Vol. 39 #1, September 2000

Ontario Mathematics Gazette

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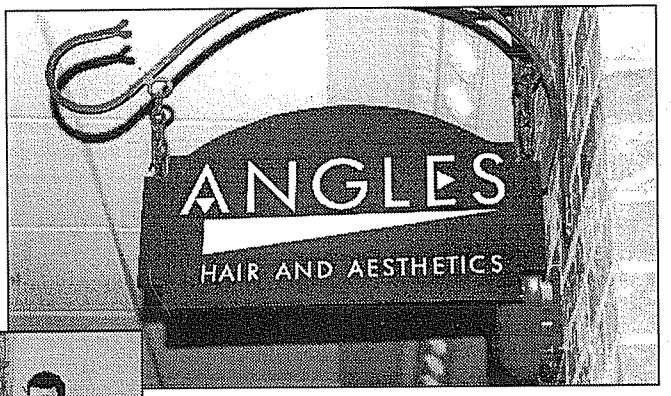
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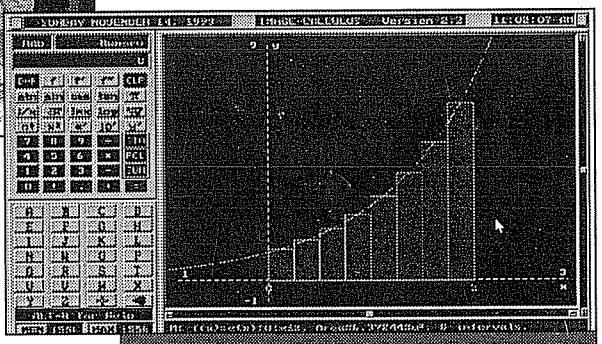
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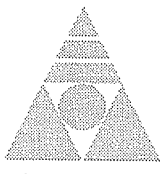
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Notice to Authors

Articles must be original and/or references clearly stated. Your article should be word-processed, double-spaced on one side of 21.6 cm x 27.9 cm paper with 3 cm margins. Diagrams and figures should be drawn by computer, if possible, or neatly drawn in black ink in camera-ready form. Please submit **four** copies to the editor, and keep one as protection against loss. Submissions are blind-reviewed, so please send your full address and affiliation on a page **separate** from the manuscript. Computer files of text, and original photos and graphics where possible, will be required later if your article is accepted.

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▲ Editorial

CO-EDITOR, TODD ROMIENS



Another year has started, perhaps the most difficult for many teachers, in terms of increased work load, government demands on their prep time, salaries which haven't kept up with inflation, and new curriculum initiatives. As always though, the dedication and interest in kids shines through, and the job gets done.

Being at the Faculty of Education in Windsor, I am somewhat insulated from many of the situations faced by my counterparts in elementary and secondary education, but the politics are still evident in our hallowed halls. The Ontario College of Teachers still plays a vital role in our accreditation, and mandates time spent practice teaching for teacher candidates, as well as time to be spent in classrooms.

This year, our enrollment is up to over 700 students. This means my workload will be over 20 hours per week of classes (normal for a university professor is 9). We are in dire need of good mathematics teachers at our faculties as well as in elementary and secondary schools. If you live near a university with a Faculty of Education, and you have time to teach a course, why not apply to teach on a sessional basis - many universities hire that way. A major hurdle to teaching full time is the doctorate requirement. This is unfortunate as there are a lot of excellent teachers out there who have a wealth of knowledge and experience that could be incredibly valuable to new teacher candidates.

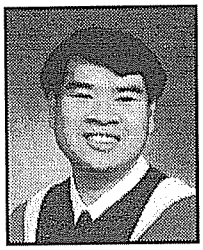
This will be my last issue as co-editor of the *Gazette*. I took on the role to help Louis get on his feet. He has proven himself more than capable of being the full editor, and I have encouraged him to do so. I will still act in an advisory capacity, and help where I can as an associate editor.

I continue to encourage you to write articles and share your expertise. This also makes the job of editor much easier. Have a great year. ▲

Todd Romiens

▲ EDITORIAL

CO-EDITOR, LOUIS LIM



I feel very fortunate to serve as co-editor of the *Ontario Mathematics Gazette*, and have the opportunity to work closely with co-editor Todd Romiens. Reflecting back on my four years as a mathematics teacher, I have many people who have and continue to support and encourage me, and to these people, I am most thankful. These people include my associate teacher, Doreen Roberts; my mathematics education professor, Gayle McDougall; my former department head, mentor, and great friend, Ron Lancaster, and my present department head, Susan Catherwood.

My love of mathematics (earliest memories) happened when my godmother, Mrs. Lillian Ross, bought me a math workbook for Christmas when I was six years old. She knew the importance of mathematics, and I remember vividly correcting my solutions with those from the back of the book. It was at that time that I knew I wanted to be a teacher. I feel very lucky to have had many exceptional elementary and secondary teachers, along with some wonderful mathematics professors at York University, who instilled in me a love of learning – a gift I strive to give my own students.

I was fortunate to be a recipient of NCTM's FLAMeS Award (Future Leaders Annual Meeting Support), worth $1000 US, which paid my expenses to the Chicago conference last April. Without the mentorship of Doreen, Gayle, Ron, and Susan, I would never have won the award. As LouAnne Johnson (remember *Dangerous Minds*?) said in her keynote address, "teachers plant the seed, but we often don't see our students blossom." To my mentors – I am blossoming, and it is because of YOU that I am where I am today.

LouAnne Johnson's speech was so inspiring that I would like to share several points she made. Johnson said that all students who enter our classrooms want to learn, but they may portray the "I don't care attitude" as they are frustrated, angry, or scared. Our roles as teachers are to make each student feel special by setting them up for success, and send the message that we like them as human beings. As teachers, our roles are so fast-paced, that we sometimes don't have the time to stop and reflect. Johnson's speech did that for me.

Johnson also stated that every day we teach, we add another layer to our heavenly crowns. We have one of the most important jobs in the world, and although we get so much teacher bashing from our provincial government, Johnson pointed out the fact that the greatest percentage of people who hire private investigators is to locate an impacting past teacher. I don't need to hire a P.I. to thank my mentors, Doreen, Gayle, Ron, and Susan, as they are all OAME members. These people are my heros, and I am fortunate enough to use this column to say thank you to them.

So enjoy the upcoming school year working, learning, laughing with, and mentoring your students. Students look at us as role models, and I am convinced that each of us makes a positive impact in their young lives. ▲





▲ PRESIDENT'S MESSAGE



MARY HOWE

Welcome to a new school year! Like the past few years, this year promises many changes and new challenges. The elementary curriculum is in its fourth year of implementation. Secondary School Reform has begun its grade ten phase. The grade 11 and 12 curriculum documents have been delivered to all schools. NCTM has published its new Standards document. Balanced assessment, evaluation, and teaching strategies are central to all the changes that are taking place.

Can OAME help mathematics teachers make sense of all these "rapid fire" changes? Can we help ensure that Ontario's mathematics classrooms are exciting, interesting, and challenging places to learn mathematics? Will OAME continue its tradition of support for teachers as they work through the changes? The answers...

Yes, yes, yes!!!

Over the next year, OAME plans to continue its active role of leadership for the mathematics education community. Several committees are in place and have planned new projects or continuation of on-going projects to help teachers deal with the new curriculum. All elected and appointed OAME Board members sit on committees and volunteer their time, energy, and expertise (weekends too!) to a variety of projects that will benefit teachers and students from kindergarten through OAC. The list of projects we have planned is lengthy:

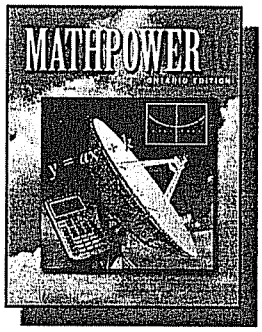
The **JK - 5 Committee** has recommendations for the Ministry for a Primary Project. They also plan to find links for the OAME website, and to make the site an Internet teacher resource.

The **Grades 6 - 8 Committee** will be generating classroom activities and articles to be published in the *Abacus* and the *Gazette.* The focus will be on linking grades 7-8 teachers to grade 9 teachers by encouraging a shared commitment to the EQAO test.

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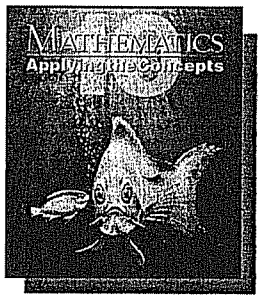
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The **Grades 9 - 10 Committee** will be helping teachers revisit the Profiles that have been prepared for these grades. Effective assessment and evaluation techniques will be the focus. A guide will be developed to help in preparation for the first EQAO Provincial Grade 9 Mathematics Test and the EQAO Literacy Test. The Ministry-funded, OAME-written, C.A.R.E. Package (**C**oncerning **A**ssessment and **R**eflective **E**valuation) will be widely dispersed so that teachers will have easy access to the materials.

The **Grades 11 - 12 Committee** will examine the new courses and pathways in mathematics. The focus will be on the similarities and differences between the 11U and 11UC courses as well as balanced assessment, evaluation, and reporting. A **C.A.R.E. Package** for grade

11-12 is being prepared with field-tested materials. The package will be ready for June 2001.

The **Futures and Promotions Committee** publicizes OAME activities and finds sites for future OAME Conferences. Dates to remember for this school year are: **OAME Conference** May 9 - 12, 2001 in Scarborough; **Leadership Conference** February 22 - 24, 2001 in Toronto; and **Ontario Mathematics Olympics** in Thunder Bay in June, 2001.

The **Publications Committee**, working with the ***Gazette*** and ***Abacus*** editors, plans to feature activities for the primary and junior grades, activities from the new Middle School Assessment Document, and articles to help secondary teachers implement the new curriculum. The website will be enhanced to provide more use for teachers.

In February 2001, OAME will publish the document **Linking Assessment and Instruction in the Middle Grades**. The writing team is currently field testing the collection of activities, and will provide exemplars in the document which will be unveiled at the Leadership Conference in February. The resource promises to be an excellent sequel to the Primary and Junior Years documents with the same title.

OAME continues to take an active role in the development of **Course Profiles for Grade 11** Mathematics courses. The Ministry has funded partial profiles to be written for each of the four grade 11 math courses. The Overview of each course will be written cooperatively by both the Public and Catholic writing teams, and each team will then separately write one full unit of study based on the overview. OAME has appointed writers to each writing team.

Two Ministry-funded projects, the **Mathematics Exemplars** and the **Grade 4 - 6 Integrated Mathematics Units on the Curriculum Planner** will be very helpful to teachers and are scheduled to be published and inserviced in the fall. OAME will continue to be supportive of the Ministry in its development and inservice of materials that help teachers and students better understand mathematics.

As you can see from the variety of projects that have been planned, the focus of OAME during 2000 - 2001 will be on supporting teachers through professional development, and resources that will help them successfully deliver the mathematics curriculum at all grades.

All the best as you embark on another year of teaching! ▲

▲ A New Environment To Deliver Introductory Calculus Curriculum

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DARCY@INTERLOG.COM



Chris D'Arcy is the Vice-principal of Academics at Royal St. George's College. His teaching load includes courses in Calculus and Computer Science. He credits his students for inspiring a passion for the development of creative tools for the delivery of introductory Calculus curriculum.

A textbook is essential for students to learn mathematics. I am also of the mind that enrichment from a variety of current and anticipated technologies are also indispensable. The challenge is to produce a seamless, dynamic curriculum that marries both.

Last September, my OAC Calculus students received their course on CD. The intent is to provide them with a comprehensive framework in which to explore the subject material in support of classroom activities and at home. The content of the curriculum includes:

Outlines	Course and student versions.
Concept Map	A visual road map so they know where they are at any point in the course.
Textbook	A comprehensive textbook linked to a variety of technologies.
Solutions	Full solutions to all questions in the textbook.
Tests	Tests from years past.
Examinations	Exams from years past with solutions.

TI-83 Program Archive	Local and internet links to programs for their calculator.
Maple Worksheets	Prepared routines in Maple.
Laboratory Exercises	Activities suitable for ISU's.
Studies	Single page discussions on precalculus concepts.
Resources	Flexible graphing software and links to web activities.

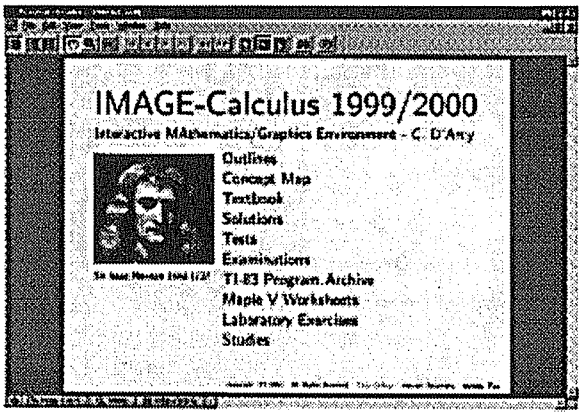


Figure 1. IMAGE-Calculus Home Page

The text files on the CD are prepared in TEX, and reside in PDF format. To support many of the links, a web browser is required. Maple 5.1™ and TI-Graph-Link™ applications are installed in the computer lab where the course is taught to support local and internet links.

Students' first tasks are to print the first two chapters of the text, and secure them in a binder. Students can see that their pages contain links to numerous support tools including graphing software, interactive web sites, animated gif's, Maple worksheets, and HTML pages. Classes consist largely of teaching from the pages in the textbook displayed on the white board, following the links as required. Students can review many of the dynamics at home. Updates to the curriculum are distributed to the students through the school's e-mail system.

Guiding Philosophy

Three criteria guide the development of this curriculum:

1. The mission statement of Royal St. George's College states that we are a university preparatory institution. Feedback from our graduates suggests that knowledge of applications like Maple and familiarity with internet resources are advantageous.
2. Competition for places in good university programs is fierce, and students must consequently maximize their efforts at home.
3. An integrated system (textbook and technology), with the ability to regularly modify the content, is the most efficient vehicle for providing access for students.

General Curriculum Development Principles

To capture and exploit the power of available resources to support this subject material, it is necessary to assemble the curriculum electronically. The advantages include:

A. **DYNAMIC LINKAGE TO ACTIVITIES** Since active links are embedded in the text at the applicable location, students can explore in the context of each concept.

B. **MODIFIABLE CURRICULUM** The curriculum can be updated at any time. As improvements are required to activities or links, updates can be made.

C. **INEXPENSIVE** The cost of the physical media is less than $1.

D. **VISUALLY SUPERIOR** Using the computer as a basis for support activities and animations offers the student a superior interpretation of the concepts.

E. **CENTRALIZED CURRICULUM** An all-in-one set of tools means seamless integration of rich activities. The extent in which students explore enrichment activities on their own is indirectly related to the degree of effort required to access it. Providing support material a mouse click away from where they are in the text means students are more likely to pursue a broader conceptual experience.

The Textbook

Pages of the textbook can be printed/reprinted as desired. Since the text has been prepared using TEX, it incorporates proper mathematical syntax. It is as much a workbook as a textbook since space is left for students to annotate and write their solutions. In this sense, the textbook and notebook are one.

Pages are divided into two columns with the text and algebra on the left, and space for graphics and notes on the right. Hyperlinks are colour-coded to reflect the nature of the activity (web-green, local application-red, solutions-blue). Solutions are hyperlinked to the questions for instant access.

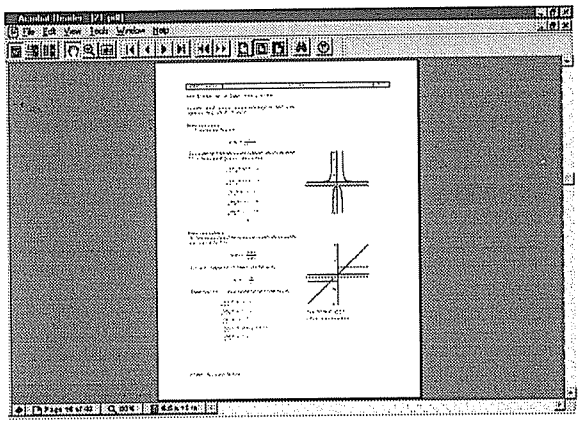


Figure 2. Sample Textbook Page

The Solutions

Students are provided with full solutions to all questions in the text. The advantages include:

- homework can be completed in full;
- precious class time is not spent taking up homework unless clarifications are required leaving time for deeper class discussions and explorations;
- through continual exposure to model solutions, the quality of student exposition improves;
- a healthier balance is achieved between conceptual understanding and getting the correct answer.

Publishing for the printed page is done in portrait orientation, and a point size of 12 is generally sufficient. Although students *can* print the solutions, it is expected that they be read from the computer screen. Publishing for the computer screen requires a landscape orientation and a much higher point size to reflect the relatively low resolution achievable. These considerations have been made as seen in Figure 3.

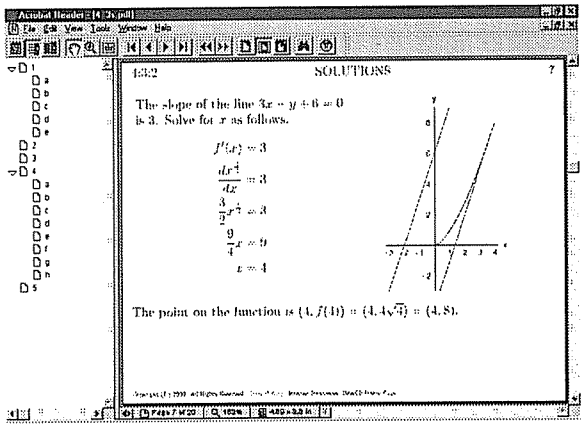


Figure 3. Sample Solution Page

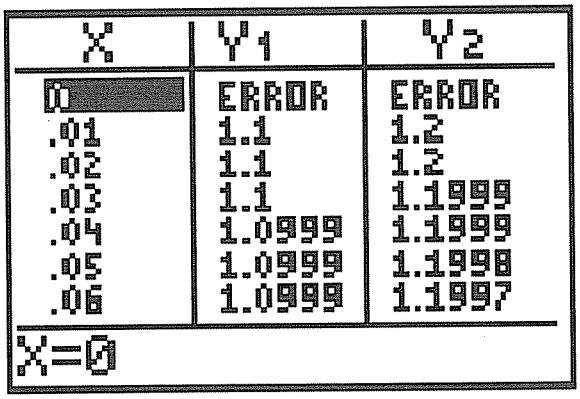


Figure 4. TI-83 Screen Capture

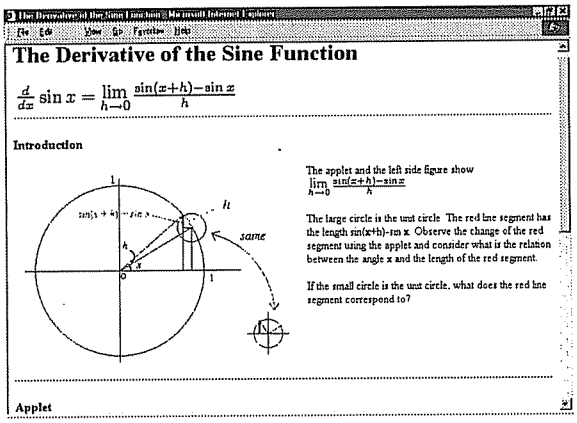


Figure 5. Interactive Web Page

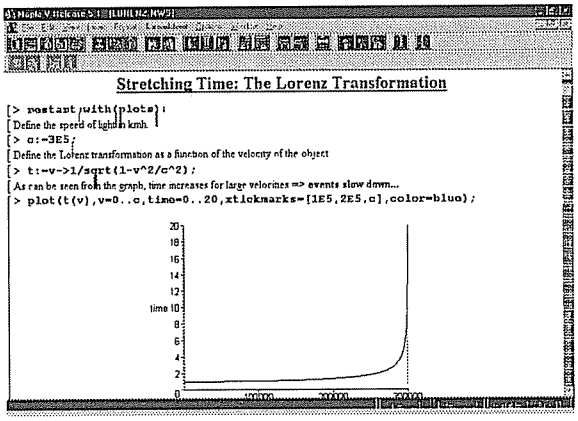


Figure 6. Maple Worksheet

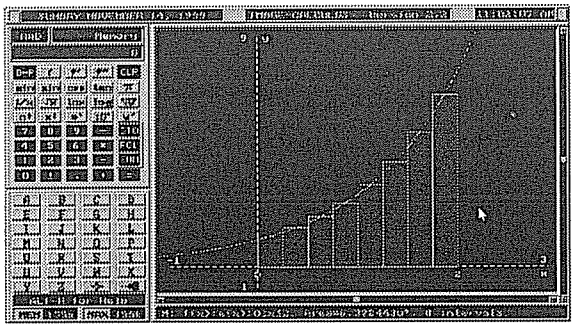


Figure 7. IMAGE-Calculus Investigation

Supporting Resources

Enrichment activities come from a variety of sources. The use of a graphing calculator is encouraged in the course, and screen captures can be found throughout the textbook and solutions.

Excellent web resources exist, some of them with illustrative Java animations. Links to these are embedded into the textbook at the location they are required.

Royal St. George's College acquired a license for Maple 5.1 in the summer of 1999. Links to Maple worksheets developed for the students allow them interactive symbolic and graphic manipulation as well as conditioning them to its use in preparation for its university requirement. An important feature of Maple 5.1 allows users to create animated gifs that can be displayed though a browser. A number of these are being developed as we go through the course.

The CD links to a number of general graphing applications including IMAGE-*Calculus* 2.2 and IMAGE-*f(x)* which have been upgraded for fast PCs. These allow immediate numerical and graphical access to the majority of concepts developed in the course.

Conclusion

The variety and availability of new resources demands that we rethink the design of our curriculum tools. The time our students are willing and able to devote to our disciplines is finite, and we must ensure that their materials are as rich and efficient as possible.

Our world has never been as dynamic as it is today, and our curriculum must be designed to adapt and reflect these conditions.

To Teachers and Students

This curriculum is offered free of charge on CD to any teacher, student, or mathematics coordinator wishing to incorporate it into their program, or to simply learn more. Send a stamped, self-addressed, CD mailer to C. D'Arcy, 211 Brookdale Avenue, Toronto, Ontario, M5M 1P4.

Finally, *IMAGE-Calculus Version 2.1* will not run on computers running faster than 233 MHz. Version 2.2 has been upgraded to run on computers with processors running faster than this. The single executable, IMAGE.EXE, can be obtained from the OAME website at http://www.oame.on.ca/. ▲

▲ Nominations for OAME/AOEM Board of Directors 2001-2002

Each year, elections are held for a President-Elect, a Vice President (3 year term) and 6 to 9 Directors (3 year term) of OAME/AOEM. Nominations for these positions are to be submitted by 4:00 p.m., January 19, 2001, to:

Peter Saarimaki, Past President, 67 Erinlea Cres., Scarborough ON M1H 2S8, Business (416) 397-3785 email saarimaki@hotmail.com

Include the nominee's qualifications with the Nominations Form. A nominee must be a member of OAME. By March 2001, the Nomination Committee will publish a slate of candidates, including qualifications, for consideration by the membership. Voting will be by mail and is open to all OAME/AOEM members. The election results will be released at the Annual General Meeting of the OAME/AOEM in Scarborough, May 2001.

NOMINATION FORM

I nominate: _____

For the position(s) of: ☐ President-Elect ☐ Vice-President ☐ Director

Nominee's Address: _____

_____

Telephone: H ( ) _____ W ( ) _____

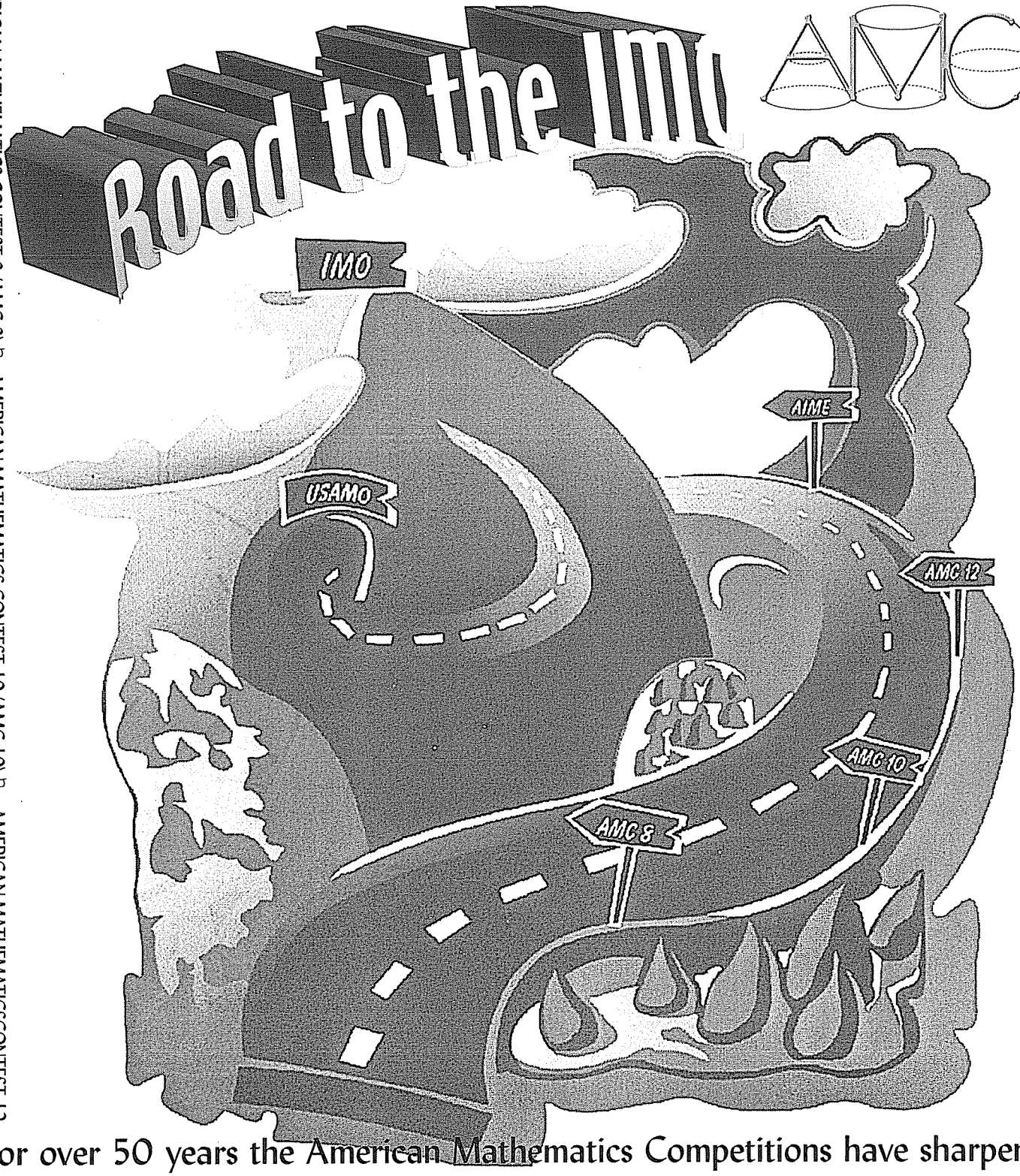
Nominator's Name : _____

Nominator's Address: _____

Telephone: H ( ) _____ W ( ) _____

AMERICAN MATHEMATICS CONTEST 8 (AMC 8) ▷ AMERICAN MATHEMATICS CONTEST 10 (AMC 10) ▷ AMERICAN MATHEMATICSCONTEST 12 (AMC 12) ▷ AMERICAN INVITATIONAL MATHEMATICS EXAMINATION (AIME) ▷ UNITED STATES OF AMERICA MATHEMATICS OLYMPIAD (USAMO)

▷ INTERNATIONAL MATHEMATICAL OLYMPIAD (IMO) ▷



For over 50 years the American Mathematics Competitions have sharpened

and opened students' minds. The path that began in 1950 with 238 schools in New York State has broadened over the years to include 5 contests taken each year in over 8,200 schools around the world. The American Mathematics Competitions has added new tests through the years, to better serve students' needs. They now challenge a wide range of abilities and talents in our young people. From these contests, the road leads to the International Mathematical Olympiad (IMO). In July, students from over 80 countries around the world will travel to the 2001 IMO, which the United States will host in Washington, D.C. For more information about the American Mathematics Competitions contact:

▷ Prof. Titu Andreescu, Director,
American Mathematics Competitions, University of Nebraska, 1740 Vine Street, Lincoln, Nebraska 68501-1606 U.S.A.
▷ 402/472-2257 ▷ Visit our web site, www. unl.edu/amc ▷ titu@amc/unl.edu

▲ Structuring Learning Tasks For Growth

GARY FLEWELLING
FLEW@SENTEX.NET



Gary is an independent mathematics consultant. He is interested in all aspects of mathematics education; including, teacher education, curriculum development, resource development, assessment, problem-solving, the use of technology, and creative thinking. When not involved in things mathematical, he is usually found with his wife, in outback Australia, looking for gemstones.

This is the third in a series of Gazette *articles, by the same author, on Rich Learning Tasks, RLT's. The first, article,* Oh Rats! *(*Gazette, *June 98), examined the nature and importance of RLT's. The second article,* Simon Says Do This *(*Gazette, *December 98), examined the importance of teaching for understanding and the ineffectiveness of rote learning. In this article, the author looks at the structure that surrounds and supports a learning task, demonstrating how different structures can dramatically effect a task's potential richness.*

Defining Terms

When I talk about the structure of a learning task, I am referring to the form or configuration of a task, the elements that make up the task, and the way in which these elements are organized. The structure of a learning task shapes the way students work on or through a task. Structure enables (or disables, encourages, discourages, provides, withholds, imposes, removes, narrows, broadens, frees, restricts, allows, accelerates, directs, indicates, guides, influences, limits, ...) student actions (or interactions, experiences, reflections, decisions, questions, tools used, time spent, directions taken, communication engaged in, assessment, ...). Some people like to use the terms over-, under-, and un-structured tasks. I prefer to talk about tasks as being effectively or ineffectively structured. The effectiveness of the structure supporting a learning task can be measured in terms of what the task enables students to do or learn. I believe many "guided discovery activities", for example, are ineffectively structured. They are typically big on guiding, but weak on discovery (e.g., learning). Many purer "discovery activities" are also ineffectively structured. They often suffer because the elements of the learning task are too loosely organized, or not organized at all, with the result that students are allowed to do just about everything, and in the process, hardly learn anything. There is a common misconception that rich learning tasks also lack structure. This is far from the truth. As you will see in this article, a learning task owes much of its richness to the effectiveness of the structure that supports it.

Introduction

Increasing numbers of learning / assessment tasks are appearing in texts, tests, and other resource materials that 'bring the world into the classroom' and in so doing 'add relevance and interest' to learning tasks. This should be good news. But, the way in which many of these tasks are written / structured / designed causes me concern. They often do deal with interesting things, but the tasks are structured in such a way that students must interact with these interesting things in pedagogically insignificant ways. They do bring the world into the classroom, but they don't give students the opportunity to learn how to deal with that world in realistic / effective / authentic ways. Such tasks keep students occupied and active, but there seems to be little significant payoff for the time and effort invested. Put simply, most of these tasks, as printed, do not give students the opportunity to learn very much of value. They create an illusion of learning, an illusion of relevancy. At the completion of a set of such tasks, students add little to their pool of conceptual and procedural knowledge. Their ability to select, or adapt, tools and procedures, and fit them to a situation, in a purposeful and integrated fashion, is scarcely improved. Their problem solving, reasoning, critical thinking, and communication skill sets are neither enlarged nor refined. No progress is made towards independence or coming to an understanding of the nature, beauty, or utility of the subject. Work on such tasks bring students no closer to, and probably impedes students from becoming the enthusiastic, caring, competent, active life-long learners we want them to become.

A Sample Task

The activity, *You Are What You Eat*, is one such learning task. It is one of 14 activities that make up the 6th annual World's Largest Math Event. (The event, sponsored by the National Council of Teachers of Mathematics, was held on April 28th, 2000.) I selected it for this article because it is representative of the type of task I am concerned about. It is a weak task, that restructured, could become a rich-learning task. Read through it. Notice how the Background Information sets the stage for what could be a very nice learning opportunity. Then notice how the Instructions to Teachers section directs the teacher to squander this opportunity. Notice also that the Teacher Notes confirm how limited the expectations are for this task.

Activity 8: You Are What You Eat.

BACKGROUND INFORMATION

Animals are notorious for having interesting diets and eating patterns. For example, the grizzly bear is feared for its size and strength, yet it actually prefers to eat berries and fruit. And although a polar bear can eat as much as 20 percent of its body weight, it eats only once about every six days. Here is some information about the amount of food that seven different animals typically eat:

- *A male polar bear can weigh up to 680 kg, and will eat as much as 68 kg in a 30-minute period, about 11 kg of food a day for energy.*
- *A vampire bat weighs about 28 g, and will eat 28 g of food each day.*
- *The queen bee weighs about 0.113 g, but will eat as much as 9 g of food each day for energy when laying eggs.*
- *An average tiger weighs about 227 kg, and can eat up to 35 kg of meat at one feeding. However, tigers often wait up to several days before killing and feeding again, and need an average of 6.4 kg of food a day for energy.*
- *An average hamster weighs about 100 g, and consumes about 11 g of food a day.*
- *An elephant typically weighs 4100 kg, and eats about 180 kg of food a day.*
- *The average weight of a hummingbird is about 3.1 g, and it must feed about every 10 minutes throughout the day. The hummingbird will consume approximately 2 g of food a day.*

TEACHER INSTRUCTIONS / STUDENT QUESTIONS

(a) Have students construct two double bar graphs or picture graphs where one bar shows the typical weight of the animal, and the other shows the weight of the food the animals need for energy in a typical day. Two graphs are suggested because the scale on the graph for the polar bear, tiger, and the elephant will need to be different from the scale for the smaller animals. Have students discuss the relative lengths of the double bars, and what they notice.

(b) Which animal eats the most? Ask the students to find the ratio of the weight of the food needed for energy in a typical day to the weight of each animal. Express the ratios as percents, and compare and discuss them.

(c) Weigh two trays from the school cafeteria - one with a full lunch meal (without dishes) and one without anything on it - to determine the actual weight of the food eaten by a student at lunch. If students bring their own lunches to school, these lunches could also be weighed. Calculate the ratio of food weight for three meals of this quantity to the weight of a "typical" student at your grade level. How does this ratio compare to the ratios of the seven animals described in this activity?

TEACHER NOTES AND ANSWERS

8 (a) Students should notice that the bars for the bee are very different from the rest in that the queen bee will eat 80 times her weight every day when laying eggs. The vampire bat eats food equivalent to its total weight in a 20-minute feeding. This would be comparable to an adult sitting down at dinner and eating 68 kg of food!

(b) Polar bear, 1.7 percent; vampire bat, 100 percent; queen bee, 8000 percent; tiger, 2.8 percent; hamster, 11 percent; elephant, 4.4 percent; and hummingbird, 64 percent. Although we usually think of elephants as being "big eaters", on a relative basis, 180 kg is less than 5 percent of their body weight, which is considerably lower than the percentage of many other animals.

(c) This answer will vary, depending on what is served for lunch, and the grade level you teach. As a rough estimate, suppose an elementary child eats approximately 0.5 kg of food at a sitting - well under 2 percent of his or her weight. Assuming the child eats three such meals each day, about 4 percent of his or her body weight would be consumed each day.

An Examination of the Sample Task

The background information for this task, describing the eating habits of seven animals, has the potential to be used as part of a rich learning task. But look at the Teachers Instructions, and see how it is intended to be used. The teacher is directed, in part (a), to ask students to construct two double-bar graphs, and then discuss relative lengths of the double bars. In part (b) the student is asked to express the ratio of food intake to body mass, as a percent, for each animal, and to compare and discuss the ratios. In part (c) the student is directed to follow a given procedure to calculate the mass of a meal, use the results to calculate the food intake of the typical student in their grade, and then compare this result with the food intake of the wild animals listed.

The task, as structured, essentially gives students the opportunity to demonstrate two technical skills, making (and interpreting) double bar graphs, and calculating (and comparing) percent. But notice, even these opportunities are limited. The student is told, in each case, which tools / skills to select and how to use them. For example, the student is directed to make two double-bar graphs, one for big animals and one for small ones (thus avoiding problems of scale). The student is also told what each bar should represent.

Looking at the Teacher Instructions and Teacher Notes, students appear to be given little or no opportunity to:

- discuss the background information, hypothesize, and get engaged in the task (before graphing and crunching percents);
- pose / focus on / answer their own questions about the situation;
- learn / practice problem-solving skills;
- become a more independent learner / decision-maker;
- formulate / discuss / defend their personal solution plans;
- carry out / monitor progress through / revise their solution plans;
- identify / select / adapt / apply mathematical tools / procedures appropriate to the situation;
- justify / summarize / communicate results;
- ask / follow up "what if" questions;
- evaluate / revise procedures and results.

The actions of the student are far too controlled / constricted / narrowed / limited / segmented to be of much value. The task is not structured for student growth. Too much emphasis has been placed on making the task 'do-able', and too little emphasis on making it worth doing. The task has been structured to ensure that the student arrives at some conclusions concerning the eating habits of animals, and not structured to ensure that the student gets an opportunity to become more skilled at being able to draw meaning from / draw conclusions about / come to a better understanding of such situations.

Students are given too passive a role to play. They don't appear to be given much of an opportunity to indulge their curiosity or put their stamp on the conduct or the outcome of the investigation. The sample task, in its published form, provides experiences that likely perpetuate, in the minds of students (and the teacher?), the feeling that math is something that happens to them rather than something that happens because of them, that math is about answering someone else's questions, that math is about doing what you are told to do, and little more.

I believe the task, *You Are What You Eat*, implemented in its original form, gives students little opportunity to learn or practice skills that will be of value in life outside of the classroom. When a student meets a comparison situation, it is the student who must be able to come to an understanding of the situation. It is the student (and not the teacher) who must be able to identify whether or not percent is a tool that applies to the situation, and if it does, it is the student (and not the teacher) who must be able to identify the terms involved, and, knowing the terms, it is the student (and not the teacher) who must be able to determine whether an estimate or accurate calculation is appropriate, and then be able to determine the appropriate percentages and use them to draw pertinent conclusions. It is simply not enough that a student be able to correctly calculate several percentages after someone else has identified ratio as the concept needed / connected to the situation, after someone else has selected percent as the preferred form, and after someone else has determined which terms should be used in the ratio.

Life outside of school presents people with 'whole' problems, bigger tasks. Students need training in working with bigger tasks. They need experience in solving whole problems, not just the simplest bits of them.

Restructuring the Sample task

Teachers wanting to rehabilitate and enrich the task, *You Are What You Eat*, know that they need to ignore the original Instructions and Notes sections and restructure / redesign the task.

The task needs to be restructured in such a way that it gives students the opportunity to examine the background information, discuss it, come to an understanding of what it is about, and then pose some questions, of their own making, that they perceive to be worth answering. In a discussion coordinated by the teacher, students would ask questions similar to the following:

1. Which animal eats the most (in absolute terms and in relative terms)? (and the related question, How do you compare things involving two variables?)
2. How much do we eat in a day? (and the related questions, What do we mean by a typical student? a typical day?)
3. How do humans compare with the animals listed? (Who are we most like? least like?)
4. a) What does 'eating like a bird' usually mean?

   b) If I ate like a hummingbird, how much would I eat?
5. a) How much would an elephant eat in a day if it ate like a queen bee? (How many truck loads, per day, is that?)

   b) If a hummingbird ate like an elephant, how much would it eat?
6. Why do some animals eat relatively little while others eat relatively so much?
7. How does the amount eaten by cold-blooded animals compare with the amount eaten by warm-blooded animals?

These questions could be tackled (as whole problems) by students working independently or in small groups. For example, students could work in small groups on Question #1, independently on Question #2 (sharing data with classmates) and then work, independently, on 1 or more other problems, of their choice. Some questions could be assigned as homework, a (multi-discipline?) project, or as a test question. In Question #1, an emphasis would be placed on generating, sharing, justifying, evaluating, and revising solutions, and solution procedures. In the other questions, an emphasis could be placed on explaining, summarizing, and reporting interesting findings. Students could be given the opportunity to summarize and communicate findings in different ways, to satisfy different tastes, interests, audiences, or purposes. Assessment of student performance would reflect these emphases.

An important thing to notice here is that both the teacher and students have a hand in the restructuring of the task. This is characteristic of most (all?) rich learning tasks. Typically, the teacher fixes certain aspects of the task and allows students a measure of freedom of action within this fixed structure. Students influence the structure of the task by such things as their response to the task, the hypotheses they formulate, the questions they pose, the targets on which they choose to focus their attention, the kind and duration of that attention, the tools, resources, and procedures they select and use, the kind of interactions they enter into, the forms of communication they choose to use, and the conclusions that they reach.

Conclusion

I believe the original task is limited and limiting. The task, as originally structured, has the teacher telling too much, directing too much, and asking too many of the questions that more properly should be asked by the student. The original task is structured in such a way that the teacher does too many things that are more properly in the student's domain to do, and does too few things that are more properly in the teacher's domain to do.

In the restructured task, on the other hand, the teacher moves away from directing an activity and moves closer to facilitating an activity. I believe the restructured task is significantly richer. It encourages the student to do more and, as a consequence, gives the student the opportunity to learn more. It is structured for growth. The restructured task gives students the opportunity to gain experience using their skills in integrated, purposeful, and authentic ways to solve a variety of problems, and in so doing, helps prepare them for life beyond the classroom. ▲

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Mathtype™ was used to create formulas in this issue of the OAME/AOEM *Gazette*.

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▲ Mittens, Mathematics, and Snow: Making Connections in Second Grade

DR. SALLY K. ROBERTS, WAYNE STATE UNIVERSITY
DR. GERALD R. OGLAN, WAYNE STATE UNIVERSITY
DR. SUSAN L. NOWOSAD
GROSSE POINTE PUBLIC SCHOOL SYSTEM



Sally Roberts teaches graduate and undergraduate courses in mathematics education. Prior to her appointment at Wayne State University, she was a mathematics instructional specialist and primary grade teacher for the Detroit Public Schools.



Prior to teaching at Wayne State, Gerry Oglan taught K-8, intermediate learning disabled students, and served three years as an assistant coordinator for the Windsor Public Board of Education.



Susan Nowosad is a second grade teacher in the Grosse Pointe School System, and teaches graduate courses in early childhood education at Wayne State University.

Introduction

Susan Nowosad's second graders sit quietly on the classroom rug as she reads *The Mitten*, Jan Brett's magical re-telling of the Ukrainian folktale about a little boy and his lost mitten. In the folktale, Nicki's grandmother knits him a brand new pair of white mittens. Alas, the very first time Nicki wears the new mittens one is lost in the snow! The tale recounts how the forest animals seek shelter in Nicki's mitten. The children listen and watch in amazement as the woodland creatures wiggle their way into the mitten. First a mole, then a snowshoe rabbit, next a hedgehog. The children wonder how all of the animals could possibly fit into the mitten. The mitten becomes overstuffed and literally explodes. When Nicki finds the mitten, it is all out of shape, and he ponders about what caused the change. As the story ends, the children discuss possible explanations. Robert notes that, "It (the mitten) got bigger. It stretched". Marcia offers a somewhat more skeptical comment, "It's not a *real* story".

Mathematics: Then and Now

Traditionally, mathematics topics have been presented in isolation. Critics of this approach argue that it presents a distorted view of mathematics as a series of concepts that are not connected to each other or to real-life situations (National Council of Teachers of Mathematics, 1989; National Research Council, 1989). *The Curriculum and Evaluation Standards for School Mathematics* (1989), published by the National Council of Teachers of Mathematics (NCTM), presents a vision for change in mathematics teaching and learning. It moves away from the traditional, narrow focus on rote activities toward approaches which emphasize the interconnections between and among mathematical ideas and connections to real-world situations. The interconnections between and among topics and disciplines addressed in the *Curriculum and Evaluation Standards for School Mathematics* is a natural way for primary educators to plan their classroom activities.

Four Standards, which cut across topic areas, provide a framework for planning mathematical experiences for young children. The first standard, "mathematics as problem solving," permeates the entire *Standards* document. This standard is followed by three critical supporting standards: mathematics as logical reasoning, mathematics as communication, and mathematics as connections.

Mathematics As Logical Reasoning

Logical reasoning is one of the four "cross cutting" standards in the *Curriculm and Evaluation Standards* (NCTM, 1989). Reasoning is a tool for understanding abstract ideas and making connections. It includes a set of interwoven skills, including the ability to represent mathematical ideas in a variety of ways, draw logical conclusions about, and explain and/or justify answers and solution processes. As young children interact with concrete materials and representations of mathematical

ideas, they begin to make generalizations about concepts and ideas. The generalizations become building blocks which help children begin to reason using mathematical ideas to solve problems. Logical reasoning goes beyond specific problem situations and helps children create a web or mathematical memory which provides the basis for insight into future problems (Russell, 1999). As children make connections between mathematical ideas, their logical reasoning skills develop, and they become independent thinkers who are willing to investigate problems for themselves and believe that mathematics "makes sense".

Mathematics As Connections

The teacher plays an important role in helping children build the bridges between concrete and abstract ideas and among topics in the curriculum. Observation and classification skills are critical to a child's ability to "see" relationships and make connections between and among concepts. Whitin and Wilde (1992) suggest that children's literature can be used to break down the "artificial dichotomy that sometimes exists between *learning* mathematics and *living* mathematics" (p. 4).

Mathematics As Communication

The cognitive connection between language and mathematics is essential in a problem solving environment. The teacher facilitates mathematical conversations by posing questions and valuing children's thinking. Children's literature can be used to stimulate and provide a common frame of reference for classroom discussions (Whitin & Wilde, 1995). Both formal and informal classroom conversations contribute to the development of mathematical ideas as children assimilate and accommodate new learning and construct links between informal intuitions and more abstract mathematical ideas. Conversations lead to deeper understandings, and help children make sense of mathematics.

Making Mathematics Real: Initiating the Process

Underlying each of these standards is the notion that mathematical ideas must be connected to real-life in order for children to make sense of the abstractions. When children are engaged in mathematical activities directly related to their own experiences, they begin to acquire confidence in using mathematics meaningfully and constructing mathematical knowledge. Children's literature provides an authentic and purposeful context for young children to explore mathematical ideas.

Susan closes the book, and the children continue to marvel at the capacity of Nicki's mitten. Susan reveals a very small mitten to her young students, and explains that the mitten belongs to her daughter who is only three years old. The children are curious about her daughter. The discussion is momentarily diverted to a discussion of brothers, sisters, and families. Susan allows time for this interlude, knowing that it is important for her students to make connections to their own personal experiences. She asks the children, "How could all the animals fit inside the mitten?" Karen offers one explanation, "The mitten got stretched". Steven confirms her explanation adding that "They (the animals) made it bigger". Mark elaborates commenting that "The bear made it get big!"

The children and Susan explore possible materials they could use to investigate the capacity of the little mitten. Susan reaches for a bucket of Unifix™ cubes, and proposes to the students that they pretend each cube represents one animal. "How many cubes do you think will fit in the mitten?" The children begin to make predictions about the number of cubes. The children record predictions on Post-it™ notes. The notes are then grouped by tens on the board with the predictions ranging from nineteen to fifty (see figure 1). The children have discovered that organizing the predictions by tens provides a good picture of the distribution of the data. Before testing their predictions, Susan invites the children to talk about what they notice about the predictions. The children note that the majority of the estimates are in the twenties.

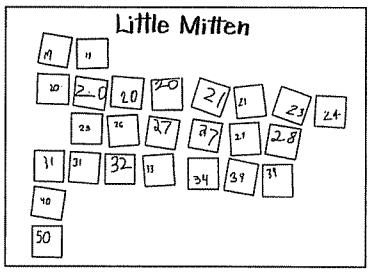


Figure 1. Little mitten estimates.

Following this discussion, the children are ready to check the validity of their predictions. Susan holds the mitten while the "helper of the day" puts in the cubes. The children count in unison as the helper adds yet another cube. The mitten begins to expand, 10, 20, 26 cubes. The children eagerly encourage the helper to add just one more cube, twenty-seven cubes. The mitten bulges, and it becomes evident that another cube will fall out of the mitten. The class agrees to stop. Students' mitten experiences bridge the connections to the literature selection, making the mathematics come alive for students.

The children buzz with comments as they compare their estimates to the actual count. As the children compare their predictions to the final results, they seem to view the activity as a competition with "winners" and

"losers". Susan is conscious of how important it is to value students' thinking, not merely the "one" right answer. Susan asks, "Is twenty-nine close?" The children suggest that the estimates in the twenties are close to the actual count. The discussion continues as the children think about what makes a "good" estimate. Susan reiterates when people estimate, the important thing is to be "close".

Stepping Back

The following day, Susan presents a second mitten which is much larger than her daughter's mitten. Very little introduction is needed for this second lesson. The children eagerly anticipate the sequence of events which will most surely include filling their teacher's mitten with cubes. Susan is interested to see how the children will use the information from the previous activity to make predictions in this new situation. She listens to the informal conversations among her students as they determine their estimates. Some children recall the number of cubes required to fill the smaller mitten, and use this as a bench mark for their predictions. This time, the estimates range from forty to two-thousand (see figure 2). Susan notes that although there is a wider range of estimates, all of the predictions are greater than the number of cubes required to fill the smaller mitten. When the estimates are arranged on the board, the students begin to comment on Natalie's estimate of two-thousand cubes. "She said two-thousand!" "It can't be two-thousand." Susan realizes that Natalie was sincere when she made her estimate so she probes further. "Natalie, a lot of people noticed your estimate. Tell us about why you predicted two-thousand cubes." Natalie exclaims confidently, "Because it's really a lot!" Natalie knows that it will take more cubes to fill the larger mitten and for her, two-thousand cubes represented a big number. She feels comfortable offering a prediction that is very different from her classmates. "An atmosphere of mutual support and respect is essential, so that all members of the class feel free both to make statements and to question, react to, and elaborate on the statements of their classmates and of the teacher" (Ministry of Education, 1997, p. 75).

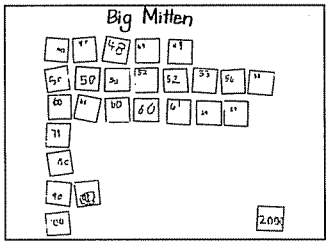


Figure 2. Big mitten estimates.

By now the children are anxious to discover how many cubes the larger mitten will hold. As a class, they decide that it might be better to fill the mitten first and count the number of cubes later. After removing the cubes from the mitten, the class decides to group the cubes. Several

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children suggest grouping by tens. The children are presently working on a place value unit in their mathematics books, and Susan is pleased that her students are able to connect their experiences to this problem solving setting. The cubes are grouped into five towers of ten with nine cubes left over, a total of fifty-nine cubes. The children compare their predictions to the final outcome. Conversations lead to discussions of the relative nature of numbers. Janice's prediction of 48 cubes is *less than* the actual number of cubes, Paul's prediction of 100 cubes is *more than* the actual count. The children are comfortable using the language of mathematics to communicate their ideas. When Susan asks the students which estimates are "close to" the actual amount, the children indicate that the predictions in the fifties are close. They do not include the estimates of sixty or sixty-one. Susan takes note of the fact that her students' knowledge of the relationship between and among numbers is still fragile.

Students in Action

The following day, Susan comes to class with an armful of unclaimed mittens which she has borrowed from the school's lost and found. The children are curious to discover what their teacher has planned for them. Today the children will work in groups of four. Each group receives a mitten and students are asked to think about which mitten might hold the most and the least number of cubes. Susan asks each group to make a prediction. As each group negotiates their prediction, she listens to the conversations. Asking children to make predictions encourage them to pause and logically reason about their responses as they think about numbers in the context of the problem situation. Discussions about how the students arrived at their predictions serve to help children compare a variety of solution strategies, and to think about the relationships among numbers.

The children are now ready to test the capacity of their mittens. Susan circulates among the groups listening to the children's conversations. At one table, the children are debating about whether or not their mitten will hold more if they snap the cubes together to form trains, or if they should leave the cubes unlinked. Children are encouraged to try both ways, and compare the results. At another table, she observes children ambitiously stretching their mitten, and is glad that she has used the unclaimed mittens from the lost and found for this activity.

Final Reflections

The whole group activities during the previous days' lessons modelled a process which the children can now apply independently. As the children pursue the problem, they negotiate decisions with their classmates, and are actively engaged in "doing mathematics". When the children complete their group investigations they confidently report their findings. As we talked about the lessons, Susan recalls the richness of the students' conversations which reflected a variety of mathematical ideas. As students "talk mathematics", both with the teachers and with classmates, they clarify their thinking and construct knowledge about mathematics (Ministry of Education, 1997). From a teacher's perspective, Susan believes, "It's more fun thinking of ways to get students to talk about mathematics, than it is to try to keep them quiet while they *do* worksheets." It is evident that opportunities to communicate with both the teacher and classmates, is helping these young mathematicians gain the confidence and skills needed to explore new problem situations.

Susan commented, "This is one of my favourite lessons. Once I read the story, the children were *hooked.* I didn't have to worry about whether or not the students were engaged. The mathematics content seemed to flow from the activities." She continues by reflecting on how her students' predictions provided insights into their understandings of number concepts. Place value, estimation, collecting and organizing data, and number sense were all represented in the context of the lessons.

The atmosphere in this classroom makes it a safe environment where children can become independent thinkers and be willing to share their ideas. When children sense that their questions and reasoning are respected, they are more willing to discuss their thinking, make predictions, and venture into unfamiliar territory. As children investigate mathematics curriculum in the context of their own interests and experiences, they create a mathematical memory which will provide insights for solving future problems.

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▲ Ontario Mathematics Olympics 2000 - A Celebratory Article



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Background

It was a wonderful celebration of World Mathematical Year! The millennium edition of the Ontario Mathematics Olympics was held at the Faculty of Education, Queen's University in Kingston, June 2 – 3, 2000. Twenty-eight teams from across the province represented their regional OAME chapters at the provincial playoffs, hosted this year by the Quinte St. Lawrence Math Association (QSLMA), and generously sponsored by *Esso*, *Spectrum,* and the *MSTE Group* at Queen's.

The Ontario Mathematics Olympics (OMO) began six years ago in Ottawa. Since then, there have been championship events in Scarborough (1995), London (1996), Windsor (1997), and Toronto (1999). Next year, the Ontario Mathematics Olympics will be held in Thunder Bay, hosted by NWOAME. The OMO has proven itself to be an invaluable event in modelling mathematics reform. It has also been enormously influential in helping 'Joe Public' understand the value of 'hands-on, heads-in' mathematics because of the wonderful publicity generated by the event whenever it is hosted in a community.

The OMO was the original idea of Rob McLeish and Jeri Lunney from the COMA chapter. These visionary educators came up with the idea of a 'different' type of mathematics competition aimed specifically at grades 7 and 8 students, and committed to gender equity. Their vision described an event that embodied the best of what we know, theoretically and practically, about learning mathematics. Key to the vision are activities that embody the development of mathematical ideas, emphasize the role of mathematical knowledge and skill in the future lives of students, and model the professional lives of practising mathematicians.

The originators of the OMO defined a day-long event in which teams acquire points as the mathletes work in pairs or teams to solve problematic situations. The secret for the four team members is working together, with each bringing concepts, ideas, and strategies to new and unfamiliar situations – the working definition of collaboration in action.

The originators of OMO wanted it to be 'constructive' as well as 'constructivist'. They envisioned students tackling complex and rigorous problems by building structures, employing technology, and applying appropriate tools; be they tangrams, pentominoes, trundle wheels, or CBL's. They saw the mathletes gathering information from a variety of sources, interpreting relationships in that data, and predicting future events – that is engaging in the higher order thinking skills that our graduates will need. After all, these mathletes are the future of the mathematical and technological world of the 21st century.

The originators specified that the OMO be relevant and realistic, with problems that have high mathematical capital. The events are intended to be engaging, interesting, and appropriate to the age of the students. They are to be real-world or context-rich, and open-ended. The mandate and precedent tell us that the events within the OMO should require experimentation, reasoning, and critical thinking. As the many markers over the years will attest, most of these fascinating problems have multiple solutions, and are best evaluated along a 'complexity continuum' – no simple check marks or red 'x's' on these submissions.

The originators also intended that the OMO be action-packed. It was specified that the participants would not be relegated to sitting in rows, silent, and sweating over solutions. They were imagined outdoors, at a computer, racing along a corridor, or staring intently at a work of art. The vision included lots of noisy and animated conversations, heated debates, and impassioned justifications.

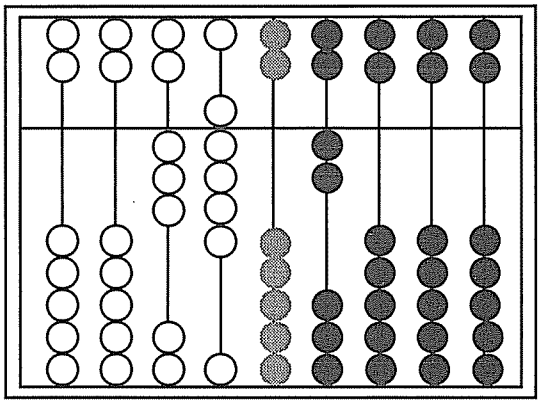
This vision came to life this year, as it has in the last five years, as the OMO took over Kingston this spring!

OMO 2000

On Friday June 2nd, the 112 mathletes and 60 coaches, supervisors, and parent volunteers began to arrive at Jean Royce Hall, the University residence in

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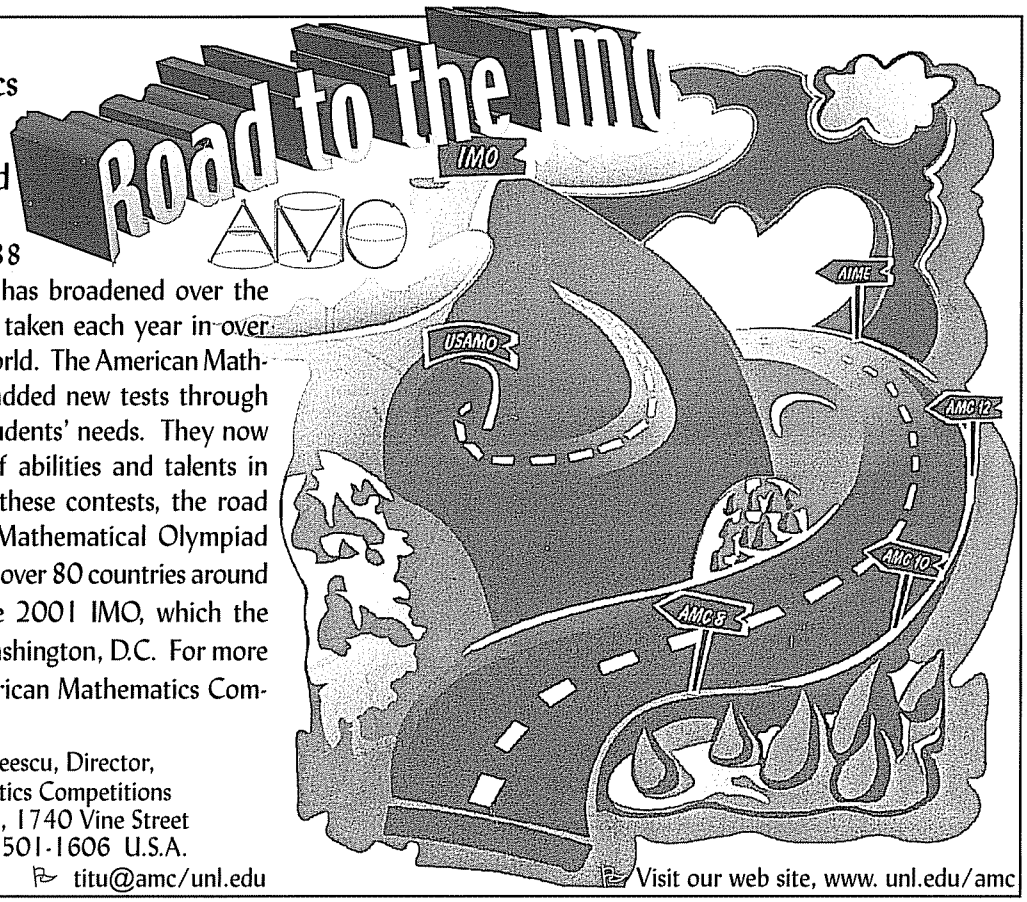


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For over 50 years the American Mathematics Competitions have sharpened and opened students' minds. The path that began in 1950 with 238 schools in New York State has broadened over the years to include 5 contests taken each year in over 8,200 schools around the world. The American Mathematics Competitions has added new tests through the years, to better serve students' needs. They now challenge the wide range of abilities and talents in our young people. From these contests, the road leads to the International Mathematical Olympiad (IMO). In July, students from over 80 countries around the world will travel to the 2001 IMO, which the United States will host in Washington, D.C. For more information about the American Mathematics Competitions contact:



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▲ From the Editor's Desk

Geometry Through the House, by **Laurie Moher** and the JK-5 Committee, links to the June 2000, *Gazette* article, "Encouraging Mathematics Communication in Children". It is an explanation of the activities described in the journal entry samples cited in the article. This unit incorporates a number of mathematical strands. Sufficient time must be given for the students to internalize the language and concepts in this unit.

Overall Expectations

(reprinted with permission from the Ontario Curriculum, Grades 1-8 Mathematics 1987)

GRADE 2

Geometry and Spatial Sense

- investigate the attributes of 3-D figures and 2-D shapes using concrete materials and drawings
- understand key concepts in transformational geometry using concrete materials and drawings
- use language effectively to describe geometric concepts, reasoning, and investigations

Patterning and Algebra

- identify, extend, and create number, geometric, and measurement patterns, and patterns in their environment
- explore patterns and pattern rules
- identify relationships between and among patterns

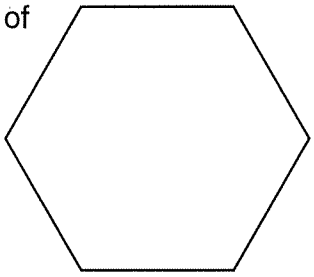
GRADE 3

(all of the above Grade 2 Expectations plus)

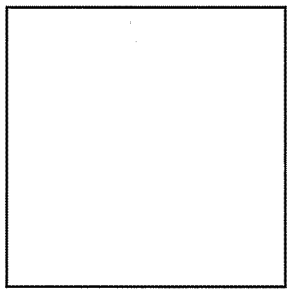
- explore transformations of geometric figures
- recognize that patterning results from repetition
- identify, extend, and create linear and non-linear geometric patterns, number and measurement patterns, and patterns in their environment.

Mathematics Language

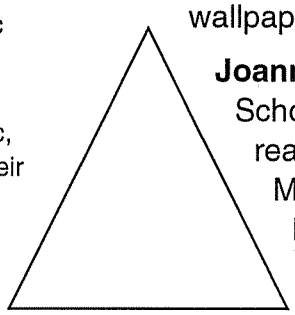
- 3-D (three dimensions)
- 2-D (two dimensions)
- Hexagon
- Square



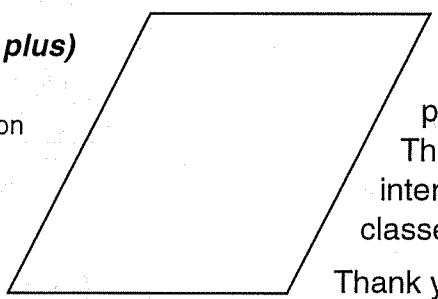
- Turn, rotate
- Symmetry-line, rotational
- 2x2 quilt
- Triangle
- Slide
- Pattern
- Repeat
- Core unit
- Rhombus
- Parallelogram
- Flip
- Design
- Motion



The students should be informed that at the end of the investigation journals, they will be using shapes cut from wrapping paper or wallpaper to create a core unit and a quilt.



Joanne Harris, Centennial Middle School, Georgetown, provides *Abacus* readers with a very interesting Data Management and Probability Performance activity. During the past year, Joanne had her class studying Ontario Hockey League (OHL) statistics. In the December *Abacus*, you will see some results produced by her students. This activity will be most interesting to grade six -eight classes.



Thank you Laurie, OAME JK-5 committee, and Joanne for providing hands-on mathematics for our elementary teachers and their students.

Frances Schatz

▲ Geometry Through the House

By Laurie Moher and the JK-5 Committee

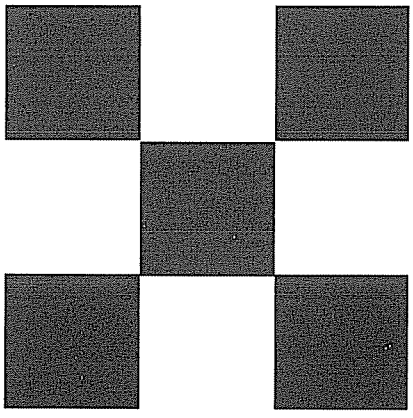
Teacher Notes

Journal 1 Investigation

Read Selina and the *Bear Paw Quilt* by Barbara Smucker with the students. When you have finished reading the book, go over the illustrations again and have the students look for the two-dimensional shapes that were used to create each quilt. Other children's books, craft books or craft magazines could be substituted for this story. Select a page in the book where a pattern has been repeated several times. Ask the students if they notice any patterns. Have them describe in their own words what they see. Record their observations on a chart for later reference. Each student can then write a journal note.

Journal 2 Investigation

Work with pattern blocks and/or tangrams. Have the students make patterns with the shapes and compare the shapes according to how many sides and vertices they have. Activity books such as *Pattern Animals* are useful for this investigation because the books provide puzzles in the shapes of animals that the students fill with pattern blocks.



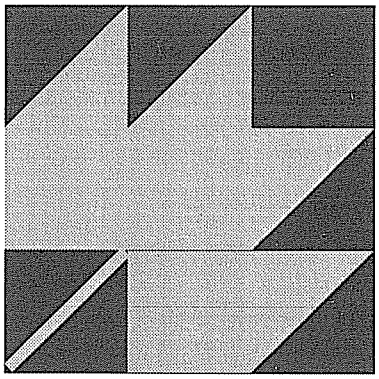
Journal 3 Investigation

Have students work with a partner. Use books or magazines that have floor tiles or quilts to observe. Describe the quilt or floor tile patterns according to the following prompts:

- What shapes have been used in the quilts (or floors)?
- How have the shapes been used to make patterns?
- How has colour been used to make patterns?

Put a picture on the journal page and complete the chart.

Journal 4 Investigation

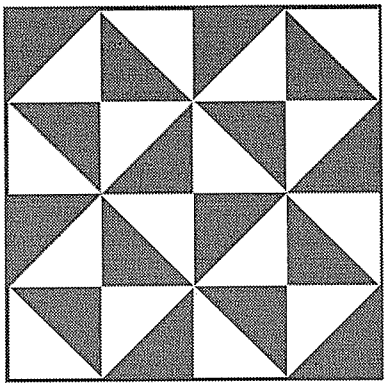


Students work with four triangles and find all the different shapes that can be made using the four triangles. The triangles must touch on one side, they cannot be joined at the vertices.

At the end of the investigation time, call the group together and have them talk about their discoveries. The teacher and some students will be able to lead the class to see that some of the shapes are the same; they have just been rotated.

Create a class chart of the different shapes that can be made with four triangles. Reinforce the language "flipped, turned, or rotated".

For the journal, have the students repeat this activity on their own using five triangles. Have the students record their discoveries in the journal. How do you know you have found all the shapes that can be made with five triangles?



Journal 5 Investigation

This investigation assumes some prior experience with symmetry. Provide a background paper that is 8 cm x 8 cm. Have students create several 4 cm x 4 cm squares using two different colours of paper. Pose the questions.

How many different core units can be made using two colours?

Which of the core units are symmetrical?

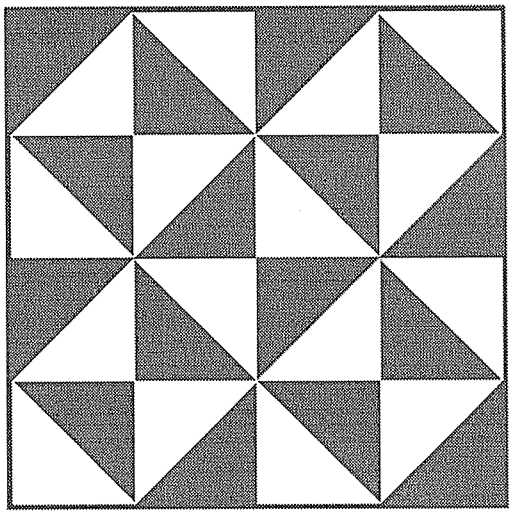
How do you know they are symmetrical?

Cut the squares into triangles. After the students have had sufficient time to investigate the various arrangements of the triangles, have them create their favourite design, draw it on their journal page, and name their design. Share the designs with others in the class, explaining what shapes they have used, where they have used flips, slides or turns, and where there is symmetry. The students will notice that some people have the same core unit but the final design looks different. Discuss why this happens, reinforcing the language of transformational geometry.

Investigation 6 - Assessment Activity

Return to the book used in Investigation 1. Students will be able to look at the quilts in the book with the knowledge they have gained throughout the unit. Add this new information to the chart made at the beginning.

Ask the students to create a core unit and a quilt using construction paper, wrapping paper, or wallpaper. The students will still need their 8 cm x 8 cm background papers, 4 cm x 4 cm squares, and 4 cm x 4 cm squares cut into quarters to create smaller triangles to use.



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Web Site:
http:www.nmt.edu/~breynold/quiltfiction_kids.html

▲ Data Management and Probability Performance Task

by Joanne Harris

Teacher Notes

This task, given to my students as a performance task after they had completed the unit on probability, could be used with a variety of sports. As a major fan of the *Ontario Hockey League* I selected their play-offs to use for this project. Hockey is a sport that most of my students know; however, many of the students were unfamiliar with the players and the team stats. The Ontario Hockey League has a web site **http://www.ontariohockeyleague.com/** that can be used to access a wide variety of statistics ranging from individual records to team vs team match ups during the regular season, to winning streaks etc. I also had recent issues of *The Hockey News*, a newspaper/magazine that is devoted to hockey information, in the classroom. Depending on your location, the daily newspaper would also be useful. Some of the assumptions include that students understand the game and what constitutes a winning team, that students understand how the play-offs are structured and that students have access to the statistical data they can use to make a prediction.



The specific expectation is to apply a knowledge of probability in sports by systematically collecting, organizing and analysing primary data, then interpret displays of data and present the information using mathematical language.

The students work in teams to make their predictions. Encourage the students to think carefully about the make-up of their team. What frequently happens is an academically sound pair of students teams up with a less academically sound but more sports knowledgable pair.

The awarding of prizes as well as grades seemed to be in keeping with the task and is a popular addition to the task. All the predictions were sealed in an envelope and we kept a large wall chart in the classroom, to track the progress of the play-offs.

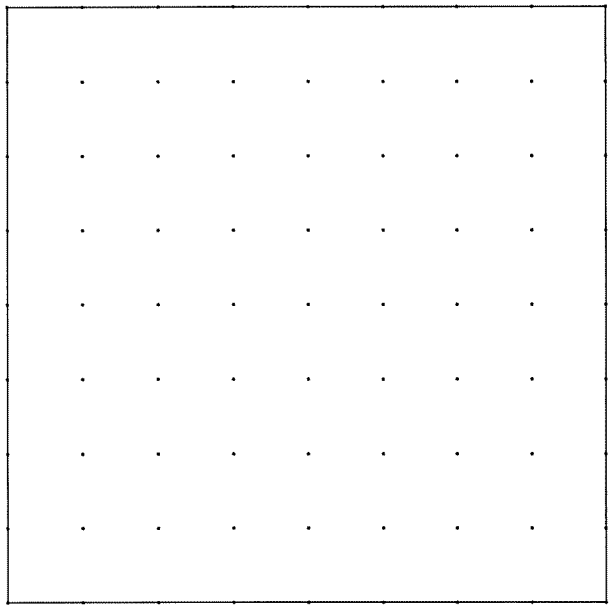
It should be noted that timing is critical for working on this project and handing it in. The teams involved in the play-offs and their first round match ups must be known but the games shouldn't have started before the due date. Our due date was six days after the play-offs began and most teams had played a maximum of two out of a possible seven game schedule. Everyone won something and the students who demonstrated an understanding of probability were rewarded with a high performance rating.

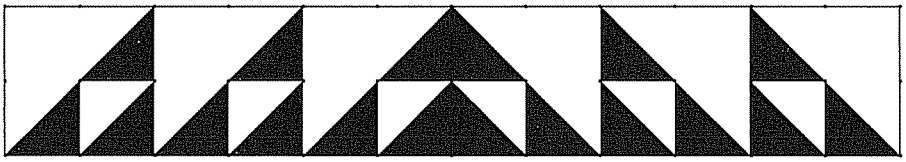


The marking scheme on page 11 is the one I used for this assignment.

Quilt Journal 1

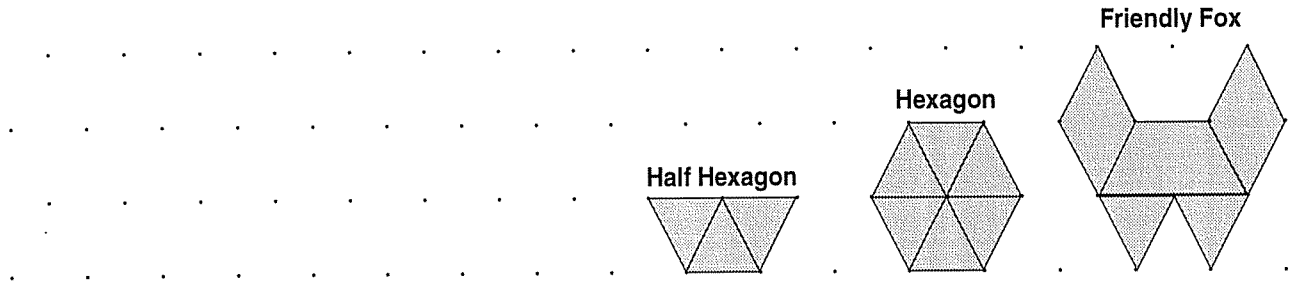
What I know about quilt patterns. Draw and write a story.

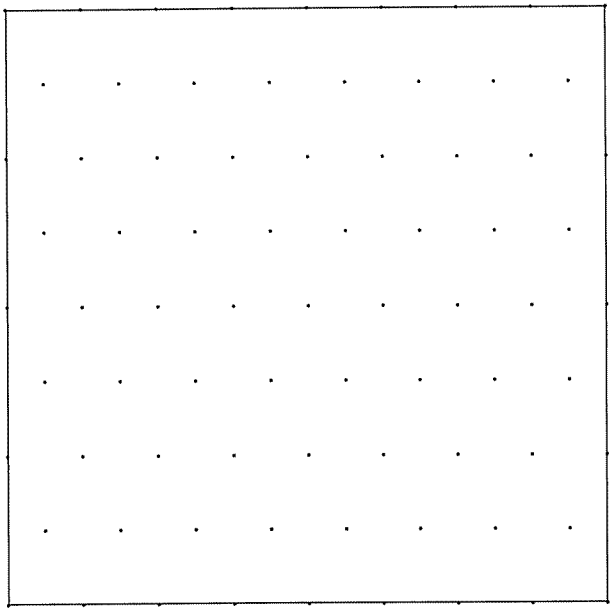


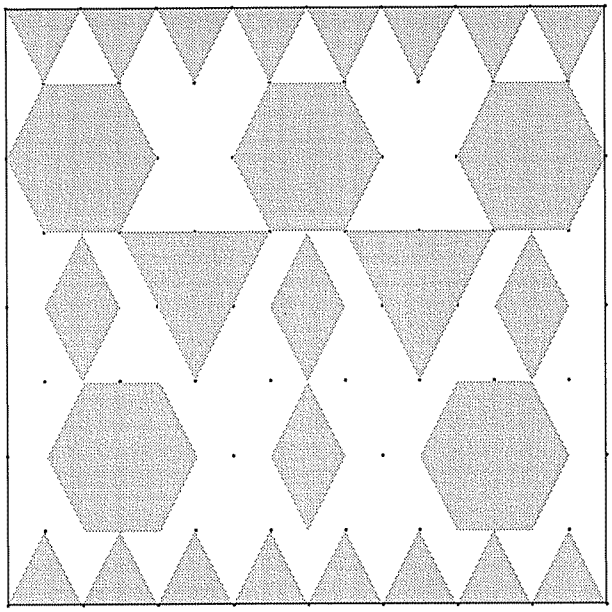


Quilt Journal 2 - 3

Here are my pattern shapes.

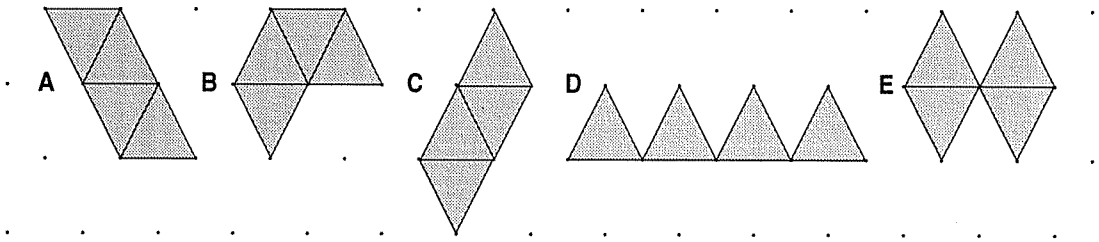






Name of Shape	Number of Shapes	Number of Sides	Number of Vertices
triangle	1	3	3
Half Hexagon			
Hexagon			
Friendly Fox			

Quilt Journal 4



C is a flip, slide, and a turn of A.

Quilt Journal 5

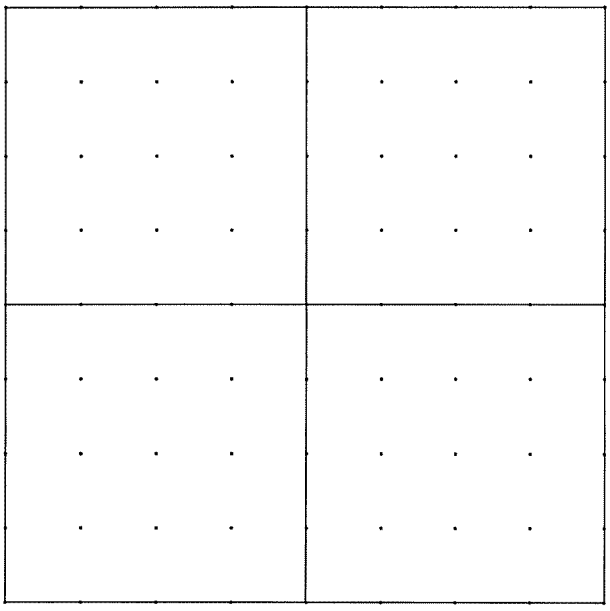
(see sample of core unit)

(provide cutting lines for four squares that are 4 cm x 4 cm in two different colours)

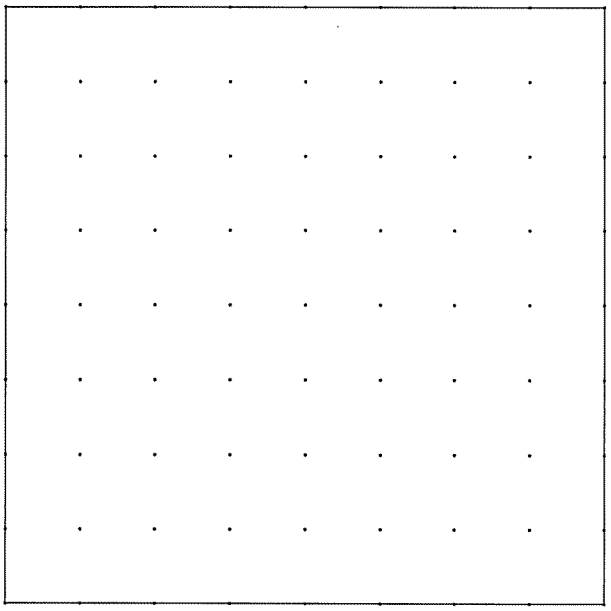
1. Draw all the possible core units.
2. Which of the core units are symmetrical?
3. I know _____ is symmetrical because _____ .

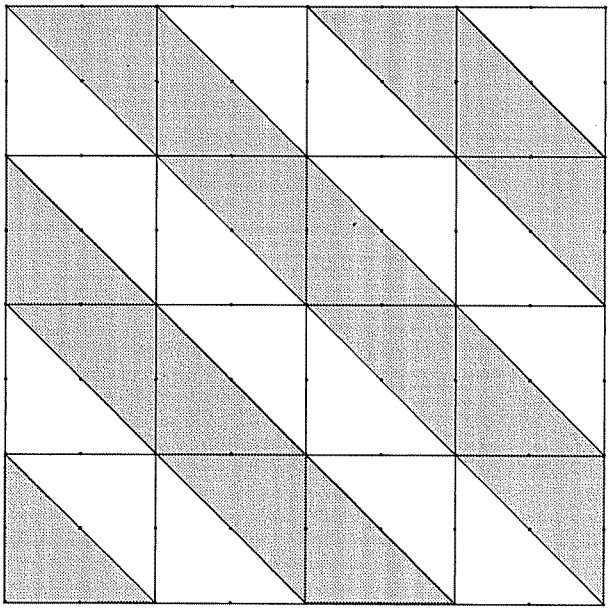
(cut the four squares into triangles)

Draw a core unit that uses some or all of the triangles.

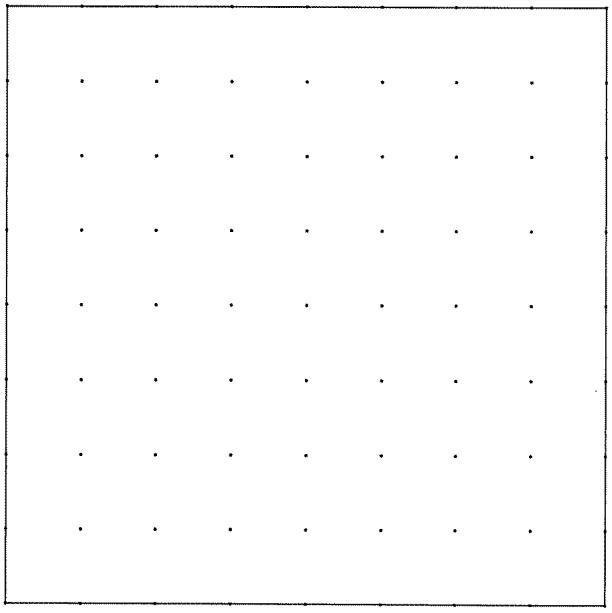


Core Unit





Opposite Stripes

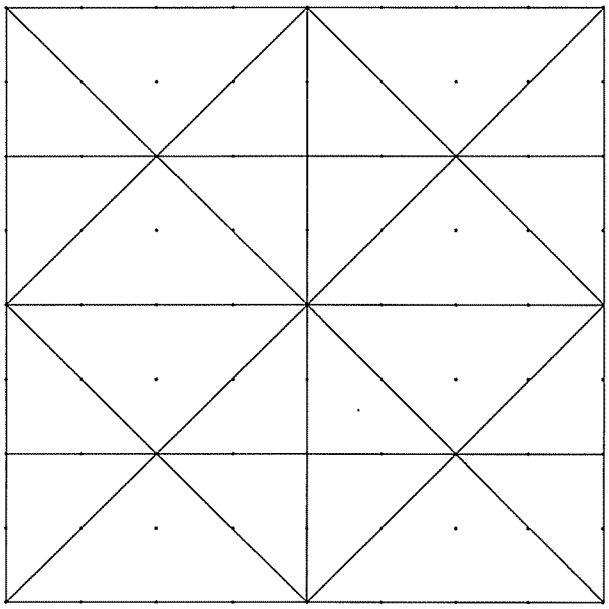


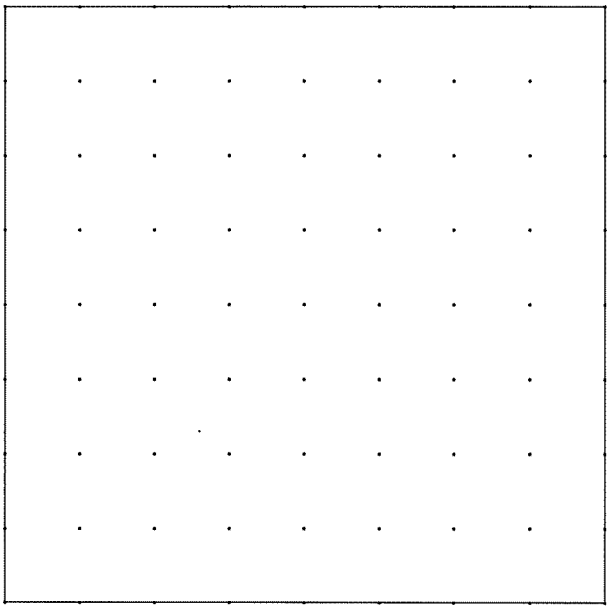
Quilt Journal 6 - Assessment Activity

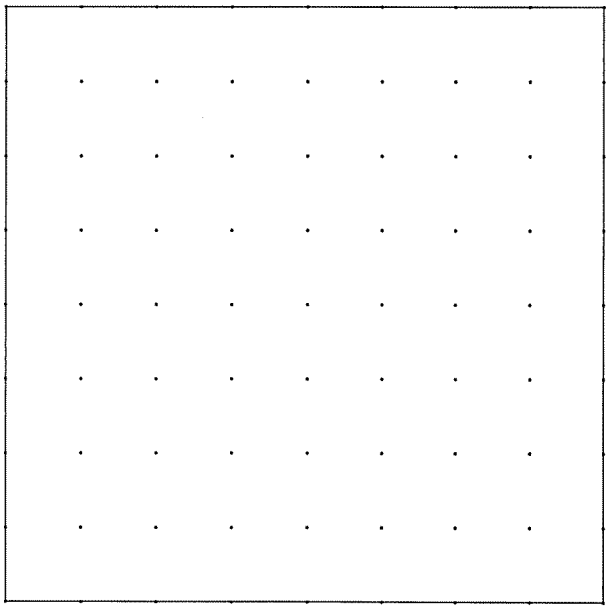
(provide the 8cm by 8 cm background paper, squares and triangles of Journal 5)

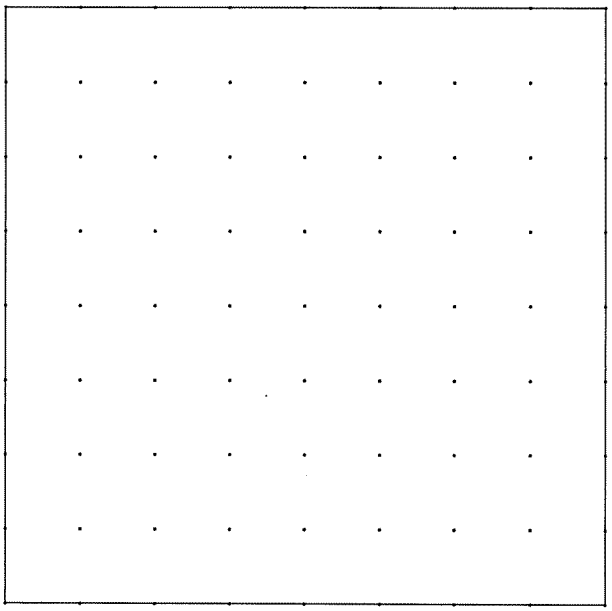
Use the squares, triangles, or small squares and triangles to make a core unit. Make the unit 5 more times. Arrange the core units to make a quilt. Your quilt must have symmetry somewhere in it. On your journal explain what shapes you used in your quilt and how you used flips, slides or turns to make your design.

Give your quilt design a name.









▲ Data Management and Probability Assignment

Group Members: _____

Class: _____

Prediction: _____

Second Choice: _____

Stated prediction in %	/1
Project handed in on time	/2
Reasons given for choice	/3
Logic clearly explained	/2
Predicted result	/3
Predicted runner-up	/2
Predicted one of the four semi finalists	/1
Assignment was word processed	/2
Graphics or charts were used	/2

Comments: _____

_____

_____

_____

Total /15

▲ Data Management and Probability Group Assignment

Overall expectations

- systematically collect, organize and analyse primary data
- interpret displays of data and present the information using mathematical terms

Specific expectation

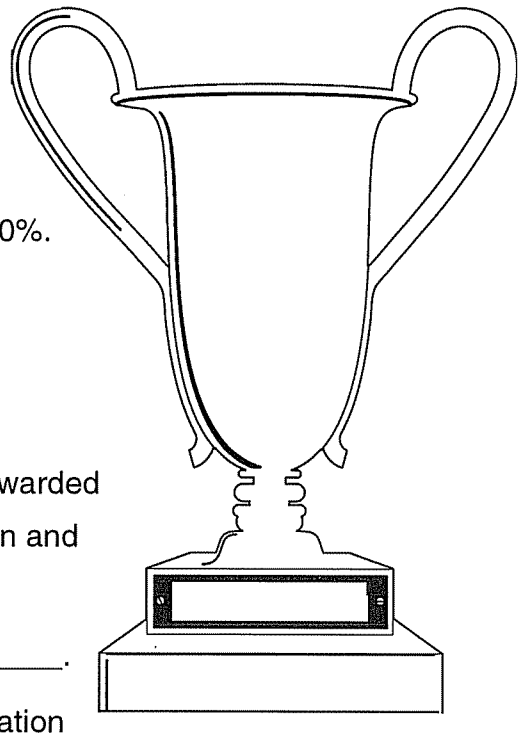
- apply a knowledge of probability in sports

Many popular sports have a regular session followed by a playoff season.

Use your knowledge of probability to predict which team will eventually win the Ontario Championship and represent Ontario in the Memorial Cup Championship.

Work in a team of four to create your prediction. Use your knowledge of the sport, specific knowledge of the playoff schedule, and knowledge of special circumstances (eg. The team's leading scorer out for the first round with a broken finger) to help make your predictions.

Hint: you might want to check the regular season records between specific teams.



State your probability for each team in this year's playoffs to eventually be declared the Ontario League Champion. Remember to state your probability in percent from 0% to 100%.

Identify the factors your group used to make its probability predictions.

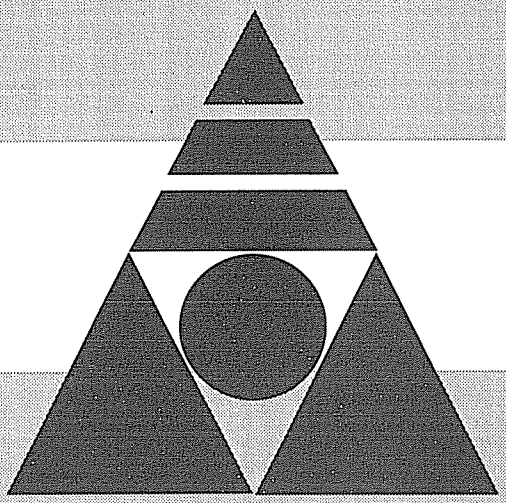
Try to keep your team's prediction confidential.

Prizes (Skittles[tm]) and high performance level rating will be awarded to the most accurate prediction, the most thoughtful prediction and the most carefully documented prediction.

Playoffs begin _____.

Your probability predictions with all accompanying documentation is due _____.

Hint: check out this web site for information. **http://www.ontariohockeyleague.com/**



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which they would be staying while in Kingston at the OMO.

After a brief opening assembly, the mathletes chose one of two 'Getting-to-Know-You' activities: a web-based scavenger hunt or a tessellation creation contest.

The 'web crawl' used was created by Dr. Sallie Paschal, and the full version is available on-line at http://www.dc.peachnet.edu/~spaschal/hunt.html. Some sample questions are listed below:

5. Who was Hipparchus, where did he live, and what was his area of mathematics?
6. Who wrote *La Geometrie*?
9. Who are considered the three greatest mathematicians in history?
10. What are tessellations, and what contemporary name is most often associated with them?
12. Summarize the "Monty Hall" dilemma problem.
14. Provide the formula for calculating wind chill.
15. Who is regarded as the greatest female mathematician?
20. Who invented the slide rule?
21. Name two pre-1800 calculating devices, and their inventors.
24. What is a Pedal Curve?
25. Who was Augustus de Morgan, and what was his contribution?
26. State Pick's Theorem.
30. What is the largest known prime number?
31. What do the variables in "$E=mc^2$" stand for, and whose work was it?
32. Who was the first woman to earn a Ph.D. in mathematics, and from where?
34. Write a new question to add to this scavenger hunt.

The students had a wonderful time searching cyberspace for the answers to these questions, and their results were impressive. 5 points were available for each correct answer, and most scores were in the 80 point range – an impressive feat considering that the mathletes had only an hour in which to complete their web crawl. The winners, with a score of 102 points, were Henry Fang (CHAMP) and Craig Bardeniuk (NOMA). Congratulations!

The students were interested in obtaining more web crawls to do on their own at home, and so we provided them with the following sites as a quality starting point:

http://hydra.educ.queensu.ca/nathsinc/chtmc.html

http://www.lbcc.cc.or.us/math/scavhunt.html

http://www.gallaudet.edu/~pcnmpg12/platonic.html

http://forum.swarthmore.edu/hunt/archive.html

Half of the students created original Escher-like tessellations which were posted on 'Student Street' (the main corridor of the Faculty of Education). The mathletes and coaches voted by secret ballot for their favourite tessellation. The winning entry (shown in Figure 1) was created by Serena Lee from Y⁴MA. The students were given an introductory lesson on modifying by translation or by rotation about the midpoints of the side, and then left to apply their creative and mathematical knowledge.

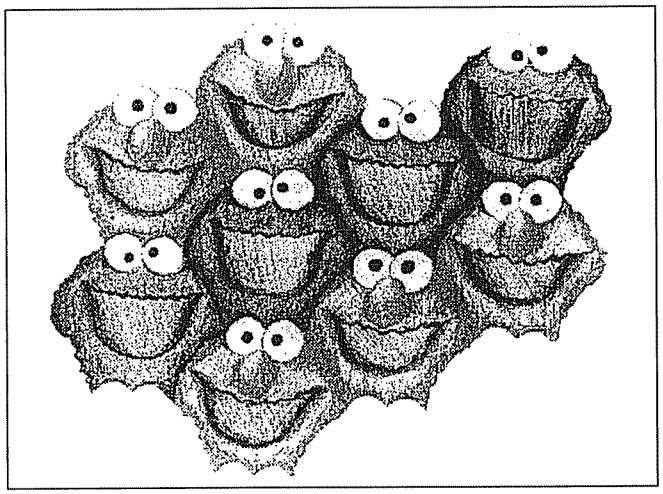


Figure 1. The winning tessellation by Serena Lee of Y⁴MA: MUPPETS.

The students were given resource materials to keep that listed books, software, and websites that they could use on their own to further their knowledge of tessellations. A sample of the websites is included below:

http://www.tessellations.com/

http://www.mcs.net/~highland/tess/tess.html

http://www.ecsu.ctstateu.edu/depts/edu/textbooks/tessellations.html

http://forum.swarthmore.edu/sum95/suzanne/tess.intro.html

http://library.advanced.org/tq-admin/day.cgi

http://library.thinkquest.org/16661/background/tessellations.html

http://www.math.csusb.edu/faculty/susan/tess/eetess.html

http://www.sanger.ac.uk/Users/agb/Origami/Tessellation/tessellation1.html

http://www2.gvsu.edu/~oxfordj/angie.html

http://mathcentral.uregina.ca/RR/database/RR.09.96/archamb1.html

http://forum.swarthmore.edu/sum95/suzanne/links.html

http://library.thinkquest.org/16661/

http://www.geom.umn.edu/software/tilings/

After the tessellation and web-crawl activities, everyone was treated to a pizza and soda social. The energy was high and the enthusiasm contagious!

On Saturday, June 3, after the teams and their coaches had breakfast in the residence cafeteria, each mathlete was presented with an OMO t-shirt, an OAME pencil, a Queen's lapel pin, a Kingston lapel pin, a postcard, and 2 welcome letters – one from the mayor of Kingston, Gary Bennett, and the other from the Dean of the Faculty of Education, Rena Upitis. Each coach received a t-shirt and a coffee mug to provide environmentally-friendly caffeine breaks throughout the day. Every team then had an official photograph taken as a momento of the day. These were provided to the coaches so that they could be used in local newsletters and awards ceremonies.

At 9:00 a.m. the group assembled in the auditorium for an energizing and warm opening ceremony. After the Mayor of Kingston brought official greetings and welcomed our 200 special visitors to Kingston, the group participated in some spirited chanting of 'Math Raps' led by Jan LeClair, a professor of elementary music and dance curriculum at Queen's. The words to 'Math Raps' are from the June 2000 *Mathematics Teacher* and are listed below for your future reference. You'll have to imagine the stomping, clapping, and stepping that accompanied the words – it was a lot of fun as well as being educational! The mathletes asked for clarification about the *We Will Graph You* song – they didn't want to sing without understanding the words!

Math Rap

Dividin' fractions, easy as pie:
Flip the second and multiply!
Multiplyin' fractions – no big problem:
Top times top over bottom times bottom!
When addin' fractions that you see,
Match the bottoms perfectly!

We will Graph You!!!
(to the Queen tune *We Will Rock You!*)

Buddy you're trying to draw the line
For the m and b we're assigned:
Ain't hard to see, put your pencil on the b,
One more point will guarantee that...
We will, we will, graph you! We will, we will, graph you!

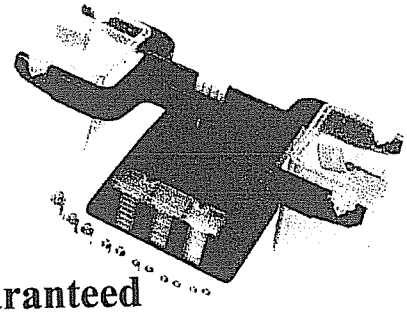
So now you know the y-intercept;
Here's how we find the rest of it:
Up the rise, across for run,
Plot another point and when they're strung, sing...
We have, we have, graphed you!
We have, we have, graphed you!

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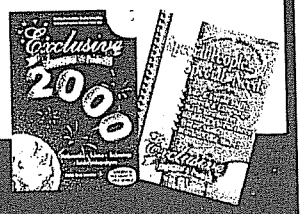


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By 9:30 it was time to move on to the actual OMO events. The first event was a team event (mathematics around the world), and involved paper-and-pencil questions as well as a challenge to build geometric nets from newspaper dowels. The second event was individual (all strands). The third event, a math trail, that took the students outside, was a team event. The day closed out with a pairs event. The questions for the 2000 OMO were designed by a team of teacher candidates from Queen's University. These dedicated beginning teachers not only created the rich and engaging questions, but they also marked the solutions and managed the data input. A few sample questions are included to whet your appetite:

Sample Pair Question (Math Around the World)

Sam Loyd 19th century USA

Using the number tiles that you have, put the numbers in order from smallest to largest by sliding one tile at a time into the blank space.

Make sure that you record your steps!

1	2	3	4
5	6	7	8
9	10	11	12
13	15	14	

Sample Pair Question (Event 4)

A figure is composed of congruent cubic blocks. It has 4 layers. On the lowest layer there are 7 rows of 7 blocks each. Centred on top of that are 3 rows of 3 blocks each. Finally a centre block is placed on top of the entire structure. Then the figure is painted, except for the bottom. How many blocks have 6 painted faces? 5? 4? 3? 2? 1? 0?

Sample Individual Questions

Between noon and midnight, but not counting these times, how often will the minute hand and the hour hand of a clock overlap?

There are 9 red marbles and 10 green marbles in a jar. Chantal plays a game by removing two marbles at a time, with the following rules:

a) if the marbles are both green, she puts one green marble back;

b) if there is one marble of each colour, she puts one red marble back;

c) if the marbles are both red, she puts one green marble back.

At the end, there will be one marble left. What colour must it be? Why?

Sample Team Questions: Math Trail

On 'Student Street' there is a work of art made up of triangular prisms. Each prism is coloured in a pattern of rectangular blocks. As you walk by, you can see different colours in the painting. Find the smallest angle from the wall where you can stand so that you can see all of the colours in this masterpiece!

If the green pillars on the second floor were replaced with square-based pillars, what would the side length be to conserve the surface area of the pillars?

Of course, there was a morning snack, a hot lunch, and more snacks in the afternoon – lots of energy is consumed doing math!

Scattered throughout the two days were activities and competitions for coaches, parents, and supervisors. Participation was good-natured, and high-spirited - the mathletes got great pleasure from watching their coaches struggle with math problems, too!

At 4:00 p.m., Kingston's award-winning Town Crier, Chris Whyman, proclaimed the OMO Awards Ceremony. Dressed in United Empire Loyalist regalia, the Town Crier congratulated all of the mathletes on their wonderful accomplishments, and extended good wishes for their future academic pursuits.

After the Town Crier's proclamation, all teams were invited to the stage. There our sponsors presented each mathlete with a certificate, an official OMO duffle bag, and a copy of the rich and fascinating Hans Magnus Enzenberger novel, *The Number Devil.* A commemorative bookplate was pasted on the inside cover of the book, noting the date and location of the event. Each coach received a binder of resources, including all of the day's OMO events, a certificate of appreciation, and a pen and pencil set.

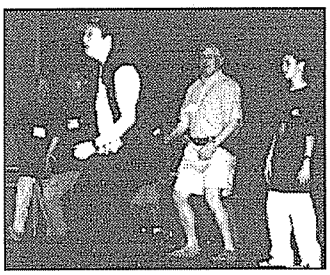
Finally, the Town Crier proclaimed the winners of the OMO – the three top teams! And what a tight race it was! The top 3 teams were separated by only 1 point. The bronze medal winners (Y⁴MA: Daisy Cheung, Adam Lerer, Michael Leung, and Catherine Lim; Coach: Bina Rizzuto) had a score of 301. The silver medal winners (Y⁴MA: Aldous Lai, Serena Lee, Joanna Patterson, and Kevin Yeung; Coach: Lech Biegalski) had a score of 302. The gold medal winners (Pine Ridge: Erik Koopmans, Nikki Shafeeullah, Melissa Sparks, and Stuart Wright; Coach: Mike Roantree) had a score of 303. They were armed with medallions, framed certificates, and for the championship team, the official trophy of OMO. The award recipients left the stage to the enthusiastic cheers of the other participants.

By 5:00 p.m., the buses were pulling out of the parking lot and plans were being made for June 2001 – the next provincial OMO.

That brings me to the point of this celebratory article. It is important for chapters to start planning the trip to Thunder Bay as soon as possible. Local sponsors need to be found and fund-raising events planned so that teams will have the necessary funds to be able to cover the expenses of travel, accommodation, and registration required for participation. Emilia Veltri, an OAME Director and OMO coach, has attended the week-end event every year with a team (in fact, the NWOAME team won the OMO in 1995 at the Scarborough event). Emilia estimates the cost to be $130 per student for 2 days of residence and meals, including the Awards Banquet at Old Fort William. Transportation costs are being negotiated and chapters are reminded to investigate Air Miles, etc. and special group rates on Westjet and Air Canada. The OMO 2001 organizers realize that this is a large task, but one that is very ordinary when you live in North Western Ontario.

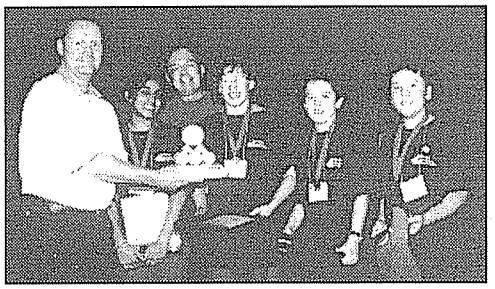
The NWOAME chapter has already started planning the 2001 OMO – they are depending on our support and participation. If local chapters are committed to the principles of the OMO and value its public relations role as an ambassador for OAME and mathematics reform, we need to find ways to work together throughout the school year so that at least 28 teams travel to the home of the *Sleeping Giant* and continue this wonderful tradition.

Photo Gallery

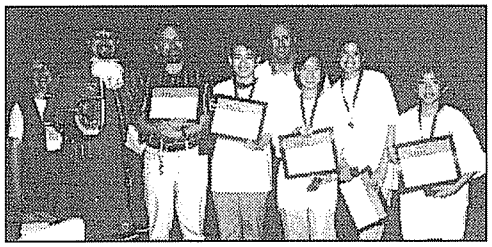




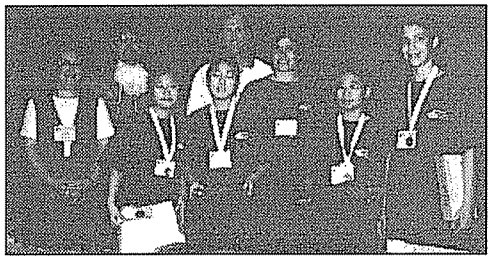
Opening Ceremonies: Math Raps!!!



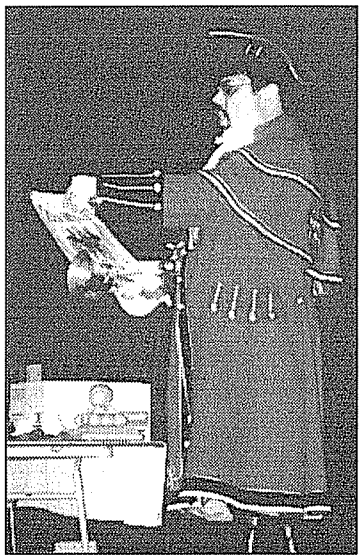
The Champions: Pine Ridge!



2nd place winners: Y⁴MA.



3rd place winners: Y⁴MA.



Kingston's Town Crier Proclaims the OMO!

▲

▲ Photo Math - A New Way of Picturing Math

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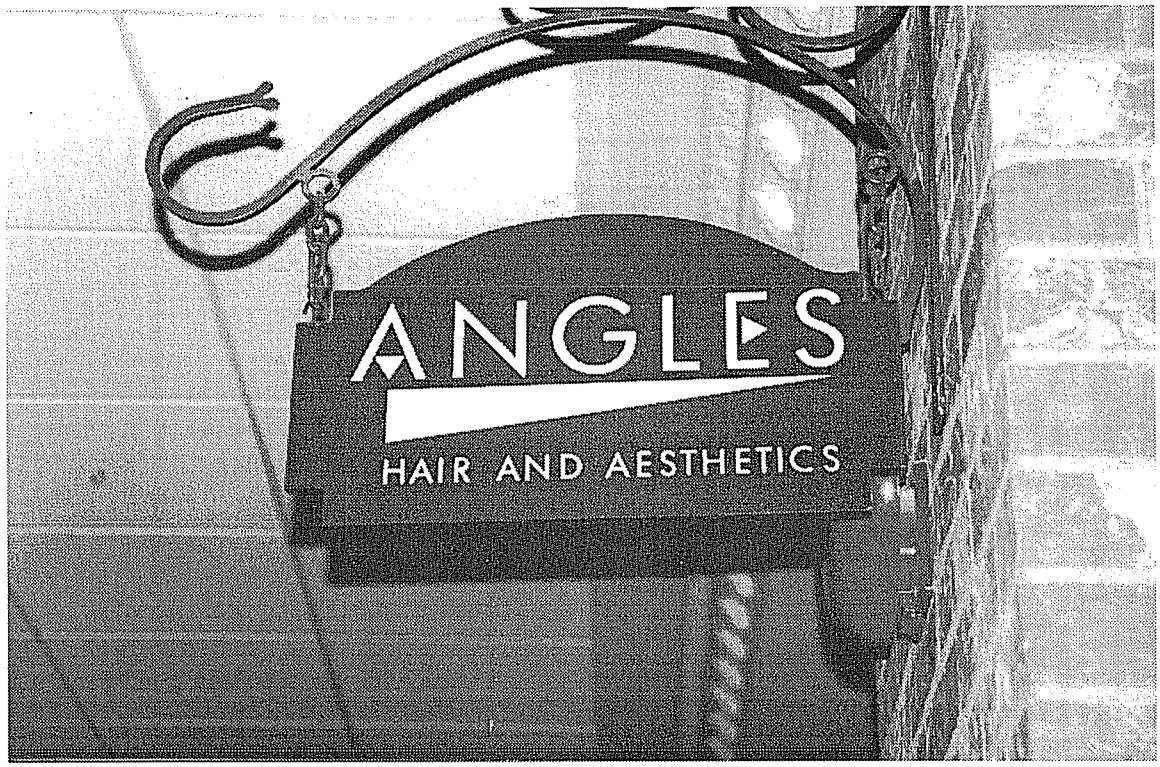


Ron Lancaster is a middle and high school mathematics teacher, currently on staff at the Bishop Strachan School as a mathematics consultant. Ron also works as an Independent Consultant throughout North America and Asia, and is also an Instructor for Texas Instruments.

"A picture is worth a thousand words" is an expression that is often used to convey the importance of using images to make a point. The point of this column is to go beyond this notion and promote the idea that in fact "A picture is worth a thousand numbers". Readers can expect to find photos with math in every *Photo Math* column, and the emphasis will be on seeing and doing mathematics everywhere. Teachers may want to assign these questions to their students as part of an overall effort to make connections between the curriculum and the world around us. Establishing these connections is at the heart of the new Ontario curriculum as well as the new NCTM document, *Principles and Standards for School Mathematics*. It is hoped that these questions will inspire students to be more creative and playful, and that in the end, students will develop an ability to see the world from a different perspective.

Teachers and students are encouraged to pose mathematical questions related to their own encounters, and to submit these problems along with photographs, to the author for possible publication in future columns. The author of this column does not presently have a cable modem, and in order to avoid long periods of downloading items, submissions to this column should be sent via Canada Post to the address given above.

Photograph 1
Outdoor sign for *Angles*, a hair salon in Calgary, Alberta



Question 1

(a) Estimate the size of the angles in the large triangle that appears below the name *ANGLES*.

(b) Use a protractor to measure each of the angles. Compare your results to your estimates.

Question 2

(a) On the photograph, highlight the hypotenuse of the triangle that appears below the name of the hair salon. Measure the other two sides of the triangle to calculate the slope of the hypotenuse.

(b) Explore how your calculation of the slope of the hypotenuse depends on the accuracy of your ability to measure the sides of the triangle.

(c) How could you use your answer to part (a) to find the size of the angles in this triangle?

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Photograph 2
Outdoor sign for *Criterion Restaurant* in Calgary, Alberta



(a) What information is being conveyed by the fraction that appears on this restaurant sign?

(b) Suppose that the owners of this restaurant were to operate three other restaurants under the same name, but each with a different fraction on the sign (see the list given below). If you looked at a map of Calgary, what might you notice about the location of these four establishments?

$$\frac{122}{9} \quad \frac{123}{10} \quad \frac{124}{11}$$

(c) If the numerator and the denominator of the fraction $\frac{121}{8}$ are repeatedly increased by 1, indefinitely, will there ever be a time when the fraction reduces to a positive integer?

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Photograph 3
Private parking sign in Calgary, Alberta



(a) Is there any error in the conversion for the clearance from non-metric to metric units, or has it been done correctly?

(b) Note that 198 is a multiple of 6. For a clearance of 7 feet 7 inches, will the clearance, when converted to cm and rounded to the nearest integer, be a multiple of 7? In general, for a clearance of x feet x inches, will the metric equivalent (rounded to the nearest cm) be a multiple of x?

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Comments and partial answers

In October 1998, I presented a three hour mini-course on Math Trails at the NCTM Western Regional Conference. I began the session by giving a one-hour overview of the concept of a Math Trail, and then I took the 60 participants on a Math Trail that winded its way through the downtown area of Calgary. The photographs used in this column were taken during my stay in Calgary, and some of the accompanying questions were part of the Trail.

I was quite impressed with the architecture of the city, and particularly enjoyed exploring the city via the many elevated and enclosed walkways that join one building to the next. I even had lunch one day at the Vicious Circle (the place was surrounded by circles and triangles everywhere).

Photograph 1 Question 1

The teachers who participated in my Trail were able to measure the angles on another nearby sign. Anyone who tries to measure the angles on the photograph will quickly find that this is not an easy task. In fact, the relative size of the error in making the measurements makes it very difficult to obtain an accurate result. Teachers might want to let their students think about different strategies for obtaining the size of the angles. For example, students could enlarge the triangle using a photocopier, and then measure the angles on this larger image. They might also discover (or remember) a method that makes use of measuring the sides of the triangle (see Question 2 for one possibility of this).

Question 2

(a) Using the image on the photograph, I measured the rise and run and found them to be approximately 0.8 cm and 6 cm respectively. Based on these results, the slope of the hypotenuse is $\frac{2}{15}$.

(b) I have frequently used this question, and most of my students have answered it by simply changing one of the measurements and watching what effect this change has on the slope. They have usually expressed the change as a percentage. Some students have turned this into a small project by gradually changing one side of the triangle while leaving the other side alone. They then calculated how the slope changes. While not necessary, a spreadsheet or the List feature of a TI83 graphics calculator can be used to alleviate the need to do the repetitive calculations (which then moves the focus to the analysis of the change). It is a very good exercise for students to see the effect of measurement errors on subsequent calculations.

(c) Using a slope of $\frac{2}{15}$, and right-angle trigonometry, one of the angles in the triangle can be calculated by evaluating $\tan^{-1}\left(\frac{2}{15}\right)$, and the other angle can be found by using the fact that the two angles add up to 90°. Doing this, I found that the two angles are approximately 8° and 82°.

Photograph 2

(a) The fraction conveys information about the address. The restaurant is located at 121 8th Avenue.

(b) If the streets and the street addresses are equally spaced then the four restaurants would all lie more or less on a line. It would be an interesting exercise to see how street addresses are spread out in a city, and readers are encouraged to submit their research to the author for possible publication in a future column.

(c) One way of tackling this problem is by using a TI83 to create a table of values for the function $y = \frac{121+x}{8+x}$. By scrolling down the table it is an easy matter to search for cases where the result is a positive integer. The set-up and partial results are shown in Figures 1 to 4. It turns out that the only time when the result is an integer occurs when the numerator and denominator have been increased by 105. Here is a question for readers: How could this answer be obtained algebraically? Readers are encouraged to submit their work to the author for possible publication in a future column.

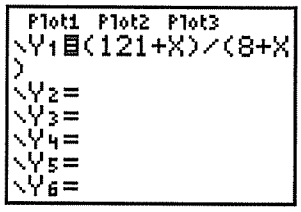


Figure 1

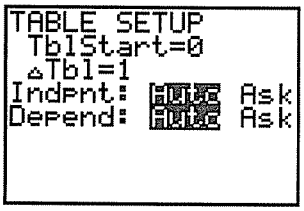


Figure 2

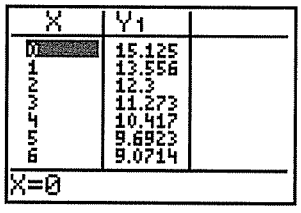


Figure 3

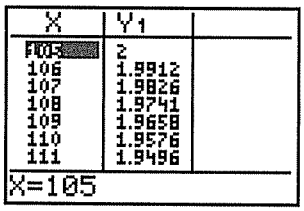


Figure 4

Photograph 3

(a) The conversion has been done correctly (one inch is approximately equal to 2.54 cm).

(b) Here are the results for clearances, starting at 1 foot 1 inch (for toy cars) all the way up to 11 feet 11 inches (for oversized SUVs). In each case, you will find that the clearance, when rounded to the closest cm, is always a multiple of x. Hmmm...Is there a simple explanation for this? Readers are encouraged to submit their work to the author for possible publication in a future column.

feet	inches	parking clearance (cm)	parking clearance (rounded to the nearest cm)
1	1	33.02	33
2	2	66.04	66
3	3	99.06	99
4	4	132.08	132
5	5	165.1	165
6	6	198.12	198
7	7	231.14	231
8	8	264.16	264
9	9	297.18	297
10	10	330.2	330
11	11	363.22	363

▲

▲ News Bulletin: OAME-NCTM Report

FRANCES SCHATZ, 56 OXFORD ST., KITCHENER, N2H 4R7
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EMAIL: FRANCES.SCHATZ@SYMPATICO.CA

Benefits Add Up

The benefits of NCTM membership add up quickly. You get a 20% discount on NCTM educational materials. You help OAME since an additional 20% of sales goes to OAME.

You receive discounts on regional and annual NCTM meetings. For each new NCTM individual membership, OAME receives $5.00US. If you need more information please contact me, your OAME-NCTM representative.

I have a good selection of NCTM Educational materials and special products available to show at chapter meetings, regional conferences, or on prepaid mail order. OAME benefits when NCTM materials are purchased through me. There are still a few copies of Addenda available. These are excellent resources for the new Standards.

Watch the December *Gazette* for a complete report of Canada NCTM Leadership that took place in July, 2000. ▲

▲ OAME 2000 Awards



Photo Lineup: Sitting (L-R): Shari Ross, Bruce Black, Janey O'Rourke. Back Row (L-R): Doug Johnston, Beverly Barkley, Sam Crossman, Suche James, Pat Grew (Dept. Head).

2000 Kenneth D. Fryer Award Recipient: FRONTENAC SECONDARY SCHOOL MATHEMATICS DEPARTMENT (Kingston, ON)

As math teachers, it is our philosophy that we not simply teach mathematics to students, but also how to study math and be successful working as a team. To assist this concept, we create opportunities for students to learn through our tutorial program. Our tutorials are monitored by teachers and senior students at lunch time, evenings during the semester, and also on weekends during exams.

We also encourage students to get help from any member of our department, not just from their own classroom teacher. To maintain consistency in this approach, we team teachers together to teach multiple sections, and mentor younger teachers into the senior math courses. This helps to ensure that everyone teaches all courses, and can assist almost any math student.

Finally, we have created a workroom where all the math teachers have their own desks. The workroom contains a large table where students may sit when obtaining extra help during their spare, lunch, or after school. Most of all, it allows us to be together more often. This offers us the opportunity to discuss our courses, teaching strategies, evaluation techniques, and most of all, get to know each other.

We enjoy teaching mathematics to students. We hope that our enthusiasm rubs off on others, and that students learn the value of working together.

2000 Morley MacGregor Award Recipient: MARGARET KEMP (WOMA member)



I look to OAME to give me opportunities to network with other math teachers, and thereby gain insights into teaching. We should always be looking for ways to include manipulative materials when presenting core curriculum, remedial, and enrichment activities to our students. I believe that the Ontario Mathematics Olympics is an excellent enrichment opportunity for our grades 7 and 8 students, and I have coached and accompanied teams since OMO's inception in 1995.

2000 Don Attridge Award Recipient: MYRNA INGALLS



I am thrilled to be the 2000 recipient of the "Don Attridge Award". Don and his offer of a 1/3 timetable lured me back into teaching in 1977, after my first 'retirement'. He acted as my mentor, and was instrumental in my becoming connected to the larger mathematics community. I have had the privilege to work on many exciting projects lately. Each project has demonstrated, again, how important it is for us to network and support each other as we move forward.

My position as creator and co-chair of the C.A.R.E. package project, developing materials **C**oncerning **A**ssessment and **R**eflective **E**valuation, has allowed me to work with leaders in assessment implementation, refine my thinking on the criteria needed when assessing learning, and to formulate my next stages for professional growth. Our materials will be used in OTF Summer 2000 Institutes, and will be made available on the OAME website.

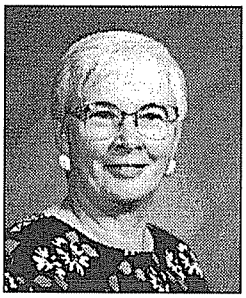
In my role as Project Leader of the grades 9 and 10 Public Mathematics Course Profiles, I was reassured that the future of mathematics education in this province is in good hands, judging by the talent and dedication of our younger team members. We more senior members of the mathematics community must continue to nurture and encourage our younger colleagues.

As chief writer, reviewer, and contributing editor of the grades 11 and 12 policy documents, I learned how divergent peoples' opinions can sound, yet how much they can share as a philosophical base. New vocabulary is often the key; something that sounds new, might in fact, be something with which we are very familiar. In times of rapid change, it is necessary to learn new vocabulary to discuss our issues and our concerns, and to explain our triumphs.

As workshop leader and speaker, I have heard the joys, challenges, and frustrations of a large number of high school teachers, schools, and boards. It is a time when we need to draw together, share our ideas and resources, try new things, and identify and preserve the best of the old.

I am looking forward to the challenges of implementing the new grade 10 courses, improving our grade 9 program, and preparing for the 11's and 12's. If we reach out and help each other, I think we can make significant motion forward. I so hope that we will not let ourselves get dragged down by political concerns. I know that it will be tough, but let's try to achieve what we know we, and our students, are capable of achieving. I have been so impressed with my students' abilities to rise to challenges, to think critically, to work at self improvement, and to teach me things I didn't know about TI83+'s and the Geometer's Sketchpad!

2000 Life Membership Award Recipient: KAYE APPLEBY



I feel incredibly lucky to have spent a significant part of my life involved with young people. They were a constant source of joy, challenge, and opportunity for me. In the midst of all the requirements of daily work, I did not always pause to appreciate the responsibilities that teaching ensures – we always have an effect on students, and so we must be as sure as possible that it is a positive effect.

Thanks to all the wonderful colleagues across the province who have shared with me over the years. As I continue involvement in a variety of projects (Profiles, Resource preparation, Althouse instruction), I hope to maintain contact.

2000 Mona MacGregor Award Recipient: PENNY CLEMENS



It is a pleasure to be recognized as a contributor to mathematics education even though I am not a teacher. Just knowing that I have a positive role amidst some very talented educators really makes my efforts feel worthwhile.

However, the real credit should go to those of you who take the time to submit articles and to the editors who pull it all together – I really enjoy making your work look good!

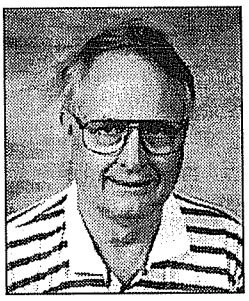
▲ 1999 OAME Awards Update

"Jack Weiner, past editor of the Ontario Mathematics Gazette, *writes, 'I humbly apologize for inadvertently omitting two important items from last September's OAME 1999 awards page: the photo of the K.D. Fryer award winning mathematics department at Dr. Dennison Secondary School, and a quote from past OAME president, Mickey Sandbloom, the 1999 Mona MacGregor award winner. I ask that these be included in this issue to properly honour these wonderful teachers. I also apologize for splitting the previous infinitive!'"*



1999 K.D. Fryer Award: DR. DENNISON SECONDARY SCHOOL MATHEMATICS DEPARTMENT (Newmarket, ON)

Left to right: Ted Cowan, John Lam, Joseph Zicaro, Shirley Dalrymple, Imtiaz Damji, Ross Ballantyne, Susan McCombes, Chin Trinh, Robyn Waggoner, Elizabeth Mewhinney.



1999 Mona MacGregor Award Recipient: MICKEY SANDBLOOM

Being honoured by OAME with presentation of the Mona MacGregor Award is the culmination of more than 20 years of rewarding effort and comradery. Many events and activities were highlights over these years, and I would like to briefly discuss two of them.

My first experience with OAME took place when Doug Henderson sent me off to Leadership in 1977. On our arrival at the Ascot Inn, Bunny and I made our first acquaintance with two wonderful people, Mona and Morley MacGregor. Unfortunately, there was not enough room at the Inn, so we had to stay at another establishment. While I registered with Morley, Mona proceeded to make arrangements to bring Bunny over to the Inn for the social events so that I would not have to miss any sessions. As we left, we wondered whether these people were for real. Time proved they were, and they became not only friends, but my guide and mentor as I proceeded through my years with OAME. In fact, it was Morley who in his own way convinced me that I should run for president of OAME.

For a supporter and lover of mathematics, being elected as president of OAME, the organization for the province's mathematics educators, was an ultimate honour and one that still leaves me feeling very humble. The opportunity to work with, and for each of you, is an experience that I shall cherish the rest of my life. The support and help I received from so many of you will never be forgotten. Thank you to all members of OAME for the privilege you gave me. ▲

"In most sciences one generation tears down what another has built and what one has established another undoes. In mathematics alone each generation adds a new story to the old structure."

(Hermann Hankel)

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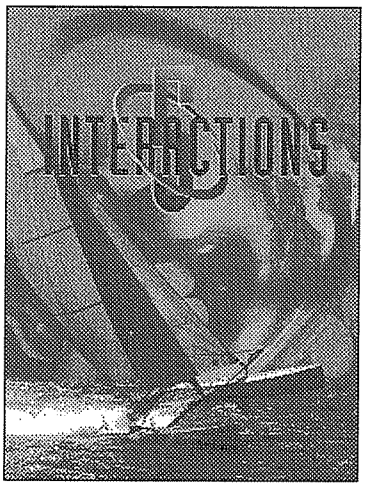
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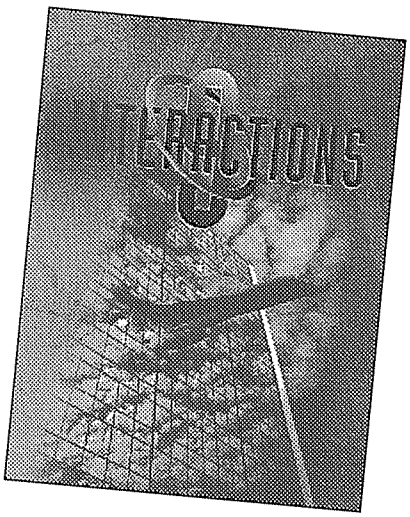
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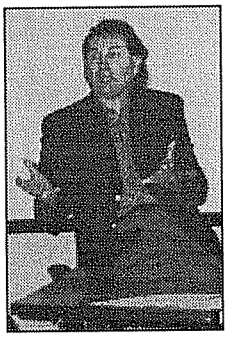
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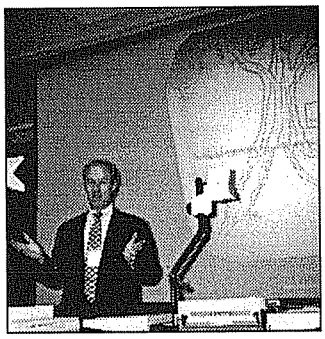
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▲ 2000 OAME Conference Pictorial

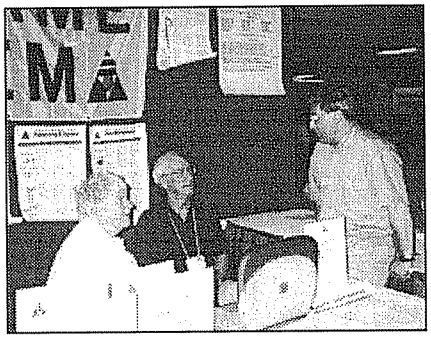
PHOTOS COURTESY OF LOUIS LIM
MAY 11 - 13, OTTAWA, ON



*LEFT: **Ron Lancaster**, the only Canadian writer involved in NCTM's new* Standards and Principles for School Mathematics, *shares his thoughts about the impact of the document in Ontario.*



*LEFT: **Dan Kennedy**, from Chattanooga, Tennessee, shares his NCTM award winning article,* "Climbing Around on the Tree of Mathematics".

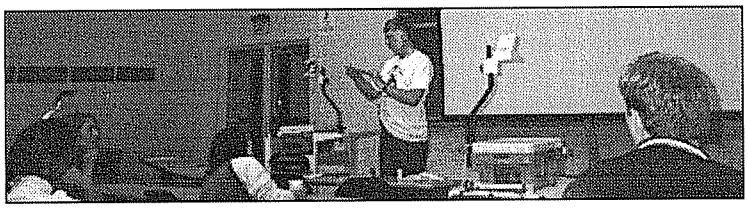


*ABOVE: Former OAME president, **Barry Onslow**, takes time out of the conference to speak with Executive Directors, **Bonnie** and **Dave Alexander**.*

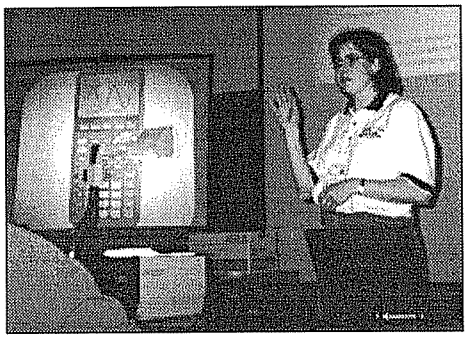


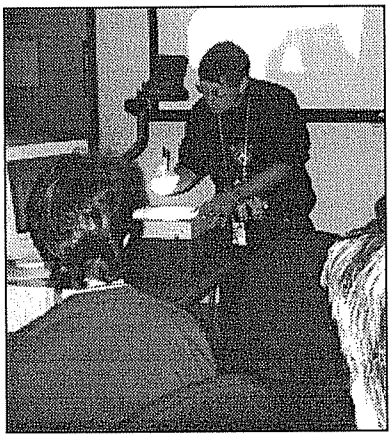
*LEFT: **Nick Jackiw**, creator of the* Geometer's Sketchpad, *receives a token of appreciation from **Sandy DiLena** for his "Dynamic Manipulation of Mathematics" presentation.*

*BELOW: Author **Ivars Peterson** shares his new book,* "Math Trek: Adventures in the Math Zone".



*BELOW: **Mary Bourassa** introduced participants on how to create and modify simple programmes using the TI-83.*

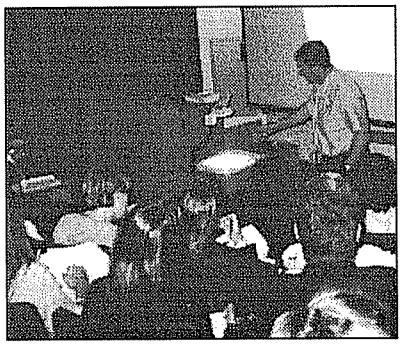




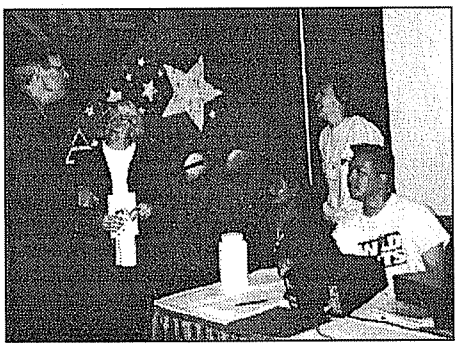
*LEFT: **Jack Weiner** energized his audience with Newton's Method and the Bisection Method using MAPLE software.*

*BELOW: NCTM rep, **Frances Schatz** and her husband, **Frank**, were busy throughout the conference selling NCTM materials.*



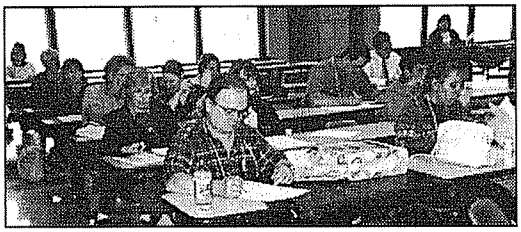


*ABOVE: **Murray Major** shares his "Pot-pourri of Good Teaching Ideas" to a packed audience.*



*ABOVE: **Sumintra Koowar**, **Kirsten Boucher**, and **Alan Chan** promote OAME'2001 hosted next year by SAME in Scarborough.*

BELOW: Participants at the OAME conference take in some professional development.



▲ Directors' Dialogue



MARILYN HURRELL, NWOAME
LAKEHEAD DISTRICT SCHOOL BOARD
THUNDER BAY, ON
MHURRELL@ALUMNI.LAKEHEADU.CA

This edition of the "Directors' Dialogue" summarizes the Saturday, June 17, 2000 OAME Board of Directors' meeting at the Four Points Hotel in Mississauga.

Congratulations to the newly elected directors, Gord Cooke, Christine Suurtamm, John Rodger, and Dean Murray, and to the new chapter representatives, Irene McEvoy, Ron Gaudreau, Wendy Gallant, and Lisa Abernethy.

PRESIDENT HOWE'S MISSION STATEMENT

Mary Howe outlined plans for her year as president of OAME. She said that OAME will continue to assist teachers as they anticipate the new curriculum in grades 11 and 12, work with grade 9 assessment, the new grade 10 programs, and provide materials for grades JK to 8. OAME will continue to be a strong partner with OMCA, OTF, and the Fields Institute. OAME will provide workshops on assessment, work with EQAO, and aid teachers with provincial assessments.

EXECUTIVE DIRECTORS' REPORT

Bonnie Alexander reported that the OAME'2000 conference in Ottawa attracted 411 new members. However, there were 518 who did not renew, and she and Dave have asked chapter reps to encourage these people to renew their membership. Bonnie will be sending out reminder cards.

Bonnie went over the list of OAME resources still available (check these with your chapter rep), and noted that she and Dave have mailed 11 638 items from their basement! Dave sat out the meeting due to a doggone mishap!

PROFESSIONAL DEVELOPMENT

NCTM: Frances Schatz congratulated **Louis Lim**, recipient of one of six FLAMeS awards from NCTM. Louis attended the NCTM conference in Chicago as a guest of NCTM. He was the only Canadian recipient of an NCTM award. Congratulations from all of us! Frances reminded OAME members to order NCTM materials through her, as you save 20%, and OAME receives a 20% rebate. Frances and her husband Frank are available to set up displays at chapter meetings and workshops.

OTF: OTF will host Summer Institutes at 18 sites across Ontario. OAME and OMCA will provide materials for the math sessions. OAME requires a new OTF rep.

FIELDS INSTITUTE: Peter Saarimaki reported that the Fields Institute held meetings with math educators in universities, colleges, businesses, the Canadian Math Society, and from the Ministry of Education. They are looking at the impending shortage of math teachers in Ontario over the next few years. Ed Barbeau noted that the Fields Institute is also looking at articulation between grades 11, 12, colleges, and universities to be sure that they are all on the same wavelength.

OAME 2000: Peter Lenczewski reported that the conference was a success, with sellout attendance. On-line registration was a good idea. Ron Gaudreau stated that a final report will be submitted at a later date.

OMO 2000: Gord Cooke reported that 28 teams took part in the provincial math olympics in Kingston at Queen's University. The top three finishers were from Pine Ridge, and two teams from Y⁴MA. A full report will be sent to the Executive.

Leadership 2001: Mary Howe announced that a flyer has already been prepared to advertise the Leadership Conference from February 22-24, 2001. The theme is "Looking at Mathematics", and the format will be four workshops covering grades 4-6, 6-8, 9-10, and 11-12.

OAME 2001: Kirsten Boucher reported that SAME is well-organized and looking forward to hosting the annual mathematics conference.

OMO 2001: NWOAME is gearing up to host the provincial olympics to be held in Thunder Bay June 10, 11 and 12, 2001. Several chapters have already declared that they will send teams. A concern is the cost of travel. Chapter reps are asked to appoint a contact person and share fund-raising ideas. Y⁴MA charged a $5 fee for their mini-conference, with proceeds going to their OMO 2001 fund. Air Miles tickets are another option. Organizers have promised to look into air travel packages, and report at the September board meeting.

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COMMITTEE REPORTS

AWARDS: The following were award winners at OAME 2000: Life Membership, **Kaye Appleby**; Mona MacGregor Award, **Penny Clemens** (*Gazette* Graphic Designer); Morley MacGregor Award, **Margaret Kemp**; Don Attridge Award, **Myrna Ingalls**, and Kenneth D. Fryer Award, **Frontenac SS** in Kingston. Congratulations to all of you!

FUTURES/PROMOTION: These two committees have been joined. Wayne Fletcher has put together a 'Communications Kit' for use by chapters to promote activities. In the current climate, teachers need to promote themselves by letting parents and the public know what we do both in and outside the classroom.

The OAME brochure has been rewritten by Ian Robertson. Some boundaries of chapters are difficult to define with the restructuring of boards. Two motions were sent to Executive, dealing with a return to the four meetings per year format, and increasing rebates to chapters.

MATH EQUITY: Emilia Veltri reported that 80 people attended the Equity Breakfast at OAME 2000. The speaker, Dr. Julia O'Sullivan of Lakehead University, was well received. The format for OAME 2001 may change, with the breakfast equity being scheduled as a workshop session.

PUBLICATIONS: Jack Weiner reported that the September issue of the *Gazette* is ready to go, while the December issue is underway. Louis Lim, Co-Editor of the *Gazette*, pointed out that the reviewers' list has been thoroughly revised, and a new column called '*Photo Math*' featuring Ron Lancaster and his travels, has been added. Louis praised Jacqueline Hill's excellent activity on page 12 (June 2000 *Gazette*) to encourage others to submit classroom ready activities to the *Gazette.* Congratulations to Frances Schatz for her 5 years as the *Abacus* Editor! Articles and classroom activities are needed for the March 2001 issue. Doug Evans will continue to maintain the OAME web site. Jack also drew attention to the many excellent advertisers in the *Gazette* who deserve our support.

CURRICULUM/POLICY COMMITTEES

JK - 5: Laurie Moher will send information re: this committee to the OAME web site.

Gr 6-8: Geoff Roulet outlined a project to link grades 6 to 9 to show continuity. The commitee will submit an article to the *Gazette,* and will produce a document.

Gr 9-10: The former Secondary Committee has split into two committees to deal with the numerous issues surrounding the new curriculum. Chair John Rodger, of the grades 9-10 committee, outlined the C.A.R.E. (**C**oncerning **A**ssessment & **R**eflective **E**valuation) package. They will send an e-mail to chapter reps on how to distribute and use it, along with how to conduct workshops in each region (this will be one of the OTF Summer Institute topics). Up to $100 per workshop x 3 workshops will be subsidized. Profiles will be written for each of the three grade 9 textbooks. This committee will also produce some materials for the grade 9 EQAO assessment.

Gr 11-12: Chair Myrna Ingalls outlined tasks for this committee. They will see the continuation of the C.A.R.E. package, focusing on assessment using rubrics. They will outline a balance between assessment and instruction, and gather materials for the three grade 11 levels. Scaffolding will be an issue. They will highlight the differences between the grade 11 college and grade 11 work/college streams. Irene McEvoy will e-mail all chapter reps, and gather materials for all three courses.

CHAPTER NEWS

CHAMP: Rep Irene McEvoy. CHAMP sent three teams to OMO 2000 in Kingston, and they plan to send two teams to OMO 2001 in Thunder Bay. A Mathfest is planned for the fall featuring PD sessions and dinner for JK - OAC teachers. CHAMP contests are planned for grades 7-11 in the fall for all schools that have CHAMP members.

COMA: Rep Ron Gaudreau. Judy Crompton presented a very informative session on May 25 describing the Math Menu and its implications for students and schools. In attendance were guidance counsellors and school administrators as well as math teachers. The session provided understanding of the Course Menu that is needed to help schools make informed decisions on course offerings and selections. Thanks, Judy! The COMA AGM was held on May 29.

GOLDEN: Rep Elizabeth Pattison. On April 5, GOLDEN held a mini-conference for elementary school teachers on assessment and evaluation, manipulatives, and the strands. On April 6, they held a secondary mini-conference with more than 175 attendees. Myrna Ingalls was the keynote speaker, and workshop leaders were Dave Zimmer, Peter Harrison, and Marg Warren. Frances Schatz put up an NCTM display. After the workshops, a buffet dinner was held courtesy of the Dean of Math and Science at Brock University. GOLDEN sent teams to OMO in Kingston; thanks to the organizers for a job well done!

GVMA: Submitted by Dean Murray. The upcoming fall conference is planned for Thursday, November 2 at Eastwood Collegiate in Kitchener. Congratulations to Doug Irving, Math Chair at Waterloo CI and long time GVMA Councillor, on receiving a University of Waterloo Descartes Medal. Murray McLennan, GVMA Councillor for Huron and OAME Chapter Rep, retires from teaching at the end of June. GVMA thanks Murray for the outstanding work he has done for the chapter. He will be hard to replace!

ISOMA: Rep Ian Robertson. ISOMA's Math Olympiad ran this Spring, organized by Garth Bragnall of Upper Canada College. Teams were selected and sent to OMO 2000.

A number of ISOMA members made presentations at the OAME conference in Ottawa, particularly in the use of technology. The ISOMA web page is maintained by Peter Thompson of Appleby and has links and articles on math and technology. In addition, a new feature aimed at improving communication and networking has been the formation of an "e-group" http://www.appleby.on.ca.

MAC^2: Rep Lisa Abernathy. A spring conference and AGM held on April 12 were well attended. Plans for the upcoming year include a web site, a database of members and e-mails, a newsletter per term, along with spring and fall conferences. MAC^2 has agreed to host the OAME 2002 Conference. A site is being sought, probably nearer to Toronto as Georgian College does not have the space. A busy chapter!

NOMA: Rep Carol Lemmon. Jerry Maloney has retired, and NOMA is going to miss his valuable contributions. Thanks for all your years of hard work with NOMA and OAME, Jerry!

Three teams were sent to OMO in Kingston. Plans are underway to highlight OMO 2001 in Thunder Bay at our fall conference with a promotion booth. The fall conference will be held in Sudbury from October 13 and 14, 2000.

NWOAME: Rep Wayne Fletcher. NWOAME held an AGM on May 2. Marilyn Gouthro, Director of Education with the Lakehead District School Board, was the

keynote speaker. She reaffirmed that mathematics is a priority with the board, and that LDSB is supportive of all that NWOAME does. Marilyn Hurrell and Wayne Fletcher were acclaimed co-chairs of OMO 2001. NWOAME sent one team to OMO in Kingston. On June 9, the 27th NWOAME - Lakehead University Math Awards Day was held at Lakehead University with over 150 students and teachers in attendance. Students attended workshops until 11 am, then received certificates and ate pizza before returning to their schools for the afternoon. This year, students from the Gauss Contest were also invited.

PINE RIDGE: Rep Jacqueline Hill. Our "Time for Math" conference brought rich mathematics to 370 math educators. Our AGM will be held in November of this year. We continue to send our top two teams to OMO. Pine Ridge stated interest in hosting the OAME annual conference in the near future.

QSLMA: Rep Wendy Gallant. This chapter did an amazing job hosting OMO 2000 in June. Twenty-eight teams (112 students) competed, and the top teams came from Pine Ridge and Y^{4}MA. Winning totals were close: 303, 302, and 301. Cindy Harvey, Joan McDuff, and Lynda Colgan are to be congratulated! QSLMA plans a re-organizational meeting in September. Gord Cooke is available to sing at chapter meetings and mini conferences!

SAME: Rep Kirsten Boucher. The AGM was held in May with the induction of seven new councillors. A fall mini-conference is planned for October 24 at Maplewood HS in Scarborough, "Googols and Ghouls". After that, SAME will focus its energies on the OAME 2001 Conference from May 9-12, "A Math Odyssey". The Fencott Award recipient was Christina Kahn, a student from Borden BTI.

SWOAME: Rep Frank Di Pietro. SWOAME held a Dinnerlude on May 29, featuring guest speaker Judy Crompton. SWOAME sponsored two teams to OMO 2000 in Kingston. Next year, a local olympics will be held to generate interest in the OMO. Ron Lancaster will hold a T-Cubed Institute in Windsor this summer.

TE^{2}Y^{2}MS: Submitted by Anne Cirillo. On March 4, a local OMO was held with 98 student participants. From these, 16 students were invited to a practice session on May 23, and 12 were selected to go to OMO in Kingston. While they did not place in the top three, they had fun, did some math, and made friends with SAME and Y^{4}MA students who shared the bus. The chapter is currently working on a newsletter to promote OAME and their chapter.

WOMA: Rep Linda Alton. This spring, WOMA hosted a series of workshops titled "Millennium Grade10ium" on three Thursday evenings. Myrna Ingalls was the workshop leader, and she was excellent. She took participants through the Profiles for grade 10, and gave practical ways of assessing students while maintaining one's sanity. WOMA is very proud to have two members receive OAME Awards: **Kaye Appleby** was the recipient of the Life Membership Award, and **Marg Kemp** received the Morley MacGregor Award for her many years of promoting excellence in mathematics in elementary schools. This is WOMA's 10th anniversary, and an anniversary edition of the *SinePost* is available from the WOMA executive.

Y^{4}MA: Rep Rosey Mastrofrancesco. A successful math olympics was held on April 13 at three locations. From these, three winning teams travelled to Kingston, and placed second and third overall. The chapter plans to support OMO 2001 in Thunder Bay and to fund-raise for this event. The cost is about $500 per student. Y^{4}MA will send three teams to the Northern Odyssey. The fall conference will be held on Thursday, October 19 at St. Elizabeth CHS, with the theme, "Connecting Math to the Learner's World: The Art of Thinking".

CLOSING REMARKS

Just at press time, I received a correct answer to the question posed in the last edition of DD: "Who was the original writer of DD (called Council Comments)?" Well, after she dug through some old *Gazette's*, **Joanne Harris** from Halton came up with the correct answer, Bob Robinson. Congratulations, Joanne! You win (something)!

Now for this edition's question: Name, in descending chronological order, 5 female presidents of OAME before Mary Howe.

It will be September when you read this. I hope you had a good summer, and return to your duties with fully re-charged batteries!

Marilyn ▲

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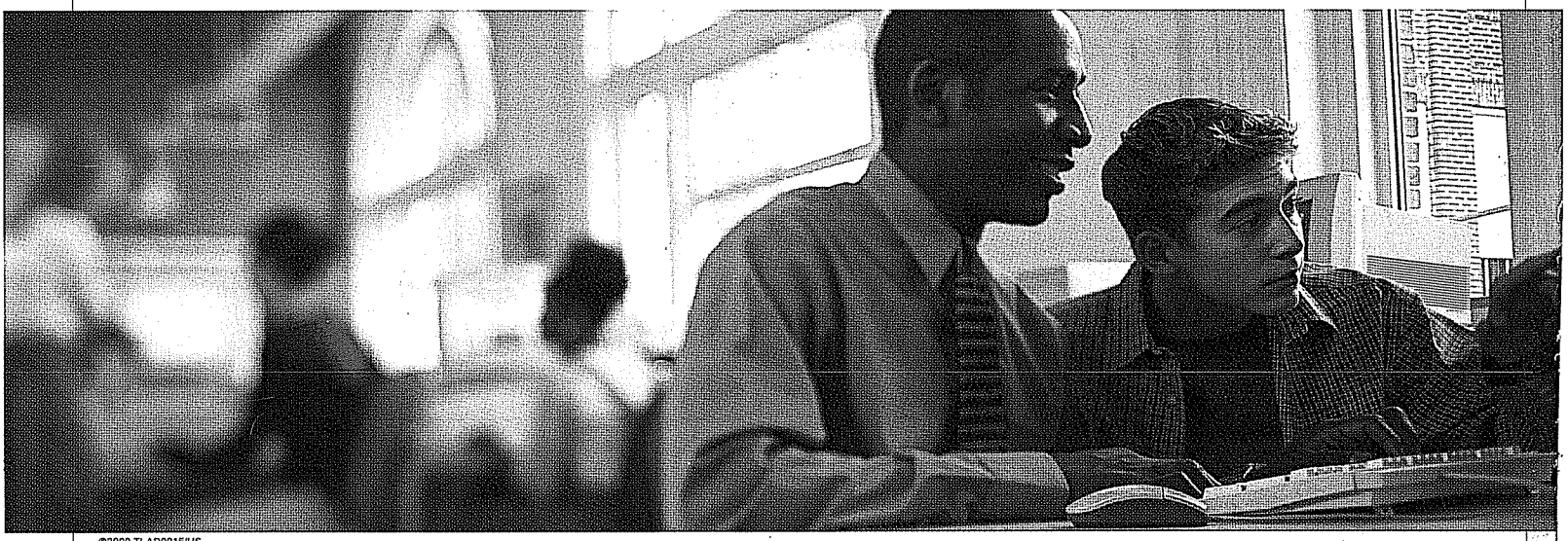
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