



Mathbits

Clear the Dates! Plan to Attend!

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2005 MCTM Minnesota Spring Mathematics Conference

Quality Teaching: The Key to Understanding Mathematics

Friday-Saturday, April 29-30, 2005

KEYNOTE SPEAKERS

Laurie Boswell and Don Balka

“Improving Mathematics Education: Two Teachers at a Time”

Description: “It is impossible to light the flame for learning in a young person if there is no spark left in the teacher.” Rekindle your fire as Laurie and Don suggest ways for each of us to get involved in improving mathematics education in Minnesota.

Jim Rubillo

“Why Study Math? Finally Giving Students, Parents, and the Public an Answer that Makes Sense”

Description: The public, as well as your students, want a reasonable answer to this important question. This session puts a new twist on the answer and illustrates the spirit of Principles and Standards for School Mathematics. No jargon, no esoteric references – just a clear connection to each student’s future.

Upcoming Events:

- **Pi Day—March 14**
- **Pre-conference Symposium**
- **Spring Conference**

Laurie Boswell is a currently a secondary teacher at The Riverside School in Lyndonville, VT. She has taught at the junior/senior high school and college levels. Throughout her career she has been active in the NCTM, and is currently on its Board of Directors. She has received numerous awards for excellence in teaching and has authored elementary, middle, secondary, and college textbooks.

Don Balka is a professor in the mathematics department at Saint Mary’s College, Notre Dame, IN. He teaches mathematics and mathematics education courses. He has also taught junior and senior high school. He has held leadership positions in numerous organizations including NCTM, AMTE, NCSM, and I(Indiana)CTM

Jim Rubillo has been the executive director of the NCTM since August 2001. Jim worked in public education for 36 years at both the college and senior high levels. He regularly conducts K-12 in-service programs for schools on a variety of mathematics education topics and has served as a consultant for many corporations in the areas of total quality management, statistical process control, and project management.

Pondering by the President

Sue Westegaard

By the time you read this, my students will have taken BST writing, reading, and math tests. Yes, I know they are 10th graders. If we have a good day, the majority will pass all of their tests. We have worked so hard to get ready! My kudos to each and every one of you who put so much time and effort into preparing your students to take tests, at any level. Bravo!

In the last issue, I wrote about my dad. I was pleased to get an e-mail from a teacher at BOLD who had also gone to a one-room country school and knew where the Niobrara ferry was. My childhood was a bit different from the norm in that my mother taught in a one-room country school (not mine) and my dad stayed home to farm. As a result, when we were sick, Dad was the one who cared for us. I have fond memories of poached eggs and toast, 7-Up with salt in it, and homemade soups.

In an effort to provide equal time—What did I learn from my mom?

- ◆ Quality time spent with family is important.
- ◆ You don't have to be paid for everything you do.
- ◆ Sometimes you do need to say NO!
- ◆ It is fun to cut fabric into pieces, sew it back together, and end up with a quilted object.
- ◆ Helping people who need it is important. Eventually, you will need to ask for help.
- ◆ How to grow older with grace!

How do these relate to my teaching?

- ◆ Quality time: It is really important to be sure that each student is acknowledged and knows that I care about them. I *try* to have quality work that engages all my students.
- ◆ I know as teachers we do way too much for free. But, when I put in a little extra time with a student, make parents calls, e-mail grade reports home, etc. and I get a thank you, it all seems worthwhile. One of my students from last year just donated some money to our Hopkins Education Foundation in my name thanking me for spending extra time with her. What makes it really special is that she earns all her own money!
- ◆ I know many of my friends think I never say No! But quite a few years ago, Blake and Judy Jaskowiak made me practice saying No. Believe it or not, I rarely agree to do something unless it is something I am passionate about—like mentoring new and upcoming teachers or working with challenging children.
- ◆ Making a quilt is a lot like preparing a lesson—taking a big concept, breaking it into small manageable portions, rearranging it a little, and putting it back together into a cohesive whole. For me, that is probably one of the most enjoyable parts of teaching—crafting a lesson.
- ◆ Helping students is important. I would hope that all of my students feel comfortable coming to get help. In my office, here at Hopkins, is a teacher who is a master at making students comfortable. No matter how frustrated she might be, she maintains her cool and works to get kids around to getting the correct procedure. After 34 years of teaching, I can still learn from her technique.
- ◆ Growing older with grace. Whew! That is the toughest. I do not get down on the floor with the kids if they decide today is the day to work lying down. I have let go of many of the irritating things that students do that used to bother me. Now I work on just a few skills—being nice to other students, no swearing, and trying your best at whatever concept is being taught. (Of course, it just doesn't help when one of your students finds out

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you are over 50 and says “and you’re still walking?”)

Did I mention that I really try to keep a sense of humor?

I know that I have learned a lot that I use every day from my parents. Do you think about what you have learned from them? Or from a mentor that you had? Thank them personally or with a letter if they are still alive. I sent a letter to my high school English teacher thanking her; I was so glad that I had taken the time to thank her because she was killed in a car accident a few weeks later.

Have a great rest of the winter! See you in Duluth! Sue Westegaard
MCTM President

At the National Council of Teachers of Mathematics Regional Conference in Minneapolis this past November I had several conversations with teachers and/or administrators that began with statements similar to, “I am a traditional teacher” or “In our school we use a traditional curriculum” or “I teach reform mathematics” or “Our school uses a reform curriculum.” The focus of discussion in each case came down to a justification or a condemnation of a “traditional” approach or a “reform” approach to teaching mathematics.

In reflecting on these conversations and many similar ones that have occurred over the last couple of years, I end up asking what does “traditional” mean and what does “reform” mean? It seems that each term has a variety of meanings. For some people, the difference in meaning is about the organization of the curriculum materials (i.e., sequential or integrated). For other people, the difference is about the instructional strategies (i.e., direct instruction or activity-based). For other people, the difference is about the manner in which students are assessed. For other people, it is a combination of materials, instruction, and assessment. And still for other people, it is about the students; who should have a “reform” experience and who should have a “traditional” experience.

As I have mentioned in earlier columns, if we are truly serious about helping all students learn important mathematics, we must be open to all practices that show evidence of helping students become proficient in mathematics. Whether it is a “traditional” practice or a “reform” practice should be the least of our concerns. As long as we view mathematics education as about making dichotomous choices, the vision of a high-quality mathematics education for all students is greatly compromised. If we spend our time and energy debating whether a “traditional” approach (however it is defined) is better or worse than a “reform” approach (however it is defined) we risk missing out on implementing practices that hold promise for improving student achievement.

For example, students being able to perform computations and procedures efficiently and accurately must be an important outcome of our instruction. An equally important outcome is that students have a deep understanding of concepts so that they can apply both their skill and understanding to solve a wide variety of problems. Are these “traditional” ideas or “reform” ideas or are they just plain “good” ideas?

There is no one “right” answer for how to best teach mathematics. In fact, we need to be highly skeptical of any approach that proclaims to be just that. Our skepticism should be in direct proportion to the degree of certainty with which that proclamation is made. However, that being said, practice and research are giving us more and more models of effective instruction. As I have stated several times in this column, we must be open to using a variety

(Continued on page 4)

MDE Mathematics Specialist Report

Tom Muchlinski

**Are these
“traditional”,
“reform”, or just
plain GOOD ideas?**

of promising approaches and strategies so as to most effectively meet the needs of a wide variety of students even when those practices run counter to what we have always done or believe.

The issues are not black and white. They are not blue and red. If we insist that they are, then our students will be black and blue and ten years from now we will still be faced with the fact that too many of our students are not empowered mathematically. The discussions that we have about improving mathematics education must move to a level of learning and acceptance rather than condemnation.

As for Isaiah Benjamin, January 8, 2005, brought the addition of classmate Josanne Marie. He is now faced with having to rapidly learn the meaning of division as well as how to accurately divide by 2. He is particularly interested in when his parents' attention is divided by two, how he can receive the larger half. Josanne is making AYP as she is at the 70th percentile for weight, whereas Isaiah is in his second year of needs improvement, coming in at the 5th percentile.

Tom Muchlinski
State Mathematics Specialist

MCTM Foundation

Spring Conference
Support

MCTM is committed to *excellence* in mathematics education. In 2002 it established the MCTM Foundation to financially support its mission. The MCTM Foundation has established an endowment whose investment returns are used to support this excellence. One type of support available through the MCTM Foundation is for teachers in the early years of their career to participate in the MCTM Spring Conference. Included in this issue of Mathbits (page 19) is the Application for Spring Conference Support. Apply for this support. Encourage your eligible colleagues to apply. For further information, contact Arnie Cutler, Executive Director (cutler@tc.umn.edu) or Cathy Wick, Chair of the Foundation Committee (cwick@ties2.net). Applications must be mailed by March 15th.

Presidential Awards for Excellence in Mathematics & Science Teaching

Do you know a great 7-12 math or science teacher? Nominate him or her to receive Presidential Recognition!

Looking for outstanding 7-12 math or science teachers for the 2005 Presidential Awards for Excellence in Mathematics and Science Teaching. The awards were established in 1983 by an act of Congress and are sponsored by the White House and administered by the National Science Foundation.

Every year up to 108 National Awardees receive a special citation signed by the President of the United States, a \$10,000 award, and a paid trip for two to Washington, D.C. to attend a week-long series of recognition events. Mathematics and science teachers from kindergarten through 12th grade are eligible for the award. In even-numbered years, application is limited to elementary teachers (grades K-6); in odd-numbered years only secondary teachers (grades 7-12) can apply.

The program is now accepting nominations for the nation's highest honor for mathematics and science teachers. Anyone—principals, teachers, students, parents, and members of the community—may nominate a teacher. Once nominated, a teacher should submit completed application materials to the state coordinator by May 2, 2005. The application includes a videotaped lesson and written responses to several questions about the teacher's instructional practice. For more information, including nomination and application forms, please visit www.PAEMST.org or contact Tom Muchlinski, the state program coordinator at tom.muchlinski@state.mn.us

What's New in Statewide Assessment?

It's the time in the school year when teachers start preparing students for state assessments. The Department of Education has information and materials to assist teachers and students.

Gridded Response Items

A new feature on the 2005 MCAs in grades 5,6,7,8 and 11 is Gridded Response items. These items are like multiple-choice items, but do not have answer choices provided. Instead, the student must work the problem and then record the answer in a response grid. Materials to help prepare students for completing gridded response items may be downloaded from the MDE website <http://education.state.mn.us>. There are 2 items being field-tested on each form of the 2005 test. A session of the MCTM Spring Conference will provide teachers an opportunity to give feedback about the materials.

Item Samplers

MDE is providing new "Item Samplers" for the MCAs at all grade levels. The samplers contain released multiple-choice items and a constructed response item from previous tests and are designed to help students prepare for the 2005 MCA. Included with the sampler are an answer document, answer key, a table showing alignment to the standards, scoring criteria for the constructed response item, and annotated examples of student work on the constructed response item. A gridded response sample is included for grades 5 – 8 and 11. The samplers will be revised for 2006 when the Academic Standards will be assessed at all grades 3-8 and 11.

Item Samplers may be downloaded from the MDE website <http://education.state.mn.us>

Test Specifications

According to NCLB legislation, states must assess student progress on meeting the state's standards. Minnesota's Academic Standards were written in 2003 and MCAs must be aligned exclusively to the Academic Standards in 2006. The document that specifies how the testing of the standards is done at the state level is called "Test Specifications". The Test Specifications document for the Academic Standards has gone through an extensive review and revision process. Look for the Test Specifications for the MCA-II on the MDE website <http://education.state.mn.us>.

BST

The Basic Standards legislation has not changed so the BST will not be affected by the changes that apply to the MCAs.

For further information about statewide assessments, you may contact Rosemary Heinitz (rosemary.heinitz@state.mn.us) or Jennifer Dugan (Jennifer.dugan@state.mn.us)

Online Multilingual Math Glossary

The number of English language learners is growing, and as a result, there are more students who need special resources to help them learn. Glencoe/McGraw-Hill has launched an online multilingual glossary specializing in math terminology at www.math.glencoe.com/multilingual_glossary. The glossary provides definitions of mathematical terminology in Arabic, Bengal, Chinese, English, Haitian, Hmong, Korean, Russian, Spanish, Tagalog, Urdu, and Vietnamese. The process involves selecting the beginning letter of the English term followed by selecting the desired language from a pull-down menu. A separate window opens displaying terms and definitions in a PDF file.

"In order to translate a sentence from English into French two things are necessary. First, we must understand thoroughly the English sentence. Second, we must be familiar with the forms of expression peculiar to the French language. The situation is very similar when we attempt to express in mathematical symbols a condition proposed in words. First, we must understand thoroughly the condition. Second, we must be familiar with the forms of mathematical expression.."

Assessment Issues

Rosemary Heinitz

Helpful Resource

George Polya (1887-1985)
How to Solve It.
Princeton: Princeton University Press. 1945.

Who's Doing the Talking?

By Cathy L. Seeley
President, National Council of Teachers of Mathematics



Photo reprinted with permission of the publisher, Early Years, Inc. From the January 2004 issue of *Teaching K-8 Magazine*, Norwalk, CT 06854.

In the November 2004 President's Message for the *NCTM News Bulletin* (available at www.nctm.org/news/president), I suggested that the most important factor in a student's mathematics learning (after teacher expectations) is the student's active engagement in the learning process. One clue to whether students are engaged in learning can be found by looking into classrooms and noticing who is doing the most talking—the teacher or the students.

Most of us learned to teach the same way we ourselves were taught. Often, the classrooms we experienced as learners were teacher-centered, with students expected to listen, take notes, do homework, and answer test questions based on what was presented to us by the teacher. Along the way, there may have been a few absolutely wonderful teachers who drew us into their teaching through entertaining and nonroutine variations on the traditional lecture model. Other times we suffered through boring mathematics presentations where we were not engaged in our own learning. Fortunately, many of us were successful as students in this type of lecture-based classroom, and we may even have become somewhat proficient using a similar model of teaching ourselves. While we were learning, however, many other students were never engaged in mathematics through lectures, even with the most energetic teacher.

Today we are called to teach challenging mathematics to a much wider range of students than ever before. Teachers tell me that fewer and fewer of even their more successful students respond positively to teacher-centered, lecture-based teaching. In recent curriculum projects based on NCTM's *Principles and Standards for School Mathematics*, a different teaching model is emerging. Often, students are expected to work in small groups around engaging tasks, either in real settings or in interesting mathematical contexts. Although it is possible to use these excellent materials in a teacher-centered classroom, far greater gains are found when the teacher gives students a greater role in the learning process.

When students have the opportunity to figure out an approach to a problem...

The teachers who are most effective with these materials offer guidance and probing questions instead of telling students all the things they are supposed to learn. In this kind of student-centered classroom, the teacher's role is to set the stage, organize the task, ask good questions, and help students connect their experience to the mathematics being addressed. Much of this work happens with the class as a whole, but there is usually a period of intense student activity where students interact around the mathematics in pairs or small groups. This new teacher role calls for sophisticated knowledge of both mathematics and learning, and it takes at least as much preparation as a good lecture or content presentation. But the payoff is immense. When students have the opportunity to figure out an approach to a problem; discuss, argue, and justify their ideas; and wrestle with challenging mathematics, they are truly engaged in their learning. They are hooked into the mathematics. They are much more likely to be able to remember what they learn and apply it to other situations than they would if they were simply told how to solve a particular type of problem.

To determine how engaged your own students are, take an objective look at your classroom and ask yourself who's doing the talking. If the teacher's voice is the voice usually heard, how engaged are students? If the classroom is largely quiet, how engaged are students? If

only short fill-in-the-blank kinds of responses are expected from students, how engaged are students? Even if students are heard, if only a few students have the opportunity to make comments or offer possible answers to the teacher's questions, how engaged are the rest of the students?

Shifting the focus of the classroom to include more student engagement does create a noisier classroom. In fact, it may appear to be less structured or orderly than a teacher-directed classroom. After all, this type of learning environment involves lots of students talking, often at the same time, as they work in small groups. Learning to see the benefits of this apparent disorder is an important step for a teacher shifting toward more student engagement. Noise and student involvement do not have to turn into chaos or lack of structure. On the contrary, effective teachers learn to manage such classrooms with clearly spelled-out expectations for student behavior and student participation. Students have well-defined roles in their groups, and the teacher serves as an organized facilitator. The result is that students learn with real understanding.

If you are accustomed to teaching in a teacher-directed classroom, it may be challenging to shift to a more student-centered style. You will likely need to go through appropriate professional development that will ideally include some kind of long-term support. But the payoff for you and your students will be tremendous as you hear a higher level of mathematics conversation and as you see for yourself a higher level of student learning.

Cathy Seeley is president of the National Council of Teachers of Mathematics (NCTM). This article is provided as a service to Affiliates of NCTM. If you are not currently a member of NCTM, find out how to be part of this national professional community committed to a high-quality mathematics education for every student at www.nctm.org.

Sponsored by the United States Department of State, the Fulbright Teacher and Administrator Exchange arranges: direct one-to-one classroom exchanges to over thirty countries for teachers at all levels. Most exchanges occur for an academic year. Argentina, Mexico, and the United Kingdom offer fall-semester exchanges. The United Kingdom and Morocco offer six-week exchanges.

In addition to the teacher exchanges, there are administrative exchange opportunities in Argentina, Bulgaria, Canada, the Czech Republic, Estonia, Finland, Mexico, Romania, the Slovak Republic, Thailand, Turkey and the United Kingdom. Jordan, and Uruguay currently offer opportunities to host incoming administrators during site visits to the United States. Germany offers a two-week special program for U.S. principals to study school systems there for several weeks.

The program also offers eight-week seminars in Italy or Greece for teachers of Italian, Latin, Greek or the Classics.

Prospective applicants must meet the following general eligibility requirements:

- U.S. Citizenship
- Fluency in English
- Bachelor's degree or higher
- Be in at least third year of full-time teaching
- A current full-time position

The application deadline is October 15, 2005 for the 2006-2007 program year.

For more information and/or an application please visit the Web site:

www.fulbrightexchanges.org or call (800)726-0479.

...then they are truly engaged in their learning.

DISCOVER A NEW WORLD OF EDUCATION

Fulbright Teacher and Administrator Exchange

**Just in Time for Winter:
A Flurry of Reports on the State of Mathematics**
(Produced by the NCTM Communications Department)

In December two reports were released comparing the math competence of American students with the skill of their international peers. These reports were followed in January by the release of the Fordham Foundation report “The State of State Math Standards.”

A brief summary of the reports follows, as well as “Talking Points” for you to consider should you be called on to talk to reporters, respond to questions from administrators or parents, or write a letter to the editor. Please feel free to share this information with colleagues and other educators.

PISA Test

The 2003 Program for International Student Assessment (PISA) concentrated on the math literacy and problem-solving skills of 15-year-olds to measure their knowledge in the context of everyday situations.

PISA is a program of the Organization for Economic Co-operation and Development (OECD), composed of 30 developed countries that participated in the 2003 PISA along with 11 non-OECD countries. PISA is designed to assess how well 15-year-old students, who are at an age when compulsory schooling ends in most countries, are able to apply what they have learned both inside and outside school. A nationally representative random sample of 5,456 U.S. 15-year-olds from 262 schools participated in PISA 2003.

The PISA assessment showed that U.S. 15-year-olds performed at a lower level on average than their counterparts in the participating countries in both math literacy and problem solving.

The information gathered from PISA 2003 supports the National Council of Teachers of Mathematics’ philosophy that students who learn mathematics with understanding are more able to solve new problems that they may face in real-life situations than students who have not fully grasped mathematics concepts.

The results also highlight the urgent need to address the achievement gaps among groups of students. The PISA results highlight the gaps among U.S. students, with white, Asian, and students of more than one race outperforming Hispanic and black students. Of all the participating countries, the United States demonstrated the strongest relationship between socioeconomic status and student performance. Less affluent U.S. students were outperformed by their wealthier peers, especially in problem solving.

**Talking Points
for PISA Test**

- In 2003, U.S. performance in mathematics literacy and problem solving earned a lower score than the average performance for OECD countries.
- In both mathematics literacy and problem solving, the United States had fewer students at the highest proficiency levels than the other OECD countries.
- Although the U.S. scores in all the mathematics areas were below the OECD average, U.S. students’ performance was relatively stronger in the areas of change and relationships than in the other three areas. Their better performance on these items may reflect an increased emphasis on algebra in U.S. middle schools over the past decade.
- **Socioeconomic differences:** PISA 2003 used an index of student socioeconomic status (ISEI) that was based on the occupational status of the student’s father or mother (whichever was higher). The average ISEI score in the United States was higher than that of all but two OECD countries (Norway and Iceland). Also, low ISEI students in the United States had a relatively higher socioeconomic status than their peers in most OECD countries. The United States was one of the few OECD countries in which high student socioeconomic status was strongly associated with high performance on PISA 2003.
- **Gender differences.** In 20 of the 29 OECD countries, including the United States, male students outperformed female students. In the United States, this difference was due in part to the presence of more male students among the high performers and not to the presence of more female students

among the low performers.

- **Racial/ethnic differences.** As in the National Assessment of Educational Progress and PISA 2000, blacks and Hispanics in the United States scored lower, on average, than whites, Asians, and students of more than one race in both mathematics literacy and problem solving.

Students' expectations. Sixty-four percent of U.S. 15-year-olds reported that they expected to complete at least a bachelor's degree. This percentage was higher than the OECD average of 44 percent. Only Korea reported a higher percentage of 15-year-olds (78 percent). U.S. students who expected to complete at least a bachelor's degree performed more poorly in mathematical literacy than their peers in all OECD countries except Italy, Greece, Mexico, and Turkey.

Students were asked what kind of job they expected to have at age 30. U.S. students with high job expectations had higher scores on mathematics literacy than their peers with lower job expectations, but their scores were lower than those of their OECD peers. These data suggest that U.S. students' performance in mathematics literacy is not commensurate with their educational and occupational expectations.

The PISA data include responses from students about motivational factors, self-related beliefs in mathematics, math anxiety, and learning strategies in mathematics. The data also include information about school characteristics, such as resources, policies, and practices. An analysis of these data for the United States has not yet been performed, but the results should be of interest to teachers of mathematics.

U.S. teachers of mathematics who are engaged in setting standards or developing assessments may be interested in the PISA framework document (OECD, 2003). It contains a discussion of literacy, mathematical proficiency, and some dimensions on which items might differ, as well as a variety of sample items that illustrate those dimensions. Teachers might also be interested in the sample items and the discussion of proficiency levels in Lemke et al. (2004).

Some mathematics items from PISA 2000 have been released and posted at the National Center for Education Statistics Web site. Teachers might find it useful to give the items to their students and to discuss the students' solutions.

Because PISA has collected a variety of background information on 15-year-olds, teachers may be interested in the student questionnaire and responses posted at the PISA Web site.

Additional Information

PISA Web site: <http://www.pisa.oecd.org>.

US Web site: <http://www.nces.ed.gov/surveys/PISA/index.asp>

Sample items: <http://www.nces.ed.gov/surveys/PISA/Items.asp?SectionID=2>

The Trends in International Mathematics and Science Study (TIMSS) provides reliable and timely data on the mathematics and science achievement of U.S. students compared with students in other countries. Offered in 1995, 1999, and 2003, TIMSS provides data on trends in students' mathematics and science achievement from an international perspective.

TIMSS 2003 results compare the performance of U.S. fourth and eighth grade students with that of their peers in other countries in mathematics and science. TIMSS is the first international assessment designed to track changes in achievement over time. The 2003 test is the third comparison of mathematics and science achievement since 1995. Moreover, it is closely linked to the curricula of the participating countries, providing an indication of the degree to which students have learned concepts in mathematics and science that they have encountered in school.

The 2003 TIMSS assessment showed that U.S. eighth and fourth graders exceeded the international average in math achievement. The steady improvement of our eighth graders placed them ahead of 25 participating countries, with only nine countries outperforming them. Fourth-grade students scored higher than the international average as well, although their scores remained unchanged from 1995.

What else can we learn from PISA?

What can U.S. mathematics teachers do with the PISA information?

TIMSS Test

The TIMSS report includes a number of encouraging findings. U.S. black students improved their mathematics scores significantly in both fourth and eighth grades. Hispanic eighth graders made good gains as well.

The TIMSS report echoed the PISA findings that U.S. students' performance is predicted by their socioeconomic background, with more affluent students scoring higher.

Talking Points for TIMSS 2003

- **U.S. fourth graders** performed above the international average in all content areas except measurement, where they scored at the international average. Only six of 25 countries outperformed the U.S. in patterns, equations, and relationships, and students in only four countries outscored American students in data.
- **U.S. fourth graders'** scores remained the same as in the 1995 assessment. There are some hints in the data that fourth graders may be doing a bit better in patterns, equations, and relationships than in 1995.
- Black students in grades 4 and 8 in the United States showed improvement.
- **American eighth graders** exceeded the international average in mathematics achievement. Nine countries outperformed the United States; 25 did less well than the U.S.
- Students in only eight of the 48 countries outperformed U.S. eighth graders in algebra and data, similar to the TIMSS eighth grade findings in 1995 and 1999. The lowest performance from American eighth graders was in geometry, where students in 21 countries bested their counterparts in the United States.
- Both boys and girls gained 12 points on average over previous years, with no appreciable difference based on gender.
- Black and Hispanic students showed large jumps in average scores, 29 and 22 points, respectively.
- **Achievement gaps narrowed significantly** among black, Hispanic, and white students, with the gap between black students and other groups narrowing by 20 points, from 97 to 77.
- The best U.S. students compare favorably with the best students of other countries. However, in a comparison of countries, there is less uniformity in what is taught and when it is taught in the United States, where education decisions, including choosing curricula, are made at the state and local level. Math programs differ widely among states and often within a state. Combined with high student mobility, this difference means that many U.S. students' mathematics study lacks continuity.
- Students need to learn with real understanding so they will be able to use what they learn not only in their higher academic study and future careers, but as real-life skills. Teaching and learning merely facts and procedures won't prepare students adequately for the future. This position is aligned with the NCTM's vision expressed in the Learning Principle and Problem Solving Standard of *Principles and Standards for School Mathematics*.

Additional Information

TIMSS Web site: <http://nces.ed.gov/timss/index.asp>

TIMSS Results: <http://nces.ed.gov/timss/Results.asp>

TIMSS for Educators: <http://nces.ed.gov/timss/Educators.asp>

Fordham Foundation Report

The Fordham Foundation recently released the report "The State of State Math Standards." The report's chief author is David Klein, and a foreword comes from Chester E. Finn, Jr. Both Klein and Finn have been critical of NCTM standards in the past and this report continues to reflect their earlier points of view.

The report runs some 130 pages and can be reviewed via a PDF of the document at <http://www.edexcellence.net/foundation/global/index.cfm>. In brief, the report's authors gave an average grade of "D" to the math standards of the majority of the 50 states (Iowa has no state standards) as well as the District of Columbia. (Editor's note: Minnesota critiqued on pages 74-75 of the report.)

The National Council of Teachers of Mathematics disagrees with many of the report's findings, and we have included a few talking points to highlight these differences of opinions.

NCTM's position on calculators is not a recommendation for their unlimited use at all times, as indicated in the Fordham report. Rather, the Council advocates the use of calculators as a problem-solving tool, along with other tools, such as mental math and a pencil and paper. Research has shown that the use of calculators does not inhibit computational skill and enhances the development of problem solving abilities.

- NCTM supports the teaching of algorithms but advocates that students should understand the operation involved so that they can more efficiently use and recall the algorithm. It is interesting to note that around the world, a variety of different algorithms are used for the same process.
- The report suggests that standards in many states place too heavy an emphasis on patterns. This is an area whose importance mathematicians may not recognize when they work in isolation from educators. In fact, the inclusion of patterns in state standards comes not only from NCTM recommendations but also from a book published almost 15 years ago by the National Research Council (*On the Shoulders of Giants*, Lynn Arthur Steen, editor, 1990). Patterns are an important way to build algebraic understanding across the grades, leading students to much greater success in an algebra course when they encounter it.
- NCTM agrees with the comment in the report that the states could do more in the area of developing problem solving and reasoning. These areas have been highlighted for over 20 years in NCTM's documents. Unfortunately, a deterrent to developing these abilities is a lack of effective and economical ways to assess these abilities, especially in the kinds of large-scale assessments used by accountability systems.
- It is important for mathematicians to work alongside educators, teachers, and administrators, since each brings an important perspective about the mathematics that students need to know.
- Proficiencies with probability and data analysis are important skills for understanding the information, graphs, and statistics that confront citizens in their everyday lives. Situations that call for statistical literacy range from reading the newspaper to being able to handle the large amounts of information that are part of almost any job situation.

Additional Information

"The State of the State Math Standards" report can be read at:
<http://www.edexcellence.net/foundation/global/index.cfm>

What is the name of this really big number?

1,363,878,977,636,549,591,212,122,247,579,712,674,984,657,654,987,654,176,541,767,654,178,781,337,556,174,617,687,651,565,176,715,675,417,978,412,978,945

one septentrigintillion, three hundred sixty-three sextrigintillion, eight hundred seventy-eight quintrigintillion, nine hundred seventy-seven quattuortrigintillion, six hundred thirty-six tretrigintillion, five hundred forty-nine duotrigintillion, five hundred ninety-one untrigintillion, two hundred twelve trigintillion, one hundred twenty-two novemvigintillion, two hundred forty-seven octovigintillion, five hundred seventy-nine septenvigintillion, seven hundred twelve sexvigintillion, six hundred seventy-four quinvigintillion, nine hundred eighty-four quattuorvigintillion, six hundred fifty-seven trevigintillion, six hundred fifty-four duovigintillion, nine hundred eighty-seven unvigintillion, six hundred fifty-four vigintillion, one hundred seventy-six novemdecillion, five hundred forty-one octodecillion, seven hundred sixty-seven septendecillion, six hundred fifty-four sexdecillion, one hundred seventy-eight quindecillion, seven hundred eighty-one quattuordecillion, three hundred thirty-seven tredecillion, five hundred fifty-six duodecillion, one hundred seventy-four undecillion, six hundred seventeen decillion, six hundred eighty-seven nonillion, six hundred fifty-one octillion, five hundred sixty-five septillion, one hundred seventy-six sextillion, seven hundred fifteen quintillion, six hundred seventy-five quadrillion, four hundred seventeen trillion, nine hundred seventy-eight billion, four hundred twelve million, nine hundred seventy-eight thousand, nine hundred forty-five

Talking Points for Fordham Foundation Report

From **Math Cats** website designed by elementary school teacher. Playful, interactive explorations of mathematical ideas. Micro Worlds for students to explore. Idea bank for teachers and parents. Writing contest for kids. Fun for all ages! You must see it to believe it.

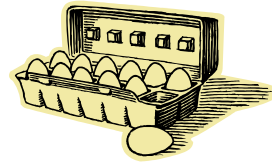
www.mathcats.com

Problems for All Grade Levels

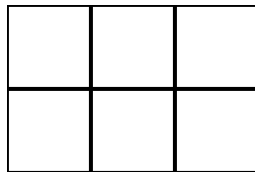
Frederika went fishing. On the first cast she hooked a trout 80 feet from the boat. Each time she reeled in 10 feet of line, the trout would take out 5 feet. How many times did she have to reel in to get the fish to the boat?



If you cut up a carton of one dozen eggs so that each section is the same shape, which different shapes are possible?



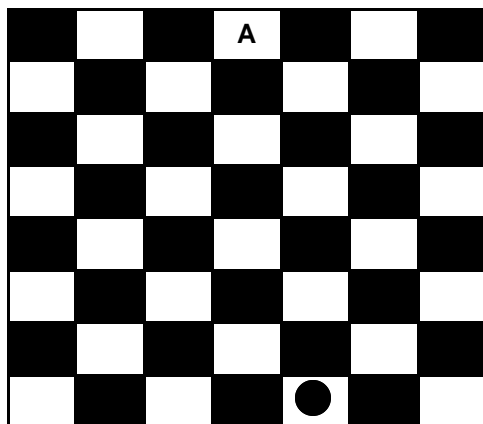
Can you change this group of six squares into three squares by removing only five line segments?



Morgan caught a fish. The fish's tail weighed nine pounds. His head weighed as much as his tail and half his body. His body weighed as much as his head and tail. How much did the whole fish weigh?



There is exactly one checker on the checker board as shown. The checker can only move diagonally "up" the board on the white squares. In how many ways can this checker reach the square marked A?



Gerald has 10 pockets and 44 dollars. Can he put dollars in pockets so that each pocket contains a different number of dollars?



A student takes a ten-question multiple choice test with four possible answers to each question. If he knows the answers to six of the questions, what is the probability of his scoring 90% on the test while guessing on the remaining questions?

A, B, C, D ????

Answers: 1) 15 times 2) 5 ways 3) 35 ways 4) 72 lbs. 5) 35 ways 6) No, he would need at least 45 dollars. 7) probability of exactly 90% is 0.0625; at least 90% is 0.0664

Shadow Stick (grades K-5)

Math concepts: measurement, collecting and representing data, observing trends in data

Preparation: Pound a dowel stick (at least two feet long) securely into the ground. Keep the dowel as perpendicular to the ground as possible.

Students will go outside to measure the length of the stick's shadow every day for two weeks—at the same time of the day. Younger children can measure with snap cubes, base ten blocks, or any other unit of their choosing. Older children can use yard sticks or meter sticks.

Students will record the information they collect and create a representation of the data. The children can observe changes in the shadow's length and consider questions such as the following:

- Was there a shadow every day? Why or why not?
- Did the shadow's length change?
- Did it get longer or shorter as time went on?
- Why do you think that happened?
- Is there a pattern to how much the shadow changed from day to day?
- Can you predict how long the shadow will be in one week? In one month?
- Will the shadow continue growing (or getting shorter) or will it change direction? Why or why not?

Variation: Measure the shadow at different times during the day. How did the data change? Why do you think that happened?

Mathematics Learning Activity

Shared by
Margaret Williams,

Curriculum Integrator for
Riverview Specialty School
for Math and Environmental
Science, Anoka-Hennepin
School District



Call for Manuscripts, Problems, Activities, and More

MCTM is a membership organization and relies on the many efforts of all its members. As a member you are invited to contribute to the organization and to the development of your colleagues by sharing your successes in the classroom with the rest of the membership. We are asking that you seriously consider sharing your successes by submitting article manuscripts, mathematics lesson activities, challenging and interesting problems, book and materials reviews, and other items that would benefit the membership. We are interested in all grade bands and all topic areas. Also useful would be your best tips for beginning teachers and your favorite strategies for classroom management, encouragement of the reluctant learner, managing papers and assignments, effectively using cooperative learning, and incorporating literature and technology into mathematics lessons. As well as fully-developed activities and articles, we will welcome short tidbits that could be inserted into an inch of extra space on a page of the newsletter or grouped together with other members' ideas under a common theme. Think creatively about how you might contribute and have the opportunity to see your name in print! Send your ideas electronically to Mathbits editor at tlgonske@nwc.edu

Share your ideas

Getting the Word Out Advocating for Mathematics Education

The National Council of Teachers of Mathematics debuted a new resource at the 2004 Annual Meeting—the NCTM Advocacy Toolkit. The materials in the toolkit were developed and assembled as a start to giving members the tools needed to assist in advocating for mathematics education.

NCTM (and MCTM) has 501(c)3 tax exempt charitable organization status and thus is limited in spending on political advocacy. NCTM and MCTM cannot endorse candidates, campaign for or against candidates, or contribute to a campaign. However, NCTM and MCTM members can directly lobby by contacting legislators and urging them to support or oppose legislation and can be active at the grassroots level by informing others of the important issues in mathematics education.

The NCTM Advocacy Toolkit contains the following items:

- Overview letter from past president Johnny Lott and president Cathy Seeley
- Congressional Directory
- NCTM Legislative Platform
- Executive Summary of the *Principles and Standards for School Mathematics*
- FAQ's about the *Principles and Standards for School Mathematics*
- NCTM at a glance...
- **NCTM Mission Statement and Key Messages**
- Communication Guide...tips on how to write letters, contact legislators, etc.

Copies of the NCTM Advocacy Toolkit may be obtained by contacting Ken Krehbiel, NCTM Director of Communications at (703) 620-9840 or by email kkrehbiel@nctm

MCTM Board members have cooperatively reviewed this set of resources. As a result, in the current and in upcoming issues of Mathbits, information from portions of the Advocacy Toolkit resources will be highlighted.

What are some of the **Key Messages** of the National Council of Teachers of Mathematics?

Highlight on Key Messages

- Mathematical literacy is essential for every child's future. A solid mathematics education is essential for an informed public, our national security, a strong economy, and national well-being.
- All students should receive a quality mathematics education regardless of gender, ethnicity, or race.
- Teachers should encourage and inspire every student to continue the study of mathematics. To be able to do so, teachers must themselves have a solid knowledge of both mathematics content and teaching strategies and also enjoy teaching mathematics.
- It is essential to have a work force of strong mathematics teachers that reflects the demographic characteristics of the student population.
- Teachers, administrators, and counselors at all educational levels should expect students from all segments of the population to be successful in mathematics.
- There is a strong, direct correlation between learning and teaching: High-quality learning requires good teaching. Furthermore, content knowledge alone is not enough to make a good teacher; effective teaching practice can and must be learned.
- The primary focus of all professional development is helping teachers teach mathematical content to their students. Effective programs of teacher preparation and professional development help teachers understand the mathematics they teach, how their students learn that mathematics, and how to help each student learn.
- Teachers must have access to professional programs and activities that will lead them to help students learn with understanding, as advocated in *Principles and Standards for School Mathematics*.

Key messages related to *Principles and Standards for School Mathematics*:

- *PSSM* presents a timely vision of school mathematics, defining a future where *all* students have access to high-quality, engaging mathematics instruction.
- Yesterday's content basics are no longer enough; the basics must be expanded to meet the needs of tomorrow and include more and better engaging mathematics.
- *PSSM* presents a vision of higher standards for students and teachers and sets forth guidelines for excellence in mathematics education.

In brief, the key messages include: quality mathematics for all students, quality training for all teachers, continued quality professional development.

**Therefore, See you at the
MCTM Spring Conference!**

2005 Minnesota Spring Mathematics Conference

Quality Teaching: The Key to Understanding Mathematics



➤ Teaching Principle ➤ Learning Principle ➤ Standards
➤ Algebra ➤ Number and Operations ➤ Problem Solving ➤ Reasoning

Join hundreds of Minnesota educators

April 29 - 30, 2005

DECC • Duluth Entertainment Convention Center
Duluth, MN

Jointly sponsored by:

MCTM • *Minnesota Council of Teachers of Mathematics*

MinnMATYC • *MN Mathematical Association of Two Year Colleges*

Get rejuvenated with

- ideas to improve the teaching and understanding of mathematics
- effective ways to help students achieve state and national standards for mathematics
- information and ideas about what works in other schools to share with colleagues back home
- an opportunity to enjoy a great area of Minnesota and learn in the company of great educators



Register Early!

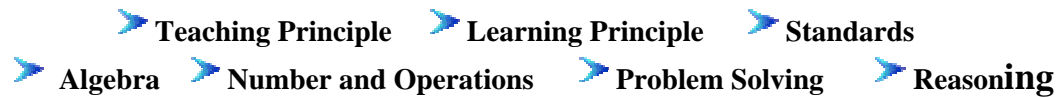


*For registration, further
conference information and pro-
gram updates access*
www.mctm.org

*For information about Duluth
call **1.800.438.5884**
or access*
www.visitduluth.com

Still have questions? Contact one of the following: Arnie Cutler, 612.626.8326, cutler@umn.edu;
Don Karlgaard, 218.824.6243 don.karlgaard@brainerd.k12.mn.us; Denise Anderson 763-753-7110
denand@stfrancis.k12.mn.us; or Jeannine Salzer jeannine_salzer@hopkins.k12.mn.us.

Quality Teaching: The Key to Understanding Mathematics



DECC, Duluth, MN • Friday, April 29 & Saturday, April 30, 2005

Sample sessions from the seven strands of the conference

<p>TEACHING PRINCIPLE Powerful Practices in Math and Science What's Up with that Graph? Get on your Feet – Make it Happen Allowing Everyone a Chance to Answer Arabesque: Studying Geometry in Spain</p>	<p>LEARNING PRINCIPLE CMP and the Special Education Student Visual Strategies and Games for Mastering the Facts Game Zone! Meeting the Needs of the Mathematically Gifted Child Simulation and the Cereal Box Problem</p>
<p>STANDARDS Lies my Graphing Calculator Told Me Hands-on Activities for Learning about 3-D Geometry Mathematics of Hmong Textiles How I Spent my Summer Vacation NCTM: Working For, and With You!</p>	<p>ALGEBRA That's a Circle Relative Humidity – How Relative is it? Function Transformation (70's Style) Looking at Functions from Multiple Perspectives Around it Goes, Where it Stops Nobody Knows</p>
<p>NUMBER AND OPERATIONS Activities with Random Digits Sketches for Young Learners Division and Place Value Let the Games Begin! Developing Base 10 Understanding</p>	<p>PROBLEM SOLVING AP Calculus: Problems and Solutions CSM: Crime Scene Mathematics Mathematics and Antarctica Real Problem Solving Through Games and Activities Math Competitions</p>
<p>REASONING Fair? Well... Elementary Dear Watson The Ten Things All Future Mathematicians and Scientists Must Know Dancing and Mathematics: Contradance</p>	<p>INVITED SPEAKERS Euclid Newton Einstein Pythagoras</p> <p>[Note: at the time of this printing none of these speakers had been confirmed]</p>

Arrange your own lodging . . .

Part of the fun of the MCTM Spring Conference is deciding where to stay. There are several hotels within walking distance to DECC, each with its own special features. You can pick a hotel that is right on Lake Superior, or one that is a converted factory, or another that is in downtown Duluth. Information on hotels and recreational activities in Duluth is available at www.visitduluth.com. Special conference rates vary by hotel and have been negotiated with the following hotels until the blocks of rooms run out. Mention the MATH conference and confirm rates for conference dates and any extended stay (rates may change for extra days, suites, location of room, extra guests, etc.).

Please note: If you use a hotel chain's 800 number, you may not get the discounted rate. Your best option would be to use the direct numbers listed below.

<p>www.visitduluth.com</p>	<p>Comfort Suites 218.727.1378</p>	<p>Holiday Inn 218.722.1202; 800.477.7089</p>
	<p>Hampton Inn 218.720.3000; 800.HAMPTON</p> <p>Hawthorn Suites 218.727.4663</p>	<p>Inn on Lake Superior 218.726.1111; 888.ON THE LAKE</p> <p>Radisson Harborview 218.727.8981</p>

Insert **Spring Conference registration form**—Word doc—no page header

YOU ARE INVITED TO
the
Minnesota Council of Teachers of Mathematics
SEVENTH SYMPOSIUM ON
MATHEMATICS EDUCATION

“Classroom Assessment – Connecting Mathematical Understanding with Instruction”

Thursday, April 28, 2005

Duluth Entertainment and Convention Center – Duluth, MN

The accountability aspect of the No Child Left Behind legislation has placed high stakes testing in the forefront of mathematics education. The sanctions for schools not making adequate yearly progress, as defined by performance on these high stakes exams, have major implications for classroom instruction and assessment. In particular, classroom assessments must provide information that can shape instructional decisions in ways that ensure that students are learning mathematics with understanding. Join leaders from across the state to discuss the central role classroom assessment can play in improving student achievement.

Who should attend?

- Administrators
- School board members
- District curriculum leaders
- Teacher leaders
- Teacher educators
- Teams from districts or schools

Why should you attend?

The symposium will provide practical tools and provocative suggestions for classroom assessment, which is defined to be attempts to answer the following questions:

- How can we communicate our expectations about our students’ mathematical understanding and the quality of their work?
- What do we think our students understand? What do they think they understand?
- Does the question, task, or activity that we choose raise the mathematical issues we hope it will raise for our students? Does it provide an opportunity for them to show us what they know?
- What question, task, or activity should we use next?
- How can we communicate to our students and others what we think they understand?

Schools and districts are encouraged to send a team of educators. The symposium is also open to teacher educators. Registration is \$135.00 for the first registration and \$85.00 for each subsequent team member. Further information and a registration form is available on the MCTM website at www.mctm.org

MCTM Foundation
Application for MCTM Spring Conference Support

Applicants must be MCTM members or be sponsored by a current MCTM member and have 5 years or less of teaching experience (including 2004-2005)

Name _____

Email Address _____

Address _____

Phone _____

Are you an MCTM member? _____ If no, who is your MCTM Sponsor? _____

Years of Teaching Experience (including 2004-2005) _____

School Name _____

Principal/Administrator _____

School Address _____

Include the following information on a separate sheet, typed or word processed.

Proposal (no more than one page)

Need: Why are you applying for this award? Please list other possible funding sources.

Outcome: Explain what you hope to gain from your attendance at the MCTM Conference. Share how you plan to use the information gained at the conference in your classroom and/or with other members of your school community.

Background and Experience (no more than 2 pages in resume or outline form)

Formal Education: Give the institution, type of degree, major, minor and dates completed.

Teaching Experience: Give the school(s), teaching assignments and dates that accurately portray your teaching career.

Continuing Education and Professional Activities: List all activities that have directly or indirectly helped you become a better teacher; include inservices, workshops, training, conferences and classes. Also list any professional organizations you are involved with and describe your involvement.

Principal's Letter of Support

The principal's letter of support must verify that release time will be provided for attendance at the MCTM Spring Conference (April 28–30, 2005) as well as additional information about your work.

Monetary awards are to be used for Spring Conference expenses (registration, lodging, reserve teacher). The value of the award will be no more than \$250.00 per awardee.

Completed applications and letters should be mailed together by March 15th to:

MCTM Foundation
c/o MCTM
PO Box 120418
New Brighton, MN 55112

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P.O. Box 120418
New Brighton, MN 55112

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cutler@tc.umn.edu

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tlgonske@nwc.edu



Mission Statement: *The MCTM is an organization of professionals dedicated to promoting the teaching and learning of meaningful mathematics for all students by supporting educators in their efforts to improve mathematics education.*

**Mark Your Calendar
for 2005**

Feb 26	Future Teachers' Conference
Apr 6 – 9	NCTM Annual Meeting, Anaheim, California
Apr 27	Mathematics Education Symposium
Apr 28 – 30	MCTM Spring Conference, Duluth
May 2	PAEMST nomination deadline

**Do we have your
correct address?**

MCTM strives to provide membership with current information regarding mathematics education in the state of Minnesota. To accomplish this goal, we need an accurate, permanent address for each member. Is your correct address printed on the label of this issue of *Mathbits*? If not, please contact Executive Director Arnie Cutler at 612-626-8326 or cutler@tc.umn.edu or visit the MCTM web site (www.mctm.org) and go to the membership page to make your change. Student MCTM members and members in transition are especially encouraged to provide us with a permanent address. Thank you for helping us stay in touch!

**Check the mailing label
for your membership
renewal date.
Renew online at
www.mctm.org**

Please submit items for the April issue of *Mathbits* to tlgonske@nwc.edu by March 15, 2005. Email or call 651-631-5228 if you have questions. - Teresa Gonske, Editor

2005 MCTM Minnesota Spring Mathematics Conference Registration Form

Quality Teaching: The Key to Understanding Mathematics

*Teaching Principle * Learning Principle *Standards
*Algebra *Number and Operations *Problem Solving *Reasoning

DECC, Duluth, MN • Friday-Saturday, April 29-30, 2005

Name _____

Mailing Address _____

City _____ State _____ Zip _____

If you are a new member OR if any of the following has changed, fill in the information requested below.

Home phone (include area code) (_____) _____ Work Phone (_____) _____

Fax (_____) _____ E-mail _____

School District Name _____ School Building _____

Circle one: teacher supervisor student retired other _____

Circle one: elementary jr. high/middle high school post secondary other _____

Spring Conference Registration Fees

Regular Friday & Saturday registration fee includes 3 meals. Regular Saturday only registration fee includes 1 meal.

NOTE: Registrations on-site or those postmarked or sent after April 8, 2005 will be charged a \$15 late fee.

	Fri.&Sat.	Sat. only	Special Meal Requests
MCTM Member	_____ \$140.00	_____ \$ 90.00	Meal Tickets for Speakers or Non-registered Guests: _____ tickets for Friday lunch @\$16.50 = _____ _____ tickets for Friday banquet @\$27.00 = _____ _____ tickets for Saturday lunch @\$16.50 = _____ _____ vegetarian meals preferred
Non-member	_____ \$165.00	_____ \$ 115.00	
Student Member	_____ \$ 70.00	_____ \$ 45.00	
Student non-member	_____ \$ 82.50	_____ \$ 57.50	
Speaker	Registration fee waived – select and pay for meals using the table at the right		

There is no Friday only registration.

MCTM Dues

Circle one: new renewal do not need to renew

Indicate membership category:

_____ One year regular \$25.00
 _____ Two year regular \$40.00
 _____ One year undergrad student \$12.50
 _____ One year retired \$12.50

I do not wish to have directory info published

**Individuals should make
their own lodging
arrangements**

Amount Due & Method of Payment: ___ credit card ___ check ___ p.o. # _____ (copy attached)

Conference Registration/Meal Fee _____

Credit card number _____

Membership MCTM _____

Expiration date _____

Total Due _____

Type of card _____ Master Card _____ Visa

Signature if using credit card _____

Mail to: MCTM, P.O. Box 120418, New Brighton, MN 55112 or register online at www.mctm.org
 For information about lodging and events in Duluth call 1.800.438.5884 or visit www.visitduluth.com