey, as all of you know.

Last but not least, our department now consists of five full-time tenured faculty: Bob Gibson, Kim Castagna, Frieda Ganter, Shawn Jackson, and Jameson Birrell. We are a close group with a shared dedication to the success of our students.

Articulation Lunch

(continued from p. 17)

students to take their senior year. And, during the spring of senior year, incorporate elementary and intermediate algebra review into the curriculum. The hope is that students will place higher on the De Anza Placement Test than they would without the senior mathematics reinforcing their knowledge. For the students who take pre-calculus (often called mathematics analysis in high school), it is important that they have a strong review in spring of all of their high school mathematics to increase the likelihood of placing directly into the first term of calculus. The AP Calculus discussion included a clarification of articulation between the community colleges and UC and CSU systems. The AP Calculus BC course does not cover the entire first year of college calculus.

We forwarded to the high school liaison our current text book list and suggested that she contact the publishers for copies for each high school department chair. The high school mathematics teachers could use those texts to help develop their own course reviews. As colleagues, we all agreed that more meetings are called for. We also agreed that one measure of success is for the demand for developmental mathematics to be greatly reduced because the students place into transfer-level mathematics courses.

Thanks to CMC^3 for funding this articulation lunch!

Math Nerd Musings

Jay Lehmann, College of San Mateo

After teaching lower-level courses for many years, it's easy to become a bit jaded. We see it all: students who skip classes, don't do the homework, get distracted with handhelds during class, and on and on.

And yet, I'm blown away by the courage of arithmetic and algebra students. Even though most have faced these courses many times before and failed, they are willing to give it another shot. And there's no hiding their past failures. No one can pretend they were too busy in high school taking classes in other disciplines and never got around to signing up for math. You can feel the beaten-down feeling when teaching such classes in a community college. The tension rises to a suffocated silence when you teach challenging topics such as fractions in arithmetic and word problems in algebra. In office hours, we hear painful stories of past math instructors, who told students they were stupid and that they would never do well in math.

After experiencing failure several times, there is a terrible tendency in humans to go through the motions of making another attempt without really trying.

After experiencing failure several times, there is a terrible tendency in humans to go through the motions of making another attempt without really trying. After all, if we fail by doing so, we can tell ourselves we would've succeeded if we'd really tried. Of course, deep down, we don't really buy this and our self-esteem takes another beating.

That's not to say students don't make any effort. At the start of the course, the material is familiar and easy. Attendance and homework completion are usually strong. It's when things get challenging that students back off.

That's where we try and step in. We allow more time for difficult topics. We put tons of effort into sorting out ways to present the material so that it will be as clear as possible. We use collaborative learning, when appropriate. We encourage students to make use of our office hours and to form study groups. We applaud students for their successes, both small and large.

And sometimes we catch a student, just as they're about to fall. The student learns something they've never understood before. A spark of hope ignites: "maybe I can actually do this." There is nothing quite as wonderful as witnessing a student's reaction when they do better on a math exam than they've ever done before. It's a mixture of delight and confusion. It's as if their low math-esteem is wrestling with the high score on the exam. Something's got to give: "Maybe I'm better at math than I thought." Despite our terrible tendencies, we humans also have wonderful ones. Such as, when we get a taste of success, we want more. And more. Suddenly, going the extra mile is doable. We're focused on reaching the mountain summit, ignoring how far we might fall. Students might do additional problems, visit the tutoring center for the first time, form a study group.

There is nothing quite as wonderful as witnessing a student's reaction when they do better on a math exam than they've ever done before. It's a mixture of delight and confusion.

Of course, there are setbacks. Students can get overconfident, job commitments interfere, family difficulties distract, and on and on. Some students get back on track, some don't. It can be heartbreaking to watch a strong student drop the course with only a couple of weeks to go.

It's not just the students who are courageous. Yeah, I'm talking about us. Despite all the obstacles we face, semester after semester, we continue to reach out to students, try new pedagogical approaches, and revamp entire programs.

We do all of this for a variety of reasons, but perhaps the most emotionally rewarding one is when students contact us years later, saying they had always done terribly in math, but their experiences in our classes made them realize they could do well in math, and that faith in themselves made all the difference.

Calendar

February 25, 2012 MAA Northern California Section Meeting, Mathematical Sciences Research Institute, Berkeley, CA. Contact: Stephen Devlin (415) 422-6509, email: smdevlin@usfca.edu

March 2-3, 2012 CMC³-South 27th Annual Conference, DoubleTree Hotel, Orange, CA. Contact: Sherri Wilson, (909) 389-3336, email: swilson@craftonhills.edu

March 2-4, 2012 Teachers Teaching with Technology, Chicago, IL. Contact: Renee Hartshorn, (888) 282-8233, email: rhartshorn@ti.com

March 15-16, 2012, **NCMATYC Conference**, Cape Fear Community College, Wilmington, NC. Contact: Ann DeBoever. Website: http://ncmatyc.matyc.org/conferences/2012-ncmatyc-spring-conference-cape-fear-community-college-%E2%80%93-wilmington-nc/

March 22-25, 2012, 24th Annual International Conference on Technology in Collegiate Mathematics (ICTCM), Orlando, FL. Contact: Joanne Foster (800) 472-6288 or (207) 676-8688, email: joanne.foster@pearson.com

March 29-31, 2012, 37th Annual IMACC Conference, Allerton Park, Monticello, IL. Website: http://www.imacc.org/

March 29-31, 2012, MOMATYC Conference, The Lodge of Four Seasons, Lake Ozark, MO. Contact: Becky Schantz. Website: www.MOMATYC.org

March 30-31, 2012, VMATYC Conference, Lord Fairfax CC - Middletown Campus. Contact: Mike Kirby. Website: www.vmatyc.org

March 30-31, 2012, NEMATYC Conference, NHTI – Concord's Community College, Concord, NH. Contact: Judy King. Website: http://www.northeast.edu/Organizations/NEBMATYC/

April 25-28, 2012 NCTM 90th Annual Meeting, Miami, FL. Contact: NCTM Office (703) 620-9840, email: annlmtg@nctm.org

April 27-28, 2012 CMC³ 16th Annual Recreational Math Conference, MontBleu Resort Casino and Spa, South Lake Tahoe, NV. Contact: Mike Eurgubian, (707) 778-2474, email: meurgubian@santarosa.edu

July 8-15, 2012 12th International Congress on Mathematical Education (ICME-12), Seoul, Korea. Contact: Sung Je Cho, email: sungjcho@snu.ac.kr

November 8-11, 2012 AMATYC 38th Annual Conference, Jacksonville, FL. Contact: AMATYC Office, (901) 383-4643, email: amatyc@amatyc.org

December 7-8, 2012 CMC³ 40th Annual Conference, Portola Hotel and Spa, Monterey, CA. Contact: Susanna Gunther, (530) 864-7000

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