## TexMATYC News

## TCCTA/TexMATYC Conference

The TCCTA/TexMATYC Annual Convention will be held in Houston at the Westin Galleria and Westin Oaks hotels February 21-23. More information can be found at www.TCCTA.org

The TexMATYC Schedule is:
Thursday February 21, 1:00-4:00 p.m.
Preconference Workshops
1:00-4:00 p.m.
(open to everyone)
"Teaching with Technology in Mathematics"
Speakers: Cheryl Mott, Professor of Mathematics, San
Jacinto College; and Nelson Carter, Professor of
Mathematics, San Jacinto College

1:00-4:00 p.m.
(by initiation only)
"New Mathways Project Focus Meeting"
Speakers: Amy Getz, Program Coordinator of the Higher Education Team, University of Texas Charles A. Dana Center; and Paula Wilhite, Professor of Mathematics, Northeast Texas Community College

Friday February 22, 9:00 a.m. - 3:45 p.m.

9:00-9:45 a.m.
"Redesigning for Student Success"

Speakers: Tom Connolly and Amy Getz, Higher Education
Program Coordinators, and Nancy Stano, Graduate Research, University of Texas Charles A. Dana Center; and Connie Richardson, Assistant Professor of Mathematics, Midwestern State University

10:00-10:45 a.m.
"Mandated Changes to Mathematics Programs in Texas"
Speakers: Cynthia Martinez, Chair of the Department of Mathematics, Temple College; and Sharon Sledge, Professor of Mathematics, San Jacinto College

11:00-11:30 a.m.
"Let Your Voice Be Heard"
Moderator: Sharon Sledge, President, TexMATYC

2:00-2:45 p.m.
"Encouraging Critical thinking and Communication in Developmental Math"
Speaker: Mark Clark, Associate Professor of Mathematics, Palomar College

3:00-3:45 p.m.
"Hands-on Modeling of Quadratic Functions: What Fun!"
Speaker: Kathleen Mittag, Professor of Mathematics, University of Texas at San Antonio

Saturday February 23, 9:00-11:45 a.m.

9:00-9:45 a.m.
"Math Literacy for College Students: A non-STEM Pathway to College Readiness"

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Speaker: Kathleen Almy, Professor of Math \& Human Services, Rock Valley College

10:00-10:45 a.m.
"Fully Integrate Study Skills in Your Classroom Using P.O.W.E.R."

Speakers: Sherri Messersmith, Associate Professor of Mathematics, College of DuPage; and Robert Feldman, Professor of Psychology, University of Massachusetts

11:00-11:45 a.m.
"Measurements: Past, Present, and in Our Text Books" Speaker: Joanne Peeples Professor of Mathematics, El Paso Community College

Mathematics Section Co-Chairs:
Sharon Sledge, San Jacinto College, and
Cynthia Martinez, Temple College

# New Mathways Project Spring to Action 

By Cynthia Martinez, TexMATYC Vice President



The Dana Center at the University of Texas is springing into action with the New Mathways Project, scheduled for implementation in fall of 2013. This year nine Texas colleges were selected to participate as codevelopment partners. The schools that were selected in November 2012 are Northwest Vista College (Alamo District), Austin Community College, Brazosport College, El Paso Community College, Kilgore College, Lonestar College, Midland College, South Texas College, and Temple College. During the Spring 2013 semester the schools will be preparing for the Fall 2013 semester implementation. A two-course companion sequence, Foundations of Mathematical Reasoning along with Frameworks for Mathematical \& Collegiate Learning, will
be offered in the Fall 2013 semester followed by a Statistical Reasoning course, Elementary Statistics in the Spring 2014 semester. The staff at the Dana Center will be developing the curriculum sequence for these courses, which will align with the course descriptions in the Academic Course Guide Manual.

The Foundations of Mathematical Reasoning course will be a four credit hour course similar to an elementary algebra course, yet will prepare the student with the appropriate pre-requisite skills needed for success in the Statistical Reasoning course. The Statistical Reasoning course will follow the ACGM course description for Elementary Statistics. The developmental and credit math courses will be taught by the same instructor. The Frameworks for Mathematical \& Collegiate Learning is a study skills course geared to provide students the opportunity to investigate careers and programs of study they wish to pursue. Students will be exposed to mathematical study skills that will enable them in being successful in their gateway math course.

## About The New Mathways Project (NMP)

The New Mathways Project embodies the Dana Center's vision for a systemic approach to improving student success in and completion of college through the implementation of processes, strategies, and structures built around three mathematics pathways and a supporting student success course.

In 2012, the Dana Center entered into a unique partnership with the Texas Association of Community Colleges (TACC) to develop and implement the NMP as a statewide reform effort. The presidents and chancellors of all 50 Texas community college systems agreed to support this partnership, which calls for reform of developmental and gateway mathematics programs based on four principles:

1. Multiple mathematics pathways with relevant and challenging content aligned to specific fields of study.
2. Acceleration that allows students to complete a college-level math course more quickly than in the traditional developmental math sequence.


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3. Intentional use of strategies to help students develop skills as learners.
4. Curriculum design and pedagogy based on proven practice.

To support colleges in this reform effort, the Dana Center is developing curricular materials for courses along with tools and services to support implementation of the courses. The nine codevelopment partner colleges will work closely with the Dana Center to inform and advise on the development of NMP.

## From the AMATYC VP

By Kathryn (Kate) Kozak, AMATYC Vice President for the Southwest Region


Hello to all members of the TexMATYC. Many of you know me, but some of you I have not met. I am starting my second year as the Vice President. I am really excited about all the activities that the SW Region is doing this year. One of those activities is the AMATYC Southwest Regional Conference which is held June 14-15 at Coconino Community College in Flagstaff, AZ. The website is tinyurl.com/swamatyc/. Currently, applications are being accepted for presenters (through February 28, 2013) and presiders (through April 7, 2013). You can also register for the conference. The registration deadline for early registration is May 17, 2013. I hope to see all of you there. Flagstaff in June is quite nice, usually in the 70 s and 80 s and plenty of sunshine.

I am planning on attending the TCCTA/TexMATYC on February 21-23, 2013 at Westin Hotel Galleria in Houston. I hope to meet you there.

The AMATYC Annual Conference is in Anaheim, CA, October 31-November 3, 2013. Go to AMATYC.org for more information.

AMATYC has a new position paper on Proctored Testing in Online Courses. Please go to AMATYC.org to see this and other position papers. There may be some position statements created or revised after the AMATYC Annual Conference in Anaheim this year. I'll let you know.

Appointments will take place this year for state delegates to the AMATYC Delegate Assembly. State delegates' duties are:

1. Attend Delegate Assembly (no reimbursement).
2. Appoint campus representatives for the colleges assigned to him/her by the Regional Vice President.
3. Actively solicit membership in AMATYC, especially membership of campus representatives.
4. Assist the Regional Vice President in updating the list of potential AMATYC members from his/her state/province.
5. Assist the Regional Vice President in updating the directory of two-year colleges in his/her state/province.
6. Furnish the Regional Vice President with a calendar of activities and concerns of members from the state/province for possible inclusion in the regional page of the AMATYC News.
7. Encourage articles for the MathAMATYC Educator and other AMATYC publications.

Appointments will take place in April of this year. If you are interested in being a state delegate, please let me and your affiliate president know by March 31.

In addition, AMATYC is going to revive the position of campus representatives. Campus representatives have the following duties:


1. Assist the state/province delegate in promoting the activities of the association at his/her campus.
2. Forward a list of possible candidates for AMATYC membership to the assigned state/province delegate.
3. Assist the assigned state/province delegate and/or the Regional Vice President in updating the directory of two-year colleges in the state/province.
4. Keep the Regional Vice President aware of the changing curriculum patterns at his/her college by sending news related items to the assigned delegate.
5. Furnish the Regional Vice President items of interest from his/her school for the AMATYC News according to schedule.
6. Encourage colleagues to submit articles to the MathAMATYC Educator.
7. Solicit AMATYC institutional membership at home institution.

Please let me know if you are interested in being a campus rep.

The AMATYC News is the newsletter of the AMATYC, and contains important information from AMATYC. Please read the News to learn more about AMATYC, and consider writing an article. You can also write articles for the AMATYC Journal called the MathAMATYC Educator.

There are numerous positions that become available in AMATYC leadership. Please see AMATYC.org for postings. At AMATYC.org, you can also find information on the various AMATYC committees. If you can't attend the committee meeting at the annual conference, you can still participate, since most work of a committee is done through email and list servers.

I look forward to working with you this year. Please let me know if you have any questions or concerns.

Kathryn Kozak
Kathryn.kozak@coconinio.edu
Vice President of the Southwest Region of AMATYC

## TexMATYC Membership Counts for You!

By Paula Wilhite, Northeast Texas Community College

\# Joint annual conference with TCCTA providing professional development for math educators in curriculum and reform
\# State-level representation of programs of mathematics for policies and legislation effecting two-year colleges

* Connections and networking of professional math educators across Texas

Representation of programs of mathematics in Texas at the national level as an affiliate of AMATYC

Your membership in TexMATYC communicates your dedication to your profession as a math educator. TCCTA works for you as a multi-disciplinary advocate for community colleges at the state level. AMATYC works for you at the national level as the professional organization of mathematics education of two-year colleges. However, TexMATYC works for you at the state level by representing mathematics education at two-year colleges. It is important that you join the ranks of math educators of two-year colleges who lead Texas through your membership in TexMATYC.

TexMATYC is the result of the dreams and hopes of math educators just like you who want to make a difference. For only \$10 per year for full-time faculty and \$5 per year for adjunct faculty, you are counted with other

professional math educators who are committed to excellence in math education. The magnitude of our membership measures the strength of our voice across our state. More than ever before, your participation is valued and needed to impact the future role of mathematics in higher education.

Together we can make a difference!
To join or renew your membership, please go to www.texmatyc.org. Click on "Become a Member".

## Back and Forth with Pi

By Todd Thomas, Associate Professor of Mathematics Lone Star College-CyFair

One of the challenges of teaching mathematics is instilling in students the beauty of number. After describing the mystery and wonder of pi, for instance, I often get the response, "That is just 3.14, right?" Of course, that is when I go into my "Pi is irrational and 3.14 is just an approximation" talk. Some students seem to glean some appreciation of the beauty of pi, but I always search for ways to deepen that appreciation.

Because pi is beautiful! It always amazes me that pi shows up in almost all important mathematical formulas. It is present in the normal distribution formula and in the beautiful $\mathrm{e}^{\wedge}\left(\mathrm{i}^{*} \mathrm{pi}\right)+1=0$, for instance.

So it was that one day while considering the irrationality of pi, I conceived the thought experiment of two men and a circle. One man, Circumference Man, walks around the circle and the other, Diameter Man, walks back and forth across the circle. If the two men start from the same place at the same time, they will never meet again because of the irrationality of pi.

I came to the conclusion that demonstrating this thought experiment to students might engender an appreciation of pi. It would show the relationship of the circumference of a circle to its diameter in a visceral way that students might enjoy. So began my journey of
making the thought experiment come alive. The idea at first was just a seed, waiting to germinate. One of the classes I taught helped the seed sprout.

While teaching Trigonometry and Precalculus, I came to the section on parametric equations and I realized this was what I needed for my idea. Certainly, the man walking around the circle was easily accomplished: $\mathrm{x}=$ cos $t$ and $y=\sin t$ gets the job done nicely and with little trouble. Making Diameter Man walk back and forth across the circle was more difficult and led to this paper.

Instead of simply presenting my results, I fashion this paper in a stream-of-consciousness approach to show the steps I used to discover the formula for Diameter Man.

Since we want the two men to begin at the same spot and $(\cos 0, \sin 0)=(1,0)$, I decided to have Diameter Man walk from ( 1,0 ) to ( $-1,0$ ) repeatedly. Since he never leaves the $x$-axis, the vertical part of the parametric equation is $y=0$. Finding an expression for the horizontal part of the walk, then, is the struggle. The journey to discovery is interesting and intriguing and I recommend it heartily as a student project. Trig and Precalc students can quickly accomplish the equations for Circumference Man, which hopefully motivates them to finish the project.

As a side note, even as I was working on accomplishing the project on a graphing calculator, I was somewhat downcast that I would not be able to get the two men to walk at the same time. This misconception on my part was dispelled by Dr. Dennis Pence of Western Michigan University at the 2009 ICTCM Conference in New Orleans. He made me aware of Simultaneous mode on the TI-83 Plus Silver Edition calculator and thus paved the way for my dream to come true. Thank you, Dr. Pence!

So... how do we make Diameter Man walk back and forth?

Let's see... let's make a chart of $t$-values and the $x$ position for each value. Then we can search for a pattern.


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```
t 0
x(t) 1 0 0 -1 0
```

Hmm... what if we simply subtract one from the other?
t $\quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \ldots$

Okay, there definitely seems to be a pattern, although the pattern does seem a bit odd (pun intended).
Breaking down the first trip from $(1,0)$ to $(-1,0)$ further, we get more information.
$\begin{array}{llllllllll}\mathrm{t} & 0 & 0.25 & 0.5 & 0.75 & 1 & 1.25 & 1.5 & 1.75 & 2\end{array}$
$x(t) \quad 1 \quad 0.750 .5 \quad 0.25 \quad 0 \quad-0.25 \quad-0.5-0.75-1$
We again calculate $x(t)-t$ at each point.
$x(t)-\mathrm{t} 1 \quad 0.5 \quad 0 \quad-0.5 \quad-1 \quad-1.5 \quad-2 \quad-2.5 \quad-3$
Hmm... that doesn't seem to help... Hey, wait a minute! Let's add them!

```
t 
x(t) 1 0.75 0.5
```



Now that is a pattern!
Since $x(t)+t=1$, it follows that $x(t)=1-t$ for the first leg of the journey.

But what happens when Diameter Man turns around and walks back to $(1,0)$ ?

Let's check it out.

| $t$ | 2 | 2.25 | 2.5 | 2.75 | 3 | 3.25 | 3.5 | 3.75 | 4 |
| :---: | ---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $x(t)$ | -1 | -0.75 | -0.5 | -0.25 | 0 | 0.25 | 0.5 | 0.75 | 1 |

Adding doesn't help this time, but subtracting does.

$t-x(t) 3$|  | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

Since $t-x(t)=3, x(t)=t-3$.
Just to make sure the pattern holds, we check the third leg of the journey.

| $t$ | 4 | 4.25 | 4.5 | 4.75 | 5 | 5.25 | 5.5 | 5.75 | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $x(t)$ | 1 | 0.75 | 0.5 | 0.25 | 0 | -0.25 | -0.5 | -0.75 | -1 |
| $x(t)+t$ | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

Since $x(t)+t=5, x(t)=5-t$ for the third leg.
This provides credence for the following piecewise function which describes the movements of Diameter Man.

|  | $x(t)$ |
| :---: | :---: |
| $0 \leq t<2$ | 1-t |
| $2 \leq t<4$ | t-3 |
| $4 \leq t<6$ | 5-t |
| $6 \leq t<8$ | t-7 |
| $8 \leq t<10$ | 9-t |

and so on. The next phase of discovery begins.

We must somehow connect each interval with the needed odd number in our description of $x(t)$. Every good math student knows that the odd numbers are described by $2 n+1$, where $n$ is a natural number. So if we can map the pieces of our piecewise function with the natural numbers beginning with 1, we are well on our way to completing the mission.

Let's see... each interval has length 2... Oh, right, now I see it... we can simply divide the upper boundary of each piece by 2 to recover the natural numbers. But we cannot use simply t/2 because we want the expression to work for all t , not just the upper boundaries.

Coming to our rescue is the greatest integer function, int(x), available on many graphing calculators, including the TI-83 Plus Silver Edition, gives the greatest integer that is less than or equal to $x$. Since each interval has


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length 2 , we can divide $t$ by 2 and then apply the greatest integer function. Let's check it out.

$$
\operatorname{int}(t / 2) \quad \operatorname{int}(t / 2)+1
$$

| $0 \leq t<2$ | 0 | 1 |
| :--- | :--- | :--- |
| $2 \leq t<4$ | 1 | 2 |
| $4 \leq t<6$ | 2 | 3 |
| $6 \leq t<8$ | 3 | 4 |
| $8 \leq t<10$ | 4 | 5 |

and so on. We have mapped the natural numbers, beginning with 1 , to each piece of our domain. How wonderful!

Considering again our piecewise function above, we notice that the sign of $t$ changes for each piece, first negative, then positive, etc. As all good math students know, this is accomplished by multiplying each piece by 1 to the appropriate exponent.

Putting all this together, we arrive at our description of $x(t)$.
$x(t)=\left((-1)^{\wedge}(\operatorname{int}(t / 2)+1)\right)(t-(2 \operatorname{int}(t / 2)+1))$
Checking this formula for $t=0, t=1, t=2$ and $t=3.5$, we find
$x(0)=\left((-1)^{\wedge} 1\right)(t-1)=1-t \quad$ check
$x(1)=\left((-1)^{\wedge} 1\right)(t-1)=1-t \quad$ check
$x(2)=\left((-1)^{\wedge} 2\right)(t-3)=t-3 \quad$ check
$x(3.5)=\left((-1)^{\wedge} 2\right)(t-3)=t-3 \quad$ check
Let's plug all this into the TI-83 Plus calculator and see our project come alive! First, the mode settings, which are key to the whole process.

Mode --> Parameter
Mode --> Simultaneous

Mode --> Radian
Now in the $y$-editor, we can carefully enter our parametric functions.
$x 1=\cos t$
$\mathrm{y} 1=\sin \mathrm{t}$
$x 2=\left((-1)^{\wedge}(\operatorname{int}(t / 2)+1)\right)(t-(2 \operatorname{int}(t / 2)+1))$
$y 2=0$
And, finally, let's set our Window. Let's see... we want to see slightly more than the unit circle and we want a square setting. The screen on the calculator is wider than it is tall, but Zoom --> Square squares things up. A personal preference of mine is to have the men walk in steps that are increments of pi, say pi/24. Let's do it.

Window
$\operatorname{tmin}=0$
tmax $=44$
tStep $=\mathrm{pi} / 24$
$x \min =-1.1$
$x \max =1.1$
$x$ Res $=1$
$y \min =-1.1$
$y \max =1.1$
$y$ Res $=1$
Now we hit Zoom --> Square to square the window.
One final detail, the need for which only becomes apparent after graphing the first time, is that we lose track of Circumference Man after he navigates the circle one time. To avoid this, we return to the $y$-editor and give each function what I refer to as the key symbol. Carefully selecting the $x 1$ line, for instance, and hitting the left arrow to arrive left of x1, we hit Enter repeatedly

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until the symbol appears that looks like a capital letter C. I call it the key symbol because it reminds me of the symbol from Pirates of the Caribbean, the key to Davey Jones' locker.

Anyway, $x 1, y 1, x 2$ and $y 2$ all get the key symbol before we graph.

Holding our collective breaths, we hit Graph and...
THEY'RE OFF!!! LOOK AT THOSE MEN WALK!!! BEAUTY ITSELF!!!

## Epilogue:

After conceiving the entire project to demonstrate the irrationality of pi, I was fascinated to discover that there are times during the walking that Circumference Man and Diameter Man appear to collide. I was amazed! This cannot happen, I thought at first. What did I do wrong?

My pattern recognition program kicked in and I noted when these collisions occurred.

The fourth time Circumference Man nears the point (1,0), Diameter Man is right there too! Spooky!

The seventh time after the start that Circumference Man nears (1,0), Diameter Man appears to collide with him. Wow!

Calculating the distances each man has walked at these critical points in their travels, we find the following.

From the first collision: $3.5 \mathrm{C}=11 \mathrm{D}$, or $\mathrm{C} / \mathrm{D}=11 / 3.5=22 / 7$.
From the second collision: $7 \mathrm{C}=22 \mathrm{D}$, or $\mathrm{C} / \mathrm{D}=22 / 7$.
So that is what is happening! Since pi is the ratio of circumference to diameter for every circle, our walking men show that a good approximation of pi is 22/7.

In fact, this is how I use the project to show pi to developmental math students. First, I convince them that the two men will never meet and then show them the graphing. I leave it to perceptive students to notice that, in fact, the two men do seem to meet. Running the graphing again and having them count leads to their discovery of the ratio 22/7.

Theoretically, of course, one could successfully argue that if the men have corporeal bodies, that is, if they have measurable volume, they will actually collide at the critical points in the journey. However, if our men are single points, or line segments perpendicular to the plane of the circle, they will never meet after the start based on the irrationality of pi.

I see it clearly now: Circumference Man and Diameter Man walking around and back and forth, never meeting throughout the eons of time. A fascinating thought experiment is brought to life using the graphing calculator and the discovery method.

The collision at ( $-1,0$ ):

## Distance Walked

| Circumference Man | 3.5 Circumferences |
| :--- | :--- |
| Diameter Man | 11 Diameters |

The collision at ( 1,0 ):

|  | Distance Walked |
| :--- | :--- |
| Circumference Man | 7 Circumferences |
| Diameter Man | 22 Diameters |

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## Joke of the Month

$(P+L)(A+N)=P A+P N+L A+L N$

## I just foiled your plan!

## Got News?

If you know of any exciting news in mathematics, have it published in your TexMATYC newsletter. Submit articles to Heather Gamber at heather.a.gamber@lonestar.edu.

Visit us at www.texmatyc.org

