TexMATYC News

Texas Mathematical Association of Two –Year Colleges
Affiliate to the American Mathematical Association of Two-Year Colleges

Spring 2005 www.texmatyc.org

Inside this issue:

Innovative Teaching Ideas

Read Dr. John Edgell's paper on Mayan and Egyptian Pyramids and see how he has turned this topic into an innovative teaching idea for his students.

Marilyn Mays received prestigious AMATYC Mathematics Excellence Award

Judy Ackerman, AMATYC President

The AMATYC Mathematics Excellence Award is presented every other year to an educator who has made outstanding contributions to mathematics or mathematics education at the two-year college. Selection criteria are national reputation, leadership and activities in professional organizations, awards, grants, publications, professional activities on a regional, state, and national scale, and other contributions to mathematics or mathematics education.

This year, AMATYC proudly presented the 2004 Mathematics Excellence Award to Dr. Marilyn Mays at the AMATYC Annual Conference in Orlando.

A popular and sought out instructor, Dr. Mays has taught at North Lake College, in Irving, Texas, for more than 30 years, where she currently serves as Professor of Mathematics and Computer Science and also Dean of the Division of Mathematics and Science.

Dr. Mays holds advanced degrees in Mathematics and the College Teaching of

Judy Ackerman (right), AMATYC President, presents the Mathematics Excellence Award to Marilyn Mays.

Computer Science from the University of North Texas and Texas Technical University.

(Continued on page 4)

There is still time to register for the TexMATYC pre-conference workshop on Thursday Feb. 17, 2005… lunch is included!

Visit our website for details and application form.

President’s Message — Linda Zientek, Blinn College

The TexMATYC Board would like to welcome everyone. We are very pleased the membership continues to grow. While we continue to investigate ways to serve our member, we continue to welcome and encourage ideas to help TexMATYC fulfill the goal of improving mathematics and mathematics education. To facilitate communication, Irene Doo has established the listserv.

In response to the fall survey, the TexMATYC board is working to establish online professional development during the spring 2005 semester. ***Don Allen***, mathematics professor at Texas A&M University, has offered to provide this service. The online material will be available free to TexMATYC members. Details will be sent at a later data. ***Don Allen, Uri Treisman***, director of the Charles A. Dana Center and mathematics professor at the University of Texas, and ***Gloria White***, managing director of the Charles A. Dana Center, are working collaboratively with members of the TexMATYC board to acquire future funding to continue this endeavor. The hope is to be able to provide continuing online professional development for teachers of college and developmental level courses. TexMATYC would like to thank Don, Uri, and Gloria for their support and assistance.

The TexMATYC/TCCTA conference schedule is posted on the website. We are very excited about the variety of presenters and believe everyone will find a topic of interest to them. Prior to the TexMATYC/TCCTA conference a workshop will be conducted entitled **"Roll, Flip, Slide, and Turn into Geometry!"** This workshop investigates the nexus between theoretical mathematical empiricism and conceptual development of those ideas through manipulatives, investigative activities, and explorations. Specifically, this workshop will develop geometric pedagogical skills and provide several activities to energize mathematics courses for future teachers. Mathematics professors ***Robert M. Capraro*** and ***Mary Margaret Capraro*** from the Teaching, Learning, and Culture Department at Texas A&M will conduct the workshop. We look forward to seeing everyone in Austin in February.

Linda

Campus News Needed!

Let us know what is going on at your campus!!

See your name in print!!!

Send news items to the Newsletter Editor.

Project ACCESS fellow Heather Gamber Cy-Fair College, NHMCCD

Twenty-eight Project ACCCESS fellows, four directors, and about 20 presenters were excited to be part of the first cohort of Project ACCCESS: a mentoring and professional development initiative for community college math instructors in their first three years of full-time teaching. We met for the first time in November at a workshop held in conjunction with the AMATYC convention in Orlando, FL.

Eric Aurand
Eastfield College

Texas was well represented with three fellows: Eric Aurand, Eastfield College, Mesquite; Katherine Villarreal, North Lake College, Irving; and myself.

The workshop began with a reception on Wednesday evening. On Thursday we participated in an icebreaker discussing the biggest surprise we had teaching at a community college. Most of us had the same surprise: the diversity of the student population. The day was full of talks and workshops that presented information about teaching and the other responsibilities of faculty members. The workshops also modeled active learning. The evening finished with dinner and a discussion on how being members of professional organizations allows us to make a difference both in and out of the classroom.

Kathy Villarreal
NorthLake College

On Friday morning we joined our regional AMATYC meetings. The Southwest Region, & the Texans in particular, made us feel very welcome. The rest of the morning we participated in the AMATYC convention.

While the AMATYC participants were out enjoying Orlando in the afternoon, we met to share "Something that Works". Each fellow presented an activity that they had successfully used in their classroom. I have already been able to use some of these activities such as assessing learning by giving each student four different colored cards and having them show a card as an answer to a multiple choice question.

Heather Gamber
Cy-Fair College

Saturday included a keynote talk on the Foundations of Statistics by Mary Parker, Austin C.C., and an introduction to the individual projects that each fellow will be working on this year. I will be applying what I learned to create a more active learning environment in my college algebra classes.

More information about Project ACCCESS can be found at www.amatyc.org/ProjectACCCESS. Application deadline is June 15, 2005.

Project ACCCESS Co-Directors:
(from left) Alice Kaseberg, Sadie Bragg, Jan Ray

(not pictured) Sharon Ross

Math Alive! CAMT 2005
Engaging Hearts and Minds
July 11-13, 2005

CAMT 2005 will be held July 11-13, 2005, at the Adams Mark Hotel in Dallas, Texas. Program Co-Chairs are Barbara Holland and Michelle King. Registration and program information will be available online in spring 2005 at:
http://www.tenet.edu/camt/

Cathy Seeley, president of the National Council of Teachers of Mathematics, will present the opening session and one of this year's featured speakers will be Kay Tolliver.

TexMATYC membership is now at 145!

Treasurer, Habib Far, reports that this represents an 87% increase in membership since last April.

ME Award (Continued from page 1)

Extraordinarily active in AMATYC, for many years Marilyn served as chair of the Equal Opportunity in Mathematics Committee, and is passionately devoted to the cause of fostering diversity in the mathematical sciences. She was a superb president of the organization.

At the ICME9 conference held in Tokyo in 2000, Dr. Mays served as chief organizer of the first presentation to deal with community colleges ever held at an ICME. She has spoken and written widely on a variety of topics including attracting minorities into teaching mathematics, mathematical misconceptions, and telecommunications.

Dr. Mays has been instrumental in AMATYC securing grants from a variety of sources. She led the effort for AMATYC to establish a close connection with the ExxonMobil Foundation. It was largely through her efforts that grants were obtained from the National Science Foundation and from ExxonMobil to fund the development and distribution in 1995 of Crossroads in Mathematics, the organization's signature publication. Dr. Mays also served as co-principal investigator on a grant for AMATYC from the Center for Occupational Research and Development which led to the production of contextual materials to support the AMATYC standards.

It is always a pleasure to honor those who have contributed so much to the profession so it was my honor and pleasure to present this well-deserved award to Marilyn Mays.

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Check us out at
www.texmatyc.org

TexMATYC Listserve

The official mailing list for TexMATYC was officially launched earlier this year. Every member should have received an email directly from the list server, informing them of their enrollment in the listserve. As a TexMATYC member, you can send messages to the list, and you will automatically receive any messages sent to the list. To send a message, use the address:

TexMATYC_Members@texmatyc.org

If you have any questions, or wish to be removed from the list, please contact the Webmaster, Irene Doo.

Dates to Remember!

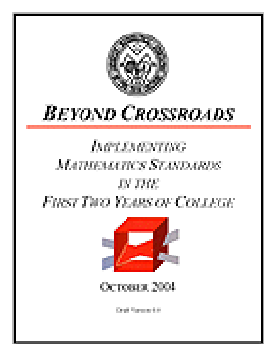
TexMATYC Pre-Conference Workshop
February 17, 2005

TCCTA/TexMATYC Conference
February 18-19, 2005

CAMT Conference
July 11-13, 2005

For more information visit
www.texmatyc.org

Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College October 2004



The *Crossroads* Revisited Project Team invites you to download the latest draft of the AMATYC Standards 2006 document, entitled *Beyond Crossroads* Draft Version 6.0. Visit http://www.amatyc.org to download the document.

The Project Team would also like your help with these questions:

- Can you suggest a title instead of *AMATYC Standards 2006* for the final document to be released in November 2006?
- The document will be accompanied by a variety of products in digital format. Can you give examples of products (topics and type of media) that would be useful to you?
  Send your responses to either question by email to Project Director Susan S. Wood (swood@jsr.vccs.edu).

Mayan and Egyptian Pyramids - Sums of Squares

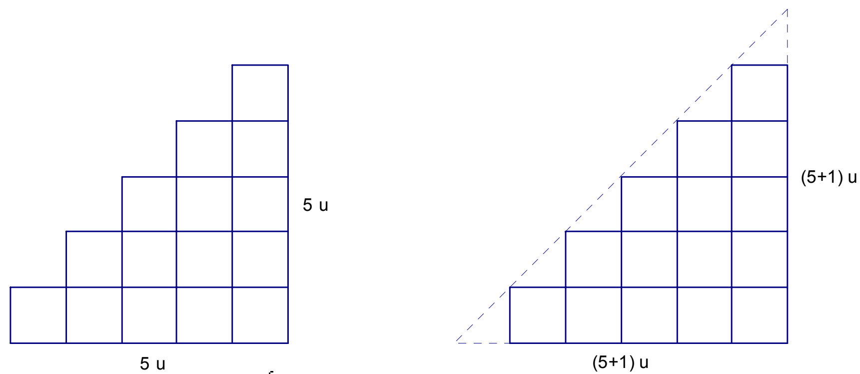
There are multitudes of algebraically equivalent formulas associated with sums of powers of consecutive counting numbers, $\sum_{i=1}^{n}(i)^p$. Sometimes one puts such formulas in a geometric setting versus an arithmetic or algebraic format. For instance, determine the number of integral sized p-dimensional cubes determined by a specific integral sized p-dimensional cube with each edge measuring n units. And, if one were a constructionist, one may prefer to guide students to discover these formulas rather than merely making such readily/easily available. Discovering conjectures can give one a feel for the dynamics of participating in real mathematics as conjuring viable conjectures usually is difficult. Further, one may be interested in having students to experience transforming geometric conjectures to theorems via applying Mathematical Induction, which is usually reserved for number theory, algebra, or discrete mathematics. After some of these experiences, students discover that Mathematical Induction is somewhat repetitious and finding viable conjectures remains challengingly difficult. In the process of discovering conjectures, we, as teachers, may suggest geometrically related hints.

Over the years teachers tend to accumulate some geometrical models which consistently seem to help students to discover and grasp viable conjectures. For instance, several geometric models probably come to mind for discovering the following: $\sum_{i=1}^{n}(i)^0 = n.$, $\sum_{i=1}^{n}(i)^1 = \frac{n(n+1)}{2}.$, or $\sum_{i=1}^{n}(i)^3 = [\sum_{i=1}^{n}(i)^1]^2 = [\frac{n(n+1)}{2}]^2.$, (see the cover of the November, 1988, issue of the Mathematics Teacher for a two dimensional model for developing a conjecture about the finite sum of consecutive cubes). But, how many geometric models come to mind for conjuring up a conjecture, particularly the traditional conjecture, for the finite sums of consecutive squares: $\sum_{i=1}^{n}(i)^2$? The following is a pair of geometric models that are useful in tandem for guiding students to discover the following expression: $\sum_{i=1}^{n}(i)^2 = \frac{n(n+1)(2n+1)}{6}$.

The first model of the tandem pair is associated with the finite sum of consecutive counting numbers: $\sum_{i=1}^{n}(i)^1 = \frac{n(n+1)}{2}.$ In retrospect, regardless of whatever geometric models students might have previously generated, one can suggest considering $\sum_{i=1}^{n}(i)^1$ as a step function or perhaps constructing a two dimensional modified right Mayan pyramid, featured below, Figure 1. And, one can suggest a corresponding two dimensional modified right Egyptian pyramid, Figure 1. Since square and right isosceles color coded tiles can be more dynamical one may prefer not to use diagrams with students, as with Figure 1. Hands-on manipulative objects tend to appeal to several senses and can aid students in conceptualizing, even at the university level. A drawing, such as Figure 1, is very static and one would need a sequence of transparencies of similar drawings. While drawings tend to help visual learners, hands-on manipulative tiles tend to help visual learners and others. Students can construct a sequence of several models with tiles in searching for a pattern. An initial property that should be reasonably clear to students, from the side-by-side constructions, is that Egyptian pyramids have more area than the corresponding Mayan pyramids. One might inquire about the relative size of the Egyptian model compared with the Mayan model. Students tend to readily realize that the Egyptian model would always be one unit wider and one unit taller than the corresponding Mayan model. Consequently, if the size of the base of the Mayan temple is n units and the height of the temple is n units, the temple represents an area of $[\sum_{i=1}^{n}(1\times i)]u^2 = [\sum_{i=1}^{n}(i)]u^2$. The base or height of the corresponding Egyptian temple would be $(n+1)$ units having an area of $[\frac{(n+1)(n+1)}{2}]u^2$. So, one might ask, "What could be done to the Egyptian pyramid to convert it to the Mayan pyramid?" Generally, students respond that one should remove the tiles between the steps. Another question might be posed, "In general, suppose one has a Mayan pyramid with n steps,

Dr. Edgell's students working on the models during class. From left to right, Melissa Jurica, David Van Voorhis, and Dimitri Hammond.

how many pieces should be removed?" Students pretty quickly realize that one should remove (n+1) pieces. Another question might follow, "What is the size of each piece being removed?" Students usually know the area of each tile is half of a square, $\frac{1}{2}u^2$. The area removed is $[(n+1)\frac{1}{2}]u^2 = [\frac{(n+1)}{2}]u^2$ and students tend to begin to get the algebraic message: $\sum_{i=1}^{n}(i)^1 = \frac{(n+1)(n+1)}{2} - \frac{(n+1)}{2} = \frac{n(n+1)}{2} + \frac{(n+1)}{2} - \frac{(n+1)}{2} = \frac{n(n+1)}{2}$, a-hah! Most often, leading questions are not necessary and a general practice is to offer hints, including leading questions, sparingly when student initiated observations might appear to stall.



A 2-D modified right Mayan pyramid with area $[\sum_{i=1}^{5}(i)^1]u^2$ A corresponding right Egyptian modified pyramid with area $[\frac{(5+1)(5+1)}{2}]u^2$

Figure 1. Transition from a Mayan pyramid to a corresponding Egyptian pyramid.

One can use the two dimensional modified temples to lever in the possibility of using three dimensional modified temples for providing insights into conjecturing a formula for determining the number of integral sized two dimensional cubes determined by a specific integral sized two dimensional cube, i.e., the finite sum of squares of consecutive counting numbers. Since one may not have commercial tiles available for the intended models, one should consider constructing color coded three dimensional tiles. One should stock up with pairs of consecutive integral sized square blocks one unit in thickness. Also, one should stock up with pairs of consecutive integral sized blocks which are right isosceles tri-lateral prisms to correspond to the lengths of the edges of the square blocks and different in color. And, one should stock up with several modified Egyptian right pyramids which are one unit by one unit by one unit and in still a different color. Notice that the square blocks occur in pairs and are to be the basis of two congruent Mayan modified three dimensional right Mayan pyramids. One pyramid will be used to compare with the other which will be transformed into a modified three dimensional Egyptian pyramid. The transformation will occur by using the prisms to smooth out the steps and the small pyramids to smooth out the intersecting edge, depicted in Figure 2 A and B.

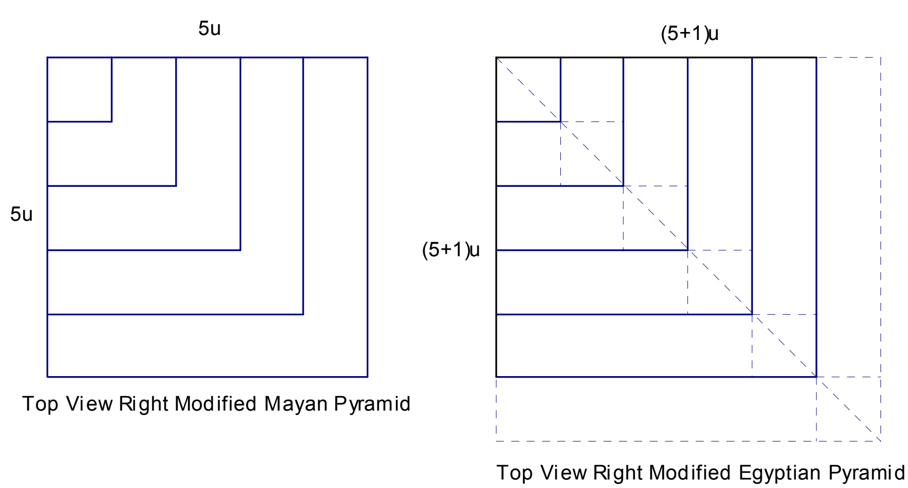
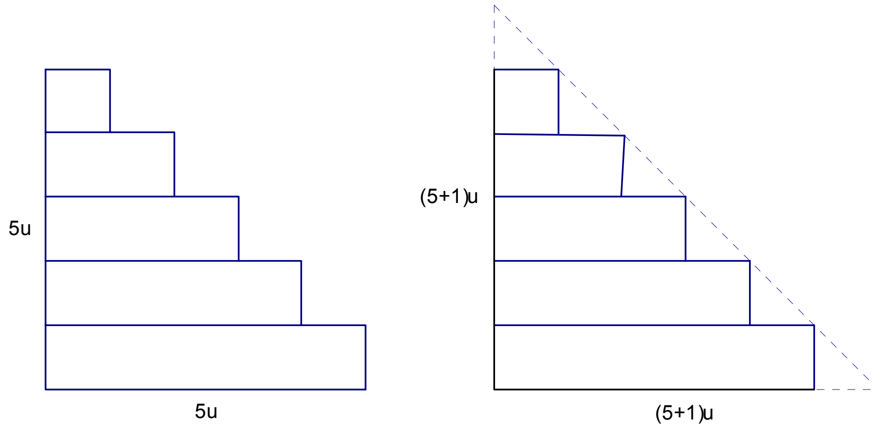


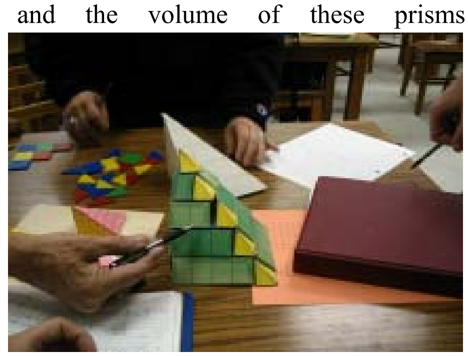
Figure 2 A Top Views of Mayan and Egyptian Pyramids



Front View Right Modified Mayan Pyramid   Front View Right Modified Egyptian Pyramid

Figure 2 B Front Views of Mayan and Egyptian Pyramids

Students readily recognize that the volume of each of the congruent modified right Maya pyramid models is represented by $[\sum_{i=1}^{n}(i)^2]u^3$. And, students also recognize that the volume of each corresponding modified right Egyptian pyramid models is represented by $[\frac{(n+1)^3}{3}]u^3$. From previous experiences students realize that parts of the Egyptian pyramid will need to be removed in order to recover the congruent Mayan pyramid. Students determine that each of the constructed Egyptian temples has one more corner tile than the dimension of the corresponding Mayan temples and each corner will need to be removed. The volume of each corner is $\frac{1^3}{3}u^3$ and the volume of removing $(n+1)$ of these corners is $[(n+1)\frac{1^3}{3}]u^3$. Removing the corners results in a volume represented by $\{[\frac{(n+1)^3}{3}]-[(n+1)\frac{1^3}{3}]\}u^3=[\frac{(n+1)^3-(n+1)}{3}]u^3$. Students realize that the prisms constructing the corresponding Egyptian model between steps of the Mayan model occur in pairs and pair-wise tessellate square prisms. And, each square prism corresponds in length to the length of the step. Further, the step lengths are in terms of consecutive counting numbers and the volume of these prisms is $[\sum_{i=1}^{n}(1\times 1\times i)]u^3=[\sum_{i=1}^{n}(i)]u^3$. Thus the volume of the prisms from the Egyptian construction is represented by $[\sum_{i=1}^{n}(i)]u^3=[\frac{n(n+1)}{2}]u^3$, from previous experience. The removal of the prisms completes a transformation of an Egyptian pyramid back to the corresponding Mayan pyramid with a resultant volume represented by $[\frac{(n+1)^3-(n+1)}{3}-\frac{n(n+1)}{2}]u^3=[\frac{n(n+1)(2n+1)}{6}]u^3$, with a few algebraic transformations. Consequently, students, realizing that the volume of the beginning and end are the same, discover the expression $[\sum_{i=1}^{n}(i)^2]u^3=[\frac{n(n+1)(2n+1)}{6}]u^3$ and hence the following formula, $\sum_{i=1}^{n}(i)^2=\frac{n(n+1)(2n+1)}{6}$. Students involved with these specific model experiences vicariously become



A 3-dimensional model, as shown by Dr. Edgell's students.

somewhat familiar with the associated algebraic statements involved in helping the Mathematical Induction proof flow somewhat easily.

Lessons involving topics such as Mayan and Egyptian pyramids are great opportunities for teachers to weave in a wealth of history, culture, environment, and address issues of diversity as well as developing significant mathematics.

By the way, does anyone out there, you the reader, have a good model to share for helping students to gain insight towards a viable conjecture for determining the number of integral sized tesseracts determined by an integral sized tesseract. The traditional associated formula is represented by $\sum_{i=1}^{n}(i)^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$, which, once conjectured, is easy to transform to a theorem via Mathematics Induction. Why not try a fourth dimensional modified right Mayan pyramid and a corresponding fourth dimensional modified right Egyptian pyramid?

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"Proof by Tomatoes?", Cover Photograph, photographed, designed, and executed by Ira Helfer and Cyrus Won, Mathematics Teacher, National Council of Teachers of Mathematics, November, 1988, Vol. 91, No. 8.

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"Geometric Reasoning – Mathematical Induction.", Edgell, John J., unpublished paper presented to the 48th Conference for the Advancement of Mathematics Teaching, July 20, 2001.