In This Issue:

Mission: Illinois Council of Teachers of Mathematics is a community of PreK through Post-graduate (PreK–20) educators promoting equitable, high quality mathematics teaching and learning through leadership, collaboration, advocacy and professional development.

Vision: The Illinois Council of Teachers of Mathematics is the state leader in mathematics education. ICTM is committed to sound pedagogy, teacher collaboration, and professional development, ensuring student achievement through engagement in meaningful and rigorous instruction. As a respected leader in mathematics education at the school, district, state, and national levels, ICTM serves as a collaborative partner to promote the achievement of every student.

President's Message
September 2015 *by Robert Mann, ICTM President*

Hello Fellow Educators and Welcome **Back**!

Yes, we are back—back in session, back in school, back in the classrooms, back to engaging students, promoting understanding, and fostering growth and learning. Yet, even as we return to our first days of school, I am now writing my last message as President of this great organization. Of course, I will also be back on the ICTM board as Past-President and hope to continue to serve our organization, profession, and membership. We have taken many steps over the past few years to help make ICTM more visible, viable, and vibrant and I hope our efforts have resulted in a more robust and worthwhile experience for our members.

Our conference in October marks a 'changing of the guard' and George Reese will begin his term as President at that time. Meanwhile, Jennie Winters, Adam Poetzel, and Kara Leaman will step down from the board and Denise Brown, Sendhil Revuluri, and Jeremy Babel will begin their terms. It has been a pleasure to work with Jennie, Adam, and Kara over the past three years as they, like so many of our members, represent excellence in teaching mathematics and in professional leadership. I thank them for their time and energy and extend that thanks to all the tremendous people I have been able to meet and work with as a part of ICTM. The new ICTM board will be back this fall and I know they will continue the journey of leading this valuable and venerable organization forward (follow us on facebook, at **www.ictm.org** and **@mathictm**).

The ICTM conference will also be back this fall and I believe it will be back with a bang! The 65th annual event will be October 23 and 24 at Tinley Park and will feature Dr. Jo Boaler on Friday and Eli Luberoff on Saturday. Dr. Boaler is the co founder of **youcubed** (see **www.youcubed. org**) and a recognized leader in mathematics education. Eli is the creator of **Desmos** (see **http://desmos.com**) and is an innovator in representing and connecting mathematics. These speakers and many others will enlighten and inspire conference participants while addressing the 2015 theme of *"What's Math Got to Do With It?"***(#ICTM2015)**.

Yes, the ICTM conference is coming back to Tinley and we welcome you back to this exciting event—whether it is your first time or simply your next time--we want to see you back at this premiere event for outstanding professional development on the teaching and learning of mathematics! The program book, more conference information, and registration materials are all now available at **http://www.ictm.org/annualmeeting.html**. Check out what ICTM and this conference have to offer, sign up now to attend this extraordinary event, encourage your colleagues to attend with you, and come back to Tinley to learn, grow, network, and enjoy!

School is back, ICTM is back, the conference is back, and the opportunity to shape and shepherd the future is back. We return to our classrooms to impact the future and we go back to move forward (Hello…McFly??). I extend to you best wishes as you embark on a new school year and I invite you back to Tinley to share the power and passion of our profession with your ICTM peers and fellow difference-makers.

Welcome back to new beginnings and thank you for serving our future!

Dr. Bob Mann
ICTM President
rr-mann@wiu.edu

President-Elect's Report

by George Reese
ICTM President-Elect

Acknowledging the Service of Our ICTM Board

The 2015-2016 school year brings transitions to the ICTM Board. Kara Leaman, Adam Poetzel, and Jennie Winters are leaving the Board as Sendhil Revuluri, Denise Brown, and Jeremy Babel join.

Kara Leaman has served as the Board Chair for the past year. As everyone on the Board knows, this is the person who does the real work of making the ICTM Board meetings function smoothly. Kara has done it beautifully. Adam Poetzel has been the stalwart monitor of content on the ICTM.org website and the regular correspondent with Don Beaty, who graciously maintains the site. Adam has also taken the modest video archive of ICTM and upgraded it to dozens of presentations that have greatly enriched the ICTM Members page. And Jennie Winters has been the frank and energetic voice of professional development on the ICTM Board. To list only two notable activities, she is the leader of the Model Mathematics Curriculum and was the very first presenter for ICTM's very first Webinar. These three leaders will be missed at the Board meetings, but we hope and pray they will continue their energetic support of ICTM.

A talented new group of educators joins the Board this fall. First is Sendhil Revuluri, who is the new Director At-Large. Sendhil is an Illinois native whose career has been dedicated to mathematics and mathematics education. Currently, he is working at the University of Illinois at Chicago. Denise Brown is a 5th grade teacher from Murphysboro who will join the Board as the EC–6 Board member. Her experience in rural school professional development, action research, and CGI will be useful to us on the Board and to the whole membership. Finally, our new 9–12 Director is Jeremy Babel. He is the Mathematics Department Chair at Leyden High School has been actively involved the MDHWCS and MMC, two powerful organizations from which many ICTM leaders have come.

Board Chair Report

by Kara Leaman, ICTM Board Chair

Hello, ICTM Friends! ICTM will be welcoming new Board members and celebrating the work of the 2015 ICTM award winners at the Annual Conference this fall. Please see the results of the 2015 Election on the adjacent page. The 2015 list of ICTM awardees were also approved through electronic vote by the Board following the May 16th meeting.

Early Bird registration end October 1st, so get registered for the 2015 Annual Meeting and Conference. Help us welcome Jo Boaler, co-founder and CEO of Youcubed and Eli Luberoff, founder and CEO of Desmos to Illinois! This Annual Conference is sure to be worth the investment. The awards reception to honor 2015 awardees and outgoing Board members will be Friday evening. The IMT reception will take place Saturday morning with coffee and rolls. The past president's and affiliate luncheon, joint poster sessions with ISTA, a job interview fair, and the annual ICTM business meeting are on the schedule for Saturday. See the ICTM website and conference booklet for further details, times, and locations of all sessions at the Tinley Park Convention Center.

Looking forward to 2016, a motion was approved to continue work on conference plans for 2016 in Peoria with ISTA. In addition, an ISTA Liaison was established, and this individual will communicate with ISTA in a reciprocal relationship.

Continue to look for information to be distributed about upcoming webinars and twitter chats from ICTM. Twitter chats can be followed and joined at any time by searching for **#ilmathchat** on Twitter. If you'd like to join in on the fun, just make sure to include **#ilmathchat** in your response, however it is also fun to experience the Twitter chats live during the scheduled time. We are also on Facebook! All you need to do to follow Facebook posts is search for Illinois Council of Teachers of Mathematics and "like" the page. We have over 200 Facebook fans!

The next Board meeting will be held at the Bloomington Holiday Inn Express and is scheduled for December 5, 2015.

Math Musings with Martin

Q: What was the score at the inverse function tournament?

A: One to one.

Submitted by Martin Funk, ICTM Director 9–12

2015 ICTM Board Election Results

Director EC–6:

Denise Brown
Carruthers Elementary School
Murphysboro, IL

Director 9–12:

Jeremy Babel
Leyden High School
Franklin Park, IL

Director at-Large:

Sendhil Revuluri
University of Illinois at Chicago
Chicago, IL

These officers will assume their duties at the installment ceremony during the 2015 ICTM Annual Meeting on October 23.

Special thanks to the following candidates for their participation in the 2014 ICTM Board Elections:
- *Cheng-Yao Lin*
- *Glory Jurich-Sarna*
- *Chad Shepherd*

ILLINOIS COUNCIL OF TEACHERS OF MATHEMATICS

SCHOLARSHIPS IN MATHEMATICS

The ILLINOIS COUNCIL OF TEACHERS OF MATHEMATICS presents annual ICTM Scholarships in Mathematics Education.

A minimum of 2 and a maximum of 5 annual awards of **$1500** will be granted to help defray educational expenses of the recipients.

Complete information and the application form can be found on the ICTM website at

http://www.ictm.org/scholarship.html

Students can download the application forms, request them from their mathematics education department or write to:

Sue and Randy Pippen
ICTM Scholarship
24807 Winterberry Lane
Plainfield, IL 60585

Please enclose a self-addressed stamped business envelope with your request for application forms.

The completed application forms must be received in one mailing or combined with an e-mail and must be postmarked on or before **March 1 of the year of application**. The recipients of the scholarship awards will be announced in June and awarded at the banquet at the ICTM Regional Meeting each fall.

NOMINATE NOW
for the
2015 ICTM AWARDS!

Please take a moment to think about a teacher who makes a difference. This person may be a colleague, an administrator, a university professor, or even your own child's teacher. Please consider nominating that person for an ICTM award. We are all aware that teaching is a lot of hard work without much compensation; one way to recognize excellence in our field is to nominate an excellent teacher. As well, it is fun and rewarding to participate in the nominating process.

The details of the awards are available on the ICTM website, **http://www.ictm.org/ictmawards/**. The process is simple. The deadline is March 30 of each calendar year, and nominations can be sent as a .pdf file or mailed to the addresses provided on the website. I look forward to reading about the accomplishments of many of the educators throughout the state.

I know that many of you who have read this are saying, "Yes, that is a good idea. I have been meaning to nominate that person." Or maybe you're saying, "Yes, but it's too late for this year." Please start the process right now, even if it's for the 2016 Awards. The nominating process is an important part of emphasizing the best parts of our profession in a moment when much of the general public wants to believe many of us are incompetent. So please commit to submitting a nomination and help to honor a fellow educator.

Illinois Mathematics Teacher Journal

Current issue online now
at www.ictm.org/journal

ICTM Listserv Update

Do you receive e-mails from the ICTM Listserv?

If you answered no, then consider subscribing today. Subscription to the Listserv is a benefit of your ICTM membership. E-mails sent through the Listserv often give information about upcoming conferences, details about professional development opportunities, information about ICTM awards and scholarships, links to math related websites and news articles, and questions/announcements from other math teachers around the state. All subscribers to the Listserv can send out messages to the recipient list. To sign up, visit http://www.ictm.org/ListServe.htm and complete the short online form. You can choose to unsubscribe from the List Serve at any time. Subscribe today and join the conversation!

MATH ENERGY
for Pre-Service Teachers
at Eastern Illinois University

In 1991 the Math Energy Club was established at Eastern Illinois University. In the fall of 1992, Math Energy became an affiliate group of Illinois Council of Teachers of Mathematics (ICTM) and received our affiliate group charter from the National Council of Teachers of Mathematics (NCTM) at the 1994 NCTM meeting at Indianapolis.

Math Energy is a pre-service teacher organization which meets monthly to give members the opportunity to attend presentations by various professionals speaking on math related topics in the field of education. Math Energy focuses on a hands-on approach to teaching math. All grade and ability levels are explored at our meetings.

Monthly meetings will be scheduled for Spring Semester. More information can be found on the Math Energy website: http://mathenergy.wordpress.com

ICTM Awardees and Scholarship Winners

One important function of ICTM is to recognize excellence. The ICTM awards for contributions to teaching and math education and the awards to the 2015 scholarship winners will be presented at the ICTM Annual Meeting in Tinley Park. The reception and awards presentation will be held Friday evening, October 23, 2015 at 5:30 p.m. in the Exhibit Hall North of the Tinley Park Convention Center. A cash bar and complimentary hors d'oeuvres will be provided by ICTM. Please join us at this important and fun event!

ICTM is proud to announce the 2015 recipients of ICTM awards for outstanding teaching and contributions to Education.

Max Beberman Mathematics Educator Award	**Martha Eggers** McKendree University, Lebanon
Distinguished Life Achievement in Mathematics Award	**Peter Braunfeld** University of Illinois at Urbana-Champaign
Fred Flener Award : Engaging Students in Math Beyond the Classroom	**Leona Mirza** North Park University, Chicago
Excellence in Middle School Mathematics Teaching Award	**Martha Reilly** Byron Middle School, Byron
Illinois Promising New Teacher of Mathematics Award	**Tina Nicola** Niles North High School, Skokie
Excellence in Secondary Mathematics Teaching Award (T. E. Rine Award)	**Richard Kaplan** Evanston Township High School, Evanston
Lee Yunker Mathematics Leadership Award	**Danyelle Larson** Oregon High School, Oregon

The awards presentation will include a short video about each awardee. This is an opportunity to honor and congratulate those who have played a special role in the lives of their students and colleagues. Come celebrate their accomplishments, say thank you to someone you know, and be inspired by the work of someone you have not yet met.

ICTM Scholarship Co-chairs, Randy and Sue Pippen, proudly announce this year's Scholarship awardees. They are:

- **Maria-Christina Gianni** from Elgin, attending the University of Illinois – Urbana/Champaign, majoring in elementary education with a concentration in mathematics
- **Amy Weiting** from Rockford, attending Illinois State University, majoring in Middle School Mathematics Education

There are only two awardees this year because of the low number of applications. We need help from ICTM members to recommend applying to any junior or senior in college who is majoring in mathematics education or elementary education with a concentration in mathematics. We need more applicants and that requires getting the word out to our members and college professors involved in preparing young teachers. We would also like to thank our committee members who read and evaluated the applicants:

Edna Bazik	Mona Busch	David Peterson
Kathleen Beard	David Elliott	Sam Urbain

Please join us in celebrating the accomplishments of all award winners at the Awards Banquet on Friday, October 23!

RESULTS from the 2015 ICTM High School State Math Contest

(held May 2, 2015, at the University of Illinois at Urbana-Champaign)

Division 1A			Division 2A	
Cornerstone	740		University of Chicago Laboratory	832
Johnston City	520		Morton	644
Northridgeprep	459		Montini Catholic	629
College Prep School of America	443		Mahomet-Seymour	609
Maroa-Forsyth	435		University (Normal)	608
Oblong	432		St. Francis	602
IC Catholic Prep	381		Marmion Academy	598
Alpha Omega	379		Richmond-Burton	555
Lexington	345		Herrin	550
High School of St. Thomas More	331		Nazareth Academy	534

Division 3AA			Division 4AA	
Libertyville	899		Adlai E. Stevenson HS	1213
Vernon Hills	850		Whitney Young	1184
Northside College Prep	835		Naperville North	1129
Marist	819		IL Math/Science Academy	1076
University of IL Lab	774		Glenbrook North	1052
Glenbard South	721		New Trier	1007
Fenwick	718		Glenbrook South	969
Lake Forest	633		Naperville Central	969
Benet Academy	598		Neuqua Valley	941
Buffalo Grove	596		Walter Payton	937

Details about team scores and specific events is posted on the ICTM Contest website **http://ictm.org/links/contest.html**

Registration for the 2016 Contest is now open.
   2016 Regional Contest - Saturday, February 27, 2016
   2016 State Finals - Saturday, May 7, 2016

The registration deadline and information about fees and registration is available on the ICTM website (**http://ictm.org/links/contest.html**) or contact the high school contest chair (**hschair@ilmathcontest.com**) or the grade school/junior high contest chair (**gschair@ilmathcontest.com**). New schools can contact **hschair@ilmathcontest.com** (for high school) or **gschair@ilmathcontest.com** (for grade school) for information and to get a school account set up.

RESULTS from the 2015 ICTM Grade School State Math Contest

(held May 2, 2015, at the University of Illinois at Urbana-Champaign)

Grade 3				Grade 6		
Place	School	City	Place	School	City	
1	Half Day School	Lincolnshire	1	Meadow Glens	Naperville	
2	Brook Forest	Oak Brook	2	Univ. of Chicago Lab Schools	Chicago	
2	Univ. of Chicago Lab Schools	Chicago	3	Avery Coonley School	Downers Grove	
4	Meadow Glens	Naperville	3	Hawthorn Middle School South	Vernon Hills	
5	Ball-Chatham-Glenwood Elem.	Chatham	5	Bismarck-Henning Jr High	Bismarck	
6	Steeple Run Elementary	Naperville	6	Meridian Middle School	Buffalo Grove	
7	Fry Elementary School	Naperville	7	Fischer Middle School	Aurora	
8	Highlands Elementary School	Naperville	8	Thayer J. Hill Middle School	Naperville	
9	Holmes School	Oak Park	9	Science Academy of Chicago	Mt Prospect	
10	Noel LeVasseur School	Bourbonnais	10	Granger Middle School	Aurora	

Grade 4				Grade 7		
Place	School	City	Place	School	City	
1	Meadow Glens	Naperville	1	Hawthorn Middle School South	Vernon Hills	
2	Half Day School	Lincolnshire	2	Univ. of Chicago Lab Schools	Chicago	
3	Highlands Elementary School	Naperville	3	Thayer J. Hill Middle School	Naperville	
3	Romona Elementary School	Wilmette	3	Fischer Middle School	Aurora	
5	Steeple Run Elementary	Naperville	5	Granger Middle School	Aurora	
6	Univ. of Chicago Lab Schools	Chicago	6	Timber Ridge Middle School	Plainfield	
7	Brook Forest	Oak Brook	7	St. Athanasius School	Evanston	
8	Naper	Naperville	8	Leman Middle School	West Chicago	
9	Holmes School	Oak Park	9	Science Academy of Chicago	Mt Prospect	
10	River Woods	Naperville	10	Lake Forest Country Day School	Lake Forest	

Grade 5				Grade 8		
Place	School	City	Place	School	City	
1	Meadow Glens	Naperville	1	Crone Middle School	Naperville	
2	Daniel Wright Junior High School	Lincolnshire	2	Univ. of Chicago Lab Schools	Chicago	
3	PL Bolin	East Peoria	3	Thayer J. Hill Middle School	Naperville	
4	Avery Coonley School	Downers Grove	4	Fischer Middle School	Aurora	
5	Scott School	Naperville	4	Hawthorn Middle School South	Vernon Hills	
6	Univ. of Chicago Lab Schools	Chicago	6	St. Therese School	Chicago	
7	Fry Elementary School	Naperville	7	Blackhawk Middle School	Bensenville	
8	Meridian Middle School	Buffalo Grove	8	Waters	Chicago	
9	Pioneer Elementary	West Chicago	9	Science Academy of Chicago	Mt Prospect	
10	Steeple Run Elementary	Naperville	10	Tri-Valley Middle School	Downs	

Junior High Algebra Contest		
Place	School	City
1	Hawthorn Middle School South	Vernon Hills
2	Timber Ridge Middle School	Plainfield
3	St. Therese School	Chicago
4	Chiaravalle Montessori Middle School	Evanston
5	Infant Jesus of Prague	Flossmoor

CONFERENCE CORNER

What's MATH Got to Do With It?

Embracing Relevance and Meaning in the Math Classroom

October 23–24, 2015
Tinley Park Convention Center
Tinley Park, IL

Register now to attend the 2015 ICTM Annual Conference! We have a strong lineup of exceptional presentations from math educators like you who are willing to share their expertise. Two keynote presentations from math innovators Jo Boaler and Eli Luberoff, and other special events round out the two-day conference.

Pull out all the stops and make sure to attend this year's conference. Start making your travel plans, and stay tuned to **www.ictm.org** and your *ICTM Bulletin* newsletters for updates as they become available!

- Featured Speakers: **Jo Boaler** and **Eli Luberoff!**
- **Earlybird registration**: register by October 1 to save money!
- **Convenient access** from Interstates 55, 57 & 80, and for bus, train and air travelers!
- **All-inclusive location** - no trekking between buildings for events!
- **Free Parking**!!!
- **Free wifi access** throughout the conference facility!
- **Convenient access** to nearby restaurants & shopping!

PROGRAM GUIDES NOW AVAILABLE ONLINE!

View your 2015 ICTM Annual Conference Program Guide online, or download a copy at **http://www.ictm.org/download/conferencebook15.pdf**

With presentations by
Jo Boaler and Eli Luberoff

Dr. Jo Boaler, Professor of Mathematics Education at Stanford University, Co-founder of youcubed, and a recognized editor, author and analyst in the Mathematics Education community, with awards in the United States and abroad.

Eli Luberoff, 2009 summa cum laude graduate, Yale University, with degrees in Math and Physics and creator of Desmos, a free browser-based, html5 graphing calculator that works on any computer or tablet

Plan now to attend!

Don't wait! Registration is open now. Make your plans to attend this amazing professional development opportunity. New this year: Based on the NCTM Conference model, participation in limited-seating workshops will be limited to room capacity and will be on a first-come, first-served basis.

We're looking for the best math/technology vendors who want to be represented at a benchmark event for math educators featuring one of the nation's biggest Math Ed celebrities. Be sure to tell your favorite vendors to check us out!

65th ICTM Annual Meeting
Registration Form — Early Bird Deadline October 1st

Name: _____

Check preferred mailing address. Please complete both columns.   ☐ Home   ☐ Work

Home Address: Work Address:

_____   _____

_____   _____

City: _____ Zip: _____   City: _____ Zip: _____

Phone: _____   Phone: _____

E-mail: _____   E-mail: _____

Mail my confirmation to: ☐ Home   ☐ School

Indicate if you are a (check as many as appropriate):   ☐ Speaker   ☐ Presider   ☐ Board Member

Early Bird Registration (deadline October 1) for BOTH Friday, October 23 (includes lunch) and Saturday (October 24).

☐ ICTM Member ($150.00) _____
☐ Non-member ($225.00) _____
☐ Student ($40.00) _____

Late Registration (after October 1) for BOTH Friday, October 23 (includes lunch) and Saturday, October 24 - registration deadline October 15.

☐ ICTM Member ($195.00) _____
☐ Non-member ($270.00) _____
☐ Student ($40.00) _____

Friday ONLY, October 23 (includes lunch) - registration deadline October 15.

☐ ICTM Member ($125.00) _____
☐ Non-member ($160.00) _____
☐ Student ($40.00) _____

Saturday ONLY, October 24 registration.

☐ ICTM Member ($110.00) _____
☐ Non-member ($150.00) _____
☐ Student ($40.00) _____

Please note that walk-in registration is not available for Friday.   **Total Fees:** _____

Ticket reservations not available. Limited-seating workshops do not require tickets. Workshop seating will be limited to room capacity, and issued on a first-come, first-served basis.

Payment Method:

☐ Check payable to: **Eastern Illinois University**   ☐ Master Card   ☐ Visa   ☐ Discover

Card Number _____   Expiration Date _____

Name on Card _____   Signature _____

Mail registration form and payment to: ICTM Conference, Eastern Illinois University, School of Continuing Education, 600 Lincoln Avenue, Charleston, IL 61920-3099, or register online at ICTM.org.

IN CASE OF EMERGENCY PLEASE NOTIFY:

Name _____ Phone _____ Relationship _____

34 _____

Gas Station Reward Points

<u>Common Core Standard:</u> 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

<u>The Task</u>

A gas station offers 20 gas points for every $50 you spend on groceries. For every 20 gas points you earn, you get to take $0.10 off every gallon of gas you buy. Currently, gas is $2.95 a gallon. When Lilly fills up her car, she usually puts around 11 gallons of gas in it. How much money must Lilly spend at the grocery store in order to fill up her car for less than $30.00?

<u>Facilitator Notes</u>

1. Allow students the opportunity to work individually or in small groups to begin solving this problem in any way they choose. There are many options for which steps to take first and how to look at the relationships between total cost and price per gallon.

2. Have students share their solution strategies with the class. Have class discuss similarities and differences among solution strategies.

3. This task may be revisited when teaching Expressions and Equations. Students could represent the problem with expressions.

<u>Follow-Up Questions</u>

1. What strategies did you use to find your answer?

2. How are the strategies the groups used similar?

3. How is each strategy unique?

4. What connections did you make to the problem?

5. Why is this important?

6. How would your solution change if the cost of gas increases? Decreases?

Elementary Musings on New Illinois Learning Standards
(otherwise known as CCSSM)

Conjunctions in English join two words with equal weight. Perhaps we should equate 'and' as the equal sign of the English language.

This school year, for the first time in my 15 years of teaching, I titled my first math lessons of the year Number and Operations. My online lesson plans state the students will review computation in all operations and begin working at an appropriate level of differentiation. Of course, I was thinking mostly of computation. Fifth grade teachers have always understood that it is our responsibility to lead students to deeper understanding of multiplication and division. So, for some, unknown reason, I decided to explore the meaning of <u>all</u> the operations. To make a short story shorter, my students don't seem to understand addition or subtraction on a deep level. Naturally, this led to some deeper thinking on my part (WTF)! Even deeper thinking led to an 'aha' moment. This is why CCSSM titles a domain 'Number **and** Operations in Base Ten.'

As an elementary teacher, I have fallen victim to emphasizing the numbers over the operations in my classroom. Now with the CCSSM expectation that fifth grade students solve multi-step problems I realize how important it is to consider the **and** in 'number and operations'. Last year I was not pleased with my students' performance on multi-step problems. As a result, I've discussed this issue with colleagues and thought about it a great deal; but, it was this week when I realized the weakness in conceptual understanding of addition and subtraction was a major contributing factor to this weakness in solving multistep problems.

Without basic understanding of addition my students were struggling to create an equation for this problem: *7 birds were sitting in a tree. Some more birds flew to the tree. Now there are 11 birds in the tree. How many more birds flew into the tree?* Most of my students characterized this problem as subtraction with the equation of 11 - 7 = 4 birds. However, this is clearly an addition problem with a missing addend. The appropriate equation which depicts the *action* of the story is 7 + N = 11 birds. My students are confusing the operation used in their *strategy* to solve the problem with the operation the problem *actual*ly represents.

We elementary teachers have heard the phrase 'number sense' many times. I propose that we begin paying attention to 'operation sense'. Students in advanced maths must understand operations deeply in order to be successful creating workable equations to solve problems. These two concepts are joined and must be developed in equal proportion for our students to be successful problem solvers. This week, I discovered just how little I consider this tiny little word and its meaning. Operations are as powerful and meaningful as numbers in 'numbers **and** operations.'

Applying Multiplication with Loom Bands

Grades: 3–6

Domain: Number and Operations

It is important to continue to use a meaningful mathematical context in upper elementary grades. This is often a challenge as students have outgrown some of the more common contexts. In fact, finding objects that are relevant, yet, small enough for my students to experience larger numbers is what led to this task.

The first week of school, I noticed students were wearing homemade bracelets made up of small rubber bands "loom bands." Everyday it seemed I saw new bracelets. Meanwhile, my 6th grade granddaughter was making and selling these bracelets to her friends at school. As I began thinking about how to develop understanding of larger numbers in my fifth grade classroom, loom bands became a logical choice. Loom bands are small, they are inexpensive, the students are interested, and the potential math problems extensive.

My first step was to introduce the topic to my math students. We explored Amazon.com and looked for the 'best buy' on loom bands. We estimated cost per 1, 10, 100 and 1000 loom band(s). Students discovered the need to understand decimal numbers through the thousandths place while getting excited about the prospect of working with loom bands.

There were several days between this introduction and the arrival of the loom bands that I used to formatively assess student fluency with multiplication. This preassessment became important later when forming groups and creating problems differentiated for each group.

Once the loom bands arrived we started working on problems that were relevant to the class. Students decided it would be interesting to figure out a plan to make a bracelet for every student in the school (school enrollment 440). We established a communal goal and then worked out what specific problems needed to be solved to reach the goal. After class discussion it was determined we needed to find out the following:

- How many students are in each class?
- How many students are in the entire school?
- How many loom bands are required for a bracelet?
- What pattern of bracelet will be made?
- How long does a bracelet need to be for a kindergartener?
- What length is needed for older students?
- How many younger students do we have? How many older students?
- How much time will it take to make all the bracelets?

Students recorded these questions in their journals and began formulating a list of required details needed in order to complete the problem solving process.

Now differentiation became easy and natural. Students were placed in groups of similar instructional need and given a question(s) to answer at an appropriate level of struggle. Then each group was given the responsibility for gathering the information needed to solve their problem. Allowing students to complete this step is important. It would be easy for me to supply the details needed to solve these problems. However, it is more interesting for students to discover how to find the information themselves. When students are invested in this way they actively work out the mathematics because the solution is important to them.

Each group worked on their respective problem and formally presented their work and solution to the class on a piece of chart paper. We discussed the details of the process each group used to solve their respective problem. These discussions were rich in mathematics and pride in workmanship!

At this point I thought that the task would be completed however, my students had other ideas. One group became curious about how far the loom band bracelets would extend if connected. Then, as a follow up, realized that these bracelets stretched much longer than they expected. So a new problem was created. How far would all the stretched loom band bracelets extend if connected. This led to more calculations. Soon we were measuring out the full stretched distance of over 1,000 feet!

While the initial goal was to strengthen and enrich student knowledge in regards to multiplication, this task evolved into an experience heavy in mathematical practice, decimal numbers and operations, measurement in one dimension, measurement conversions, base ten understanding, and beginning development of rate. Obviously, this type of task results in opportunities for teachers to guide students in many possible directions.

Allowing students to lead this exploration resulted in a much richer and meaningful mathematical experience. Students worked on problems during the first half of each period and then spent the second half of class working in their journal performing calculations. The students remained eagerly engaged in multiplication tasks because the work had real meaning for them. It was a wonderful way to hook students into the joy of problem solving early in the school year.

Fellow elementary teachers, please share with me additional contexts for mathematics that are currently interesting to your students (dbrownictm@gmail.com). I will share additional ideas in a future column!

Sincerely,
Mathematical Brown

Birthday Fractions

1. Write your birthday as a fraction (MM/DD): _____

2. Write your partner's birthday as a fraction (MM/DD): _____

3. Calculate the following:

    a. [your birthday fraction] + [your partner's birthday fraction]

    b. [your birthday fraction] - [your partner's birthday fraction]

    c. [your birthday fraction] * [your partner's birthday fraction

    d. [your birthday fraction] / [your partner's birthday fraction]

4. Compare your answers with your partner's answers. What do you notice?

5. How "easy" or "difficult" would you consider each of the calculations you had to perform? Make a mark on each spectrum below to indicate the level of difficulty (in your opinion):
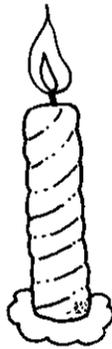
    a. Addition: Very Easy --- Very Difficult

    b. Subtraction: Very Easy --- Very Difficult

    c. Multiplication: Very Easy -- Very Difficult

    d. Division: Very Easy --- Very Difficult

6. If Mary's birthday is May 15, what other days will have equivalent birthday fractions to hers?

7. What days of the year (if any) have "equivalent" equivalent birthday fractions to yours?

Coordinate Birthday Quiz   Names: _____
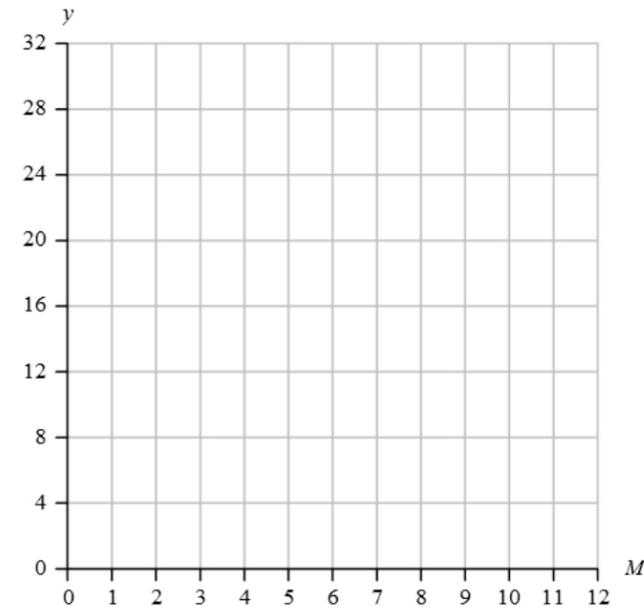
1. Write down the month and day of your birthdays:

    Birthday A: _____   Birthday B: _____

2. Now, write each birthday as a coordinate pair: i.e. November 30 would be (11, 30).

    Birthday point A: _____   Birthday point B : _____

3. Graph both points below, label them (A and B) and connect to make your birthday line:

4. Find the slope of your line:

5. Find the slope of a line that is perpendicular to your line:

6. Find the midpoint of your two birthday points and mark this point M on the graph:

7. Find the coordinate distance between your two points:

8. If two people had birthdays in the same month, what would their birthday line look like:

9. Suppose two people determined that the slope of their birthday line was 0. What does this tell you about their actual birthdays?

10. Determine the equation of your birthday line and express in $y = mx + b$ form:

11. Bonus1: Find another point, G, on your line and indicate what birthday that corresponds to:
    (If this is not possible, explain why not)

12. Bonus 2: Find the coordinates of another point C on your grid such that the triangle ABC is isosceles.

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