TOMT
The Oregon Mathematics Teacher

Various Math Terms

Significant Digits

The digits of the decimal form of a number beginning with the leftmost nonzero digit and extending to the right to include all digits warranted by the accuracy of measuring devices used to obtain the numbers.

—The American Heritage Dictionary

EXAMPLES	# OF SIG. DIG.	COMMENT
618 mg	3	All non-zero digits are always significant.
4038 lbs	4	Zeros between 2 sig. dig. are significant.
2.00	3	Additional zeros to the right of decimal and a significant digit are significant.
0.008	1	Placeholders are not significant.

An easier way to remember significant digits...

...toes and fingers are digits. The big toe and the thumb are... uh... significant digits.

January/February, 2012
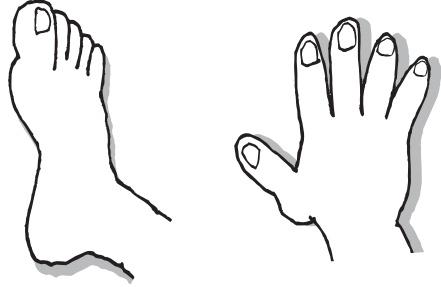
Editorial

by Marj Burak, OCTM President

Hello members of OCTM!

I would like to thank Don Fineran for sharing some important correspondence with the OCTM board and now I would like to share some of his words and quotes with you. Many in the Oregon math education community are listed on the back cover of *TOMT.* Don includes us all in his recent words,

> "I am pleased with Oregon's math education community. …all promote the sharing of successful teaching strategies, activities and materials with conferences, workshops or publications.… Perhaps SHARING could be the motto for the Oregon math education community".

I suspect that we all agree with this and I propose that we all commit to visibly act on it. Make a note to share something today.

Following NCTM President J. Michael Shaughnessy's thought provoking opening keynote at the recent 50th Northwest Math Conference, program chair Phil Bartsch acknowledged the many exceptional educators in the room and asked everyone to take a moment, look around, and find someone to thank for a significant act of sharing. I was delighted to see a young woman named Misty turn around, smile, and say "thank you". She had been my high school math student for four years and she was at the conference presenting one of the MATH-A-RAMA pre-service math teacher sessions. My mentor was also at the conference as well as his mentors — generations of mentors who share. That is what the Oregon math education community is all about.

The Don Fineran Scholarship was established in 1990 to honor one of the most influential people in the history of Oregon's math education. Don contributes to the fund every Christmas and on his birthday, which is March 28. He invites anyone who wishes to contribute to consider birthday wishes to Don together with a check for $20.12 payable to OCTM marked for the DF Scholarship Fund. His family, friends, and many people who are connected to Don and/or OCTM, have also contributed to the fund. It provides scholarships to teachers to help them attend the Oregon Math Leaders Conference and the Northwest Math Conference. OCTM would like to join Don Fineran in thanking all of you who have helped to make this scholarship possible with your SHARING. This scholarship recently played an especially significant role in both the 2011 Oregon Math Leaders Conference and the 50th Northwest Math Conference.

During the summer of 2011, a team of five OCTM board members attended the NCTM Affiliate Leaders Conference in Denver, Colorado. While at the conference, during a goal setting session, OCTM treasurer Becky Reed ignited an idea and the team formalized it. The result was a special scholarship event to honor both Don Fineran and the 50th Northwest Math Conference on October 13, 14, and 15 of 2011. The special offer, called "2 for $50," allowed one attendee of the OML conference in August to reach out to a new–to–be member of OCTM and invite them to attend the NWMC as a partner. They had to commit at the summer conference and check in with their partner at the NWMC. They would receive funding from the Don Fineran Scholarship Fund to attend the NWMC for an out-of-pocket fee of $50 for the two of them. In return they would send a short essay and a thank you note to Don. It turns out this was a "highly successful idea!" to quote Don Fineran's response to the special scholarship opportunity.

Don Fineran was very pleased to receive numerous letters from teachers who attended the 2011 NWMC in Portland. They agree; the NWMC earned straight "A"s! He has shared the following quotations from a portion of their letters to provide the evidence.

Primary teachers: "I left every session with ideas and thoughts to ponder about my current and future teaching" and "Without the grant I would not have been able to bring my daughter-in-law, a 1-2 blend teacher. It is wonderful knowing that she is starting her career by understanding the value of attending professional development opportunities."

Elementary teachers: "The energy at the conference was exhilarating. I met passionate colleagues at inspir-

Features

January/February, 2012

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End the Winter Doldrums by Mixing in Math

by Jackie Cooke, Title One Math Specialist, Gresham-Barlow School District, Gresham, Oregon

I LOVE ATTENDING MATH CONFERENCES! The annual math conference in Indianapolis was no exception. While cruising through the exhibit hall, I stopped to talk to an acquaintance and ended up joining a new professional organization. If you haven't ever heard of TODOS and their mission to make math accessible for all, you might be interested to check out their Web site at http://www.todos-math.org/. They have many different member benefits including a journal called *Teaching for Excellence and Equity In Mathematics* (TEEM), an electronic newsletter full of timely tips and many opportunities to participate in professional development by attending conferences sponsored by their organization and signing up for online webinars.

This fall they sponsored an excellent webinar called Mixing in Math (MiM). By participating in this webinar I learned about some wonderful math resources that I wanted to share with all of you. Mixing in Math is a resource made available by TERC, a not-for-profit education research and development organization dedicated to improving mathematics, science, and technology teaching and funded in part by the National Science Foundation. These materials offer over 200 English and Spanish resources that blend math with fitness, nature, cooking, and daily routines like cleaning up. The materials were developed with input from hundreds of after-school educators, librarians, and others who support children's learning. MiM is easy to use, written at a 5th-6th grade reading level for those with little time to read, and best of all, they are all available as a free download from the Mixing in Math Web site (http://mixinginmath.terc.edu)! The activities and projects use only a few common materials, such as old paper towel tubes, scrap paper, decks of playing cards, etc. They are intended for use with children in kindergarten through sixth grade. The activities are written with "easy," "medium," and "hard" variations for everything from five-minute activities to projects that take an hour or more and are designed so that adults can customize them to fit the interests, cultures and languages of their audiences.

MiM can be used during out-of-school time or in school. These routines, projects, and materials could be used at day care centers, libraries, public programs, and at home. They show how math can be mixed into everyday things. Children learn that math can be part of the things they enjoy. Adults don't need to set up a separate "math time." MiM can be a separate program—but it doesn't have to be. They suggest many ways to integrate math into a wide variety of other content areas.

These resources include games, projects, movement activities, and posters for display. They would be great to use at a Family Math Night, for after-school math clubs and for "sponge" activities when there are a few extra minutes during the school day. I have hung several of their posters of interesting math topics on bulletin boards out in the hall for classes to talk about when passing by my room and have included games and activities in my weekly homework newsletter. Below and on the following pages are just a few examples of the amazing wealth of resources available from this site.

The authors of these materials love to hear from people who are using Mixing in Math and would welcome questions and comments a mixinginmath@terc.edu.

Example of English poster from MiM

Examples of calendars in English and Spanish.

Example of a Spanish poster from MiM

Continued...

Games in English and Spanish

Pile Up 100

Be the first to reach 100—in piles of 10 or 20 at a time.

Grades: 4–6+ **Players**: 2
Skills: logic; reasoning **Deck**: number cards and wild cards

Set up. Each player lays out five cards face up. If you get a wild card, keep it and draw an extra card. Pile the rest face down.

If you have a wild card, you may take a card from the other player's layout. You can only use each wild card once.

How to play

- Look for cards in your layout that total 10 or 20 (such as 8, 7, and 5). Remove those cards from your layout.
- Take turns. On your turn:
  ▶ Draw a card. Add it to your layout.
  ▶ If you find cards in your layout that make 10 or 20, remove them. Take another turn.
  ▶ Your turn is over when you can't make 10 or 20.
- The first player to reach 100 wins.

mixing in
MATH Card games: addition, subtraction and more
http://mixinginmath.terc.edu
©2010 TERC

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Capturar Cartas

Compare cartas. El número más alto gana. (Parecido a "Guerra.")

Grados: PreKinder–2 **Jugadores**: 2–3
Habilidades: contar; comparar **Baraja:** sólo las cartas de números

Preparación. Repartan las cartas a partes iguales para cada jugador. Los jugadores ponen sus cartas en un montón cara abajo.

Cómo jugar

- En cada turno, los jugadores:
  Voltean la carta de encima de su montón. El jugador con el número más alto toma las cartas jugadas.
  Empates: Aparten las cartas jugadas. En el próximo turno, el jugador con el número más alto también toma esas cartas.
- Jueguen hasta terminar los montones de cartas. El jugador con el mayor número de cartas gana.

1, 2, 3, 4 peces son más que 1, 2, ¡3!

Más difícil. Cada jugador voltea dos cartas y las suma. El jugador con el total más alto toma las cartas jugadas.

mixing in
MATH Juegos de cartas: suma, resta y más
http://mixinginmath.terc.edu
©2010 TERC

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Cómo jugar

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  Voltean la carta de encima de el número más alto toma las cartas jugadas.
  Empates: Aparten las cartas jugadas.
  En el próximo turno, el jugador con el número más alto también toma esas cartas.
- Jueguen hasta terminar los montones de cartas. El jugador con el mayor número de cartas gana.

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Activities

mixing in MATH

How Many in a Minute?

Goal: Keep track of how much you can do in a minute

Grades: K–6+

Minimum number of participants: 1

Suggested grouping: individual

Time: 10 minutes or less

Math: estimating time (a minute); counting by 2's, 5's, and other numbers

Materials:
clock or watch that shows minutes and seconds
paper and pencil (optional)

Prerequisites: none

Books about minutes:

A Second Is a Hiccup: A Child's Book of Time. Hutchins, H. J. (Arthur A. Levine, 2007).

Ten Minutes till Bedtime. Rathmann, Peggy. (Putnam, 1998).

Before beginning

Pick something everyone will do for a minute, such as jumping jacks or drawing stars.

① Predict

How many stars do you think you can draw in a minute? Why do you think so?

Talk About…

Record predictions (optional).

② Keep track

Time for one minute while everyone does the activity and keeps count.

Jay 9/30
Estimate-30
Jumping Jacks 65
Jumping Jacks 70

Jay 10/10
Estimate-70
Jumping Jacks 72
Jumping Jacks 66

③ How many?

Compare predictions with results.

④ Repeat

Children compare their times on different trials. Choose a different child to be the timekeeper each time.

Variations

Draw, then count (easier). Children draw as many circles or stars as they can in a minute. Then, they count them. They don't have to draw and count at the same time.

Estimate a minute (same as main activity). Explain the procedure, and then try it:

Everyone shut your eyes. I'll say "Start!" when I'm going to start timing. Raise your hand when you think one minute is up.

Note whose hands go up before one minute, whose at one minute, and whose after one minute. Once all hands are up, tell them the results.

Time yourself (harder). Children pair up. One times a minute while the other does the activity and keeps count. Then, they switch roles.

For more math ideas, visit http://mixinginmath.terc.edu

mixing in MATH

Descártelo

Objetivo: Hacer preguntas de sí o no para identificar el objeto secreto (similar a Veinte Preguntas)

Grados: K-6

Número mínimo de participantes: 2

Tamaño del grupo: dividir en grupos de 2 a 4

Duración: 10 minutos o menos por juego

Habilidades matemáticas: usar la lógica

Materiales:

un surtido de objetos por grupo (Fácil: 10-15 objetos. Medio: 15-25 objetos. Difícil: 25-50 objetos.)

Prerrequisitos: ninguno

Libros sobre categorías:

Vamos a Clasificar/Let's Sort. Trumbauer, Lisa. (Red Brick, 2005).

La Casa Adormecida. Wood, Autrey. (Libros Viajeros, 1995).

① Preparación para el juego

Cada grupo distribuye sus objetos sobre la mesa y decide quién va a ser el Líder.

El Líder escoge un objeto sin decirlo a nadie y sin moverlo de la mesa.

② Tomen turnos haciendo preguntas de sí o no

Los niños y niñas hacen preguntas para eliminar varios objetos. No pueden preguntar si un objeto en particular es el objeto secreto.

¿Tiene un '50'?

¿Tiene forma de disco?

¿Tiene líneas paralelas?

El Líder responde una pregunta. Entonces, la persona que ha hecho la pregunta quita los objetos que se han eliminado.

Para Conversar...

¿Cuál es una pregunta de sí o no que podría eliminar casi la mitad de los objetos? ¿Cómo decide qué objetos quitar de la mesa si la respuesta es no?

③ Sigan tomando turnos hasta que alguien identifique el objeto

La próxima vez, esa persona puede ser el Líder.

Variaciones

Adivine quién (igual a la actividad principal). Juegue al menos con 10 personas. El Líder escoge una persona del grupo sin decírselo a nadie. Los jugadores hacen preguntas como por ejemplo "¿Esta persona lleva gafas?" para eliminar personas hasta que puedan identificar la persona secreta.

Jueguen con formas (igual a la actividad principal). Jueguen con figuras de origami que los niños y niñas hayan hecho, o jueguen con imágenes de banderas con formas geométricas diferentes.

Para más ideas matemáticas, visite http://mixinginmath.terc.edu

Call for Nominations: Math Education Awards

Each year the OCTM Executive Board gives two awards that recognize and honor teachers and leaders. The recipients exemplify the spirit and dedication of mathematics teaching in Oregon. A third award may be given when appropriate.

The Mildred Bennett Elementary Math Education Award is given to an elementary or middle school teacher based on the following criteria:

☐ A spirit of joy and work ethic which promote quality mathematics education for all children
☐ An innovative approach in taking ideas and adapting them
☐ Exemplary work in his or her own school
☐ An ongoing commitment of time and energy to improve teaching in his or her community
☐ Support and promotion of mathematics throughout the state.

Past recipients have been Mildred Bennett, Joanne Wilkie, Judy Johnson, Diane Price-Stone, Pam Alexander, Jackie Nissen, Phil Bartsch, Shirley Payne, Jerri Wickert, Kathryn Warrior, Jackie Cooke, Tari Querin, Jan Hill, Kayda Mitchell, Kathy Reed, Cheryl Klampe-Van Hess, Ann McMahon, Giny Christensen, Jill Board, Nancy Anderson, Cheri Clausen and Jan Gillespie.

The Oscar Schaaf Secondary Mathematics Education Award is given to a middle, high school or college teacher based on the following criteria:

☐ Enthusiasm as a person, teacher and leader that reflects the person for whom the award is named
☐ Demonstration of thinking by using a model that makes mathematics meaningful
☐ An organized focus for his or her teaching
☐ Great interest in problem solving
☐ Generous sharing of information, serving as a mentor, offering support and guidance long-term involvement with the mathematics community.

Past recipients have been Scott McFadden, Jim Young, Wally Rogelstad, Richard Brannan, Chuck Peterson, Anne McEnerny-Ogle, Tom Swanson, Tom Stone, Jim Specht, Gwen and Ron Waite, Brent Freeman, Ralph Schubothe, Sue Ann McGraw, Trudy Mitchell, Linda Samek, Mike Gould, Fred Board, Karen Higgins, Winnie Miller and Lynn Bonser.

The Oregon Mathematics Education Hall of Fame members currently include Mildred Bennett, Bill Burger, Oscar Schaaf, Don Fineran, Gene Maier, Ron Morgali, Dwight Lippe, Linda Foreman, Ron Nicholson, Wally Rogelstad, Marj Enneking, Richard Brannan, Doug Cruikshank, Chuck Peterson, Judy Johnson, Ted Nelson, Michael Shaughnessy, Cathy Brown, Tom Dick, Jim Specht, Diane Price-Stone and Tom Stone. Nominations for this award should consider those who have:

☐ A long history of service and achievement to math education in Oregon
☐ A commitment to making a change in the quality of math education
☐ A history of time and involvement with OCTM
☐ Given of themselves through workshops, articles, presentations and personal contact.

Nominations are now being requested for 2012. These awards will be presented at the Oregon Math Leaders Conference in August. If you would like to make a nomination for one of these awards, please use the form on this page and mail your nomination to:

Roxanne Malter, Recognition Chair
1826 SE 12 Avenue, Portland OR

Nominations must be postmarked by April 1, 2012. Feel free to email Roxanne at **rmalter@hevanet.com** if you have any questions.

(Please check one.) The nominee is being recommended for:
☐ Mildred Bennett Elementary Math Education Award   ☐ Oscar Schaaf Secondary Math Education Award
☐ Oregon Mathematics Education Hall of Fame
Nominee's name: _____ Telephone number: (   ) _____
Home address: _____
_____ ZIP: _____
School address: _____
Your name: _____ Telephone number: (   ) _____
Your address: _____
_____ ZIP: _____
Why should the nominee receive special recognition? (200 words or less, on a separate sheet of paper):
Please include how the nominee meets each bullet of the criteria list above.

2011 Math Education Awards

by Roxanne Malther, Recognition Chairman, Portland, Oregon

Mildred Bennett Elementary Math Education Award

Jan Gillespie

After graduating from Stanford in 1970, then getting her elementary certification at UC Berkeley, Jan taught grades 2-3 in a school in Oakland, California where many families would have qualified for Free and Reduced lunch if they were going to school in this day and age.

Moving to Oregon in 1974, Jan was hired by Portland and spent most of her 30 years as a Title 1 building-level math specialist. Through creating innovative curriculum, planning collaboratively, co-teaching, tutoring, and involving parents, Jan and her colleagues were able to significantly boost math achievement in some of Portland's most disadvantaged elementary schools. For this work, Jan was recognized in 1997 as one of the first recipients of the Excellence in Education Award for Teaching from the Portland Schools Foundation.

Through much of her career, Jan worked in her district and also with OMEC, the Math Learning Center, and PSU Extended Studies to provide professional development in more than 30 districts in Oregon.

In 1991, with co-author Patsy Kanter, Jan wrote *Every Day Counts Calendar Math* (Houghton Mifflin), a K-5 approach grounded in using visual models, which recently celebrated 20 years of use in classrooms. This experience provided her the privilege to work with teachers and children throughout the Northwest and the nation.

In her "retired" life, Jan has volunteered in local Title 1 schools and low-income preschools in the Bay Area, created edconline.net to support K-5 teachers, and established The Math Place in Portland to provide K-5 tutoring and parent-child activities.

When queried about her life experiences, Jan had the following to say.

"When I moved to Oregon, I was fortunate to participate in the Math Enthusiasts Project, organized by Jay Greenwood and the Oregon Math Education Council. My project team, including future OCTM leaders, Tari Querin and JoAnne Wilkie, learned from great math educators such as Judy Johnson, Mildred Bennett, and Bob Wirtz. Classes with them and later *Math Their Way* author Mary Baratta-Lorton, along with inspiration from Math Learning Center instructors Becky Boergadine, Allyn Snider, and Beth Ardell, my principal, Linda Harris, my teaching colleagues, and coauthor, Patsy Kanter, encouraged my ongoing enthusiasm for teaching math."

Jan Gillespie

"My advice to new teachers would be to think back to your own school math experiences. Was there a grade level or topic where you experienced frustration or lack of success? I first hit the wall in a college calculus class. When I began my career, I would look at students' bewilderment and let their scrunched-up faces remind me of sitting in that first calculus class. That provided me with motivation to try to find multiple ways to approach math. There is much joy in finding and creating classroom solutions."

OCTM thanks Jan for her enthusiasm and commitment to mathematics teaching and learning in Oregon.

The Oscar Schaaf Secondary Mathematics Education Award

This award was shared by two outstanding teachers this year.

Winnie Miller

Winnie arrived in Oregon in 1969 from the U.S. territory of Guam. Guam is part of the Northern Mariana Islands, surrounded by the Pacific Ocean and the Philippine Sea. She came to Oregon to attend Western Oregon University (at the time, Oregon College of Education). She received her degree in secondary mathematics education in 1973 and began teaching at Talmadge Middle School in Independence, Oregon. From there, her career took her to teaching positions at Hillsboro High School, Lake Oswego Junior High School, Lakeridge High School, and Portland State University. Leadership has always

been a commitment. As a facilitator, she conducts workshops for Teachers Inspiring Problem Solvers and the Professional Development Cadre of OCTM. Winnie has presented at a multitude of national and regional conferences and is a past president of OCTM. Thank you for choosing Oregon, Winnie and for sharing your experiences with us!

"I love problem solving! I can't tell you how much I love to see the insightful approaches my students (and their parents, too, sometimes) come up with when they work problems. They just never fail to amaze me no matter what their age. And now in my retirement life, after 30 years of full time teaching in middle school and high school, I work with young mathematicians as a volunteer in my grandchildren's classrooms.

Lynn Bonser, left, and Winnie Miller

"I thought I knew everything until I met Linda Foreman and she introduced me to Visual Math. What a challenge for someone like me who always wanted to write equations! Kathy Pfaendler and Nicole Rigelman encouraged my teaching of Visual Math to my 7th graders. Now I try to represent everything visually before I do the algebra. The more I work with students and adults, the more I value this notion of using multiple representations.

"I just love the beginning of the school year; I'm rested and energized and so are the students. It's no surprise to those of you who know me that I always do some kind of problem solving on the first day of class. After sharing solutions, I post "model student work" samples on my walls so students know what the expectations are.

"Surround yourself with positive energy! If your faculty room is a negative environment, avoid it as much as possible. Go to conferences and meet other enthusiastic, energetic educators. Be open to new ideas and try at least one of those new ideas or activities the first day you return to your classroom after the conference. Don't be afraid to take risks. Know some things you try may not work the first time or may not work with a particular class, but give it a try and sometimes even a second try. Keep learning, love what you do, and love those kids. I'll look forward to seeing your smiling face at the next conference!"

Lynn Bonser

Following her graduation from Linfield College in 1979, Lynn began teaching 7th and 8th grades in Knappa, Oregon, a small town on the Columbia River about fifteen miles east of Astoria. From there, she moved to the Rainier School District where she spent most of the next twenty years. Lynn taught math, science, and journalism in middle school, while finishing her Master's Degree and earning the Advanced Mathematics endorsement at Linfield. The remainder of her time in Rainier was spent teaching math at Rainier High School. The most recent ten years of her career have included teaching math at Milwaukie High School and working as a Math Specialist and Math Coach in Clatsop and Columbia counties. As a workshop leader, she has presented at dozens of local, state, regional, and national conferences. As a writer, Lynn has worked for the Oregon Department of Education as an item writer and reviewer, and she helped develop the Oregon Problem Solving Scoring Guide. She has served on the Math Content Panel and continues to work for ODE writing assessment items and updating web page projects. Decades of commitment to OCTM have included positions as area representative and contest coordinator. Most recently, Lynn served as the 2006-2011 coordinator of the Professional Development Cadre.

When asked about her life choice to teach, Lynn had much to say.

"I had this amazing 7th and 8th grade teacher who made me just love the idea of learning all kinds of new things. He renewed my confidence in myself after a very bad experience with math in the 5th and 6th grades. His name was Joe Hurka and when I first started teaching at Rainier Middle School in 1980, I was replacing him! I did not know I wanted to teach
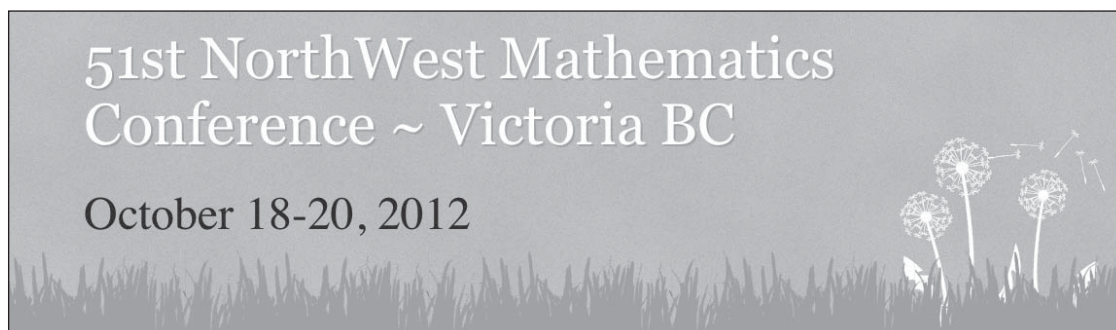
math until my 10th grade year when I was absolutely loving Geometry and getting a real kick out of helping classmates with their work! When I approached my amazing teacher, Shirley Jensen, and asked her if she thought I would be capable of becoming a math teacher, she encouraged me.

"There have been hundreds of teachers and thousands of students who have inspired me! Many of those colleagues were people I met through OCTM as well as teachers I have worked with along the way. To name just a few, Jim Muck (my other high school math teacher), Larry Wallace, Stan Peerboom, Dan Jacobson, Lorie Newton, Cathy Brown, Marie Cramer, Don Fineran, Doug Cruickshank, Jill Sumerlin, and Mike Gould have all spurred me to greater heights… it feels wrong to list names since there are so, so many others and I have learned so much from them.

"My favorite part of any day, unit, or year happens whenever I see my students (kids or adults) get excited about a new concept or sometimes, just by the joy of learning. It's more than watching a concept 'click,' it's watching students really enjoy the pursuit of knowledge.

My advice to teachers would be to not try to reinvent the wheel. Beg, borrow or steal as many ideas from other teachers as you can but don't try to be just like them. Allow yourself to be you. Put it all together in a way that fits your own special abilities and interests. I used to see an amazing teacher, then try to be just like them, but I finally realized that my own style was as important as the great ideas I got from others."

51st NorthWest Mathematics Conference ~ Victoria BC

October 18-20, 2012

PHILADELPHIA, PA | APRIL 25–28, 2012

NCTM 2012

Annual Meeting & Exposition

Sponsored by the
BC Association of
Mathematics Teachers

Hear the latest from math education experts on hot topics such as Intervention, Differentiated Instruction, Technology, Common Core State Standards, and much more.
Whether you're a classroom teacher, coach, administrator, preservice teacher, or math specialist there's something for you. Attendees will:

- Develop strategies to relate the **Common Core** to your curriculum.
- Explore different learning styles and **intervention** strategies.
- Refine your **assessment** techniques.
- Discover new ways to use **technology** in your classroom.
- And more!

Visit www.nctm.org/meetings for up-to-date information.

OCTM Books

Elementary Problems, Book 2.......................____ copies @ 10.00 _____

Elementary Problems, Book 3.......................____ copies @ 10.00 _____

Intermediate Problems, Book 2....................____ copies @ 10.00 _____

New & Improved Secondary Problem Book ...____ copies @ 10.00 _____

Monday Math...____ copies @ 10.00 _____

Puzzle of the Month & Math Magic..............____ copies @ 10.00 _____

Math in Literature....................................____ copies @ 10.00

Total: _____

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Street: _____ City: _____

State: _____ Zip Code: _____

Send to: Francie Bostwick, 8 Richmond Ave., Medford, Oregon 97504
Questions? Contact bostwickf@sou.edu

If you are not completely satisfied with the item or items you received, please wait until several of the state primaries have been completed and then return your purchase to the party of your choice: they are counting on your contribution.

Through the Eyes of Our Students

Part 3: Fractions

by Sonya Richardson, Oregon State University, Corvallis, Oregon

WHAT DO OUR STUDENTS SEE when they encounter a fraction? It's a strange looking thing with one number balanced on top of another! Fractions are by far the most dreaded part of mathematics for many of our students. Talking to my students about the various kinds of abbreviations we use to make complex ideas such as fractions easy to work with, I have begun to compare the process with text messaging. This seems to really touch base with the students.

One of my current frustrations is that many textbooks present decimals before fractions. I had the privilege of teaching at a small independent school in Corvallis for a year of transition and was assigned a class of fifth and sixth grade students who were behind their peers in math. We began with the textbook assigned to the class and it was almost immediately apparent that the students could not handle the decimals at the beginning of the book. The students were missing a background in fractions to understand decimals. After the first two weeks I put aside the textbook and began again with an exploration of fractions. We began by using egg carton fractions from the *Math & the Mind's Eye* materials.[1]

We had a great time modeling fractions on the whiteboard using egg cartons and fraction cards with magnets glued to their backs. Scrambling the cards before the students came in gave them the opportunity to voluntarily sort them back where they belonged, with equivalent fractions below the egg carton representation. Before long the students hit on the idea of scrambling the cards at the end of the class so that the Pre-Algebra class that followed could experience the same thing. It was interesting to see this happen as no instructions were given to the students in either class about scrambling and unscrambling the cards in relation to the other class. It was clear that they were having fun.

Next we made fractions from colored strips of paper, folding them to create fractions up to 12ths. Then we pasted the strips on poster paper with the whole unit at the top, then the halves and proceeding in order to the smaller fractions. Students ended up with a complete chart showing equivalent fractions.

There is a comprehensive explanation of a similar activity on the NCTM Illuminations Web site.[2]

We followed this exploration with pattern block fractions presented by Cindy Lanius on her Web site.[3] Her fraction lessons encourage students to explore the various pattern block shapes and discover relationships among them.

In the midst of these explorations, one of the fifth grade girls got so excited she jumped up out of her chair and exclaimed "Now I understand what we were trying to do in decimals!" What a wonderful "AHA" moment!

The National Library of Virtual Mathematics (NLVM) Web site has wonderful visuals of fractions that can be used for demonstrations in the classroom or for interactive practice by the students individually. It includes models for equivalent fractions, adding and subtracting with either circle or square models, multiplying fractions, etc. It is a great place for both students and instructors to explore.[4]

The result of all this "play" with fractions was a group of students who were coming to class with some measure of enthusiasm instead of dread and a learning environment that encouraged the students to become proficient in working with fractions with real understanding taking place. We proceeded to the more standard paper and pencil math with fractions and they proved to be ready to handle the more abstract processes.

There are many excellent methods of experimenting with probability that illustrate the many uses of fractions. Most students like to play Monopoly. When they travel around the game board, they sometimes land in Jail. Let's recall the rules: There are three ways to get out of jail.

1. Use a "get out of jail free" card
2. Pay a $50 fine
3. Roll doubles with the dice (You are limited to three turns to try this method.)

Suppose you have landed in jail and do not have a "get out of jail free" card and either cannot pay or do not want to pay $50. Do you think you could get out of jail by rolling doubles?

Set up an experiment for the students. Make a table of all the different combinations of pairs of dice rolls that are possible. Have them roll a pair of dice at least 50 times and record the results.

It may also be useful to look at the theoretical probability of all the different combinations of two dice that could be rolled. A tree chart is a form that is easy for students to understand.

Here are some questions students could explore:
1. What would be the probability of getting out of jail on your next turn by rolling doubles?
2. What would be the probability of *not* getting out of jail on your next turn by rolling doubles?
3. What would be the probability of *not* getting out of jail in two turns in a row by rolling doubles?
4. What would be the probability of *not* getting out of jail in three turns in a row by rolling doubles?
5. Do you think you could get out of jail by rolling doubles? Please explain your thinking.

Here's another activity that students enjoy. Do you recall the old Monty Hall TV show, "Let's Make a Deal"? In this game, a participant is presented with three doors. The Master of Ceremonies explains that behind two doors are "phony" prizes, such as a donkey or a mop and bucket. The third door contains a fantastic prize, such as a vacation in Bermuda. The participant is asked to select a door. It is not opened. Then the MC opens one of the remaining two doors, which always turns out to be a loser. The participant is asked whether he/she wants to switch their choice or stick with the original one chosen. So the students are asked what the participant should do. This generally results in a heated discussion about the possibility of winning in each case.

Students should then experiment with this situation. The NLVM Web site, under Parent/Teacher, provides a Monty Hall Tally Table and directions for conducting an experiment with the students.[5] It may be useful to divide the class into three groups, where each group follows a set strategy for a given number of games so that collectively the class can generate enough data to convince themselves that there is a substantial difference: always sticking should win about $1/3$ of the time; alternating at random between sticking

and switching should result in about a 50-50 split between winning and losing, and always switching should win about $2/3$ of the time.

Having actually seen their own data, students can get confirmation by using the NLVM simulation to play multiple games with any chosen strategy. In addition, there is an excellent discussion of the problem under Parent/Teacher. It includes the following: "encourage students to play the game a number of times, either individually or as a class, and just observe what happens." Be aware that students generally do not believe what they see in the simulation if they have not done the experiment themselves!

Multiplication of fractions is fairly easy to model with the area model of multiplication. You can find excellent interactive examples at the NLVM Web site.[6]

Division of fractions is tougher for students to understand. A number of rules for dividing fractions are taught, but I seldom see students understanding why they are used. They continue to forget or get them mixed up. One of the methods I see students using is "first we smile and then we frown." It goes like this:

$$\frac{3}{4} \div \frac{3}{8} = \frac{3}{4} \diagdown \frac{3}{8} \diagdown \frac{24}{12} = 2$$

First we smile: 3 times 8 = 24, placed on top because that's the direction of the curve.

Then we frown: 4 times 3 = 12, placed on the bottom because that's the direction of the curve

Students learn to follow the rule, but make a lot of mistakes determining when and how to do it!

A method that teaches understanding of the "flip the divisor and multiply method" has the students change to common denominators! Recall that for understanding, the usual $3/4$ divided by $3/8$ may be rephrased as how many groups of $3/8$ths are in $3/4$ths?

Here's an example with a drawing:

$\frac{3}{4} \div \frac{3}{8} = \frac{6}{8} \div \frac{3}{8} = 2$ since there are 2 sets of $\frac{3}{8}$ in $\frac{6}{8}$.

Here's what it looks like:

This is a 2 by 4 table, representing $8/8$.

$3/4 = {}^6/8$ has been shaded. Two groups of have been indicated with arrows, so the answer is 2.

After practicing this a number of times, illustrate the usual method of division using common denominators and have students explain what they see happening:

$$\frac{3}{4} \div \frac{3}{8} = \frac{6}{8} \div \frac{3}{8} = \frac{6}{8} \times \frac{8}{3} = \frac{6}{1} \times \frac{1}{3} = \frac{6}{3} = 2.$$

Be sure students understand that canceling the 8's is really 8 divided by 8 and equal to 1. Also call attention to the fact that this is a shortcut and can be used without changing to common denominators. For example:

$$\frac{3}{4} \div \frac{3}{8} = \frac{3}{4} \times \frac{8}{3} = \frac{24}{12} = 2$$

Dividing common factors could be done before multiplying.

Another stumbling block that frequently occurs happens when students work with a calculator. If they want to change this fraction to a decimal, does the top number go in first or does the bottom number go in first? Many of them just don't remember.

Here's the question students should consider: Suppose you are changing to a decimal. Is the number going to be more than 1 or less than 1?

Students do recognize that the decimal should be less than one but seldom translate that to the decimal they get on the calculator. If they enter the 3 first, then divide by 4, they get 0.75. But what happens if they enter the 4 followed by the division sign, then the 3? They get 1.333... Many students accept whatever the calculator prints out without regard to whether the results are reasonable.

We should always be teaching students to evaluate their answers to make sure they are reasonable! Part 1 of this series of articles, in the problem about the garden and the sidewalk, is just one example of unreasonable answers. There are many others. Our students can do better!

Have fun Exploring!

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[1] *Egg Carton Fractions: Math and the Mind's Eye* from the Math Learning Center in Salem, Oregon. Unit IV. www.mathlearningcenter.org/

[2] Folding Fractions, Posters: This NCTM website has a comprehensive lesson similar to the one described. However, I do not have the students cut the strips. http://illuminations.nctm.org/LessonDetail.aspx?ID=L540

[3] Cindy Lanius from Rice University provides explorations of fractions using Pattern Blocks. Young children especially enjoy it. http://math.rice.edu/~lanius/Patterns/notes.html

[4] NLVM Fractions: This site contains a large number of interactive explorations about fractions that are bright and colorful and easy for students to work with. Under Grades 3-5, Select Numbers & Operations. Scroll down to find the fractions material. http://nlvm.usu.edu/

[5] Monty Hall: Select grades 9-12, Data Analysis and Probability, then scroll down to Stick or Switch. Be sure to explore the Parent/Teacher information at the top of the page. http://nlvm.usu.edu/

[6] NLVM multiplication: Under grades 6-8, select Numbers & Operations. Scroll down to Fractions, Rectangle multiplication. http://nlvm.usu.edu/

![Dept.] **Historical Notes**

Honoring the Many While Recognizing a Few

by Cathy Brown, OCTM Historian, Redmond, Oregon

THE PRESIDENTIAL AWARD FOR EXCELLENCE in Mathematics and Science Teaching (PAEMST) is the highest recognition that a kindergarten through 12th-grade mathematics or science teacher may receive for outstanding teaching in the United States. Enacted by Congress in 1983, this program authorizes the President to bestow up to 108 awards each year. The National Science Foundation administers PAEMST on behalf of the White House Office of Science and Technology Policy.

For the first several years, awards were given to both elementary (K – 6) and secondary (7 – 12) teachers in both mathematics and science. As budgets and policies changed, the granting of the awards was modified to be given on a rotational basis to elementary teachers one year and secondary teachers the next. I'll focus on the mathematics awards.

Awards are given to mathematics teachers from each of the 50 states and four U.S. jurisdictions. The jurisdictions are Washington, D.C.; Puerto Rico; Department of Defense Schools; and the U.S. territories as a group (American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands). Teachers are selected by meeting a rigorous set of criteria demonstrating an understanding of current practices and pedagogy, contributions to teaching and learning and their ability to help students make mathematical progress.

> **In addition to honoring individual achievement, the goal of the award program is to exemplify the highest standards of mathematics teaching.**

In addition to honoring individual achievement, the goal of the award program is to exemplify the highest standards of mathematics teaching. Oregon has always chosen to value commitment to the strengthening of Oregon's Mathematics Community as an essential component of this award. Awardees serve as models for their colleagues, inspiration to their communities, personal and professional growth and are leaders in the improvement of mathematics education statewide.

This statewide impact is the reason why three state finalists are honored at the Oregon Math Leaders conference each year. A professional biography in *The Oregon Mathematics Teacher (TOMT)* journal is written by the OCTM Recognition Chairman. Although only a few can be recognized in this process, teachers receiving this award represent exemplary mathematics teachers in Oregon.

In addition to recognizing outstanding teaching in mathematics, the program provides an opportunity to build lasting partnerships with colleagues across the nation. This growing network of award-winning teachers serves as a vital resource for improving science, technology, engineering, and mathematics education and keeping America globally competitive.

There is an active network of PAEMST award winners, currently chaired by Oregon's own Sara Normington!

The following are eligibility criteria for nominees. They must:

- Teach mathematics appropriate to the grade level for the particular year's application, in a public or private school.
- Hold at least a bachelor's degree from an accredited institution.
- Be a full-time employee of the school or school district as determined by state and district policies, and teach K-12 students at least 50 per cent of the time.
- Have at least five years of full-time, K-12 mathematics teaching experience prior to the current academic school year.
- Teach in one of the 50 states or the four U.S. jurisdictions.
- Be a U.S. citizen or permanent resident.

- Not have been previously awarded the PAEMST award at the national level in any competition or category.

There are two steps in the selection process:

- State level: coordinators convene local selection committees, which include mathematics educators, and past awardees. Committees select three finalists for recognition at the State level. To ensure consistency across the country, all state selection committees score their applications using the same review criteria and scoring information presented in the application packet.
- National level: NSF convenes a national selection committee composed of prominent mathematicians, mathematics educators, and past awardees which review the applications of the state finalists and recommends to NSF one finalist in mathematics from each state or jurisdiction. The Director of NSF then submits the recommendations to the President of the United States. All finalists are subjected to an FBI background check. It is possible that the finalist may be rejected at this point in the process, so announcement of the finalists comes from the White House.

During most of the years this honor has been awarded, it was administered by the Oregon Department of Education: Don Fineran, Cathy Brown, and now Mark Freed. In the interim between Cathy Brown and Mark Freed in order to maintain the statewide mathematics involvement criterion, the award was administered for 5 years by Giny Christensen, Past Awardee and Past OCTM President. The process now allows self-nomination. For further details, go to www.paemst.org. Please see http://www.octm.org/PAESMT_Prev.htm for the list of Oregon awardees in Mathematics.

Editorial, continued from page 2.

ing workshops. I feel energized to implement some of the techniques I learned."

And another description from Don……Her handcrafted card featured an F on the front cover. Inside she wrote "F is for fantastic! F is for fabulous! F is for the future! F is for Fineran." (She is obviously giving her impression of the NWMC.) Further –"I was thrilled to invite a colleague. He would not have gone on his own, but with the grant eagerly jumped at the chance. The very first session presented ideas I plan to implement immediately in my classes."

Middle school teacher: quoting one of his students, "I like how excited you are today, Mr. Hirsch." Hirsch explains – This excitement comes from all of the ideas and resources I came home with!

High school teachers: "It is difficult to choose just one session as one's favorite – hands-on activities or engaging math problems - I learned SO VERY MUCH! I have already received an email from the presenter!" and "My first NWMC was in 1975, they are still inspiring, invigorating, rich with ideas – helpful in mentoring student teachers." And, finally, "This was the best NWMC I have attended."

I would have to agree with this last statement. We were honored with the presence of the current NCTM President Mike Shaughnessy. Mike has spent over 50 years sharing his strengths and making a huge difference in Oregon's mathematics education. The sharing of quality presentations and workshops throughout the conference was outstanding! All of the time and energy that many of you shared to make it possible was phenomenal. Thank you, Don Fineran, for sharing yourself so deeply. Thank you, OCTM members, for continuing to make our Oregon math education community stronger by demonstrating that the more of our individual strengths we can share with each other, the stronger we will become as a whole.

Sincerely,

Marge Burak

Math 581 Measurement Project

by Francie Bostwick, Mathematics Education Professor, Southern Oregon University, Ashland, Oregon

This is a project for one or two students. You are to research and explore measurement investigations appropriate for K-12 students. The goal is to provide students an opportunity to be guided to think deeply about measurement tools and concepts and to use them appropriately and skillfully. The following directions were given to my students:

"You need to develop one investigation per person. Some suggestions using topics we will investigate include: what it means to measure, metric system, customary system, angle measurement, indirect measurement and trigonometry, area, circles and pi, volume, or measurement relationships. You might find something useful in an article (e.g., *The Oregon Mathematics Teacher (TOMT)),* curriculum available in our classroom, or on the internet. This investigation does not have to be original as long as you cite the source and do your own write up. If your project is original, I will expect that you are willing to have it submitted to TOMT for publication so other teachers in Oregon can also use your investigation in their classrooms."

The project consists of two parts: written and oral.
The written should include:

1. The research and sources you used. Research should include an article out of NCTM's *2003 Learning and Teaching Measurement Yearbook* along with the additional research to close the gap between the years 2003 – 2011.
2. The relevant grade level and the standards addressed (both Oregon and CCSSM).
3. The teacher directions, including a list of materials (classroom ready).
4. Any handouts or recording sheets.
5. The key questions you would ask as you are facilitating this investigation to ensure conceptual understanding.
6. The questions you would ask for students who are struggling with the concepts and what you would do to make accommodations for them during the investigation.
7. The questions you would ask for students who need more of a challenge and what you would do to make accommodations for them during the investigation.
8. A reflection of your thoughts completing this investigation.

The oral should include:

1. A brief presentation of what you researched.
2. Presentation of investigation(s), with class involvement.
3. Involvement of both students, if acting as a team.

Author's Note: The following is an excerpt from a final project turned in by two of my students.

Math 581 — Measurement Project

by Katie Ward, Science Teacher, Grants Pass High School, Grants Pass School District and Jill Croucher, Mathematics Teacher, Phoenix High School, Phoenix-Talent School District

Grade Level and Relevant Standards

According to the National Common Core State Standards for Mathematics (CCSSM), metric system should be taught in grades: K, 1, 2, 3, 4, 5, and high school Geometry.

Investigation #1: Guessing Metric Measurements

In this investigation students will problem solve, estimate, and perform mental math. They will also perform direct and indirect comparisons.

Teacher Directions

Inform the students that today they are going to study a measuring system called the metric system. Depending on the age, some students will have familiarity with the metric system while others might have only used the customary English system to conduct measurements. Tell the students that they are going to need to work with a partner to take measurements and to answer questions. They will use a piece of string to take some indirect measurements before using a meter stick to get the exact and direct measurements.

List of Materials:

■ String
■ Meter stick
■ Writing Utensil
■ Handout: Guessing Metric Measurements

Directions

How good are you at guessing your metric measurements? For this activity you will need a meter stick and a piece of string.

Procedure

1. Using string, have a partner cut a piece as long as you are tall.

2. How does that length compare to your arm span? _____

3. Count how many times the string can be wrapped around your head, waist, ankle, wrist, neck, and thigh.
   Your head: _____   Your wrist: _____
   Your waist: _____   Your neck: _____
   Your ankle: _____   Your thigh: _____

4. Without measuring, cut a piece of string that will go around your waist. Now wrap the string around your waist.

   How many centimeters off were you? _____cm
   Your waist is _____cm.

Repeat this activity for other parts of your body.

   Your neck = _____cm.
   Your wrist = _____cm.
   Your thumb = _____cm.

5. Your waist measures about _____times your neck.
   Your waist measures about _____ times your wrist.
   Your waist measures about _____ times your thumb.

Check for Understanding

If students are struggling with the concept you could ask them the following questions: what have you tried, what didn't work and why, what have we been doing in class that might be related to this problem, what does the prefix centi - tell you, can you draw a diagram or sketch to help you, is there a simpler, or similar problem we can do first, and what do you think comes next?

To accommodate for students who are struggling with the concepts you could give them more time to finish the assignment, pair them up with another student who could peer tutor,or have them practice estimating with another manipulative.

For students who need more of a challenge you could ask them to show how they could check their work and their answer, to explain the reasoning they used, develop another problem that their method could work for, and have them convert their answers to another unit of measure.

To accommodate these students during the investigation you could have additional questions that would allow them to take their understanding to another level. For example, you might ask them to make a bar graph representing the different lengths of each body part and discuss the relationships shown by the graph. You could also have them peer tutor other classmates struggling with the concepts.

Investigation #2: Getting to Know the Metric System (Teacher Information)

In this investigation students will problem solve, make indirect measurements, define the metric system for themselves, and discover personal references.

Teacher Directions

Inform the students that they are going to work through a series of stations to learn about the metric system. They are going to be able to learn how to change between one unit of measure and another, explore references, and create their own mnemonic device to help them learn how to convert between metric units. All of these stations are set up around the room so the students will be working in small groups to complete each of the stations. Before the students get into their groups, walk to each station and explain to the students what supplies are at each station and what they are expected to do. It is important for the students to stay on task at each station and to complete their work quickly because they will only have a set amount of time.

List of Materials
- Butcher paper
- Handout: Getting to Know the Metric System
- Writing utensil
- Dime
- Textbooks
- Doorknob
- Cereal box
- A liter Of water
- Dropper
- Cup
- Paper clip

Directions

How familiar are you with your metric measurements? For this activity you will need a handout and a writing utensil for each station.

Procedures

Station #1

Pick one of the traveling problems from below and walk the metric path explaining your reasoning for the pathway you chose to your partners. Partners should be able to explain to each other why they are moving in the direction they are on the metric system. Each partner should solve a different traveling problem.

Traveling Problems

You are at meters but you want to get to kilometers. Explain how you get there.

You are at hectograms but you want to get to grams. Explain how you get there.

You are at milliliters, go to deciliters, but realize you want to get to liters. Explain how you get there.

Station #2

A mnemonic device is any learning technique that aids memory. For example, to remember the order of biological classification kingdom, phylum, class, order, genus, and species you could use the mnemonic device **K**ing **P**hillip **c**ame **o**ver **f**rom **G**ermany **s**oaked.

1. Create a mnemonic device to remember the prefixes in the metric system: kilo-, hecto-, deca-, unit/base, deci-, centi-, and milli-.

Station #3

"A knowledge of a wide variety of everyday measurement references, such as that doorways are about two meters in height, is the foundation of good measurement sense as well as good number sense." (Clements, p. 59) At this station you will develop this measurement and number sense.

1. Match the given measurements with the available references.

a. centimeter = _____ (Ans: Diameter of a dime)

b. milliliter = _____ (Ans: 20 drops)

c. gram = _____ (Ans: Mass of a paper clip)

d. 1 kilogram = _____ (Ans: Mass of a liter of water)

e. 5000 grams = _____ (Ans: x number of textbooks)

f. 1 meter = _____ (Ans: Doorknob is typically about 1m high)

g. 425 grams = _____ (Ans: Cereal box)

Check for understanding

If students are struggling with a concept you could ask them the following questions:
- What steps did you take?
- If you set up a unit analysis would your units cancel each other out?
- What equivalent statements have you learned?
- Can you use your metric chart to help you?
- How did you organize your information?
- How did the members of your group explain this problem?
- What are you starting with, and what are you trying to find?

To accommodate students who are struggling with the concepts you could make up a simpler problem for them to try, have them work with manipulatives to visually show the increase or decrease when converting to another unit, or have them work with a peer tutor.

For students that need more of a challenge you could ask them if their reasoning makes sense, is that the only possible answer, and how could your method work for other problems? To accommodate students during the investigation you could have them peer tutor other students or go to an extra station that would have the following word problems to apply their understanding to real-world examples: the room down the hall has a temperature of 38 degrees Celsius. Would you be comfortable or uncomfortable? Defend your answer. Albert Einstein loved ice cream! Would he rather have 1kg of Rocky Road or 10,000mg? Express both in grams.

Reflections

The metric system is often a difficult thing for students to learn, but if they are taught through investigations and hands-on activities it should be a less complicated concept for students to learn. By familiarizing students with the metric system when they are young they will become more accustomed to the system and feel more comfortable using it as they get older. According to the standards, the students spend a lot of time with the metric system, but they slowly stop using it as they get older. Without using the system as they get older they are more likely to forget the simple conversions and feel less confident in their ability to use the system. We recommend continuing to teach the metric system as the students get older so that they continue practicing and working with the metric system. They will gain confidence and ability to use it successfully when they become adults.

When students are younger we recommend similar activities to the article from the NCTM article Learning and Teaching Measurement that it is important for students to develop their own references because they are more likely to remember the units and be able to compare them. It is also important for students to investigate and experiment with different metric measurements so that they become familiar with converting between the units. Through a mnemonic device the students can learn and remember how the units in the metric system relate to each other and for more advanced students they can complete unit analysis to convert mathematically. By using indirect comparisons and measurements the students are gaining a sense of how the metric units compare to the world around them instead of simply measuring them with tools and devices.

While researching the metric system, it was surprising how few standards there were in the middle school and high school grades. During our research we also found that most people suggest using hands-on activities and references to help the students become more familiar with the metric system. We were surprised that there weren't many investigations or activities that involved actually analyzing the metric system and why the conversions work by just moving the decimal point.

Getting to Know the Metric System (Student Handout)

Directions

How familiar are you with your metric measurements? For this activity you will need a handout and a writing utensil for each station.

Procedures

Station #1: Pick one of the traveling problems from below and walk the metric path explaining your reasoning for the pathway you chose to your partners. Partners should be able to explain to each other why they are moving in the direction they are on the metric system. Each partner should solve a different traveling problem.

Traveling Problems

You are at meters but you want to get to kilometers. Explain how you get there.

You are at hectograms but you want to get to grams. Explain how you get there.

You are at milliliters, go to deciliters, but realize you want to get to liters. Explain how you get there.

Station #2

A mnemonic device is any learning technique that aids memory. For example, to remember the order of biological classification kingdom, phylum, class, order, genus, and species you could use the mnemonic device **K**ing **P**hillip **C**ame **O**ver **F**rom **G**ermany **S**oaked.

Create a mnemonic device to remember the prefixes in the metric system (kilo-, hecto-, deca-, unit/base, deci-, centi-, and milli-).

Station #3

"A knowledge of a wide variety of everyday measurement references, such as that doorways are about two meters in height, is the foundation of good measurement sense as well as good number sense" (Clements, p. 59). At this station you will develop this measurement and number sense.

1. Match the given measurements with the available references.

   a. centimeter = _____

   b. milliliter = _____

   c. gram = _____

   d. 1 kilogram = _____

   e. 5000 grams = _____

   f. 1 meter = _____

   g. 425 grams = _____

Multiples and submultiples		Prefixes	Symbols
1 000 000 000 000	$= 10^{12}$	tera	T
1 000 000 000	$= 10^{9}$	giga	G
1 000 000	$= 10^{6}$	mega	M*
1 000	$= 10^{3}$	kilo	k*
100	$= 10^{2}$	hecto	h
10	$= 10$	deka	da
0.1	$= 10^{-1}$	deci	d
0.01	$= 10^{-2}$	centi	c
0.0001	$= 10^{-4}$	milli	m*
0.000 001	$= 10^{-6}$	micro	μ*
0.000 000 001	$= 10^{-9}$	nano	n
0.000 000 000 001	$= 10^{-12}$	pico	p
0.000 000 000 000 000	$= 10^{-15}$	femto	f
0.000 000 000 000 000 001	$= 10^{-18}$	atto	a

   *Most commonly used

Guessing Metric Measurements

Station 1

Directions

How good are you at guessing your metric measurements? For this activity you will need a meterstick and a piece of string.

Procedure

1. Using string, have a partner cut a piece as long as you are tall.

2. How does that length compare to your arm span?

3. Count how many times the string can be wrapped around your head, waist, ankle, wrist, neck, and thigh.

   Your head: _____   Your wrist: _____

   Your waist: _____   Your neck: _____

   Your ankle: _____   Your thigh: _____

4. Without measuring, cut a piece of string that will go around your waist. Now wrap the string around your waist.

   How many centimeters off were you? _____cm

   Your waist is _____cm.

   Repeat this activity for other parts of your body.

   Your neck = _____cm.

   Your wrist = _____cm.

   Your thumb = _____cm.

5. Your waist measures about _____times your neck.

   Your waist measures about _____ times your wrist.

   Your waist measures about _____ times your thumb.

Oscar Schaaf-Scott McFadden Scholarship

Oscar Schaaf and Scott McFadden were both mathematics educators in Oregon and were instrumental in promoting change in mathematics education. Both shared a dedication to promoting problem solving and helping teachers and students view themselves as successful problem solvers in mathematics. With this spirit in mind, the families have set up a scholarship fund to be used for a recipient to take college courses in mathematics education.

Requirements

☑ The scholarship will be awarded to a teacher (any grade level K – college) who exhibits enthusiasm and dedication in mathematics education.

☑ The scholarship is available for tuition only (maximum amount $750).

☑ The money will be paid directly to the institution.

☑ The awardee must be an OCTM member and preference will be given to Oregon teachers.

Contributions can be made in memory of Oscar Schaaf or Scott McFadden. Please send checks (payable to OCTM) to:

> Oscar Schaaf/Scott McFadden Scholarship
> Becky Reed, Treasurer
> 4413 Indian Earth Ave. NE,
> Salem OR 97305

Schaaf-McFadden Scholarship Application

Name _____ Phone _____

Home Address _____

City & State _____ ZIP _____ Email _____

School _____ Phone _____

School Address _____

City & State _____ ZIP _____

Number of years taught _____ Present Grade Level _____

Please answer the following on an additional sheet:
1. What math education courses have you taken recently?
2. Are you enrolled in an advanced degree program? Where?
3. What math education course(s) do you plan to take?
   (Please include a description of the course(s) if possible.)
4. What institution?
5. What term?
6. Exact tuition cost. Amount of money requested.
7. How will the tuition money be used to further your knowledge of mathematics education and how will that impact students? (300 words or fewer)

Please submit completed application: Francie Bostwick, 8 Richmond Avenue, Medford, OR 97504

Scholarship application deadline: Postmarked by April 15, 2012

Conferences

April 25 – 28, 2012
NCTM Annual Conference
Philadelphia, Pennsylvania

October 18 – 20, 2012
NW Math Conference
Victoria, BC

August 5 – 7, 2012
OML Conference
Linfield College
McMinnville, Oregon

Meetings

Feb. 4, 2012
OCTM Board Meeting
Electronic Web Ex

May 5, 2012
OCTM Board Meeting
Sheet Metal Training Facility
Troutdale, Oregon

August 5, 2012
OCTM Board Meeting
At Math Leaders' Conference

January 2012

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8	9	10	11	12	13	14
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29	30	31				

February 2012

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5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29			

How to Join the OCTM Listserv

OCTM has its own mailing list or listserv, provided by the Oregon State University computer science outreach services peak.org. The purpose of the OCTM mailing list is to offer communication between math, science, and technology educators. Use the following bulleted instructions to communicate with the listserv:

■ If you have an interesting project, task, strategy, or other educational information to share, simply e-mail to: octm@peak.org. (Please note that only members of the listserv can post messages.)

■ To subscribe to the OCTM mailing list, write the message: "subscribe octm@peak.org" and send it to majordomo@peak.org.

■ Majordomo is an automated mailing list management program. Majordomo understands several commands, and is not limited to a single command per message.

■ Documented commands for mail lists can be obtained by sending the message: "help" to majordomo@peak.org.

■ To find out who other members of the OCTM mail list are, send the message: "who OCTM" to majordomo@peak.org.

■ To remove your name from this mail list, send the message: "unsubscribe octm@peak.org" to majordomo@peak.org.

■ To communicate with the OCTM system moderator, send your messages to: octm-Request@peak.org.

■ To change your address on a listserv you need to subscribe to the listserv using your new address. You should also unsubscribe your old address from the listserv.

Instructions for subscribing to the OCTM listserv are always posted on the OCTM Web site <www.octm.org>.

Please keep all postings brief and to the point.
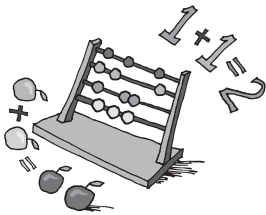
**Oregon Council of Teachers of Mathematics
Professional Development Cadre presents**

Crunch and Brunch

**Learn all about the latest topics in math in Oregon while enjoying a delicious brunch and mingling with other math enthusiasts from your local region!
For a current list of brunch locations and dates, go to www.octm.org/pdc.html**

Use Oregon's Official Math Problem-Solving Scoring Guide

- Changes to Scoring Guide
- Hints for teaching problem solving
- Guidelines for scoring student work
- Assessment of Essential Skills
- State requirements for work samples
- Write tasks to use in your classroom
- Hints for using the scoring guide as a feedback tool for formative assessment

Learn about the Common Core Mathematical Practices

- Build understanding of the Common Core standards for mathematical practice
- Enhance skills in identifying students exhibiting the standards for mathematical practice
- Generate ideas for how teachers can integrate the standards for mathematical practice with instruction to support student proficiency

Cost: $25 for training and meal

$20 if you are a current OCTM member — see membership details at www.octm.org.

District Discount Rate: Buy two, get one free! Get three people to register and only pay for two!

For more information, contact Winnie Miller (millerw1@comcast.net)

Registration

Choose your favorite location and send this form with your check at least one week in advance of the date.
(If your registration is close to the deadline, please email Winnie that your check is in the mail!)

Name: _____   School: _____   Grade(s) taught: _____

☐ I am a current OCTM Member.   Email: _____

Brunch Date/Location: _____

Make checks payable to Oregon Council of Teachers of Mathematics (or OCTM).

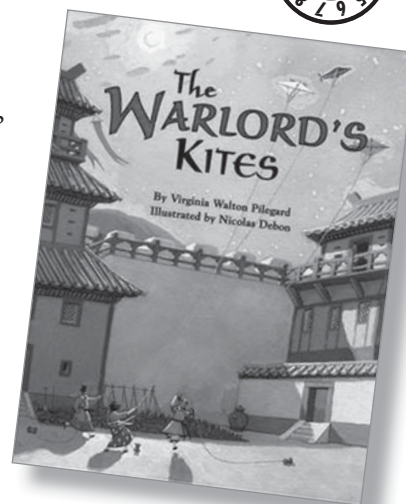Send to: Winnie Miller
2762 Vale Court
Lake Oswego, OR 97034

Math in Literature

by Kathy Reed, Retired Educator, Gresham, Oregon

The Warlord's Kites

by Virginia Walton Pilegard; illustrated by Nicolas Debon, Pelican Publishing Company, Gretna, LA, 2004. ISBN 1-58980-180-6

Theme: Area

Estimated Reading Level: Third

Prereading: Invite students to share what they know about making paper and about kite flying.

Vocabulary: This is a possible list. You can vary the list for students, or students can generate their own.

Chuan	Jing Jing	bellowed	spadefuls
douse	intimidating	vat	fermented
Han dynasty			

Read the story aloud: Students may enjoy a picture walk through the book before you read it. This will help them anticipate what the story will be about. Enjoy the story.

As you re-read:
1. Locate China on a map.
2. Read to the part where the Warlord's son says they will outwait the enemy, and then ask students what the benefits and possible problems might be for this approach. What would the Warlord's subjects need to survive a long attack?
3. Students may notice that the hand-stamped paper is not a square— allow them to explore why this is so (hand length vs. hand width).
4. Discuss how Jing Jing tricked the warriors.

Projects:
1. Discuss what students know about China.
2. Share the Warlord's Puzzle (about tangrams) with students.
3. Explore area of rectangles with tiles, geoboards, and grid paper. Encourage students to generalize their own explanation of how to find the area of rectangles.
4. Compare perimeter and area.
5. Make paper with your class.
6. Make a kite as suggested at the end of the story. Explore other kite designs. Have a kite contest — who can fly their kite the longest, the highest, the closest to a target (flag pole, etc.).
7. Experiment with ways to make a better kite.

Mixing Music and Math

by Marilyn Harlow, Waldo Middle School, Salem-Keizer School District, Salem, Oregon

I HAD ALWAYS HEARD ABOUT HOW great it was to use music in the classroom. I got the idea of this musical rotating activity from a colleague who used Elvis songs and had students answering a variety of math problems and then rotating at the end of each song. On my first attempt to mix music and math my songs were too short and problems too hard. I didn't want to throw the idea out so I tried again. On my next try I used ABBA songs that were over three minutes in length and carefully selected problems that were from the current curriculum that were accessible by most levels. I used a variety of problems in the form of a review. There were eight tables and different problems at each table. It was important to minimize the use of paper and pencil to increase the enjoyment of the activity for my students.

The variety of problems I used were:

- Problems that were from *Get It Together* where everyone in the group needed to collaborate with their individual clue. I used the problems that were noted as good beginning problems.
- An activity that students needed to match equation, table and graph.
- Basic area and perimeter: These were paper and pencil; however, they could easily be made into matching problems.
- Regular investigation problems that were from their homework, three very similar questions typed on separate sheets then three answers for students to match.
- When I did Music Mingle Math at OML this past summer I used mostly puzzles.
- The Happy Cube which are six different colored cubes that increase in difficulty. More about these cubes can be found at www.happycube.com.
- I also used tangram outlines to create different shapes. I made those tangrams out of foam sheets I purchased at a craft store.
- Reptile puzzles that were used to review similarity, four congruent shapes used to create one similar shape. I also made these puzzles by enlarging the reptile puzzle pieces and cutting them from the foam sheets.
- Pythagorean Puzzles were enlarged from the book *Pythango's Geometry Puzzles* in the references.

When creating the groups for this activity I allowed students to select their group after I selected eight leaders. The leaders then picked from the class the students they wanted in their group. The selection went quickly.

These are the instructions I used with my eight groups:

- Move with your group at the end of each song. I asked students to move even if they were unable to finish the problem. I put instructions on each table for which table students would go to next.
- Each table also had instructions for the problem to be completed at that table.
- At the end of the song, I said "Time to move," I gave students time to get up and begin moving, and when most students were at their tables, I began playing the next song and said "Begin."
- Time permitting, if each group were able to get to every table, then we took some time and went over the solutions.

The day before I planned to do this activity I talked to teachers around my room to make sure they were not doing testing or some other conflicting activity. After all the planning, this was a win-win activity. I had a very relaxing and enjoyable time listening to some of my favorite music and the students seemed to be working on and talking about math.

References

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Dale Seymour (1971) *Tangramath,* Creative Publications Sunnyvale, CA

Lappan, Frey, Fitzgerald, Friel, and Phillips (1998) *Moving Straight Ahead Linear Relationships,* Dale Seymour Publications Menlo Park, CA

Lappan, Frey, Fitzgerald, Friel, and Phillips (1998) *Stretching and Shrinking,* Dale Seymour Publications Menlo Park CA.

Siva Heiman (1997) "Pythango's Geometry Puzzles," *Math Games with Manipulatives,* A Division of Success House Cincinnati, OH 45220-1579

Free Math Apps for Elementary Students

by Jane Osborne, Hood River Math TOSA and Jackie Cooke, Gresham-Barlow School District Title I Math Teacher

At the 50th Northwest Math Conference in Portland this last October, Jane and I were excited to attend a presentation by Tim and Leslie Pelton on using Apps for iPads or iTouches in the classroom. The presenters showed us some wonderful free apps available from Mathtappers! for download. I was hooked and wanted to know about more math resources like the ones we'd been introduced to in this session. It is overwhelming to visit the App Store with its huge number of educational apps available. So, I wrote to Jane and then surveyed a few other teachers I know who are using these tools to enrich their math curriculum. Which ones have we found that are good? This article will provide a partial list. If you have multiple iPads in a classroom, and you download an app, you can set them up to all be synced to your account. Then the app will automatically be downloaded to all the iPads in your set at the same time. In the list below, we have only considered free apps. There are other versions of many of the apps on the list below. Often the lite version is the one that is provided for a free download but another version with lots more bells and whistles is available for a cost. There are many other apps we did not include in the list below that are good and reasonably priced, some as cheap as 99¢. But in this time of tight budgets we thought free was indeed a very good price. The following are our favorites for now:

Mathtappers! Multiples: Multiples is a simple game designed first to help learners to make sense of multiplication and division with whole numbers, and then to support them in developing fluency while maintaining accuracy.

Mathtappers! Estimate Fractions: Fraction Estimation is designed to help learners to build their intuitive understanding of fractions by helping them to relate fractions (both symbols and pictures) to the nearest half (e.g., 0, ½ 1, 1½, 2, etc.) and then to extend their understanding by challenging them to use fraction estimates in addition and subtraction problems.

Mathtappers! Find Sums: Find Sums is a simple game designed to help learners to make sense of addition (and subtraction as a related operation), and then to support them in developing accuracy and improving their speed.

Mathtappers! Clockmaster: Clockmaster is a game to help children make the connection between hours and minutes and to help them become fluent in both reading and setting time on digital and analog clocks

Mathtappers! Numberline: Numberline is a learning game that challenges players to find the locations of numbers on a number line. This game allows players to develop their understanding of our number system and their proportional reasoning skills by giving them an opportunity to consider the relative positions of whole, integer and real numbers.

Mathtappers! Equivalents: The Equivalents app challenges players to find groups of tiles (pairs or triples) showing equivalent fractions, decimals and/or percents. To assist the player, the game can display a number line, a 100-grid or a pie chart showing the value of the initial fraction selected.

Mathtappers! Carbon Choices: Students do math in a real life context with this app. Carbon Choices is designed to help students become more aware of the amount of CO_2 equivalent (CO_2 e) pollution introduced by their lifestyle choices.

Nine Gaps Lite: Nine Gaps Lite is an electronic variation of Benjamin Franklin's Magic Squares. The player is challenged to position the digits one through nine onto a 3-by-3 equations grid such that all of the equations formed (horizontal and vertical) are true.

Addition Coach: Addition Coach is a perfect app for beginner mathematicians. It shows the relationship between objects and numbers.

Pig Dice: Pig Dice is a very simple jeopardy dice game in which two players race to reach 100 points, but watch out for those ones!

Math Puppy Bingo: Math Puppy consists of two math skills building games, Math Bingo and Math Challenge. As in Bingo, the goal of Math Bingo is to fill a complete row or column with math puppies. Each time you answer a question correctly, you get to fill one spot. The goal of Math Challenge is to become a math expert by answering as many questions correctly as you can. In addition to the two games, you also get a standard calculator. The free version practices subtraction only.

Motion Math Zoom: In this game, students play with numbers — they'll have a blast zooming through the number line as they master place value.

LetsTans Lite: LetsTans delivers a totally new experience of the captivating tangram puzzles.

PopMath Lite: A fun math game that helps with the memorization of math facts. It's easy to use and quick to learn. Students pop balloon pairs to add together for a particular sum.

123 Number Magic: This app helps kindergarten and first graders to strengthen number concepts from 1 to 10 while having fun!

Math Drills Lite: I always found math to be easiest when I knew a few tricks to help me solve equations. Math Drills lite provides kids with a selection of drills that focus on basic addition, subtraction, multiplication and division. However, besides just offering a set of drills, each problem is accompanied by a visual aid or trick to help players solve the equation. Math Drills Lite plays to the strengths of various learning styles, making it a pretty great math app.

Kids Math Fun ~ Kindergarten: Tailored toward the Kindergarten learner, this segment of the Kids Math Fun app series provides practice that is intended to build young students' math confidence. How so? Only grade-level appropriate equations, such as single digit addition and subtraction, are included in the app. To play, children and parents can adjust settings to include timed tests, "do overs," and score tracking within the kid-friendly display. The Kindergarten level is the only app available for a free download, but the rest of the grade levels through 5th grade are available for a small charge.

Rocket Math Free: Rocket Math is an appropriate free math app for children of all ages. With various sections, children are able to practice basic mathematical functions, or work on telling time, handling money and identifying three-dimensional shapes. As players successfully complete math problems, all of which are formatted into game-like interfaces, they earn virtual money. That money can then be used to build a personalized rocket ship! This one offers a great mix of play and learning, all in one.

Basic Math: Most appropriate for elementary-aged students, Basic Math offers a simple platform for partaking drills to perfect addition, subtraction, multiplication and division skills. After the settings within the app have been personalized to include the desired equations and number of problems, players get to work solving equations by selecting the correct answer from a selection of three options. At the end of each drill, children and their parents, tutors or teachers are able to assess the progress of students by checking out a report of correct and incorrect answer.

Mad Math Lite: Although this is a lite version of a paid app, Mad Math Lite offers plenty of opportunity for kids to practice their basic math functions. As each question is presented, players must enter the correct answer via a calculator-like answer pad. Why is this so helpful? Instead of being allowed to use multiple choice options as a crutch for guessing, kids are required to come up with an answer independently.

Telling Time Little Match Ups: A fun matching game to tell time — fully customizable too.

Khan Academy: Khan Academy is a non-profit video channel with over 1,000 videos covering topics ranging from high school math and science to banking and venture capital. Profits from this app will go to support Khan Academy on its mission to create valuable content.

Rush Hour Free: This is the original sliding block Traffic Jam puzzle, brought to you by the company who created it.

Counting Coins: Counting Coins lets you practice working with U.S. pennies, nickels, dimes, and quarters. You can play in four modes:

Counting Bills and Coins: Counting Bills & Coins lets you practice identifying and solving math problems with money. Count, match, and make change with coins up to quarters and bills up to $20. Practice money skills in five unique activities:

**Crunch (24) Lite:** Like the game of 24. Good for practicing order of operations.

PearlDiver: Throw on your diving helmet, and head into the depths of the sea! Dive amidst shipwrecks and sunken ruins for the valuable pearls, maybe even the elusive black pearl. But watch out for that pesky electric eel! Students are given a segment of a number line and have to dive to the correct position of the identified number.

KosmicMath Lite: KosmicMath is a mathematical drill instruction application built to support and reinforce mathematical tables and educational scope & sequence requirements covering Preschool through 4th grade.

Frac Factory: Enter the Fraction Factory and use your math skills to place fractions into their correct positions on a number line. When the game begins, fraction gears will move across the screen on a conveyor belt. Use your finger and drag the fraction gear to where you think they should go on the number line at the top of the screen.

Math Blaster: The MathBlaster app is a new twist on a computer software and Web site game that has been around for a long time. In this game, players shoot the spaceship with the correct answer while navigating to avoid an alien attack. As players progress through the levels, the Math difficulty increases and the alien ships get faster. Each level is locked until the previous level is completed.
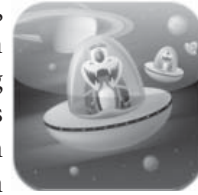
Multiply Wiz Free: This app is a great tool to use for kids to do multiplication drills the fun way and still have them become very good at multiplication, which is an important life skill.

My Most Memorable Student

by Jim Specht, Retired Math Teacher, San Juan Island, Washington

KHAI PHOUTINANE WAS BORN IN LAOS. As a young man, he trained to be a Buddhist monk. He spent much of his life fasting in those days, and he spent long periods of time in meditation. His hair was shorn, as that was a symbol of human vanity. His is the Hmong tribe, and during the Southeast Asian wars of the 1960s and 70s, his people sided with the Americans, sometimes fighting for them and also sheltering American pilots who had been shot down by the Communists. After the war ended, the Pathet Lao went from village to village, seeking out and killing all of those who had been friends of the Americans. Khai fled from his village to a refugee camp in Thailand in the dead of night with no money and only the clothes on his back. There he remained until finally a church in Minnesota sponsored him to come to America.

When Khai first came to Minneapolis, he felt himself to be pretty much a stranger in a strange land. Minnesota would be among the American states least like his homeland. To help facilitate the influx of Asians into the Minneapolis schools, his spon-

Khai Phoutinane with his family

sors arranged a job for him as an interpreter with the school system. Many Laotian and Vietnamese chil-

dren were being resettled into the schools of the Twin Cities, and interpreters were needed. This was a modest, but necessary position, and it helped him settle into American culture. After a few years, he became an American citizen, and his caseworker suggested, "Why don't you work with us?" After some thought, he left his position with the school district and signed on as an officer with the Immigration and Naturalization Service. It was a part-time position, but he was called upon several times to interview travelers who did not speak English and he testified in several court cases, so it was important. When the INS was integrated into the Department of Homeland Security, his part-time position was eliminated, but he was also offered an opportunity to attend Basic Training at the Federal Law Enforcement Academy at Brunswick, Georgia. He accepted.

This was where the paths of our lives crossed. Khai and I were both scheduled into Customs and Border Protection Class 518A. The Academy is a curious place. The grounds are very large, and many branches of Federal Law Enforcement go there simultaneously. Alligators make their homes in the larger mud puddles, and mosquitoes the size of barn swallows live in the shade. The recruits are National Park Rangers, EPA Deputies, US Marshalls, ATF, Capitol Police, Drug Enforcement Agents, NCIS, and others, all attending classes at the same time. Each group has their own, unique, attire. In the chow hall, it seems most natural to sit with students who tend to be wearing the same kind of uniform as yourself.

This was how I came to be seated at the same table as Khai, on our first day there.

After introductions, it was clear that Khai was very nervous. He told me that the officers back in Minneapolis had told him that he would never make it. His wife also had told him that it would be the greatest shame on his family if he failed, and they could not go on living in their house, having to face the neighbors. I could see from the recruits seated at the table, that we were among the oldest, but as his story unfolded I also realized the he was probably the reason that I had been brought to that place. He sounded much disciplined, and very motivated. I had a career as a teacher, so it seemed natural to think that I should be able to help him. I could do this! So I told him, "I'll help you. I can get you through the Basic Training, but you have to do everything I say."

He started doing this bowing thing where he put his hands together and rocked forward and said, "Thank you. Thank you, so much." I whispered to him, "Stop it. People are watching! Don't thank me, Khai. You are going to hate me before this is over."

I was committed.

Khai was good for his word. Every night after evening chow he would stop by and we would study at least two to three hours. I would ask questions. He would write the question that I had asked on one side of a 3-by-5 card. Then he would turn it over, and look it up, and write the answer on the back. I would do the same. After we were finished with a chapter, I would go through and read the questions one after the other. If Khai could answer them correctly, we would pile the cards on the right. If he had them wrong, they would go into the pile on the left. When all the cards were done, I would pick up the pile on the left and do the same thing, then again, then again - until there were no cards left. Then we would do the whole thing again. He had to get through an entire deck in one try before I would let him go back to his room. AND, he had to promise to go thru them at least one more time on his own before breakfast.

After Khai would leave, I would look thru the content for the next day and use a highlighter on all the relevant text. All the government tests are multiple-choice, so it wasn't that hard to discern what the test questions might be, and one only had to recognize the correct answer. We were not particularly encouraged to know why anything was true.

The next evening we would do everything anew, and when that was done we would pull out the cards from the previous night and do those. Then get out the cards from the night before and do those, too.

> "He sounded much disciplined, and very motivated. I had a career as a teacher, so it seemed natural to think that I should be able to help him. I could do this! So I told him, "I'll help you. I can get you through the Basic Training, but you have to do everything I say.""

I utilized all of the multiple learning styles that I could. Howard Gardiner would have been proud of me. In addition to notes and verbals, I made Khai learn little songs, and sing the song out loud to me to help remember phrases and legal terms. (Most of the songs sounded like Old MacDonald.) I told him to just sing the song in his head on the exam, and the next words to the song would tell him which answer to shade. We were kinesthetic, and would practice pushups, sit-ups, and go on distance runs. Between pushups and during the runs (between gasps) I would drill him again on content. More questions. More answers — this time without the cards. We would go out into the parking lot in the evenings and practice vehicle extractions on the parked cars. We would practice postures and stances for the firing range to help get his scores up, and we would practice defensive strikes and blows out on the lawn of our barracks.

What we did in those days was not really teaching and learning, and I would hope it would never be a model for a school curriculum. It was just simple programming. Study, Study, Study, Test. Study, Study, Study, Test. I am certain that almost all of the content evaporated within days, possibly hours, of each exam. The classroom instruction was pretty much just reading Power Point presentations. If one of the recruits had a question, the instructor would scroll back and read it again. Some people were injured during training, and had to leave. Some failed. Some decided that this was not a career that they wanted. Over four and a half months, the class got smaller. I think, now, that was the point. This was not about learning. It was about attrition. It was without mercy. Failure was not an option, and we redoubled our efforts.

As time passed and his graduation became more of a probability than a possibility, Khai's family would send him emails telling him how proud they were of him, and that he was bringing great honor to their family. Many family members, including some from Laos, were planning to come to his graduation. I am sure that this was meant to reassure him, but it only raised his internal stress level to astronomical heights. There were six exams. Recruits were allowed to fail three exams if they could pass them on retest. Khai had already failed two. Two days before graduation, he failed his third. He would have one chance for a retest, the afternoon before graduation. At that time, his family would already be on board the plane to Georgia.

Looking back, it was a challenge, but the real challenge was not actually mine. When we started our class that July, we had 48 recruits. When graduation came in October, we had 40. On Graduation Day, the 40th student was Khai, our anchorman. He had passed his final retest. He was the last to walk across stage and shake the Director's hand, but his badge looks the same as everyone else's. I remember the Phoutinane family was very well-represented at the ceremony. Afterward, during a quiet moment, Khai and I shook hands to say farewell. He would be going back to the airport at Minneapolis. I would return to my corner of Washington State. I told Khai that we were both equal, now, just the same. We had sworn our oaths during the ceremony, and now were both Americans in the service of our country. He started to argue, but I shook my head. Nope, Khai, we are just the same.

I was genuinely relieved that he had made it, but also honored. All he had ever wanted from our country was a fair chance, and I was grateful that I had been able to help him achieve it. It was his courage that had been tested, and he had proven himself worthy.

From there, our paths diverged. I received an email from Khai that winter. He had gone back to Laos for a visit. I guess that it's safe to travel there, now. In his village, he is quite the celebrity. His grandmother was very proud, and she told his cousins that if his life can be like it is, so can theirs. So maybe his dream can help them with their own dreams.

For me, I guess once a teacher, always a teacher. This just underscores that teachers' lives are never actually about themselves, but always have been about the lives that they touch. It's like the ripples on a pond, spreading outward. You just never know when you might have made a difference. Perhaps it could also be that there was an inspiration, or something somebody else once did long ago, that is just echoing through you, and you are just the conduit of the moment. Who can know?

I do know that it goes on forever.

Two for $50

by Jill Sumerlin, OCTM Past President

THE OFFER WAS INTRIGUING! The OCTM Board members that attended the leadership conference in Denver in July of 2011 made a monumental decision. Let's do something to spark interest in attendance at the Northwest Math Conference (NWMC) in Portland, Oregon and help boost our membership. School districts are strapped for funds and staff development and professional organization memberships have been casualties of that trend.

The basic idea was this: an OCTM member that had attended Oregon Math Leaders Conference in

A technology presentation inside the exhibit hall

McMinnville in August would go back to their districts and invite a non-member to the NWMC. They would each pay $25 toward their registration and the Fineran Scholarship Fund would pick up the remainder. This number was arrived at in order to honor the 50th anniversary of NWMC. It was limited to fifty such pairings.

This support was enough to allow some districts to release teachers to attend this highly successful conference. Those that were able to attend were able to gain great insights. Here's a few of the comments we heard from others . . .

Jennifer Cox: "First of all, this was the best Northwest conference I have attended thus far. My favorite session was Shannon McCaw's Engaging Students in the Secondary Classroom. This session, late on Friday afternoon, was engaging and active. I learned to not be afraid of stations and other ways to get kids moving in the classroom and doing math. I have already implemented an idea and it is only noon on Monday. I learned some great ways to help my intervention students learn & understand fractions."

Chris Escher of Colton Middle School said, "Without a doubt, my favorite session at the conference had to be Greg Tang's "Fact Fluency – Do You Kakooma?" His philosophy on number sense and fluency made me completely rethink how I am going to approach teaching math facts at the fourth grade level. I love how he made me think that I can't just teach $5 \times$ (1 through 12). I have to teach kids how to do $5 \times$ (everything). I have always been a proponent of fluency, but I think I restricted myself and my students to the little box called a multiplication table. I felt validated by the importance he placed on practice, practice, and practice while still being a proponent of making sure kids understand 'why?'"

"This conference has inspired me to make important, higher-level cognitive demand, fun and interesting tasks. I gathered tools to analyze the tasks that I create and some really great activities that others have made. It has inspired me to add real world data, dance, rap, singing, videos, radio, games, open-ended and higher-level demand into my problems. And in this creativity I need to keep asking myself: What experiences and perceptions of math do I want my students to walk away with? And what strengths and skills am I developing in my students? Be reflective and deliberate," said Amanda Uerlings.

"I have already implemented the use of media, YouTube, into my classroom. At the conference I went to the "Math is So Boring. HELP!" Session. They showed some good videos that were educational so I decided to find one that went with today's lesson, and I have to say the kids really seemed to like it. While I was at the conference I was reminded of the fact that if kids don't enjoy what they are doing then they aren't going to want to be involved, so my goal

is to do more interactive things with my students, to have a classroom that goes beyond the notes, lecture and homework, and to get my kids interested and engaged in learning," said Veronica Kreder.

Jennifer Bell, NW Conference Chair

Stacey Stover reported that, "Some sessions showcased products and programs created specifically for math such as the session I attended on a program called Catch Up Math. I even have a free trial coming! That one could be my favorite if my students actually catch up. I attended some sessions in order to learn for other teachers who couldn't attend such as the Math in CTE session and Mark Freed's session on the CCSS at the very, very end of the conference. Those could be my favorites because I learned SO VERY MUCH and can use the information to better our school. Still other sessions were put on by teachers-in-the-trenches who were willing to share what was working for them. What a cornucopia! While Mark Cote's Study Team Strategies session is at the top of the pile, I must choose Roger Hunter's Strategies to Engage Reluctant Learners and Promote Cooperative Learning in Mathematics as my single favorite. Not only was Roger's accent delightful but his strategies match my style of teaching and I realized that I have used many of the same strategies before but have forgotten. "

Our school has a $50 budget per teacher per year for professional development so the two-for-$50 deal made the difference for my colleague and me as to whether or not we could attend the conference.

Michael Shaughnessy, NCTM President

The finale… "Your letter of explanation arrived today. Thank you very much! As the thank you letters keep pouring in, I had become quite curious what "Two for $50" meant. Now I know. It has turned out to be a highly successful idea! All of you who came up with that one should be commended! When the OCTM Executive Board is puzzled about the inquiry in my letter to the Board, you may tell them. 'Don has been informed.' Cheers! Don Fineran"

The final verdict: It was a highly successful idea and well worth the effort! Thank you once again to the family and fans of Don Fineran for providing this fund and opportunities for teachers in Oregon to attend such an outstanding conference.

Many volunteers gave their time for OCTM

DO MATH and Share It!

by Kasi C. Allen, Ph.D., Graduate School of Education & Counseling. Lewis & Clark College

Christmas Eve morning had arrived and instead of baking cookies, I found myself driving to DMV to renew my vehicle registration. Despite the noon hour, the lines were nonexistent and the staff jovial, even chatty. The woman behind the counter asked, "Have you ever considered a personalized license plate?" Truth be told, I had. "I'm just mentioning it," she continued, "because all the prices go up at the end of the year and the fees you're paying today nearly cover it — kind of like getting personalized plates at half off." "Really?!" I responded. She smiled. Temptation came calling.

I told her something "math-related" would appeal. "Math related?! You must be a teacher. Nice! Let's look." And so the search began. We had seven letters and spaces to work with. "Bummer! MATH is taken," she announced, "but LUVMATH isn't and GOTMATH isn't either." "How about DO MATH?" I asked. "DO MATH is available! I like it!" She beamed. And I was sold. Her nearby colleagues reacted almost immediately. "DO MATH, huh?" the man to her right leaned my direction, "We probably wouldn't have such a big mess on our hands in this country if we took that advice. Good for you." His response was only the beginning.

Weeks later, I eagerly opened the large envelope containing my Christmas gift to myself and proceeded to search for a screwdriver. I gathered my old plates off the ground as my teenage children began arriving home for the evening. The oldest blurted, "Seriously?! I can't believe you are going to put that on your car. You are such a geek, mom." The youngest chimed in, "Yep, that's my math geek mama. Actually, I think it's kind of cool. Only you, mom, would do something like that." I wondered if that was true, growing increasingly curious to see the reactions of my students (all pre-service teachers) the next day.

As anticipated, a few students saw the plates before I could share a photo in class. "Is that your car with the DO MATH license plates? That is so awesome. It's like DO MATH kids, your future depends on it." Another corrected him, "No, it's like the NCTM thing, right? DO MATH and you can do anything!" Yet another added, "DO MATH … it's like drink your milk, eat your Wheaties." We all laughed.

Throughout the day, many of my students responded in a similar vein, with their own continuations of the imperative — DO MATH. From my pre-service elementary teachers, I heard statements like:
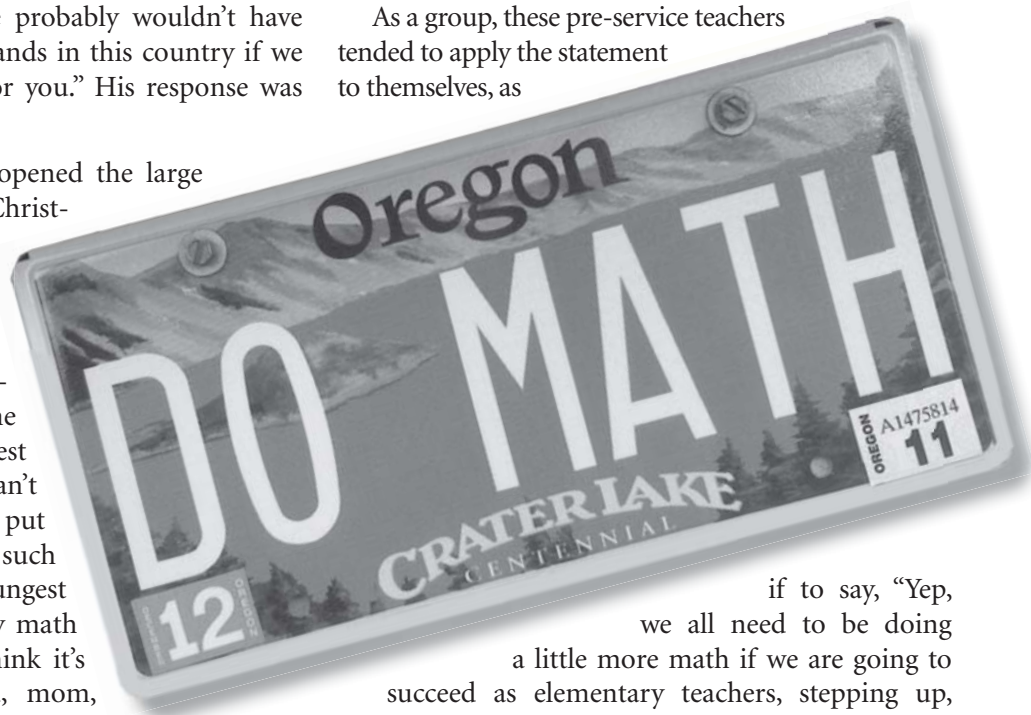
DO MATH … if you're going to be great teacher.

DO MATH … you know you can!

DO MATH … and the rest is easy.

DO MATH … like you've never done it before, baby!

DO MATH … I sure hope I can!

As a group, these pre-service teachers tended to apply the statement to themselves, as

if to say, "Yep, we all need to be doing a little more math if we are going to succeed as elementary teachers, stepping up, thinking differently, overcoming our fears and anxiety so that our students will succeed in math." Their stance reflected much about their evolving relationship with mathematics as future elementary teachers

and their efforts to mediate some of those lingering less-than-confident feelings about their own mathematical abilities. It is evidenced their deep desire to give children more rich and empowering mathematics learning experiences than they had had in school.

From the secondary folks came comments with a different slant:

DO MATH … it's fun! No kidding!

DO MATH … and nothing can stop you!

DO MATH … you won't regret it.

DO MATH … you might even find out you like it.

DO MATH … if you want choices.

DO MATH … if you want a job.

DO MATH … or you won't be graduating.

These soon-to-be-teachers generally applied the statement to their students as opposed to themselves — as both a source of encouragement and a bit of a threat. The nature of the group response reflects their own mathematical confidence combined with the concern they have for their students' performance.

While my students' reactions to the new DO MATH plates continue to fascinate me, even more surprising (and often entertaining) have been the responses of the public. It has become fairly commonplace for people to pull up alongside me (on the freeway even) to give me the thumbs up or to shrug their shoulders with a puzzled what-the-heck-are-you-thinking look. When I am stopped at a crosswalk, many pedestrians will smile, point, and wave. Of course, there's always a few who frown and shake their heads. Living in a state where there are laws against pumping your own gas, some of my most memorable interactions have been with gasoline attendants. Here is a favorite:

Hey! Nice plates! I mean that's really true. It's like, come on, do math. I mean it's not rocket science. Well, I guess sometimes it really is rocket science. Funny. But you can't do rocket science without doing a little math, can you? That's really a good one.

There's also this one from our neighborhood bank manager who stopped me as I was getting into my car one afternoon:

Is that your car? I've been wondering who drove it. I should have known it might be you. I just love it

because when I was in school I hated math. I thought it was stupid and worthless. And now, I use math everyday. I couldn't do my job without it. And you know what I use all the time? The whole cross multiple thing. That turned out to be so useful in my job. Who knew?

As time goes on, the reactions have too, right up to the present day. And each new occurrence has reinforced my own need to share this experience with my fellow mathematics colleagues who might consider embarking on a similar journey.

I purchased the new plates on a whim — mostly because I thought they would be fun professionally, attract a little attention to the subject I love, and slightly annoy my children. And they were on sale! Never in my wildest dreams did I imagine the conversations that have ensued as a result of that decision. I have treasured every one and look forward to more. As teachers of mathematics, I think it is easy to forget the extent to which we are ambassadors for our discipline — for what mathematics can and should be. American society has such a pained and impoverished relationship with our favorite subject. Unlike what occurs in some other cultures, children in the United States rarely get a chance to experience math as recreation or play, let alone beauty. Instead, they learn to equate mathematics with arithmetic and computation, many never recognizing math as the "science of patterns."

My wish for every Oregonian, young and old, is to become acquainted (or reacquainted as the case may be) with mathematics as something that adds to their life rather than detracts from it… something they can DO and explore, as opposed to something that is done to them. For this reason, I want everyone to have a chance to DO MATH… and to experience the thrill that comes with it!

The Project of Learning Vocabulary

by Aleta Kandle, Sandy High School, Sandy, Oregon

"MISS KANDLE, A PENTAGON HAS seven sides, right?" my students inquire. Vocabulary is critical in math class. Without a solid understanding of mathematical terminology, students miss questions simply because they cannot decode the directions. Is there a way to make the learning of terms fun and engaging for students?

One successful tactic I use is the standard Unit One geometry project. (Most geometry texts outline foundational terminology within the first unit.) Students use the terms to create a children's story, drawing, comic strip, board game dictionary, design plans or joke book.

The element of choice, simply choosing their favorite form of the assignment, inspires the students to complete quality work. The most commonly chosen project is the dictionary. Some of my students like to add terms in their first language to their dictionaries. Several students have written fun stories and others enjoyed labeling schematics for boats, planes and houses with geometry terms. Two students chose to write jokes. My teacher ears were delighted to hear students joking about geometry terms! They gained a deeper understanding of the terms as they used them in humorous lines. Artistic students have drawn beautiful images and then labeled each term illustrated on an overlay or a basic outline of the drawing. (They usually prefer not to mar their art with the terms.) They completely enjoyed the opportunity to use their artistic skill in geometry class.

A couple of students have made board games with cards that practice the terms. Others have enjoyed finding pictures of nature or cityscapes on the internet (or in magazines) and labeling the terms inherently used in all shapes.

Not only will students review the terms in their own project, but will discuss with classmates other projects, thereby reviewing more terms. What more could a math teacher want then to have students happily discussing terminology? So, pull out the colored pencils and let creativity take over the vocabulary lesson for the day.

Geometry Project Unit 1:   Name: _____

|		
Children's Story: 50 terms, used and defined through narrative and/or illustrations	**Comic Strip:** 50 terms, used and defined through narrative and/or illustrations	**Board Games:** 50 terms used and defined through narrative and/or illustration
Drawings: Create two complex drawings. Use and define/label 50 terms through narrative and/or illustrations. You may label terms on an overlaying tracing paper.	**Your Choice:** Be sure to get your idea checked by your teacher before you begin. Define/apply 50 terms	**Dictionary:** 70 terms used and defined through narrative and illustrations
Design/Sketch/Label House Plans: Use and define 50 terms through the plans and sketches.	**Write Jokes:** 50 terms, used and defined through narrative and/or illustrations	**Copy Photos of Architecture, Construction, Nature, Etc.:** Label 80 terms, organize and bind illustrations professionally in a book.

PRIMARY PROBLEM BOX

by Craig Martin
Bellview Elementary
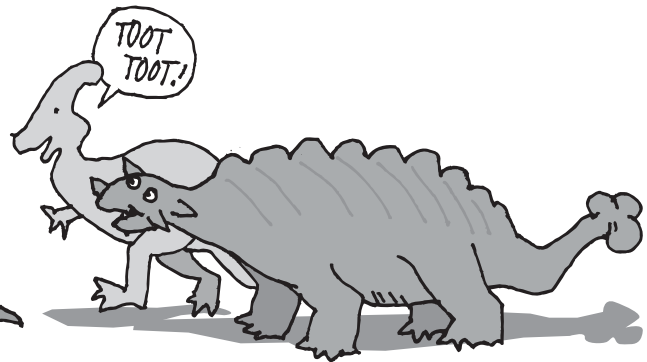Ashland, Oregon

11-9

Baby Apatosaurus walked 8 laps, stopped to nibble a tree and then walked 6 more laps. How many laps did he walk?
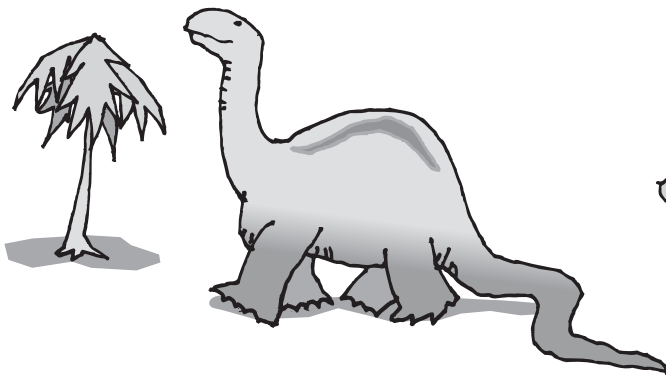
11-11

Ankylosaurus did 7 laps. Parasaurolophus did 15 laps. How many more laps would Anky have to do to have the same number as Para? By the way, Para politely honked her horn each time she passed Anky. How many times did she honk?

11-10

Half way through the Jog-a-Thon Stegosaurus had run 10 laps. Her goal was to run 22 laps. How many more laps does she have to run to make her goal? Do you think she will meet her goal? What will she have to do?

11-12

Baby Maiasaurus' mother pledged her 10 cents for every lap she did. She walked and ran 8 laps. How much did she earn?

by Wade White
Dallas School District
Dallas, Oregon

Ginni, Abe, Doug, and Cindy (all brothers and sisters) received money from their Gramma for Christmas since she lives far away.

11-9

With the $50 that Ginni got, she spent $23.75 on shoes, $17.20 on a hoody, and $4.55 on a bell for her bike. How much money did she have left?

11-11

Since Doug was a little older Gramma gave him more money. He spent $18 on computer games, $12 on music for his iPod, and ½ of what was left on his bike. How much did Gramma give Doug if he spent 1/3 of the money on computer games and music? How much did Doug spend on his bike?
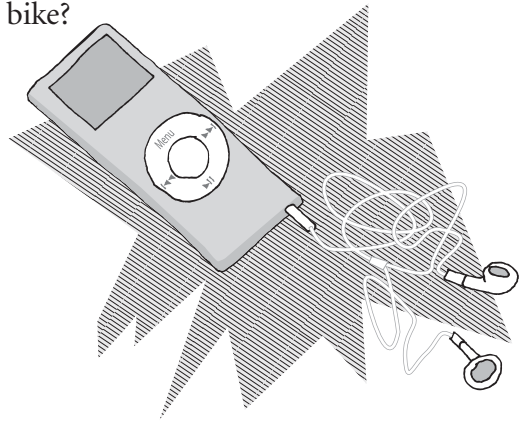
11-10

Abe also got $50 to spend. He decided to spend $1/2$ of it on his bike, $1/4$ of it on his toys, and the rest on books. He bought new pedals for $12, colored handlebar grips for $8.25, and a rear view mirror for $9.75. He bought two books for $5.40 each. How much did he spend over or under his bike and book allowances? How much does have left to buy toys?
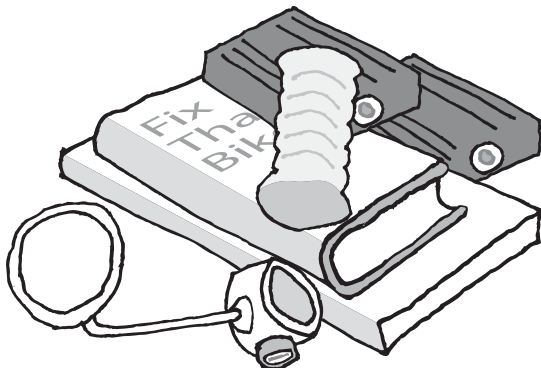
11-12

Cindy spent $1/3$ of her money on a jacket. She spent $1/4$ of the remaining money on a pair of shoes. If the pair of shoes cost $20 less than the jacket how much did Gramma give her?
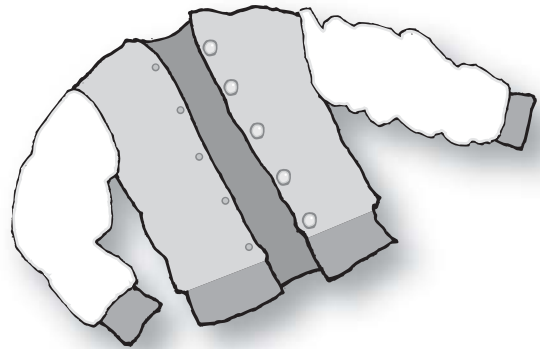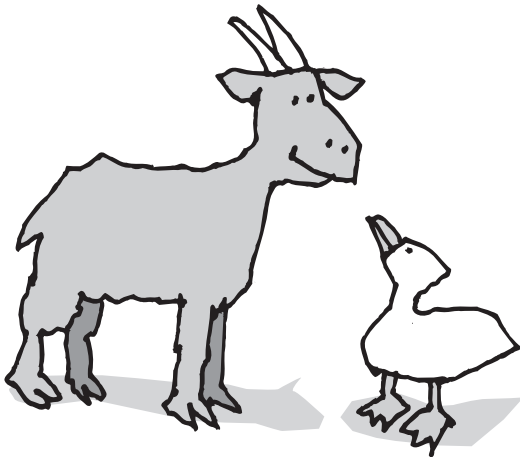
INTERMEDIATE PROBLEM BOX

by Elizabeth Warren, Sally Wood
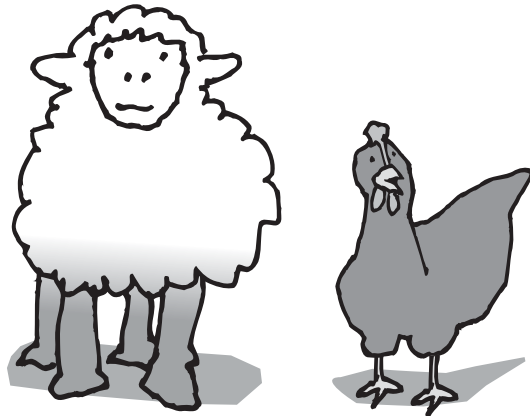Estacada Junior High School
Estacada, Oregon

11-9

Farmer Sam has ducks and goats. There are 19 heads and 46 feet. How many animals are ducks and how many are goats?
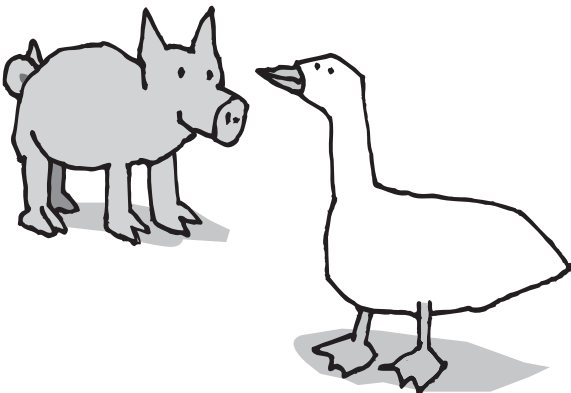
11-11

Rancher Kyle has chickens and sheep. There are 245 heads and 888 feet. How many are chickens and how many are sheep?
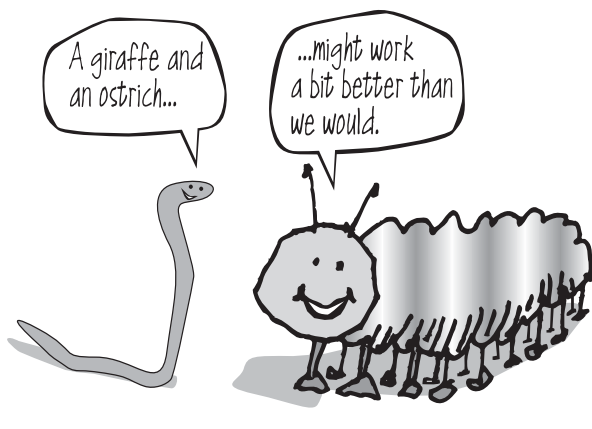
11-10

Farmer Sam also has geese and pigs. There are 72 heads and 196 feet. How many are geese and how many are pigs?

11-12

Make up your own problem of appropriate difficulty. Then solve it.

A giraffe and an ostrich...

...might work a bit better than we would.

SECONDARY PROBLEM BOX

by Don Crossfield
Roseburg High School
Roseburg, Oregon

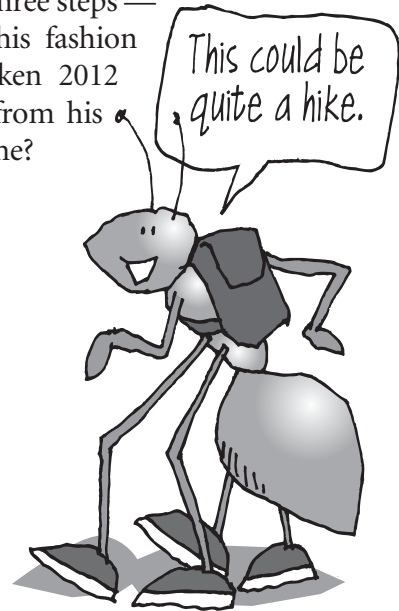## 11-9

A box has integer dimensions and a volume of 2012. None of its dimensions are 1. What is its surface area?

←A box
(Maybe not *the* box, but certainly *a* box)

11-10

A factor of 2012 is chosen at random. What is the probability that the factor is odd?

Just how odd does a factor have to be to be... *odd?*
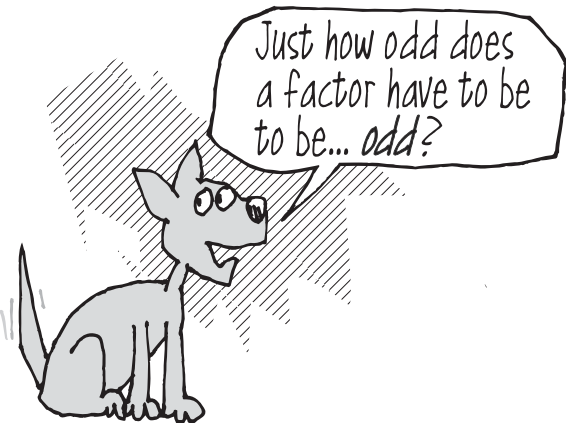
11-11

An ant takes one step, then turns 90 degrees and takes two steps, turns the same direction 90 degrees and takes three steps — continuing in this fashion until he has taken 2012 steps. How far from his starting place is he?

This could be quite a hike.

11-12

If the ant stops after taking only 2011 steps, is he closer or farther from his starting place than if he continues to that 2012th step?

...too dizzy... can't go on...

PRIMARY

Younger children may be confused by the idea that a distance (a completed lap) can be represented by an object, which is something they can count. Experience running laps and recording each lap with a tally mark helps. A whole class lesson on a diagram of a track modeling what it means to complete a lap can also be used to introduce a strategy of tallying how many times the starting point is passed. Ask questions that help students visualize what is happening. What if Stego ran one lap while Velociraptor ran two? Who is going faster? Would they pass each other?

11-9 Answer: 14 laps

8 laps + 6 more laps = 14 laps
Students represent laps and count all or count on.

11-10 Answer: $10 + c = 22$ $c = 12$

Strategies from more concrete to more abstract:

■ Represent 10 laps with objects or marks. Represent and count on to 22. Count the new set.
■ Write numbers to 10. Write on to 22. Count the new numbers.
■ Count on from 10 using fingers, holding up one finger for additional lap. Recognize 10 and 2 more as 12.
■ Use derived facts and knowledge of tens and ones.

"Ten plus ten is twenty and two more is twenty two so it's 12." She will have to run faster since she has more than half of her needed laps to go.

11-11 Answer: $7 + c = 15$ $c = 8$

This problem was purposely worded with action to help make students make the transition from a joining to a comparison problem and to encourage a counting on strategy. She passed Para eight times and honked each time.

11-12 Answer: $10 \times 8 = 80$

Strategies from more concrete to more abstract:

■ Represent eight groups of ten with objects or marks and then count all.
■ Write 10, 20, ... count out 8 groups or count by tens keeping track with fingers.
■ Recognize that 8 tens is 80.

ELEMENTARY

Sample solutions: The strategy of model drawing with bars was used to find these solutions.

11-9 Answer:
Ginni
Amount spent
$23.75 + 17.20 + 4.55 = 45.50$
$50.00 - 45.50 = 4.50$
Ginni had $4.50 left.

11-10 Answer:
Abe
$1/2 \times 50 = 25$
$1/4 \times 50 = 12.50$
$12.00 + 8.25 + 9.75 = 30$
$2 \times 5.40 = 10.80$
$30 - 25 = 5$
He spent $5 over his bike allowance.
$12.50 - 10.80 = 1.70$
He spent $1.70 less than his book allowance
$12.50 - 5 + 1.70 = 9.20$
He has $9.20 left to buy toys.

11-11 Answer:
Doug
$18 + 12 = 30$
$30 \times 3 = 90$
Gramma gave Doug $90.
$90 - 30 = 60$
$60 \div 2 = 30$
Doug spent $30 on his bike.

11-12 Answer:
Cindy
$1 - 1/3 = 2/3$
$1/4$ of $2/3$ is $1/4 \times 2/3 = 2/12 = 1/6$
$1/6$ is half of $1/3$ so $1/6$ is half of the cost the jacket
$1/3 - 1/6 = 1/6$ which is $20
$6 \times 20 = 120$
Gramma gave Cindy $120. **Not Fair!**

PROBLEM BOX SOLUTIONS

INTERMEDIATE

11-9 Answer: 15 ducks and 4 goats
To solve this, you can draw a picture of 19 heads. Then put two feet on each head, because each animal has a minimum of two feet. This will make 38 feet you've drawn. There are eight feet leftover to put with the heads. They have to be placed in groups of two additional legs, so there will be four animals with four legs and 15 animals with two legs.

11-10 Answer: 26 pigs and 46 geese
To solve this, you can take the number of heads and multiply it by two. This will give the number of feet if they are all geese. $72 \times 2 = 144$ geese feet. Now take the total number of feet and subtract the number of geese feet. $196 - 144 = 52$ extra feet. Because the feet are in pairs, you need to divide by two. $52/2 = 26$ pair of feet. These pairs of feet make up the pigs. Subtract the number of pigs from the total number of heads and you will get the number of geese. $72 - 26 = 46$ geese.

11-11 Answer: 46 chickens and 199 sheep
These problems can also be solved using systems of equations. First write the two equations:
$2c + 4s = 888$
$c + s = 245.$
Then multiply the second equation by –2 to eliminate a variable.
$-2(c + s) = 245 (-2).$
This gives a new equation of
$-2c - 2s = -490.$
Add the two equations together and then divide by two to get the number of sheep.
$2c + 4s = 888$
$-2c - 2s = -490$
$2s = 398$
$398 \div 2 = 199$
$s = 199$
Now substitute in the number of sheep into the equation to get the number of chickens.

11-12 Answer: Answers may vary.
(The number of heads can be either odd or even, but the number of feet needs to be even. The number of feet must be more than two times of the number of heads but less than four times the number of heads.)

SECONDARY

11-9 Answer: 4032
Since 2012 factors into $503 \times 2 \times 2$, those must be the dimensions. That makes four faces with areas of 2×503 and two faces with areas of 2×2.

11-10 Answer: $1/3$
Since 2012 prime factors into $2 \times 2 \times 503$, the six factors of 2012 are 1 , 2 , 4 , 503 , 1006, and 2012.

11-11 Answer: $1006\sqrt{2}$
After each group of 4 steps, the ant is facing his original direction and has moved a 2×2 from his location prior to those 4 steps. So, 8 steps moves him a 4×4 away, and 2012 steps moves him a 1006×1006 away.

11-12 Answer: Neither.
He's just as far. It's easier to see when you compare the 3 step walk and the 4 step walk. That last step just moves him into a different quadrant, but both walks make him a 2×2 away.
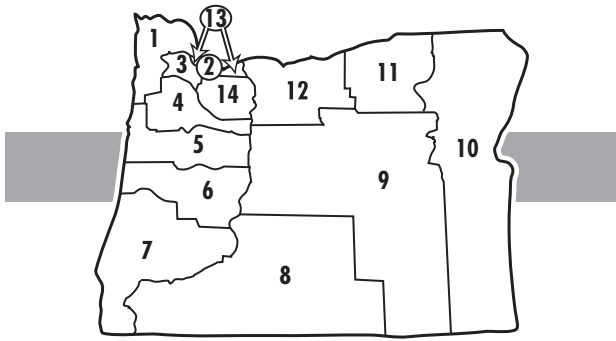
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The Oregon math education community consists of a number of organizations and many individuals representing all levels of education. The state level organizations are listed below. Some names and phone numbers may change as the year progresses. For information, please contact the person identified for each agency.

Public Agencies

Oregon Department of Education (ODE)
Web site: www.ode.state.or.us
Public Services Building, 255 Capitol St. NE, Salem, OR 97310-0203

Assessment and Evaluation
Contact: Jim Leigh, james.leigh@state.or.us

Educational Improvement and Innovation
Contact: Mark Freed
mark.freed@state.or.us

Oregon University System (OUS)
Contact: David McDonald, Academic Affairs, 541-346-5729 david_mcdonald@ous.edu

Advisory Groups

Oregon Mathematics Education Council (OMEC)
Chair: Mike Boardman, boardman@pacificu.edu
www.omec.org

Professional Organizations and Interest Groups

Oregon Council of Teachers of Mathematics (OCTM)
Web site: http://www.octm.org, President: Jill Sumerlin, PO Box 981, Tillamook, OR
jills@tillamook.k12.or.us

Math Learning Center
Contact: Fraser Boergadine, 503-725-8316
frazerb@mathlearningcenter.ort

Mathematics, Engineering, and Science Achievement (MESA)
Contact: Joan Kurowski, Portland State University
503-725-4666

Columbia EQUALS
Contact: Joy Wallace, joywallace@attbi.com, URL
http://www.col-ed.org/equals
3738 NE Prescott, Portland, OR 97211, 503-284-2613

Oregon Mathematical Association of Two Year Colleges (ORMATYC)
Contact: Charlie Naffziger, Central Oregon CC
541.318.3285 cnaffziger@cocc.edu
ORMATYC Homepage: www.chemek.cc.or.us/ormatyc/

Teachers of Teachers of Mathematics (TOTOM)
Contact: Nancy Drickey, ndricke@linfield.edu

Science and Math Investigative Learning Experiences (SMILE)
Program Coordinator: Jay Well, Programs Coordinator, SMILEinfo@smile.oregonstate.edu
http://smile.oregonstate.edu

Northwest Regional Educational Laboratory
Web site is available at http://www.nwrel.org/msec/
Director, Kit Peixotto, 503-275-9594
Resource Specialist, Amy Sutton suttona@nwrel.org

Teachers Development Group
Linda Cooper Foreman, 503-650-1914 (toll free: 877-650-1914)
linda@teachersdg.org

Teachers Inspiring Problem Solvers (TIPS)
Contact: Cathy Brown, TIPS4CathyBrown@gmail.com
www.Math-Tips.net; 937 Niagara Falls Dr, Redmond, Oregon 97756, 503-705-1469