Vol. 36 #1, September 1997

Ontario Mathematics Gazette

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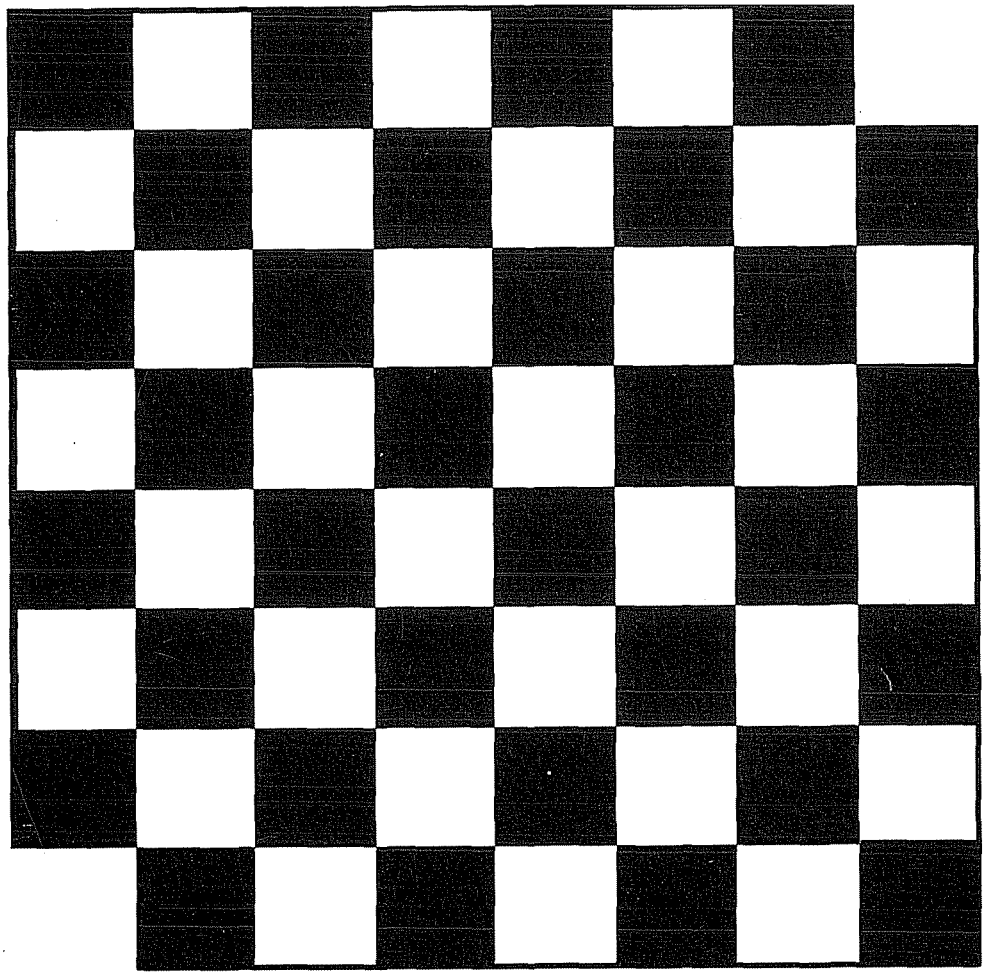
What's Old and What's New:
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You are given a set of dominos each of which can exactly cover 2 squares of a checker board. 32 dominos will cover completely an ordinary checker board. Is it possible to cover every square of the illustrated checker board with 31 dominos? Give a proof for your answer.

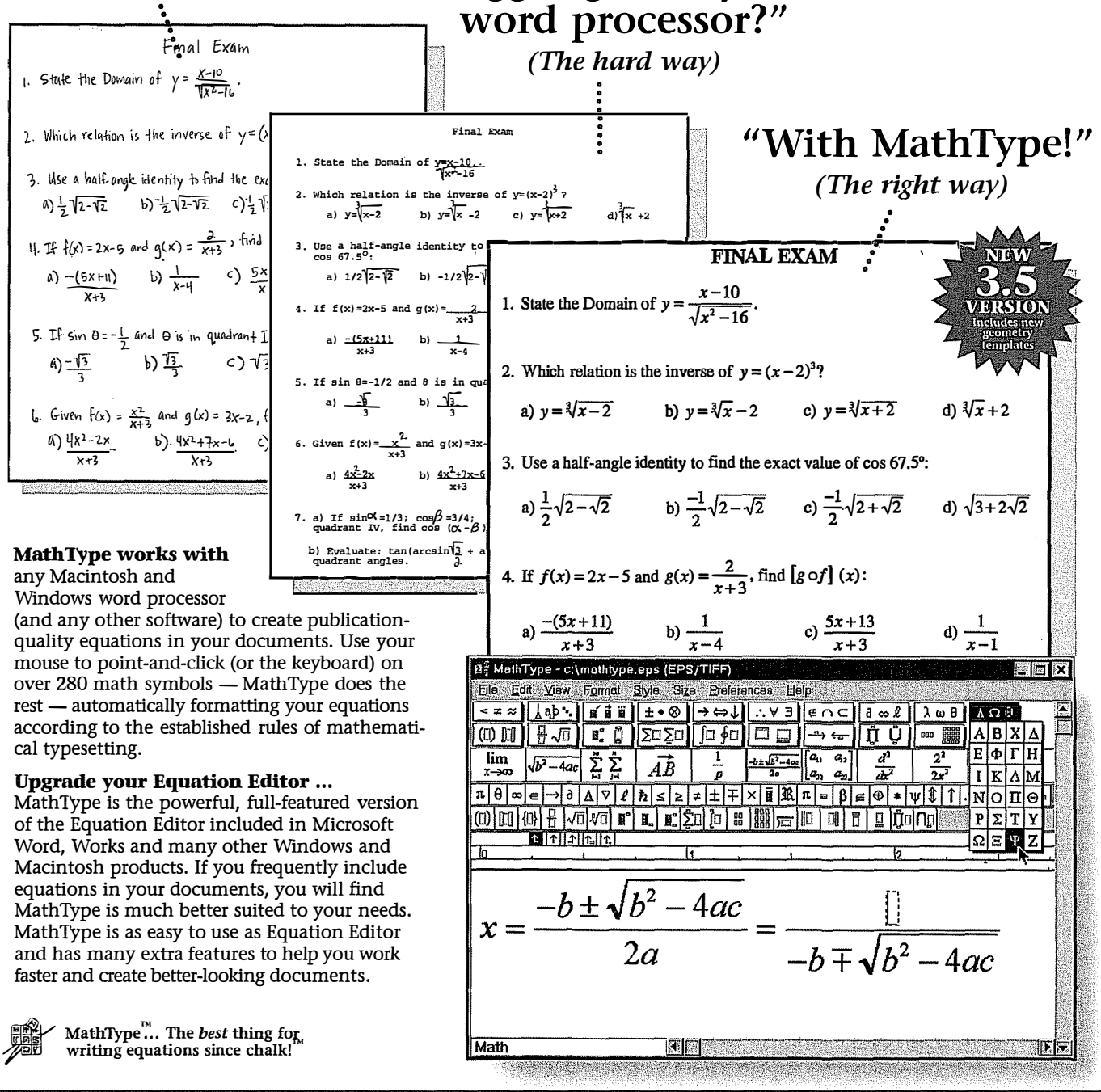
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The Gazette—ISSN 0030–3211—is indexed in the Canadian Education Index and is published four times per year. Its Canadian Publication Mail Product Sales Agreement Number is 601349.

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Deadlines for information to be included in the Gazette or the Abacus are: June 15 for the September issue, October 15 for the December issue, January 15 for the March issue, and April 15 for the June issue.

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▲ Editorial



As we begin a new school year it is important to look at ideas that will help us to make use of the renewal brought on by our summer vacation. The articles in this issue try to do this. Our president, Judy Crompton, sets the stage in her message to us. Susan Stewart in ***What's Old and What's New*** outlines the changes in the grades 1-8 mathematics curriculum. For those of you interested in using the World Wide Web, Eric Wood has given hints in ***The Top Ten Free Software Picks***. Teachers who want to begin to prepare for mathematics contests will find assistance in Tom Griffiths article ***Math Contests Grades 7 to OAC - Getting Underway***. John Grant McLaughlin returns with ***About Problem Solving - Making a Case for Multiple Solutions***. Suggestions for geometry in elementary school are contained in Ann Anderson's article ***Using Paper to Learn about Geometry***. Our final article from the Ontario Women's Directorat entitled H***ow Hard Can It Be - Resources for the Future Education of Girls and Young Women*** gives resources that will help encourage girls and young women to pursue a career in certain mathematically oriented areas. Please do take time to read the ***Letter to the Editor*** that comments thoughtfully on my definition of a good mathematics teacher contained in my editorial of June, 1997.



▲ Letter to the Editor

Dear Editor :

In your editorial in the June 1997 issue of The *Gazette* the following statement caught my attention: "A student with a gift for mathematics can learn from any mathematics teacher, good or bad, but EVERY STUDENT can be successful when taught by a good mathematics teacher."

I believe that this statement is not only hardly true, but it can be harmful. I once met the head of a math department who was proud to assign the least competent teachers the task of teaching the classes with the brightest and the most motivated since the strong students would SUCCEED anyway. Succeed to be bored by easy and mostly meaningless drills that will award them a 95% average? Succeed to lose their edge? Succeed to go through high school without discovering the soul of mathematics and without experiencing the thrill of a good problem?

At the same time, in a world where a party is pleased to get 53% popular support, the top baseball teams win "only" about two thirds of their games and the Beatles had less than a quarter of their songs make it to the charts, claiming that "good" math teachers can make EVERY STUDENT SUCCESSFUL sounds extremely ambitious. In teaching, politics, sports and the arts, success depends too much on human nature to allow anyone to be "perfect".

The expression "successful in the math class " itself is open to interpretation. Do we measure the "fun" the student has? We shouldn't. The math class is not a sitcom or a ball game. Do we measure it in test marks? We shouldn't. A test mark measures how patient a student was to learn the techniques in a particular unit, not whether or not (s)he knows math. I have students who score 85% in class tests, but who cannot place the particular unit in a broader context. They are not successful.

I agree that we have the obligation to TRY to make EVERY STUDENT SUCCESSFUL but it's an uphill battle since we compete for the student's values and thinking patterns against one or more of the following: glitzy and superficial mass media, Doom's Day computer games, peer pressure, lack of respect in the family for intellectual achievement, and fast-fix Fairview Mall math franchises.

We should stop expecting and promising perfect success rates in math education. Otherwise, teachers will tend to give EVERY STUDENT good marks to avoid being branded "bad" by the parents. Students with talents and interests in other areas will waste their time taking Calculus over and over until they meet the "good" teacher capable of "teaching them" 80% worth of this subject in order to become -say - engineers (according to their parents' wishes).

Alexandru Pintilie, Bayview Glen School, Toronto

▲ PRESIDENT'S MESSAGE



JUDY CROMPTON

I know that you are reading this in September, but I am writing it in July ... sitting on my patio ... it is warm but not humid. Remember?

I hope that your year has begun well. We certainly have a number of challenges facing us this year. Those teaching in Grades 1-8 have a new curriculum to implement. See Susan Stuart's article in this issue of the Gazette. Sue has spent a lot of time examining the new curriculum in detail and has written a good overview that will help those of you trying to sort out the curriculum.

Secondary School looks forward to a year of announcements about Secondary Reform and related curriculum change. Students entering Grade 7 this September will be the first to enter the new secondary program ... the next two years should prove to be very busy. Also on deck for secondary is Grade 9 testing, scheduled to occur on a random basis some time during this school year.

OAME continues to work in supporting teachers through the various changes that are occurring. A good example was the Annual Conference held in Toronto last May. Kudos to Peter Saarimaki, Sandy Woodcock and their "team from TEY^{2}MS" for a job very well done! Congratulations are also due to Bill Morrison and the members of MAC^2 chapter that put on an outstanding Ontario Mathematics Olympics in Barrie last June. This annual problem solving event for Grade 7-8 students is a prime example of how OAME seeks to aid students in striving for excellence.

And coming up in November is the 1997 OAME Leadership Conference. Its theme of "Teaching and Learning Through Rich Learning Tasks" is intended to help teachers do what we all want to do but haven't figured out how to do ... make problem solving and connections the centre of learning mathematics. Participants will spend 7 hours in workshops that will give them experience in doing, recognizing, assessing, and creating tasks that are focused in reasoning and problem solving, simulate real life situations and problems, make links between topics in mathematics,

and answer the question "Why do we have to do this stuff?" Workshop leaders include Nancy Moore and Jane Lind at the Primary Division, Susan Stuart and Nancy Viita at the Junior Division, and, at the Specialization Years, Shirley Dalrymple with Myrna Ingalls, and Mary Lou Kestell with Margaret Warren. The conference runs from 8 p.m. on Thursday, November 13 to 1 p.m. on Saturday, November 15. The OAME member fee of $370 includes accommodation, meals and all workshops. What a bargoooooon!!! Be there or be a rectangular parallelopiped!

So, OAME has a very busy year ahead of it (as do you). We intend to continue to be proactive with the Ministry around issues of curriculum and assessment. We are also seeking to become accredited by the Ontario College of Teachers so that your membership and conference attendance (both provincial and chapter) will be recognized. We intend to keep in close touch with our members through our Chapter Representatives. The Chapter Rep's perform the extremely important function of letting you know what the OAME Board is doing and of letting the Board know what you think about what it is doing. If you have comments, concerns, suggestions, contributions ... let your Chapter Representative know, please. Their addresses and telephone numbers are all listed on the back page of the Gazette.

I won't keep you any longer from enjoying this issue. Have a good read ... and have a good year!

It is a mystery that has long plagued educators: why do boys, on average, do better than girls in mathematics? Last week, a study conducted by researchers at Boston College in Newton., claimed to provide at least part of the answer: boys are better at visualizing and mentally manipulating 3-D objects. The researcher speculate that boys hone those skills through blocks, crafting model airplanes and taking part in team sports. Said the study's leading author, developmental psychology professor Beth Casey: "The take-home message is, 'Wake up and think about spatial skills.' " Still, the researchers sounded a note of caution: more than a third of the measurable difference between the sexes, they concluded, can be traced to girls' low self-confidence. Apparently, the riddle of gender and math is far from solved.

Reprinted from
Maclean's *Canada's Weekly Newsmagazine, August 11, 1997, Vol. 110 No. 32*

▲ WHAT'S OLD AND WHAT'S NEW: A QUICK LOOK AT THE ONTARIO MATHEMATICS CURRICULUM, GRADES 1-8 (1997) FOCUS ON GRADES 1-6

SUSAN STUART
CHAIR, OAME FORMATIVE YEARS COMMITTEE

The Ontario Mathematics Curriculum Grades 1 - 8 (The Curriculum) was released in a flurry of media attention in the middle of June 1997. By the time the doors had closed on the last day of the 1996-97 school year, few, if any, teachers had seen a copy of the document.

Most school boards, over the last few years, have either developed or purchased a grade-by-grade math curriculum based on the Mathematics Standards (1995). Each school board now must compare the 1997 Curriculum with its existing second-generation document. Some school boards will have begun this process over the summer; others will convene teams in Fall 1997.

The purpose of this article is to assist teachers and board writing teams to initiate the process of implementing The Curriculum. The article begins with an identification of issues, both "Old" and "New". "Old" issues remain from the introduction of the Mathematics Standards (1995); "New" issues are unique to The Curriculum. The article then goes on to examine some details in the content of Grades 1-6.

ISSUES

New: The Curriculum defines "expectations" for the end of each of grades 1 - 8, in contrast to the Common Curriculum and the Mathematics Standards (1995), which defined outcomes for the ends of grades 3, 6, and 9 only.

New: For grades 1 - 8, the Common Curriculum and the Mathematics Standards (1995) are gone. The reference to "outcomes" used in the Mathematics Standards (1995) has been replaced by "expectations" in The Curriculum. One wonders at this substitution, given that the international education community uses the word "outcomes". Perhaps it is related to the more "rigorous" and "stringent" view of mathematics that The Curriculum professes in its introduction.

Old: There is frequent reference throughout The Curriculum to "pencil and paper computations". This, however, is balanced by the grade-by-grade Specific Expectations in which action verbs predominate. Children are to "explain, create, demonstrate, model, represent, build, investigate, develop, discuss..." These verbs give a clear expectation of an activity-based approach to the learning of mathematics.

New: Problem Solving is no longer the sixth strand. It has been included in each of the five strands. Although it could have been more strongly emphasized, its importance is stated.

Old: The Curriculum organizes mathematics into the same five strands used in the Mathematics Standards (1995). Each strand is dealt with separately, as in the Mathematics Standards. This is easier for the writers to write, and it is easier for parents to see what their children will be learning. But it is far more difficult for teachers to see, and therefore to make, necessary links between concepts and skills of different strands. It is through connections that students experience rich learning in mathematics. It will be important for board writing teams to make a specific effort to identify meaningful connections across strands.

New: Each of the strands in The Curriculum contains two major sections: Overall Expectations and Specific Expectations. The Overall Expectations were written after the Specific Expectations and were intended as an "executive summary" of the Specific Expectations. BEWARE! There are some serious mistakes in these summaries. The reader should remember that the Specific Expectations contain the skills and knowledge that students are to develop at each grade level. These override any discrepancies found in the Overall Expectations.

New: Four levels of achievement are described, as in the Mathematics Standards (1995). Unlike the Standards, in which levels of achievement were described for each strand, The Curriculum provides one generic rubric to be used in all situations. The *meanings* of the levels are better described than in the Mathematics Standards, with level 3 clearly identified as presenting "characteristics of student achievement that represent the expected level of achievement, which is considered to be the standard for each grade" (p. 8).

The generic rubric in The Curriculum presents some problems in that it uses teacher assistance to distinguish between levels of achievement. In Levels 1 and 2, the intent is clear: Level 1 describes students as working "with assistance" and Level 2 "with limited assistance". Levels 3 and 4, however, describe the student as working "independently". Is the use of the word "independently" intended to imply that the student is to work individually, meaning, not in a cooperative group? Or is it intended to describe the student who can successfully complete a task without assistance as an individual when it is appropriate to do so? Clarification of this meaning would be welcomed, since the ability to work cooperatively is a cornerstone, not only of modern education, but also of modern business.

SOME DETAILS: GRADES 1 - 6 CONTENT

Data Management and Probability:

No major surprises here. The delineation by grade may help ensure that learners are not given the same experiences at each grade level. It will be important for teachers to read *each* grade level to understand some of the subtleties.

Example:

grade 1's generate *yes/no* questions for given topic;

grade 2's generate questions that would have *finite number of responses* for *given* topic;

grade 3's generate questions that would have *finite number of responses* for *their own* topic.

New: (1) develop data management skills using *computer applications* beginning in grade 5.

(2) Sub-headings. An additional one, Analyzing Data, is added at the junior level.

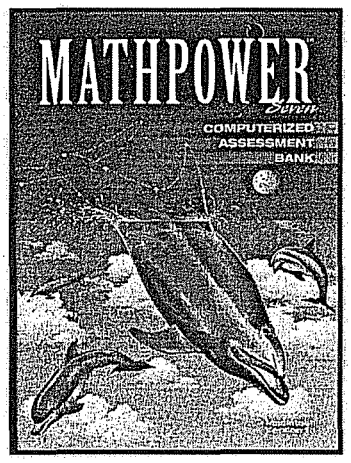
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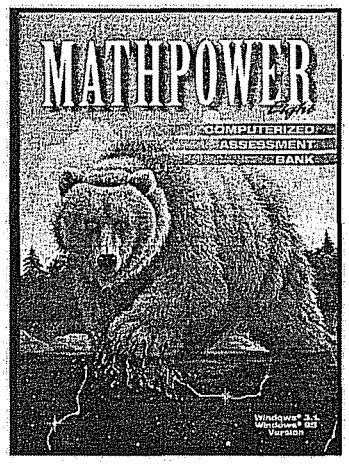
Grades 7, 8 and 9

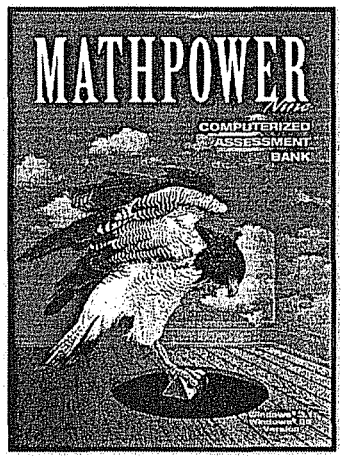
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Geometry and Spatial Sense:

The grade–by–grade development shows some important delineation in topics. The information contained in the bracketed examples indicate to us that the writers intended less repetition of content and more development of knowledge.

Example: Three-Dimensional Geometry

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
cube, cone, cylinder, sphere	prism pyramid	variety of prisms and pyramids	skeletons	use of nets	design of nets

Example: Two-Dimensional Geometry

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
circle rectangle triangle	pentagon hexagon octagon	rhombus parallelograms	quadrilaterals	triangles	all- detailed properties

The growth illustrated here should be considered a guide rather than an example. The topics at each grade build a foundation for solid knowledge development. For example, in grade 4, the learners have the opportunity to thoroughly explore and investigate all types of quadrilaterals for a deeper understanding. However, the delineation may be limiting if it deters teachers from allowing students to explore on their own. Students achieving at Level 4, in particular, need freedom to learn.

If topics are changed to provide for individual programs, the teacher must examine all expectations for geometry at that grade, because the expectations are conceptually linked: for example, the study of triangles in grade 5 'goes with' the study of angles found in the same grade.

Measurement:

New: The omission of "Estimation" in the title (as used in the Mathematics Standards) reflects the thinking that estimation is important in all the strands.

Temperature:

Grade 3's learn to read a thermometer and this is the last time the skill is mentioned. Junior grades teachers will need to be made aware of this and ensure that their students have continued practise to perfect this skill.

Time:

This learning is spread over all the grades. Some boards may find it unusual to see telling time in grades 4 and 5.

- *Page 36*: 1998 06 30 is *not* SI notation. It is, however, standard notation used internationally and should be taught.

Mass:

Page 37 "metric tonnes" is incorrect. Use either TONNE *or* METRIC TON. Do not combine the two. It is like saying "a square square shape"

Perimeter, Area, Volume:

There are several major difficulties in the transitions between grades 6 and 7 in these topics.

For example:

- In Grade 6, students find area of a parallelogram and triangle using formulas. In Grade 7, students *develop* the formulas for these two shapes.
  Perhaps these two expectations should be switched.
- The same difficulties arise with volume of a rectangular prism - both grade 6's and grade 7's are developing the formulas, but the grade 7's are expressly using manipulatives.

Patterning and Algebra:

The development of patterning skills in the primary and junior grades is fairly straight forward. The teacher must remember to maintain the manipulative focus in the classroom.

Most of the difficulties in this strand relate to the heavy emphasis on manipulating algebraic equations in grade 7 and 8.

Number Sense & Numeration:

Whole Numbers:

Grade 2 (Page 15) and Grade 3 (Page 17): Do they really mean that learners will add and subtract 2 -and 3-digit numerals *using concrete materials* only? This does not make sense in light of the requirement: "add and subtract money amounts to 100¢ *using concrete materials, drawings, and symbols*".

Fractions:

- Grade 3 (page 16):
  The Overall Expectations state that children will represent "mixed numbers". This does not match the Specific Expectations, which refer to common fractions only.
- Grade 4 - 6
  One of the major changes is the removal of computations with fractions from the junior curriculum. Students will spend time in these grades strengthening and deepening their understanding of fraction concepts, ordering, comparing and

equivalence. This does not mean that 'intuitive' computations would not arise and be solved (e.g., half of 30, where there are 30 students in the room). Formal computations will begin in grade 7. This change brings us in line with the Western Protocol Curriculum.

- On Page 22, the statement "select and perform computation techniques appropriate to specific problem solving involving unlike denominators in fractions ... " does not refer to computations of fractions, but to computations that a student might have to perform to solve a problem which contains fractions:

  e.g., "Marie addressed $\frac{2}{3}$ of the envelopes in a box and her friend addressed $\frac{15}{20}$ of the envelopes in another box. Each box contained the same number of envelopes. Who addressed more envelopes? Explain how you got your answer."

Decimals:

- Grade 4: decimals to hundredths may be new, but when used with money, it should not cause a problem.
- On Page 20, the Overall Expectations state that students will multiply and divide by decimals. This does not match with the Specific Expectations, is definitely unsuitable at grade 5, and is in error.

  Grade 5 & 6 students should solve problems that would require multiplication and division of decimals by whole numbers (e.g., sharing money).

Percent, Rate and Ratio

The expectations do not 'flow' smoothly from grade to grade. It seems as if some of the expectations were simply "popped in" here and there to fill space.

Examples:

- On Page 22, we find the statement "justify and verify the method chosen for calculations with whole numbers, *fractions, decimals,* and *percent.*" But, students are not required to do calculations with fractions or percent in grade 6; therefore, they should not have to verify their choices.
- On Page 23, we find the statement "demonstrate an understanding of ratio".

  This statement is meaningless because the concept of ratio is so complex. What understanding would be expected at the grade 6 level? Students at this age will have little chance of fully developing proportional thinking.
- Also on Page 23, we find the statement "solve simple rate and ratio problems" .

  What is meant by "simple". If you read on to compare with what is required in grade 7 or 8, you will find that there are no references to rate and ratio in grade 7, and only two in grade 8, these being somewhat trivial.

Rate & Ratio is the weakest area of the Number Sense and Numeration section. An understanding, suitable for entry into grade 9 mathematics, cannot be expected using these few disconnected statements.

- On Page 23, we find the statement "estimate and *calculate* percent" (e.g. find the percent of blue balls in a box). This and the other expectations referring to percent do not imply calculating *with* percents, but expressing fractional situations in percent form. Therefore the application expectation "pose problems involving...percents, and solve them using the appropriate calculation method" does not match.

Integers:

On Page 23, the statement "identify real-world applications of integers" was included in grade 6 content because most students at this level have already encountered negative numbers in applications such as temperature, sea level, games, etc. Computations with integers is *not* implied.

SUMMARY

There may be other anomalies that teachers/ consultants/coordinators notice as they begin to make sense of this material. The transition from grade 6 to 7 needs to be studied in detail to ensure that key skills and knowledge have been included. The OAME Formative years Committee would like to assist in any way that it can. Please contact us with additional information and we will try to get it out to our members.

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UNIVERSITY OF WESTERN ONTARIO



Eric Wood teaches preservice secondary teachers. He is primarily interested in the long term growth and development of teaching expertise; and, how the predisposition to learn can be fostered in student teachers.

With the birth of the World Wide Web, the simple retrieval of information has become a possibility. However, not all information is useful and "Surfing the Web" can become a great black hole into which all spare time is inexorably drawn. There are a number of excellent pieces of freely distributable software available on the WEB and in order to save a large collective chunk of time, I offer my Top Ten list. These programs were all picked because of ease of use and relevance to the secondary mathematics classroom; and, they can all be downloaded from my website.

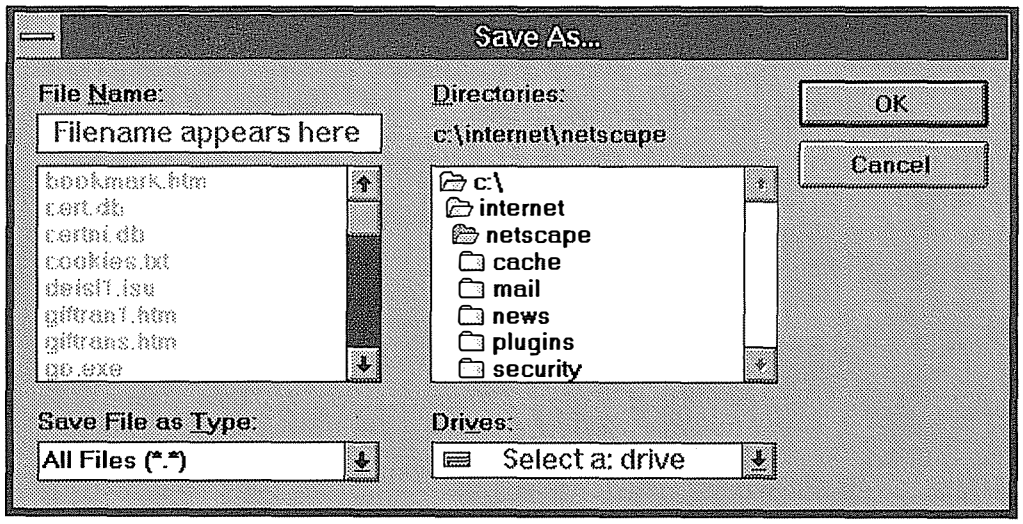
Downloading the Software

The address for each program is listed at the end of a short description of its features. Simply entering this address will begin the download process and if you are using NETSCAPE, for example, a dialogue box appears like the one below.

The specific filenames in the dialogue box will differ, of course, but all that you need to do now is decide where you want the file to end up (click on the **Drives:** option for this), click on **OK** and the file will be downloaded. If you are doing this at school on a network you will most likely need to save the file on a floppy. In that case you should select drive a: when you click on the **Drives:** option.

Once the program is safely on your hard drive (or floppy) you will need to put it somewhere before you install it. All of the files noted here are stored in the form of compressed, self-extracting archives. This is done to make the downloading of dozens of individual files easier and quicker. However, it also means that they need to be installed before they can be run. Do not try to run any of these programs before you install them or you will end up with hundreds of files cluttering up your hard drive! Having said this, the installation is very simple, even for a novice user.

I suggest you create a directory called MATHSOFT and then create subdirectories for each separate program. This can be done in the **Windows File Manager** by selecting **File** and then **Create Directory**. For example if you downloaded the program WLPLOT, make a subdirectory called WLPLOT by first clicking on MATHSOFT and then using the **Create Directory** feature to create WLPLOT as a subdirectory of MATHSOFT. Then move the file that you downloaded into this subdirectory. The file will have an .EXE extension. In **Windows**, double clicking on the file will cause it to expand itself and store all of the files that are contained in it in the subdirectory where it is stored. In DOS, just change to the directory containing the file and then type the name of the file — this will cause the files to be unpacked into the subdirectory where the original file is stored.



Now look for a file such as RUNME.BAT or a file with an extension such as .EXE to run the program. All of these programs are DOS applications which should also run out of Windows 3.1 or Windows NT.

Top Ten Free Software Picks

1. Wlplot

Probably the best all around plotting program I have seen. Mouse compatible, it plots functions in cartesian, polar and parametric form along with bifurcations and recursive functions. For example, it will graph a beautiful Sierpinski Triangle in a matter of seconds. The program is very simple to use with on-line help and it allows you to graph transformed and untransformed conic sections too! It will also allow you to save graphs as .PCX files and then retrieve them into a word processor to make student handouts.

http://www.uwo.ca/edu/math/mathpk52.exe

2. Functional Analysis Program

At first glance this program might seem to be just another function graphing program and in a sense it is. It uses VGA graphics so the graphs are smooth and crisp; however, it does a number of other things that make it very useful for Calculus. For example, it will automatically trace a curve and find any extreme values, it will find zeroes of the function and it will integrate the given function between defined limits. It also shows graphically how Newton's Method is used to solve for the zeroes of a function. It is menu driven and this feature makes it easy for students to use.

http://www.uwo.ca/edu/math/mathpk14.exe

3. Comprehensive Calculus Tutor

The program provides a full calculus course in a CAI format. It is quite good because it creates new questions each time it is run and it will show students full solutions (step-by-step) to problems they miss. At any time you can pop-up a graphing utility or calculator.

http://www.uwo.ca/edu/math/mathpk42.exe

4. Simple Matrix Calculation Program

A very easy to use matrix operation program. It does all the basics such as the inverse, row reduced form and so on. It is mouse compatible and requires almost no instructions before use.

http://www.uwo.ca/edu/math/mathpk15.exe

5. Find Polynomial

A very interesting program for a variety of purposes. It will allow user input of a function and then produce the graphs of $f'(x)$ and $f''(x)$. Alternatively the computer will choose a polynomial and give the user the graphs of $f'(x)$ and $f''(x)$ along with the ability to find $f'(x)=0$, or $f''(x)=0$ or the value of $f(x)$, $f'(x)$ and $f''(x)$ at any x. The student uses this information to figure out what $f(x)$ is. There are many ways to do it, but it requires that they use clues from both the graphs as well as other factors (roots for example) to establish the equation of the original function. A great exercise in problem solving and applying ideas from calculus. It features pull down menus and a very friendly user interface.

http://www.uwo.ca/edu/math/mathpk8.exe

6. Integration Demonstration

A slide show that illustrates numeric integration by a variety of methods. Very good for showing students how increasing the number of subintervals increases the accuracy.

http://www.uwo.ca/edu/math/mathpk47.exe

7. Identify a Function

A great program for problem solving. Students are told that the computer has picked a function of a particular type (linear, polynomial, trig, log) and then they have to guess what it is. They can get various clues to help them do this such as a graph, a table of values or the function's value for any particular x-value that they pick. All normal features for graphing programs are available such as zoom and trace. This is a nice way to have students think about the math they have learned rather than just carrying out procedures. If you restrict the choices to linear functions this program could be used starting in Grade 10. Obviously senior students can use other categories as well. Menu driven, it can be used with almost no previous computer experience.

http://www.uwo.ca/edu/math/mathpk1.exe

8. Study Transformations on Functions

The easiest program to use for teaching students about the effect of varying parameters in equations I have ever seen—it was featured in the article *Twiddling With Transformations* (March, 1997). The details are noted there, suffice it to say that it is very powerful and yet simple to use with almost no prior instruction.

http://www.uwo.ca/edu/math/mathpk3.exe

9. Basic Function Plotter

Another function plotter but with some differences. For one thing it uses colour and so you can get multiple

graphs on the screen in different colours. It also is very simple to use and I would suggest is an excellent plotter for junior students who are just starting out. It will also graph and solve systems of inequalities which none of the others will do. The graphical interface is effective and simple and the curves are crisp and clean. A great beginner's program.

http://www.uwo.ca/edu/math/mathpk19.exe

10. Relationship of Unit Circle and Trig Functions, Animation of Sine and Cosine Functions, Animation of Tangent Function

Actually a sequence of three separate programs. The first in the series shows how the unit circle can be used to generate values between -1 and 1 for a variety of angles. The second goes the next step to show how the trig curves are generated by the unit circle. Sine and cosine are done together so that the relationship between the two can be illustrated. The third illustrates how the tangent function is generated by the unit circle. This method is not as well known but it is very slick!

http://www.uwo.ca/edu/math/mathpk46.exe

If these programs pique your interest, check out the other programs available for downloading on my webpage. Simply go to **http://www.uwo.ca/edu/math/** and click on **Download Software from Faculty of Education Archive**. Then you can browse to your heart's content!

▲ Teaching Ideas from the Editor

Why the graph of y = f(x+k), k > 0, is congruent to the graph of y = f(x) and is k units to the left.

The graph of y = f(x) consists of points **(x,f(x))**.

The graph of y = f(x+k) consists of points **(x,f(x+k)). (1)**

Replace x+k by t in (1).

Thus, x = t–k..

Hence, the point (t–k,f(t)) lies on y=f(x+k).

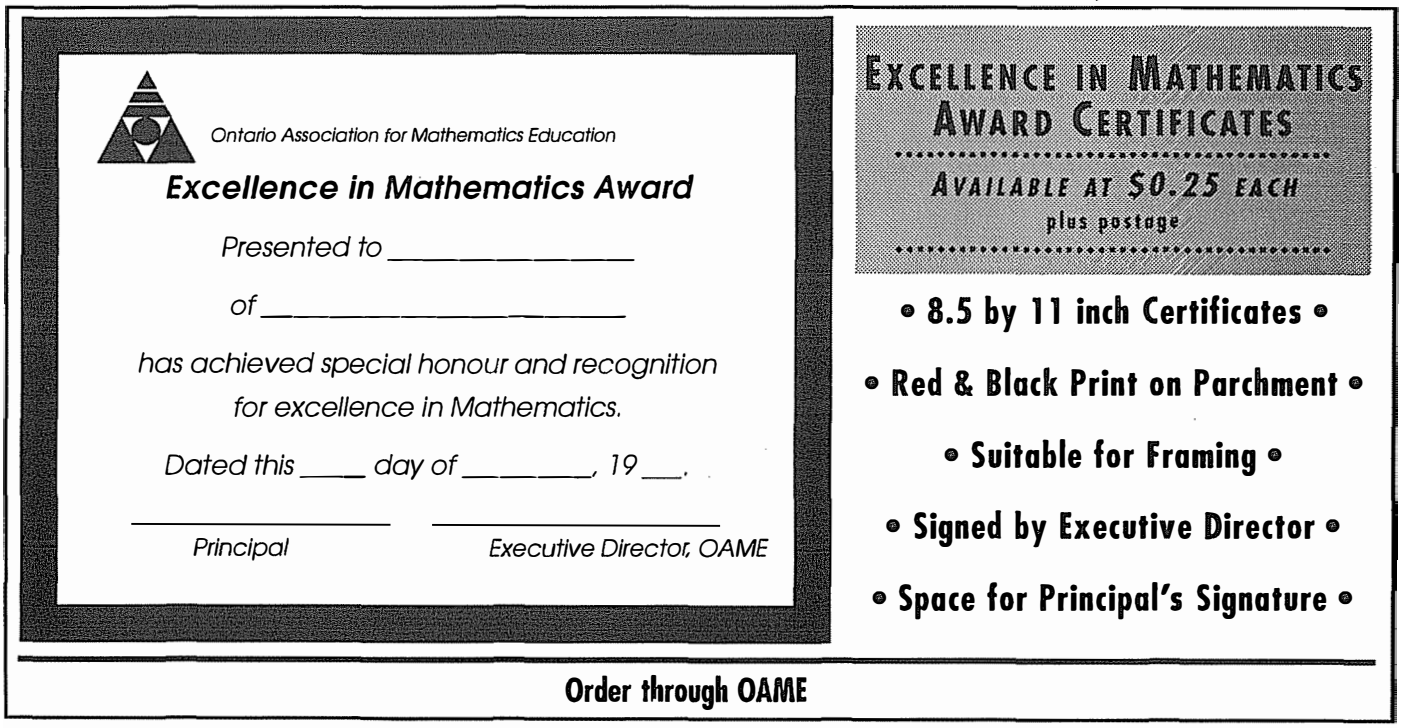
On y = f(x), the x value for y = f(t) is t. Hence the point (t,f(t)) lies on y=f(x).

But the x value t–k, k>0, is k units to the left of the x value t.

Hence the point (t–k,f(t)) on y = f(x+k) is k units to the left of the point (t,f(t)) on y = f(x). Both points are the same distance from the x-axis.

This shows that the two graphs are congruent and the graph of y =f(x+k) is k units to the left of the graph of y = f(x).

Note: if k<0, a similar argument moves the graph to the right.



1997 OAME Award Winners



Ron Lancaster Don Attridge Award Recipient

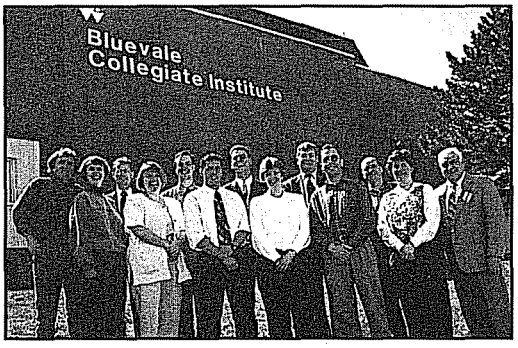
Since Ron's term as President ended in 1993, he has been exceptionally busy working with his students at St. Mildred's and with mathematics educators throughout North America. In the classroom Ron has spent hundreds of hours developing Math Trails throughout the downtown area of Toronto for his Grade 7 students. Ron has also been working hard to make effective use of hand-held technology both with his middle school and his high school students.

For the past nine years Ron has been an instructor at the Phillips Exeter Academy Mathematics Conference and this work has connected Ron to educators all over the United States. Ron has also been heavily involved with the development of Canadian Summer Institutes organized by Texas Instruments and his efforts have enabled a number of other Canadians to become involved as Instructors.

During the March Break this year Ron was hired by the International School in Manila to do some extensive professional development with all of their middle school and high school teachers. He was there for two weeks and he will be returning to the school this summer to do some follow-up work.

In addition to being a full-time classroom teacher, Ron is currently acting as a consultant for Owl Television and this summer Ron will be in San Francisco to begin what could be his most important work to date. He was recently chosen to be one of the major writers for the revised NCTM Standards and this work will take place over the next three years.

Ron's family is highly important to him, as is his relationship with Dr. Shelly Sender. Having a partner who grew up on the Upper West side of Manhattan has opened up a new and exciting world to him.



Bluevale Collegiate Institute
Kenneth B. Fryer Award Recipient

L to R: Klaus Schaloske, Christa Bender, Ken McDonald (Dept Head), Tracey Kelly (Assist. Dept Head), Mark Fangrad, Eric Ciezar, Balir Allison, Linda Behnke, Jim Saddler (Principal), Jeff McManus, Ron Nichols, Shelly Erwin, Ron Weaver.

We are venturing into a time of much uncertainty in education. There is much anxiety surrounding issues such as increased class sizes, shrinking resources, greater demands, revamped curriculum and unclear direction from the Ministry of Education and Training.

Suggestion of change in how curriculum is delivered have been evident both in the Gazette and at the May OAME Conference. More emphasis would be given to investigation via 'Rich Learning Tasks" where learning occurs through open-ended exploration with students pursuing solution in various directions and at various levels.

Delivering new curriculum in a different manner as well as coping with all of the other current education issues will be a challenge to us all. However, it is the tone we establish within our classrooms, the relationships which we build with our students and our obvious enthusiasm for our subject that creates the atmosphere for optimum learning to occur. This has always been important at Bluevale Collegiate and this is where our optimism still lies.



Elaine Harvey Life Member

Elaine is a 'Charter Member' of OAME having attended the inaugural meeting in North Bay in 1973. She has been active in many roles in the organization, serving on the executive of QSLMA, working on conference committees, speaking at conferences, serving as an OAME Councillor, and serving on the OAME Executive. In one capacity or another Elaine was a member of the OAME Council or Board from 1980 to 1997 and prior to that she was active in QSLMA (President in 1978).

During these years she has made many contributions to the work of OAME.

As Chair of the Constitution Committee she completed the significant task of rationalizing the Constitution, the Bylaws and the Terms of Reference.

In 1983 Elaine introduced a motion in Council, which established the Women and Mathematics Committee (as of Sept 1991, the Mathematics Equity Committee), and spoke on various Equity topics at annual conferences. She served as Executive Liaison on the Women and Mathematics Committee from 1984 to 1986, and as Chair from 1986 to 1988. She also served as Chair of the Mathematics Equity Committee 1993-94 and Executive Liaison and Chair 1994-97.

As Chair of the committee, Elaine planned and hosted the Breakfast meetings at the OAME Annual Conferences 1986-88 and 1993-97. At the 1996 Conference Elaine filled in as speaker at the last minute when the programmed speaker withdrew the night before. Elaine provided, after overnight preparation, an interesting and informative talk on Native Culture and Mathematics.

Throughout the years Elaine has continued to support the activities of QSLMA and Although retiring from the OAME Board she is taking on the role of QSLMA Membership Secretary.

Elaine Harvey is awarded a Life Membership in OAME for her significant contribution to the organization and to her leadership in mathematics education.



Charles Cipolla, President and Chief Executive Officer of Rockwell Automation Canada
Mona MacGregor Award Recipient

Charles A. Cipolla is chairman and president of Rockwell International of Canada Ltd. Mr. Cipolla also serves as president of Rockwell Automation Canada, a post he has held since September 30, 1995.

Mr. Cipolla joined Rockwell in 1974 as manager of Accounting. In 1977, he was named corporate controller and, ten years later, was promoted to the post of treasurer and secretary. He was appointed vice president, Finance, and secretary-treasurer in 1988.

A graduate of Sir Wilfrid Laurier University in Waterloo, Ontario, Mr. Cipolla received his Chartered Accountant's designation from the Institute of Charted Accountants of Ontario in 1972. Mr. Cipolla was a supervisor with the chartered accountant firm of Peat Marwick prior to joining Rockwell.

Rockwell Automation Canada, with 1,250 employees and four manufacturing facilities in Ontario, is the country's market leader in advanced automation products and part of Rockwell Automation, a $4.5 billion business that operates in 70 countries and manufactures more than 500,000 automation products.

Teamwork that counts

For the past two years, Rockwell International of Canada Ltd. has sponsored the Ontario Mathematics Olympics, providing an annual grant of $15,000 to underwrite the cost of travel expenses and competition materials. In light of this support and Rockwell Canada's broad commitment to education, Charles A. Cipolla, chairman and president of Rockwell Canada, received the 1997 Mona MacGregor Award. The Gazette invited Mr. Cipolla to submit an open letter explaining why the company supports this OAME initiative. His letter to all members follows:

When I first learned of the Ontario Mathematics Olympics (OMO) in 1996 from representatives of the Ontario Association for Mathematics Education (OAME), I was impressed with the bold and innovative thinking behind this province-wide initiative.

The idea of creating a high-profile math competition to showcase the skills of Ontario's best mathematicians at the grade seven and eight level was ambitious and, in itself, worthwhile. As a society, we have too few forums to demonstrate the academic excellence of our young people.

What also impressed us about the OMO was the idea of combining communications and team building skills with pure mathematics and presenting math as a fast-paced, exacting team sport in an Olympic-style competition.

The OMO's approach represents an interesting image-shift, and convinced us that — with financial support — the OMO could stimulate excitement about mathematics among a significant number of young people at the start of their high school careers.

The fact that thousands of grade seven and eight students from all regions of Ontario have participated in the Ontario Mathematics Olympics is testament to the potential of the initiative in this regard.

It is also interesting to note that, in addition to mathematical prowess, the ability to communicate and work effectively in a team environment are qualities Rockwell values highly in its employees.

Rockwell supports the OMO as part of a broad corporate commitment to encourage young people to undertake studies in mathematics and science. In 1996, for example, our company contributed more than $300,000 to education-related projects at the elementary, high school, college and university levels, mainly in the communities in which we have manufacturing facilities.

Our predisposition towards the support of education is a reflection of an advanced technology company's need to encourage young people to undertake studies in mathematics and science.

It is vital to Rockwell's future, as well as Canada's, that we better prepare young people for careers in the sciences, engineering and other technology-related fields.

It goes without saying that the role of math educators is of considerable importance to the economic future of our province. The skill, dedication and innovation of OAME members is very much appreciated.

On behalf of the people of Rockwell Canada, I would like to take this opportunity to salute those OAME volunteers who have worked tirelessly to make the Ontario Mathematics Olympics an outstanding success. Their efforts have brought math to life for a significant number of grade seven and eight students and advanced the cause of mathematics education in Ontario.

Yours truly,
Charles A. Cipolla
Chairman and President
Rockwell International of Canada Ltd.



Mary Storey
Morley MacGregor Recipient

During my career, the challenge has always been to "turn students on" to mathematics. Because teachers at the elementary level usually teach all subjects, they do not tend to be specialists and thus don't always promote mathematics. It has always been my goal to have students proclaiming, "Math is great and Math is Fun!"

To assist in promoting mathematics, teaching must contain many components. One of these is the use of manipulative in every aspect of the program. One often hears that manipulatives are only for use in the primary grades and students will not use them. This is not true. Linking all mathematics topics to the world around us is a second concept that I promote. Students need to see the relevance of every math question or problem to their own life and daily activities. Career links can start in the primary classes. Thirdly, the use of technology always makes the learning of mathematics more exciting and efficient. For example, students having some difficulties in algebra can easily grasp the concepts when they program with variables in Logo.

Promoting mathematics for all students in all situations will prepare our students for the best of futures.

▲ Math Contests Grades 7 to O.A.C. Getting Under Way



TOM GRIFFITHS
THE CENTRE FOR EDUCATION IN MATHEMATICS AND COMPUTING
FACULTY OF MATHEMATICS
UNIVERSITY OF WATERLOO

This article is short and simple since it is easy to get your students writing Mathematics contests.

The major concern I hear from teachers wanting to get started on mathematics contests is that they do not know how to do the questions themselves. This is not a problem or even a disadvantage. If you do not know how to solve the problems, then when you work with your students you will be doing genuine problem solving. So often the chapters labeled Problem Solving in text books are simply a set of examples of a type of question followed by an exercise of that type of question. This is not problem solving. Real problem solving is learned by trying to solve a question for which neither student or teacher knows the method of solution. So the beginner almost has the advantage of lack of preconceived ideas. Besides this, the beginner has the joy of being able to learn with the students. The teacher does have two advantages. One is age, experience and wisdom, and the other is usually access to the answer book if all else fails. Don't be too quick to resort to that resource, it is much more fun to struggle with the problem for a time. Above all do not be concerned that you cannot do the problems immediately. It is good for the students to realize that even their mathematics teacher is still learning, and besides that it really is fun to problem solve.

In order to get into problem solving mathematics contests, the only items you need are some sets of problems and some students who want to have fun and satisfaction writing contests.

There are many contest sources but I recommend two to start with. One is from Waterloo University, the **Canadian Mathematics Competitions**. There are different contests for each grade, and there are published books of problems and solutions. The books are published with problems for grades 7,8 and 9, for grades 9,10 and 11, and for senior high school. The problems in these books are typed by categories and come with solutions. There are also less expensive books for senior high school students which have questions but no solutions. They also sell bundles of ten papers all the same to hand out to students. The Waterloo group also offer the **Open Mathematics Challenge** in the fall for really able students. The other contests are offered in February, April and May. For the grade 7 and 8 there is the **Gauss Contests** written in May. For each of grades 9 through 11 there is a one hour paper written in February. There is the **Pascal** paper for grade 9, the **Cayley** for grade 10 and the **Fermat** for grade 11. In April there are two and a half hour papers for the seniors. There is the **Euclid** paper for grade 12 and the **Descartes** for O.A.C. students. This final paper is also the one used to determine University scholarships. All these contests are written only once a year. Naming the contests after famous mathematicians even gives an opportunity to offer a little introduction to the History of mathematics.

There is another contest offered through the University of Windsor, the **Canadian High School Math League**. This contest consists of six half hour papers, each with six questions graduated in difficulty, written monthly from October though to March, with the scores cumulative. The questions are meant to be from a grade nine to senior standard, but I have found that the questions are usually too difficult for grades nine and ten. With practice these papers are excellent for students from eleven and up. I have found that students really like the monthly challenge, and also enjoy the feature of being able to see the cumulative score grow, as well as comparing themselves with competitors across Canada. Competitors also have six opportunities in the year for achieving a perfect six. There is a book of old problems available for practice sessions.

So these are two sources of papers. They are not the only ones but they will give the beginner a good start.

That's the question source. Now you need students. Announcements on the P.A. are the easiest way to let students know you are in business. First find a time which will be convenient to a good many students. You will never find a time appropriate to all of them, as the ones you want are usually busy doing many things. Fix a time, often lunch hour or after school, and be there as advertised. Some students will come and collect papers



GATEWAYS

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but will be too busy to stay. Make sure that you make a time that they can get some help and advice, and if they work the papers they will make progress. The others will come and together you can start learning how to solve the problems. Start with easier questions, early ones in the papers in both sets of contests, and try to make sure that all participants find some success. Often it is really difficult to get solutions for the first few sessions, but perseverance pays off. None of the students would expect to be immediately successful in music or sports, so why would they expect immediate success in solving mathematics problems. Also as in music and sports, only with a lot of continuous and consistent practice will they become good. This of course is also true for the coach, who must also work at the problems. The solutions will help, and with practice the identification of the types of problems and knowledge of methods of solution will be acquired.

I would recommend as a starting kit of papers and books the University of Waterloo series *"Problems, Problems, Problems".* Volumes 1 and 2 are written for grades 9,10 and 11; Volumes 4 and 6 for grades 7 and 8, and Volumes 3 and 5 for senior high school students all at a cost of $15 each. Volumes 3 and 5 also come in a smaller version without solutions at $4 each. In addition to this, Waterloo publishes an excellent book, *"Let's Solve Some Math Problems"* by Derek Holton at $20. Old papers come in bundles of 10 at $2.50 a bundle. Add to these prices shipping at $2 and G.S.T. I would recommend purchasing at least the last three years for each grade involved. The address to obtain these materials is:-

The Centre for Education in Mathematics
and Computing,
Faculty of Mathematics,
University of Waterloo,
Waterloo, Ontario N2L 3G1.
The phone number is 519 858 1211 ext 2697.

For the **High School Mathematics League** the book of problems comes from the states from *Math League Press* P.O. Box 720, Tenafly, New Jersey 07670. The Contest contact in Canada is at Windsor University.

The initial cost for getting started on practicing can be as little as $60 if only old papers are purchased. There are then the costs of entering the students into the contests, but these costs can be charged to the students if necessary.

Although I am retired, I am still experiencing great pleasure from preparing students for Mathematics contests. It always impresses me how well some of them do, and how elegant are some of the solutions they invent.

At the moment I am offering a weekly seminar at the University of Western Ontario for any High School students in the London region who wish to prepare for contests, and a monthly enrichment session for grades 7 and 8 students. I would be pleased to offer assistance to any teacher requiring help I can be contacted at e-mail – tgriffit@julian.uwo.ca.



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Using Paper to Learn About Geometry

ANN ANDERSON
ASSOCIATE PROFESSOR
DEPARTMENT OF CURRICULUM STUDIES
UNIVERSITY OF BRITISH COLUMBIA

As associate professor in Department of Curriculum Studies at UBC, Ann teaches mathematics education and research methods courses. Her research focuses on young children's mathematics learning and caregivers' role(s).

> ***Insights and intuitions*** *about two–and three–dimensional shapes and their characteristics, the interrelationships of shapes, and the effects of changes to shapes are important aspects of spatial sense. ... In learning geometry, children need to investigate, experiment, and explore with* ***everyday objects*** *and other physical materials.*
>
> *(NCTM,1991,p. 48, emphasis added).*

I propose that one way we can fulfill this vision is through the use of sheets of paper. Although a commonplace material in many homes and primary classrooms, I sense that most of us have not used paper as a manipulative material for learning mathematics to the extent we could. The purpose of this article, then, is to explore how we, as parents and teachers, can facilitate children's early geometry learning through this medium. Drawing from (i) a recent study of parents and their four year old children (Anderson, in press) and (ii) activities I have used and/or observed in primary classrooms, I offer these particular paper activities as a means to remind ourselves of experiences created with and for children, in which the inherent mathematics may have been overlooked or undervalued.

Parent Mediation of Mathematics

In a recent study into parents' mediation of mathematics learning (Anderson, in press), I provided each of 21 parents with a box containing 4 sets of materials. One of these sets consisted of an envelope containing 3 sheets of colored paper, 3 sheets of plain white paper and 3 sheets of lined white paper. A pencil was also included in the box. No directions were given regarding the use of any of the materials but all parents were aware of the researcher's focus on mathematics. Each parent was asked to share each set of materials with their four year old child, as they would do normally, and to audio tape the interactions which occurred.

Interestingly, 20 children drew or wrote on the blank paper, four of the parent-child pairs also co-constructed paper folding activities, and two parents and their children cut shapes and designs. When parents were asked which materials in the kit seemed mathematical, most parents expressed uncertainty about the blank paper and its connection with mathematics. Yet, the data suggests these parents did capture opportunities during their blank paper activity to discuss mathematical concepts with their children.

Drawing and geometry

As indicated earlier, drawing was the most common response to a parent's query, "What will we do with the paper?". Most often the four year old children drew pictures of their favorite things such as a girl flying a kite, a bunny, a mermaid, a house. This array of pictures ranged from scribbles and broad strokes on the paper to well defined figures. On other occasions parents drew pictures, usually of geometric shapes or a number of objects.

Drawings of specific geometric shapes permitted parents to name the shapes or point to a special case. However, some parents also used such drawings as opportunities to define concepts as they were manifested in the activity. For instance, while drawing shapes for her twin sons, Andy and Cliff, to recognize and name, a mother also drew their attention to some mathematical properties of the shapes, namely the relationship among the sides of a square and among those of a rectangle.

M: *Square, very good.... What's this one; what shape is it?*
Remember this one? That was a triangle, so what's this one?

A/C: *Square.*

M: *No, square is equal on all sides. If I make a longer on this side, what's that called ... do you know?*

A/C: *Is it a rectangle?*

M: *This two side, long; four sides altogether, right across from each other...*

On those occasions where drawings did not contain conventional geometric figures, parents spent a great deal of time trying to decide what the drawings represented. In doing so, references to the mathematics inherent in the process or product varied. For instance, Zelda began with a shape which her mother thought might be an "umbrella", but which Zelda identified as a "kite". Once the objects were agreed upon, Zelda's mom (as well as most parents in the study) asked "how many?" questions.

M: *Now what would you like to make on the first lined paper?*

Z: *A sun.*

M: *One big something. It looks a bit like (inaudible)*

Z: *It's not.*

M: *You put a cross through it. Now it looks a little bit like a kite, it looks like different things. ... Well that looks like a face. A person with arms and is this an umbrella?*

Z: *No. A person, a kite.*

M: *How many people and how many kites?*

Z: *1 kite, 1 person.*

Could it be that these parents saw counting as a means by which they could inject mathematics? Perhaps, but, this mother made reference to size ("big something") and drew attention to the intersecting diagonal lines ("the cross through it") the child had used. Indeed, other children used size to describe objects in their pictures. One girl noted the Dalmatian puppy's "body is not so big is it?". A boy asked his mother to draw a dog chasing his fly "a little bigger". Another parent likened "a kite" to "a diamond shape" as she attempted to further clarify her son's picture. Of course, looking at geometry is seldom the focus of such free drawing activity, so talking more about the story the picture tells, or praising the colors chosen or the beauty of the picture rightfully dominates. In turn, however, free drawing activity also provided a context for shape and size to arise informally, and to be readily connected to the task at hand.

In a second drawing, Zelda described her scribblings as a map to Whistler - a ski resort near Zelda's home town - and shared with her mother certain landmarks she had included along the way. Her mother supported her efforts. Unlike the first example, geometrical concepts

▲ NOMINATIONS FOR OAME/AOEM BOARD OF DIRECTORS 1998-99

Each year, elections are held for President-Elect, 3 Vice Presidents (1 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 15, 1998, to:

Barry Onslow
Past-President, OAME/AOEM
Faculty of Education

Include the nominee's qualifications with the Nominations Form. A nominee must be a member of OAME. By March, 1998, 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 will be released at the Annual General Meeting of the OAME/AOEM in Toronto in May, 1998.

Nomination Form

I nominate: _____

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

Nominee's Address: _____

_____

Telephone: (h) ( ) _____ (w) ( ) _____

Nominator's Address: _____

_____

Telephone: (h) ( ) _____ (w) ( ) _____

were not interwoven orally.

M: *Do you know what this is going to be or do you want to decide later?*

Z: *A map*

M: *A map. That looks a lot like a map actually. I was going to say it looks a little bit like the world.*

Z: *This is the way you get to Whistler, straight up the hill. This is Ottawa.*

M: *Island of Ottawa*

Z: *You go a little further and this is Blackcomb and this is Whistler.*

Accepting that it would be unwise to overanalyse such free drawing activities, it still seems worthwhile for us, as teachers and parents, to pause and consider how such pictures may permit the child's world and geometry to connect? Zelda's map drawing, for instance, could be seen as an informal exploration of scale and distance, wherein the many scribbles leading from home to Whistler may be the child's way of representing the real distance. Certainly, the child's description of the locations on her map suggest she was aware of distances (i.e "and further on"). She also spoke of places being located at different points, and although the words 'between' or 'middle' were not used explicitly, she implied as much. Thus, if we recognize geometry as the study of spatial relationships as well as conventional shape recognition, we as parents and educators can begin to realize that free drawing and geometry are connected.

Paper folding and geometry

Paper folding was another response to the set of blank paper. Four children and their parents in this study opted to fold the blank paper into boats, airplanes, hats and snowflakes. Two of the parents spent considerable time providing directions for completing the folding task and verbalizing geometrical concepts both directly and indirectly. For instance, both Sadie and her Dad folded their own sheet of paper as they each built a boat. As he gave step by step instructions, Sadie's Dad consistently named the geometric shapes involved.

D: *"... a paper boat. okay. Fold this corner over to here, and then it will make a triangle".*

S: *Yeah, you're right ... a triangle.*

D: *And now look at the inside of the triangle here and open it up. You can make another square. ..."*

Sadie and her dad also folded an airplane. This time her Dad's directions seemed to concentrate only on the actions needed. Yet, symmetry (e.g. "turn it over and fold the other wing to match") and measurement concepts (e.g. "as close as you can") were implied.

D: *Okay... Now you take this side and fold it over onto this side.... as close as you can. Straight.*

S: *Flatten it down. ...*

D: *Open it up again. Now you take the edge and fold it over right on that line....Now you fold it again on the line.*

S: *This is getting trickier....*

D: *"... And then you fold one wing down. Okay, can you flatten that out? Good. Then we turn it over and we fold the other wing down to match".*

Again, let us pause and consider how paper folding provides a means to connect geometry with child's play. Making airplanes with Sadie, for instance, offered a context in which a child (and adult) may explore properties of the shapes they create along the way. Whether through explicit queries or silent consideration of what's happening, the act of paper folding itself or the resultant shape(s) offered occasions to experience and reflect on the measure, the shape and the properties of geometrical figures.

Cutting and mathematics

Cutting designs in the folded paper was one family's response to the set of blank paper. Jake and his Mom created snowflakes from some of the paper provided. Cutting one shape on a fold through several layers produced numerous copies of a symmetrical shape. Jake's mom drew attention to this multiplicity of form indirectly by noting the number of 'boats' in his opened design, although counting seemed to be her intent .

M: *(as Jake is cutting)... "Oh Jake I like your steam boat shape.*

M: *(Reacting to opened snowflake) "It looks like 4 steam boats coming to crash".*

J: *"Where?"*

M: *... You see, one boat going in, 2 speed boat, 3 speed boat, 4 speed boat; neat, they're gonna crash."...*

J: *Let's see. How many do I have? 1,2,3,4. How many do you have? 1,2,3,4.*

M: *You have hearts,... count your heart?*

J: *1,2,3,4,5,6.*

M: *Do you think any of these are heart shape?*

J: *No.*

Another child, Bill, and his mom named and described their cut out shapes, and dealt indirectly with a defining property (i.e. number of sides(angles) of a figure).

M: *Do you know what those shapes are?*

B: *Hearts*

M: *That's hearts, what are those?*

B: *Triangles*

M: *Yea, triangles and diamonds*

B: *What are those? I have cut up some shapes, what are those?*

M: *How many sides to it?*

B: *1, 2, 3, that, a point pointing up.*

M: *That's right, that has 3 points.*

Since cutting designs (snowflakes, doilies, paper dolls in a row) and paper folding fit comfortably into a primary classroom context, once again it is worth pausing and considering how geometry connects with the paper cutting crafts children enjoy. Paper cutting episodes such as those described offer an opportunity to explore line symmetry or reflections. Thus, craft activity provides a context in which geometry can be examined.

Paper Activity in Primary Classrooms

There are many other things children do with blank paper in primary classrooms (and in the home) which were absent in this study. For example, children often cut out pre-drawn pictures of figures to create their own scenes or cut various shapes from magazines to create collages or pictures. Through such cutting activity children may begin to feel (and visualize) the differences, for instance, among angles and straight and curved lines. They may begin to notice that taking away from a shape creates yet another shape (i.e. cutting corners from a square can produce an octagon). Cutting in general involves spatial thinking, a geometrical ability which we want to help children develop.

Using paints, glue, or wax crayons as part of blank paper activity also provides opportunity for mathematical experiences. Indeed, it is common in our primary classrooms to find children drawing or cutting half a figure along a fold line to create a whole figure or using wet paint between folded paper to create an image as they explore line symmetry. Likewise, the act of folding **and** unfolding paper encompasses mathematical ideas. For instance, a single fold of square paper from corner to opposite corner produces creases which are the diagonal of the square or produces a new shape which is a triangle. Measurement also arises when sides are matched and at times adjusted. For instance, folding the shorter side of a rectangular piece of paper along its longer side can lead to the comparison of the two lengths. Folding the corners of a square to its center leaves the imprint of an inscribed square whose vertices are the midpoints of the sides of the original square. Examining and talking about these outcomes help children visualize the properties involved and encourages further exploration.

Creating and solving 'puzzle like' shapes similar to pattern blocks or tangram activity also offers much opportunity for geometric learning. By folding a piece of paper, cutting along the fold lines and reassembling all the parts into a new shape, children explore principles of "dissection motion geometry (DMG)" (Rahim and Sawada, 1986) which stems from a formal branch of mathematics involving dissection theory (Eves, 1972). Simply put, dissection motion geometry combines folding, cutting and moving shapes in such a way that the original shape and new shapes have the same area. By creating "puzzle-like" shapes from paper and completing the puzzles, children are exposed to slides, flips, turns, in addition to many other properties of shape. I have heard children's comment to one another (e.g."Sliding the small triangle to the left turned your rectangle into a trapezoid, wow."). I have seen questions I asked (e.g. "Do your boat and your rectangle cover the same area?") arouse children's curiosity about the mathematics they used and influence questions and observations of other moves and shapes they can make.

Conclusion

When it comes to using paper to explore mathematics, we should not be drawing a blank. As we become better at recognizing the mathematics hidden in blank paper activities, we need to consider when and how to use such activity to raise or examine explicitly inherent mathematical features. However, a word of caution is needed. Parents and teachers need not overanalyse these integrative experiences but neither should they undervalue their mathematical potential.

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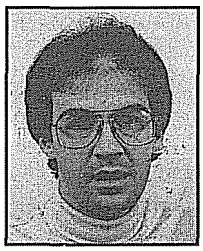
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▲ ABOUT PROBLEM SOLVING: MAKING A CASE FOR MULTIPLE SOLUTIONS



JOHN GRANT MCLOUGHLIN
OKANAGAN UNIVERSITY COLLEGE

What is 4 + 4? the average of 23, 16, and 9? the square root of 64? The experience of mathematical learning is often filled with single answers. Perhaps the experience would be enriched with more possibilities to consider. In fact, I am confident that you will find this to be the case. The primary grade teacher may wish to rephrase the initial question "What is 4 + 4?" to be "What is 8?". Inviting students to tell you what they know about a number is a valuable means of drawing knowledge from the class. Students will get chances to make connections when 5 + 3 and 3 + 5 are both offered as acceptable solutions. Perhaps a student will say "5 + 2 + 1" or "12 - 4" or ... Teachers and students may benefit from such an approach. Reframing a question to invite multiple solutions allows people to process ideas and continue to work with them beyond the statement of a single response - one that may even come before some students have had time to process what is being asked.

The crux of this article focuses on material that seems best suited for intermediate grades; however, most of the ideas could readily be adapted for use at other levels. The notable exception to single solutions in math class is work with quadratic equations. The predictability remains in that exactly 0, 1, or 2 real solutions will exist; usually it is a basic exercise to verify exactly how many, thus, reducing the suspense.

Math classes need to be places in which students are encouraged to investigate and explore ideas beyond a single answer. It is essential that teachers provide fertile ground for developing such skills among students. The problems that follow are intended to provide some potential starting points. These problems have multiple solutions. A few ideas are provided for creating such problems and it is hoped that you will adapt some of them for use in your classrooms. Feedback is certainly welcomed.

Properties of numbers offer an avenue into this domain of problems. The first problem is an example of a mathematical fact that one is unlikely to discover by accident. It is possible that you live at house number 153 and have discovered that it is not just any house number. There are a few others that share its curious property.

> **Some three digit numbers share an unusual property. The sum of the cubes of their digits equals the three digit number itself. Find as many of these numbers as possible.**

Definitions of mathematical terms offer another means of creating problems. The next example considers abundant numbers. Note that students need not be familiar with a term though it may become necessary to clearly define the term in the statement of the problem.

> **A number is abundant if it is less than the sum of its proper factors. For example, 12 is an abundant number because its proper factors 1, 2, 3, 4, and 6 add up to more than 12. List as many abundant two digit numbers as you can find.**

Other properties of numbers may be examined as the basis of a problem. Here is one such example:

> **Many numbers can be expressed as the sum of consecutive positive integers. For example, 86 = 20 + 21 + 22 + 23 and 13 = 6 + 7. List as many two digit numbers as possible that can be expressed as the sum of consecutive positive integers.**

The level of difficulty may be upgraded by insisting that a minimum of three consecutive integers be used to express the number. Try to find numbers that can be expressed as sums of consecutive integers in multiple ways. For example, you may wish to consider a number like 30. Of course, the restriction of consecutive positive integers could be amended to allow consecutive integers that may include 0 and negative quantities.

Magic triangles offer an interesting source of multiple solutions. Consider the digits 1, 2, 3, 4, 5, and 6. Arrange these in such a way that they form a triangle with each of the digits appearing once as either a vertex or a number between two vertices. The sum of the digits along each of the three sides must be equal to produce a

magic triangle. Elementary students will find that more than one possible "magic sum" exists. In fact, there are four possible totals that are feasible. The following example offers considerable depth in terms of potential for investigation:

The digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 may be arranged to form various magic triangles. Find as many different magic sums as possible.

Such magic triangles require two distinct digits to be placed between each pair of vertices. Some high school students and readers may wish to consider the challenge posed here: "Using some algebra, try to verify that indeed you have found all of the possible magic sums. "

An effort has been made to introduce some readers to a selection of problems that may open discussion of mathematical ideas - a discussion that will not end when one answer is found. It is also hoped that the commentary associated with the problems will assist you in adapting the ideas or creating your own problems for investigation in class. Any feedback on these ideas or your experiences with particular problems is welcomed. It seems appropriate to finish with another challenge related to fractions. You may wish to reframe it in terms of multiplication. That is, 5 times some quantity equals another quantity.

The digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 are each to appear once in the form of a fraction. The challenge is to create a fraction equivalent to $\frac{1}{5}$.

Ontario Mathematics Coordinators Association
Ontario Association for Mathematics Education

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▲ How Hard Can It Be? Resources for Supporting the Future Education of Girls and Young Women

ONTARIO WOMEN'S DIRECTORATE

There's a lot going on in the world of girls and education. As we approach the end of the century, educators are preparing students to meet the demands of a more scientific and technological society. Placing girls and young women front and centre in this plan will ensure that they participate fully and equitably in the future development of Canada. As a contribution to these educational efforts, the Ontario Women's Directorate has prepared a timely resource. *How Hard Can It Be? An Annotated Bibliography of Background Materials and Curriculum Resources to Encourage Girls and Young Women into Computer Technology, Engineering and Trades, Leadership and Entrepreneurship, Mathematics and Science* provides resources that will enable young women and their teachers to explore these fields and consider careers within them.

The 178 annotated selections in the Bibliography are designed for both elementary and secondary school levels and offer analysis, strategies, and curriculum resources including classroom activities. The Bibliography is divided into eight sections. What follows is a selection of what you'll find there.

Girl-friendly Internet books and Web Sites are listed in the **Resources for Students**. Internet guide books help girls connect to the Internet itself and a selection of Web Sites plugs them into creative girl-friendly spaces on the World Wide Web. These are points of departure intended to encourage girls to explore their world in cyberspace. Included here is a reference to the Canadian Association for Girls in Science, which offers 7-to-16 year-old girls a chance to learn more about science, technology, engineering and mathematics.

Key Internet Web Sites connect teachers and students to a wide selection of girl- and women- friendly resources. These sites offer a variety of activities that encourage both the student and the teacher to use the Internet for learning as well as developing technological skills.

The five key sections – **Computer Technology, Engineering and Trades, Leadership and Entrepreneurship, Mathematics and Science** – are divided into Background Materials and Curriculum Resources. The field of **Computer Technology** has grown by leaps and bounds over the past decade. The new and exciting literature exploring women's place within technology and on the Internet is both optimistic and cautious. Current research continues to point out that technology must be shaped to welcome female students and that education must build curriculum that addresses their learning needs. By doing so, greater rates of retention may be achieved and greater numbers of female graduates will move into the computer industries.

Engineering and Trades includes professional reports offering strategies for recruitment, training and retention of women in the engineering profession. National and local trade organizations are producing a wide selection of resources for women on the job and for those women just entering the trades. And a new and exciting Construction Technology for Women program is gearing up for September 1998. The curriculum materials being developed for this program will promote positive change in both the climate and the representation of women in construction technology fields.

Resources identified in **Leadership and Entrepreneurship** will help educators, practitioners and parents promote economic independence and initiative in girls and young women. The background literature identifies how women undertake and develop their leadership skills. It profiles those who have advanced women's positions in science, education and business. Curriculum resources explore entrepreneurial science activities and show how to carry out inventive initiatives. Leadership workshops and creative awareness training for students promote attributes that are inherent to successful entrepreneurship.

Mathematics continues to be the most important building block in education. Recent research redefines the "problem" with girls and math by locating the "problem" in the way math is taught rather than in the

way girls learn. New curriculum resources include instructional and assessment materials that can help mathematics teachers pinpoint their student's needs.

A major problem facing **science** today is the retention of female students in both secondary and advanced educational programs. Girls approach science differently than boys and these approaches need to be incorporated into the teaching of science to help girls succeed. Leadership and mentoring programs may also improve female retention rates and self- confidence. Girl-friendly curricula have been developed by women scientists that incorporate these crucial aspects into girls' learning.

What is really striking in this collection is the small number of computer curriculum materials designed for girls and young women. The research shows that the much needed curriculum resources that ensure balance and fairness in computer technology training for girls and young women are either not yet available or not easy to find. This shortcoming needs to be addressed and curriculum materials need to be developed to fill the gap. Overall, the collection provides a rich and exciting sampling of the excellent work that is being accomplished in these fields.

The Bibliography was released in May 1997 and is available from the Ontario Women's Directorate. It is on-line through the Ontario Women's Directorate Web Site

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OAME/AOEM Awards Nomination Process

Deadlines

Nominations for awards to be presented at the Annual Conference must be received by January 31 of the calendar year in which the conference takes place.

Nominations received after January 31 will be considered for awards to be presented during the next three calendar years. A nomination will be allowed to stand for three consecutive years. After that time, the nomination must be renewed. A standing nomination may be amended at any time by the original nominator. The nominator need only inform the chair of the Awards Committee in writing of the proposed changes to the nomination form.

The OAME/AOEM Nomination Form

Write a letter supporting the nomination of your candidate for the indicated award. Provide specific and detailed information about the nominee's activities as they relate to the following areas of consideration;

- demonstrations of excellence and creativity in mathematics education.
- specific contributions to mathematics education in the school, region, province or nation.
- demonstrates leadership in mathematics education in the school, region, province or nation.
- support of and contribution to the activities of OAME/AOEM.
- contribution to the development of students both within and outside of the classroom.

Please include any additional information that you feel may be relevant to the nomination, but which may not be specifically mentioned above.

The Nomination Cover Page

Complete the Nomination Cover Page and attach it to your letter of recommendation for the nominee.

Incomplete or inaccurate information may cause a nomination to be withheld form consideration.

OAME/AOEM LIFE MEMBERSHIP AWARD

The Life Membership Award is given to recognize a person who has contributed in a significant was to OAME/AOEM; demonstrated outstanding leadership in mathematics education; and accumulated 10 or more years of membership in OAME/AOEM.

KENNETH D. FRYER AWARD

In Memory of the late Kenneth D. Fryer, OAME/AOEM, in conjunction with the Grand Valley Mathematics Association, established the Kenneth D. Fryer Award. The award is to be given annually to recognize a mathematics department which fosters collegiality, team work, and excellent classroom teaching; contributes to the overall development of students; and demonstrates leadership in the mathematics education community.

MONA MACGREGOR AWARD

In recognition of the contributions made by Mona MacGregor, former OAME/AOEM Co-Secretary-Treasurer, OAME/AOEM established the Mona MacGregor Award. This is to recognize an individual who has made significant contribution to OAME/AOEM, but who is not necessarily an educator or a member of OAME/AOEM.

MORLEY MACGREGOR AWARD

In Memory of the late Morley MacGregor, former OAME/AOEM Secretary-Treasurer, OAME/AOEM established the Morley MacGregor Award. The award is to be given annually to recognize an elementary teacher who has demonstrated excellence in mathematics education, as well as contributing to the overall development of students beyond classroom activities.

DON ATTRIDGE AWARD

In recognition of the contributions made by Don Attridge, a founding member, former president and the previous Executive Director of OAME/AOEM, OAME/AOEM established the Don Attridge Award in the spring of 1995. The award is presented annually to recognize an exceptional and creative secondary school mathematics teacher who enhances the teaching of mathematics in Ontario.

AWARD NOMINATION COVER PAGE

Send to: David Zimmer

Intended Award (please check one)

❑ Life Membership ❑ Mona MacGregor ❑ Morley MacGregor ❑ Kenneth D. Fryer ❑ Don Attridge

Nominee Information:

Name of Nominee (Principal and Department Head for K.D. Fryer Award) _____

School, Organization or Business Address _____

Telephone Number ( ) _____

Fax Number ( ) _____

Home Address _____

Home Phone ( ) _____

Nominator Information:

Name of Nominator _____

School, Organization or Business Address _____

Telephone Number ( ) _____

Fax Number ( ) _____

Home Address _____

Home Phone ( ) _____

▲ DIRECTORS' DIALOGUE



BY PETER SAARIMAKI
COORDINATOR OF MATHEMATICS
TORONTO BOARD OF EDUCATION

Reporting on the OAME Board of Directors Meeting held Saturday June 14, 1997.

Important News - Chapter Happenings

(Yes, this is supposed to be a Board report, but we will get to that on the next page: first the interesting stuff! These comments have been extracted from reports submitted to the Directors. Omission does not necessarily imply inaction!)

CHAMP

MATHFEST '97 is coming **Thursday November 6th**: plan to be there! A spring awards ceremony/conference, regional playdowns for the Olympics and yet another great looking CHAMP NEWS (4 issues are planned for next school year) kept people busy, involved and informed.

COMA

Tentative date for the AGM and mini-conference is **Monday January 26, 1998**. Math Olympics, a secondary forum and a summer calculator institute comprise some of this chapters recent activities.

GVMA

This chapter will be celebrating its 25th year with a fall conference on **Thursday November 6th** in Kitchener.

ISOMA

A listing of 96-97 highlights included reports on their fall conference, preparations for several contests and the Olympics, and the AGM. For 1997-98, plans are underway for a **fall conference**, more editions of their newsletter, and hosting the 1998 OMO in June.

NOMA

Get ready "to boldly go where no math has gone before" on **Friday evening September 26th and Saturday morning Sept 27th.** NOMAs fall conference will be held in Sudbury. The keynote address, Taking the Math Curriculum into the next Century will be delivered by Mary Lou Kestell. NOMA is also preparing for the 1998 OAME Annual next May in North Bay.

NWOAME

Math Fest '96, Olympics, co-hosting the Canadian Mathematics Education Study Group, and encouraging over 20 NWOAME members to attend the NCTM National conference in Minneapolis - whew! What a busy group! And two members were elected as OAME Directors!

MAC^2

This fledgling chapter had a very successful spring, hosting an AGM and mini-conference, regional Olympics, and the widely acclaimed OMO .

PINE RIDGE

Mark **Thursday April 10, 1998** in your books for the next mini-conference (this years attracted approximately 200 participants). This chapter has also sponsored local Olympic competitions and sent two teams to Barrie, and held their 14th Annual Math Awards Night attended by over 300 students and their parents.

QSLMA

A recent newsletter presented information on OMO participation, the spring conference and their new constitution. QSLMA has a presence on the web: *http://www.mulberry.com/~gordcook/index.html* is the place to go.

SWOAME

Plans are in the works to again have the cities of Windsor and Essex declare a Math Awareness Week next April, with the support of area boards and the University of Windsor. Teams were selected and sent to the Olympics, two SWOAME members will be sponsored to attend the OAME Leadership conference, and a **fall conference** is planned: watch for further information.

TEY^{2}MS

As well as running a successful Annual Conference last spring, the chapter sponsored three teams to the Olympics (and our Pascal team raked in a third). Two members will be sponsored to attend the OAME Leadership conference. Plans are underway for a **fall mini-conference** and AGM. Metro teachers should watch their school notice boards for more details in September.

Y^{4}MA

A successful spring meeting and AGM confirmed this chapter's request to host the 1999 OAME Annual conference. The fall mini-conference is slated for **Tuesday September 23** in Thornhill with the intriguing title: E^4: Engaging, Enriching, Exciting, and Empowering.

INTRODUCTION

As the first meeting of a new Board of Directors, President Judy Crompton extended welcomes to newly elected and appointed Directors. Judy also shared a vision of OAMEs mission (see her report). There was the usual administrivia, correspondence shared, and Executive Directors report - don't get me wrong, they are all very important, but we can use this space for other items as well. (If you really want to know about these details, ask your chapter rep).

One important aspect of each initial Board meeting is discussing and setting a budget for the year. Although membership is still slightly below previous figures, sales of the Linking Assessment and Instruction documents have kept us in the pink. In general, revenues are meeting or exceeding expectations and expenses appear to be coming in under budget.

Some time was also spent on approving an up-dated set of Terms of Reference. These define the positions and committees of OAME, their duties, membership and timelines.

OAME 1997

Conference attendance was up, evaluations were very positive and a full report will be found elsewhere in this *Gazette* (with pictures).

OAME 1998

Get out your calendars and mark down **May 21 - 23, 1998** because that's when you should plan to be in North Bay. 1998 will be the 25th Annual OAME conference so there will be lots of special events. Early this fall schools will receive flyers outlining keynote speakers, workshop presenters, as well as costs and travel arrangements. Many chapters may be arranging for joint travel, so be sure to check for ways to reduce costs and increase sociability and networking opportunities.

OAME 1999 and 2000

OAME has approved future sites with 1999 going to Y^4MA and 2000 to COMA.

▲ LETTER TO THE EDITOR

Dear Editor :

THROUGH THE EYES OF A STUDENT VOLUNTEER

In early February, the prospect of missing two entire days of school for the O.A.M.E. conference was the perfect birthday gift (I was born in February). So I wasn't thinking much mathematics. My friends and I signed up thinking: two days of no school + all our friends are going to be there = party! By the time May came around, nobody wanted to go. There were assignments to complete (or start in most cases), tests we would have to make-up, and tons of homework. Who could afford to miss a chemistry class? It was confusing enough as it was. With the grade twelve board-wide math exam right around the corner, you couldn't expect anyone to really want to go. There was just too much luggage to carry. And by May, it doesn't take much to have one break. You really can't blame those dozen or so students who chickened out. One thing is for sure, I'm grateful that I was a part of the O.A.M.E. conference.

Grateful? Yeah, that's right. Grateful. Sure, being a student volunteer from York Memorial Collegiate Institute in the City of York, for the conference held at the Sheraton Centre on May 8, 9, and 10 meant waking up earlier than usual, getting home later (not that there was much to look forward to but a pile of work), sore backs and arms from carrying gifts and projectors, and swollen feet from running errands. Okay, so we got free T- shirts, lunch and snacks which were great. I guess I should be thankful for that, and I am. But so much happened to me during those few days that helped clear my foggy vision. Little, but significant, they will stay with me forever.

I remember coming home Thursday evening feeling horribly dispirited. I recognized that I enjoy being around people and prefer a career in a vivacious and jubilant environment. I also confronted my love for literature. It was painful reckoning why I had been ignorant for so long. A combination of events took place that day that made me realize who I really am, and forced me to re-evaluate the path I was so blindly following. The next day, I met this wonderful woman who encouraged me to write about my experience at the conference. It's funny the way it all happened. I know, I know. So I didn't learn much math, but my experience at this math conference (with the magnificent people, my teacher and friends) taught me very valuable lessons about life itself.

Don't get the wrong idea. It was a math conference with a load of mathematics. I had the pleasure of being a workshop helper with which came the opportunity to participate in some of the fun packed activities. Of course, there were also challenging workshops that involved some heavy-duty math. The volunteers supervised elementary school students in the Games area, loaded with creative mathematical board games made by young people.

My friends and I had a blast playing some new games for youths and adults that involved mathematical concepts. I never believed math could be so much fun! The volunteers were also gophers, hospitality and/or facility people trying to make this year's conference one of the best.

It doesn't end there. For a privileged few, the math conference had even more to offer. I had the delight of being a part of my teacher, Mr. Komlos', presentation. From fractals and spirals in nature to math of the billiards and soap bubbles, it was pleasant sharing our adventures into the wonders of math.

The O.A.M.E. math conference was fun while it lasted. I wish I could say the same about getting back to the books.

Aneesa Patel, Student Volunteer

SECONDARY REFORM

OAME continues to be vigorously involved in the provincial discussions, debates and deliberations regarding the on-going Ministry initiatives to reform secondary education. Two OAME Directors, Mary Lou Kestell and Marg Warren, were appointed to the Ministry's Math Expert Panel that met throughout the spring. The eight person team also included math reps from University and Community College, along with four representatives from the general public. The public reps were: a union member, an accountant, a nurse, and a professional engineer.

The panel first worked from a background paper (prepared by OAME Director Geoff Roulet and available on the OAME website), then received submissions, from OAME and OMCA amongst others, and finally spent a week coming to grips with the issues facing mathematics in a reformed secondary program.

The Expert Math Panel concentrated on the following issues: math as a filter; calculus for everyone; selecting up instead of dropping down; avoiding differentiation by destination; developing a core set of competencies; technology; and inservice need. They have submitted a report to the Ministry and we all await further developments.

STANDING COMMITTEE REPORTS

See a notice in this *Gazette* for the 1997 winners of OAME **Awards.** This committee, under David Zimmer, will receive nominations throughout the year before they make their selections for presentation at the Annual conference. Don Gray and Barry Scully agreed to cochair the **Equity** breakfast next May and look into widening the scope of this committee to encompass other issues, such as accessibility. If you have any thoughts please share with Don or Barry (see listing of Directors on the back cover).

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Publications, under chair Murray McLennan, continues to monitor the workings of *The Gazette* and *The Abacus* (articles and advertising) as well as the OAME web-site (check it out at its home base of:

http://www.mathstat.uoguelph.ca/oame/index.html).

The **Promotions** committee, under John Kersley and Bill Otto, continues with several ongoing projects designed to attract new members, including new promotional kits for chapters to use. Other standing committees, whose work has been reported here, but under different guises, include Constitution and By-laws, Finance, Futures, Leadership and Nominations- Elections.

ADVISORY REPORTS

Our new **NCTM representative**, Frances Schatz, will handle orders that OAME members wish to place with NCTM: placing them through Frances provides OAME with additional revenues. Your humble reporter attended a meeting of the **OTF Curriculum Forum** where subject association representatives were given a presentation on Ministry initiatives 1 - 8 and secondary by Pauline Laing. Teachers will all be receiving copies of the recently released documents: *The Ontario Curriculum: 1 - 8 for Language and Mathematics.* OAME is also in contact with the College of Teachers regarding professional development portfolios. Teachers working for and/or attending OAME sponsored conferences will, retroactively, receive *credit* for their professional development work.

Yours truly also gave Directors a brief report on happenings from the Education Quality and Accountability Office (where I have been seconded for another year). **EQAO** communications are now distributed through individual board, so contact your Board Contact for copies of newsletters, FAQs and releases. Early this fall, each school will receive a report on its students performance in the *Grade 3* Reading, Writing and Mathematics Assessment held last spring. Board and Provincial Reports will also be available. Plans are well along the way for the next Grade 3 test in 1998 (which will be shorter and likely a little later).

The *Grade 6* provincial assessment in mathematics, held this spring in a sample of schools, will produce a provincial report as well as reports for the schools involved. At all grades, the EQAO focus is on modelling good classroom practice, encouraging performance based activities, and holistic assessment.

The next new assessment will be for *Grade 9* in mathematics for a sampling of schools. The Grade 9 will still be based on the Provincial Standards since the new TOC only covers grades 1 to 8. Field testing of the Grade 9 will occur in some Grade 10 classes in October, 1997 and testing in the spring of 1998. Reports are also becoming available for SAIP and TIMSS. Information on all these events can be found on the EQAO website at: *http://www.eqao.com.*

CURRICULUM COMMITTEE REPORTS

The **Early/Formative Years** ensemble, through Susan Stuart, reported on the new **TOC:1 - 8.** The group felt that there were too many negative implications and messages in this document and recommended that OAME send a letter of concern to the Minister/Ministry. The constant emphasis on *paper and pencil computations* and *standard procedures* was felt to be contrary to OAMEs vision as expressed in **A Focus on Renewal.** Ralph Connelly will be working with members of OAME, OMCA and CAPE (the Coordinators /Consultants Association for Primary Education) to produce the third OAME sponsored Assessment Resource document, for Primary educators.

Meanwhile the **Transition Years** entourage, under Joe Hall's chairmanshipability, are working on a support booklet for Data Management for distribution at OAME 98. The **Specialization Years** report starts above and continues with the production of a technology booklet, to be released at OAME 98.

RESOURCES

Directors received many extra resources to take back and share with their chapters including: hot-off-the-net copies of the 1-8 Ministry Curriculum, a wicked computer disc with hidden knife, information on the Canadian Mathematics Society and its website (at *http://camel.math.ca*), pamphlets for Grades 4 - 6 and 10 - 12, illustrating *A Vision of Mathematics Education for Canada* (from the Queens/Gage National Math Institute) [Ed note: grades 1 - 3 and 7 - 9 are now available], and various math related press clippings and cartoons. Your chapter rep is listed on the inside back cover if you want to see any of these, just don't tell them I sent you!!

APPENDIX

(Something unnecessary that can be annoying!?!)

President Crompton started the meeting by stating that she liked to end meetings early. I think we can only give her a technical award on this one, as the official adjournment was 3:59 pm. Almost too close to call, but that does not reflect the intensity of discussions that went on over the day, the depth of information we digested (and the fact we were only allowed 45 minutes for lunch), and the height of the materials we waded through. If you have recommendations you wish your chapter rep to bring to OAME, the next Board meeting is October 3/4 (to be reported in the December Gazette). So until then, à bientôt!

▲ The Name of the Game

A wrap-up report by Peter Saarimaki and Sandy Woodcock

Now that **The Name of the Game** has been played, it's time to reflect on "the essential points of the conference: what it was all about". Over the May-days, 7 - 10, 1997, crowds gathered at the Sheraton Centre in downtown Toronto for the 1997 Annual OAME Conference. The events of the Game can be set out as follows:

Pre-Game Warm-up

Wednesday evening: **Games for Everyone:** *A Celebration of Multicultural and Student-made Math Games* attracted parents and teachers to interact with students and their games. The Scavenger Hunt and Math Trail intrigued early delegates into touring downtown Toronto.

Players

Lead-off pitcher was **Ken Dryden** whose key-note talk was to the middle of the more than 900 delegates at the opening ceremonies on Thursday morning. Mayor Barbara Hall, Toronto, threw out the ceremonial ball, in absentia, by proclaiming May 7 - 10 as ***Math Days in Toronto***. The opening ceremonies also recognized the winners of several awards, with the team award being presented at the closing "banquet".

Relief was provided Friday by Featured players: Jack Benoit, Katherine Heinrich, Constance Kamii, Fraser Simpson, each pitching their views to over 300 enthusiastic delegates each time.

Mid-game breaks were provided each evening with: **In-house Games** - Thursday: a rousing Casino Night and highly competitive auction filled the left-field gap: the last item of the evening was a class set of calculators with overhead that went to a highly competitive consortium for ... are you ready for this?? .... ***7.5 million dollars!!***

Games on the Town - Friday at *Vinnies Social Club and Midway*, players tested their skills at skiing, volleyball, billiards, motorcycle racing, skittles, ... and had several chances to win some lucky-draw door prizes.

The closing pitcher, **Don Fraser**, allowed over 125 delegates to *Laugh and Lunch* as they prepared to slide home, as a timely conclusion to the exciting three-day match. Recognition must also be given to the rest of the team, in there pitching their workshops to capacity crowds the whole game.

Game Attendance

Over **200** presenters gave almost 200 workshops, with over half filled to capacity with pre-registrations *before* the conference began. Notwithstanding, all on-site registrations still had workshops at their level available for them to select.

A total of **26** co-chairs worked with over 50 committee volunteers (teachers, superannuated and real, as well as Faculty of Education students) to prepare the ground-work. **Hundreds** of students from our four Boards developed and presented math games for the conference, with over **100** coming to demonstrate in person Wednesday night and over the conference. Several school musical groups, elementary and secondary, serenaded the delegates over the noon hours and a class of elementary students played *live* chess on two occasions.

Total **Name of the Game** attendance over the three-day match had over 1200 educators attending as paid delegates or speakers/workshop presenters.

Future Games:

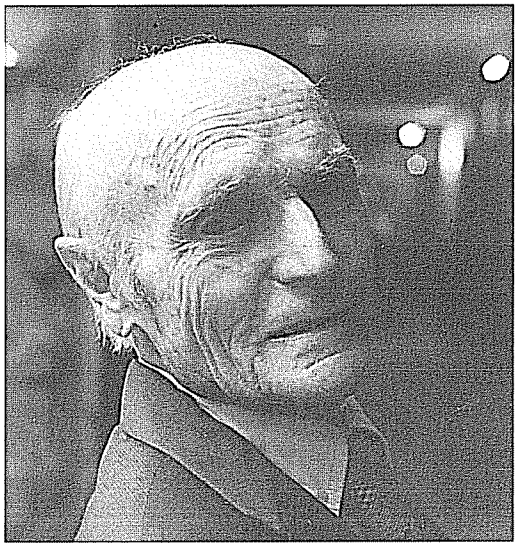
Comments from questionnaires: delegates, on a scale of 1 - 5, heavily favoured 4's and 5's for the important components of the conference. Sample comments: *wonderful organization, stimulating workshops, terrific atmosphere to meet old friends , fantastic opportunity to see the sights in the city,* ... See you in North Bay!

Peter Saarimaki and Sandy Woodcock, the co-captains of the Team who put together the Game, wish to express their sincere gratitude to the committee chairs and their members for all the work and exhausting efforts that they delivered to make the Game such a success. An event such as this demands the long term commitment of a great number of dedicated people, and we had those in spades. The two comments that were repeated many, many times, reflected the talents and attitudes of our volunteers, namely: "Everything ran without a hitch!" (meaning: the clean-up crews did their work unnoticed) and :"Everyone was so helpful and friendly" (meaning: we kept smiling because, after all, it was enjoyable and something to be proud of. It just goes to show that there **are** friendly people in Toronto!!).

And now, as Shakespeare said, "The Game is up!".















Top left clockwise

Opening ceremonies with co-chairs Peter Saarimaki and Sandy Woodcock.

Happy gamblers at Casino Night. Left to right: Social Co-chairs, Suzanne Kane, Candace Pacey and Sandy Woodcock.

Students demonstated the intriguing nature of their math game.

Proud students displaying their math games: student-designed and constructed – and enjoyed.

Publishers display area.

H.S.M. Coxeter (90), the worlds greatest geometer.

Opening keynote speaker Ken Dryden, about to turn over a new leaf.

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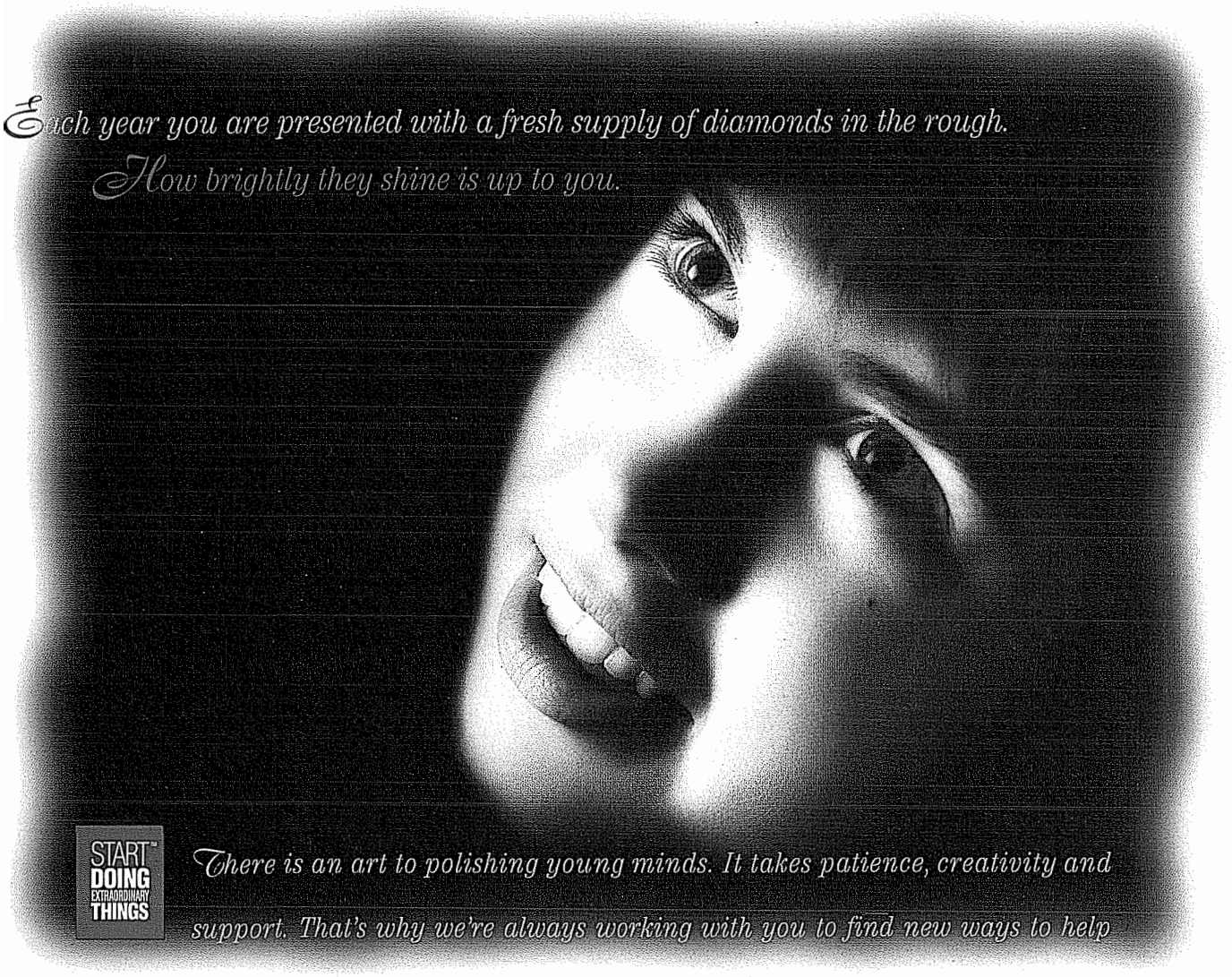
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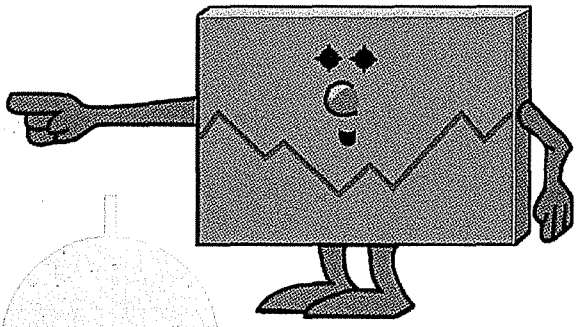
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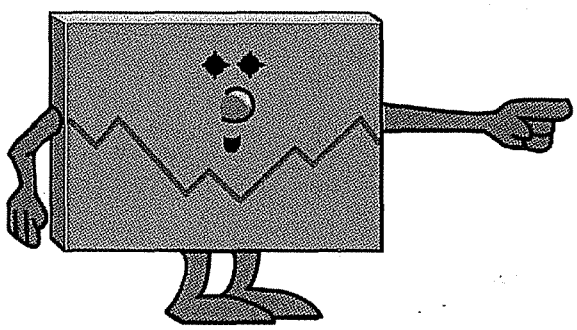
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