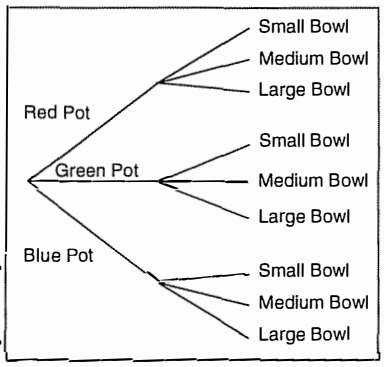
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Ontario Mathematics Gazette

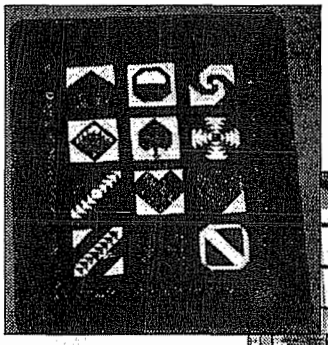
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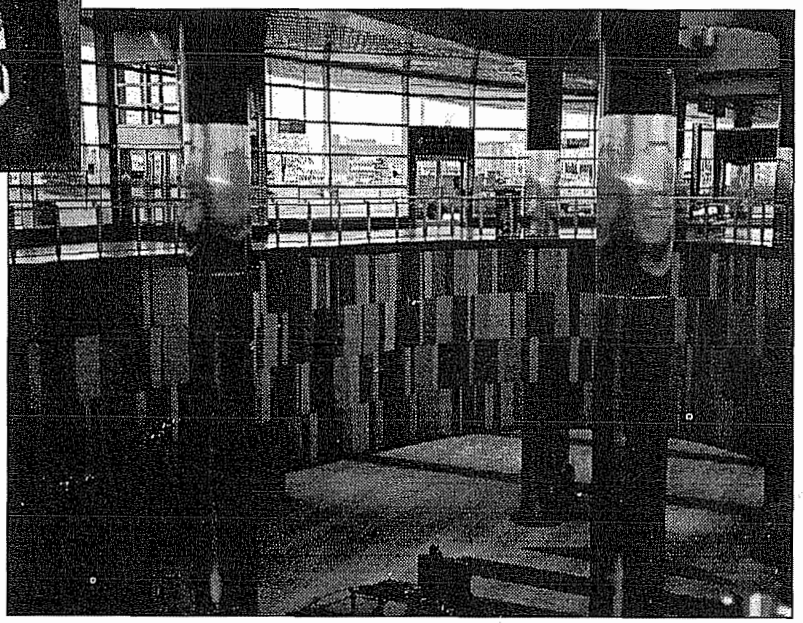
See *Connecting Mathematics Through Creative Writing: Goldilocks*

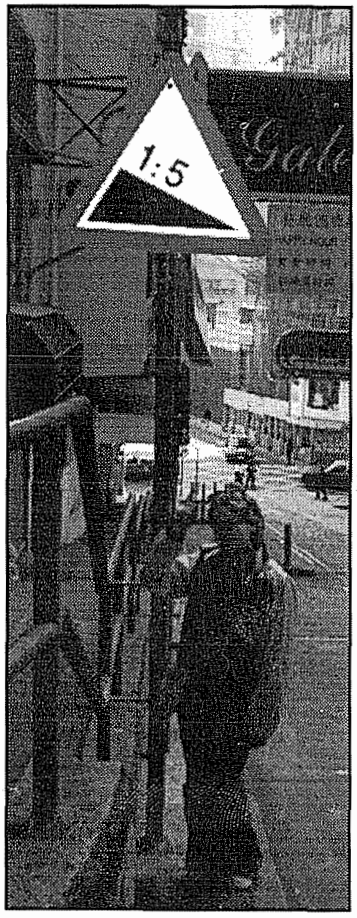
Student Connects Mathematics in Hong Kong! See *PhotoMath* Column



See *Mathematics and Quilts: Making the Connection*

Sliding Pi at Downsview Subway Station in Toronto! See Louis Lim's Editorial





FOCUS ISSUE: Connecting Mathematics

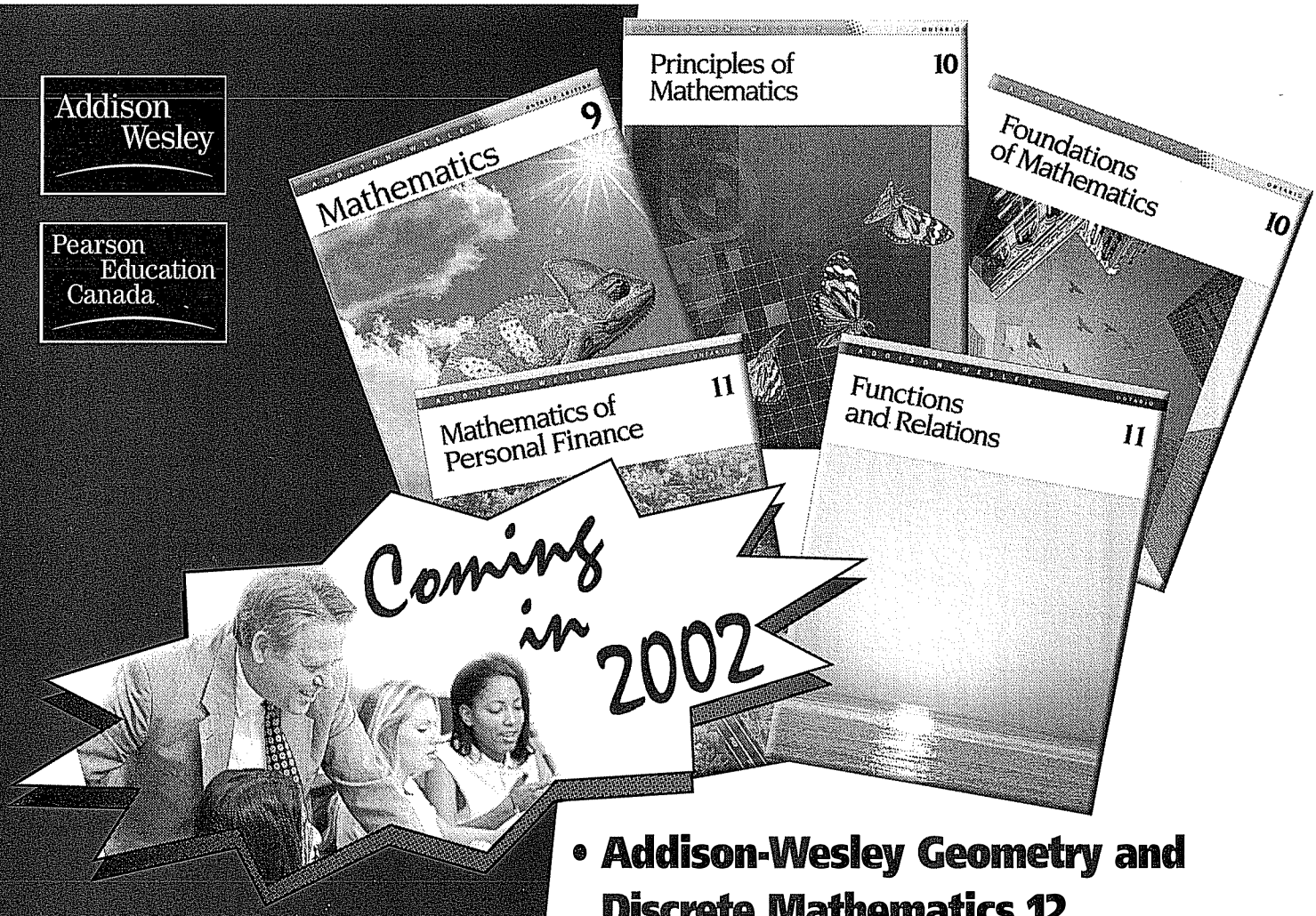
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▲ Connecting Measurement and Probability: A Multi-Level Activity
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▲ Editorial



LOUIS LIM, EDITOR
E-MAIL: Louis_Lim@edu.yorku.ca

"Learning is enhanced when embedded in a context. Well-chosen contexts for learning are those that are broad enough to allow students to explore and develop initial understandings, to identify and develop relevant supporting skills, and to gain experience with interesting applications of the new knowledge. Such rich environments open the door for students to see the 'big ideas' of mathematics – the major underlying principles, such as pattern or relationship. This ability to understand key principles will encourage students to continue using mathematical reasoning throughout their lives" (The Ontario Curriculum Grades 11 and 12: Mathematics, *2000, p. 7).*

Welcome to this focus issue of "Connecting Mathematics". The National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics* lists **Connections** as one of its ten standards. NCTM defines a *standard* as "descriptions of what mathematics instruction should enable students to know and do – statements of what is valued for school mathematics education" (p. 7). Some teachers may describe this standard as making mathematics real for students (hence an answer to, "Why do we need to learn this?") while others would describe it as teaching mathematics in context or with meaning. The emphasis of learning mathematics is no longer about acquiring isolated skills and procedures: "By emphasizing mathematical connections, teachers can help students build a disposition to use connections in solving mathematical problems, rather than see mathematics as a set of disconnected, isolated concepts and skills" (p. 64).

I had the privilege of teaching the Additional Qualifications on-line course "Intermediate Mathematics" during the past summer for Queen's University. The teachers taking this course, the majority who did not specialize in mathematics at university, stressed the need to teach mathematics for understanding – accomplished through teaching mathematics in context. We had an interesting discussion about the term "real world mathematics". Ron Lancaster, my department head during my first year of teaching, gave me the gift of "mathematical eyes" so I could view the world mathematically. Whenever I walk in the community, I have my "mathematical eyes" open – seeking connections to art, geometry, and science to

name a few. I have since done my best to share this gift bestowed to me by my mentor with the teacher candidates that I have worked with at Queen's and Nipissing Universities and in my work as a Continuing Education instructor at Queen's. Thank you, Ron!

The new mathematics curriculum promotes connecting mathematics. Here are five examples:

- students construct "home made" clinometers in class and then work in groups to measure the height of inaccessible heights such as the school or a tree;
- students design cylindrical cans to minimize the amount of tin used while maintaining the volume of the can – Why would anyone want to do that? Why do can companies not actually do that?;
- collect data through experimentation and attempt to determine an equation of the curve of best fit which can then be used to predict other data;
- students design a financial plan for a long-term goal such as post-secondary education, purchasing a car, etc. in the new grade 11 College course;
- students carry out a culminating project in the grade 12 data management course by integrating the techniques of data management.

In this issue of the *Ontario Mathematics Gazette*, you will find two articles on Mathematics fairs – one is a fair at an all boys' school written by Arthur Wenk, and another by Susan Smith who connects mathematics and science. A neat connection provided by Smith is that $y = mx + b$ and $v_f = v_i + a\Delta t$ are in fact the same equations, but have different variables and constants! You will also find a cumulative assessment for grade 10 applied mathematics where Jacqueline Hill takes her students on a math trail. Joanne Harris connects mathematics to art and geometry in her "Mathematics and Quilts: Making the Connections" article. Also, be sure to read Bonnie Litwiller and David Duncan's article as they connect measurement and probability. And finally, Wayne Erdman's "Connecting Mathematics and Creative Writing: Goldilocks" connects mathematics and literature – wow!

As always, you will find excellent columns. Ron Lancaster's *PhotoMath* column contains photos and questions of his experiences travelling the world as a mathematics consultant and workshop leader. The setting is Hong Kong and Ron received a submission from a teacher in St. Thomas, Ontario who sent in a photo of his grade 9 student connecting mathematics in Hong Kong! In addition, Chris Suurtamm, Ed.D., an expert in assessment issues, connects assessment with instruction, the "big ideas" of mathematics, the "real world", and including students in the assessment process so students can make connections to their own learning. Fred Ferneyhough's *Technology Corner* connects the CBL and graphics calculator to teaching mathematics. Ferneyhough demonstrates how to save CBL data for future use by using a student's data.

I thank the submitters of manuscripts, my columnists, associate editors, reviewers, and OAME's graphic designer for making this focus issue a reality. I know that there is a lot of "neat stuff" being created for mathematics students in Ontario – please share them with readers of this journal. We need to learn from each other and to support each other during these changing times. For further information, please e-mail me.

Holiday Stocking Stuffer...

Ivars Peterson, in his new book, *Fragments of Infinity*, does a marvellous job at connecting mathematics and art. The book contains a lot of high quality photos (with 8 pages of colour plates!) with discussions of contemporary artists such as Helaman Ferguson. The book, in hard cover, is available at most bookstores for $46.50 CAD (ISBN 0-471-16558-1).

What astonishes me is that during my final year of studies at York University in 1996, when the 106A express TTC bus began its route to the university from Downsview subway station, that I must have passed by the *Sliding Pi* mosaic hundreds of times, without knowing that it was created using the digits of the mathematical constant, π. Peterson describes the mosaic, created by artist Arlene Stamp:

"The basic unit in Stamp's design is a rectangle, ten units wide, made up of square tiles. The amount of overlap between adjacent rectangles is governed by the decimal digits of pi. For example, the first digit of pi after the decimal is 1, so the first two rectangles from the left overlap by one unit, just as if the second rectangle were sliding over to the left to rest partly on top of the first. The second digit is 4, so the third rectangle overlaps those already by four units ... by using several sets of colours, Stamp could vary the look of her Sliding Pi *mosaic in interesting ways ... Stamp's design for* Sliding Pi *doesn't repeat itself anywhere in the Downsview subway station, so it's interesting to look for different "pieces of pi" scattered throughout the structure" (p. 92-93).*

Enjoy the holidays! My former teaching colleague, Dave Handley, from Quinte Secondary School in Belleville would say, "HO^3!" ▲



Louis Lim

▲ PRESIDENT'S MESSAGE

SHIRLEY DALRYMPLE



*"When students can connect mathematical ideas, their understanding is deeper and more lasting. They can see mathematics connections in the rich interplay among mathematical topics, in contexts that relate mathematics to other subjects, and in their own interests and experience. Through instruction that emphasizes the interrelatedness of mathematical ideas, students not only learn mathematics, they also learn about the utility of mathematics" (*Principles and Standards for School Mathematics*, 2000, p. 64).*

Students often view mathematics as a collection of unrelated ideas, skills, and concepts. Helping students to see the connections among different mathematics concepts helps then to expand their view of mathematics and see it in a broader context. The insights that students gain from one context can often be used to solve problems in a different situation. As they build their knowledge of mathematics, they are better able to relate their knowledge to other disciplines. Part of our role as teachers is to help students connect their personal perspective to the more standard and traditional representations of mathematics. It is necessary for us to provide opportunities for students to experience mathematics in a context that is important and meaningful to them. It is also important for us to help students make connections among mathematical concepts. Links that often seem natural and obvious to us are often revelations to our students. As they explore and investigate problems many students see the patterns, draw accurate graphs, describe correct relationships, write correct solutions, and form appropriate conclusions. However, they often have a difficult time generalizing what they have learned and applying it to a new problem. As we assist students to make connections and understand concepts that they have been working on, we will have some special classroom moments. We may hear someone shout, "Oh, I get it!" or we may see the looks on their faces change from stunned to satisfied. This is why we work so hard.

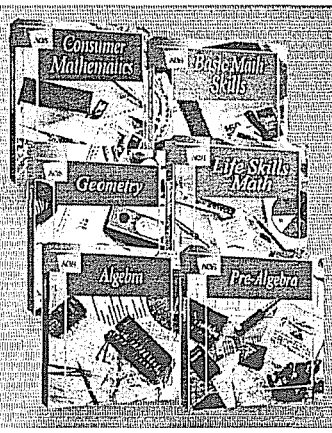
Accomplishing this is not an easy task. We may lack the contextual experience ourselves or we may not be aware of how the mathematics is connected to many situations that occur in other subject areas. We need to make some connections of our own. This issue of the *Ontario Mathematics Gazette* is focussed on connecting mathematics. I trust you will find some useful ideas in this journal. Some of my best resources have come from my connections with other educators, as I read their work, hear them speak, or have a chance to talk with them. Many high school teachers in the York Region DSB have formed a sharing network, connected to each other by e-mail. We share our grade 11 creations: ideas on tests, quizzes, activities, journals, and performance tasks. It has saved us time, helped to clarify our thoughts on assessment, and has been a tremendous resource as we prepare our grade 11 courses. We intend to continue this practice next year for the new grade 12 courses. We have lost so much of our PD time, and although this is not a replacement, it has been a tremendous help. I highly recommend that you form a similar network in your board, as it would be useful at any grade level.

One of the ways that you can stay connected to OAME is to visit our web site, www.oame.on.ca, on a regular basis. We have expanded our capacity so that we can post resources as they become available to mathematics educators. As our separate committees complete items and activities, we will post them for your use. I wish to thank the many members who continue to work many hours in support of mathematics teachers in the province during this time of great stress and change. Let's stay connected to each other. Please contact me or any Board of Director if you have any questions or concerns that OAME may be able to address.

"...the universe...cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics, and its characters are...geometric figures without which it is humanly impossible to understand a single word of it; without these, one is wandering in a dark labyrinth."

Galileo Galilei

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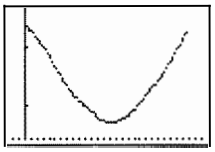


Fred Ferneyhough is Head of Mathematics at Central Peel SS in Brampton and is technology consultant for the McGraw-Hill Ryerson texts in Ontario. He is an avid user of, and advocate for, the use of technology in the mathematics classroom.

Yes, you can. It can be saved as a program on the graphics calculator and then stored to a disk for future reference. I have used canned data as the basis for tests. Last fall, I had my MPM 2D class use the motion detector to develop a quadratic graph. I liked Ashley's work so much that I saved it as a program. Later, I can load the program and run it.



The students were asked to walk towards the motion detector, slow down, and then back up. We did this later with the Parents' Council which was a great public relations move for the department and the school. Ashley's graph is shown.



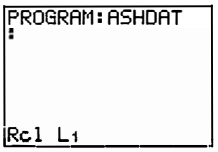
The data is stored in lists 1 through 4 as time, distance, velocity, and acceleration respectively. It is interesting to note that L_3 and L_4 appear to have been calculated by using the ΔList command.



To create a program to save the data, press the PRGM key and move over to the option NEW. Hit ENTER and you will be asked to name your program. The Alpha Lock is automatically turned on so you can just start typing. Enter any name that you wish to use.

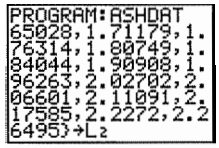


The first thing that we need to do is retrieve the data from List 1. Press RCL (2^{nd} and STO➤) followed by L_1. This command is displayed at the bottom of the screen. Be prepared for a surprise when you hit ENTER. The entire set of data from L_1 is loaded into the program. At the end of this, press STO➤ and L_1. The effect of this line in the program is to retain all of the data from list 1 in memory. When the program is executed, these values will be stored back into L_1.

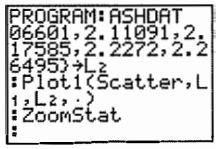




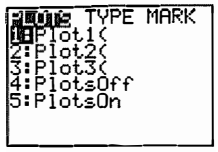
Repeat the same steps to retrieve the data from list 2. To abbreviate this process, do not bother with L_3 and L_4.



In order for the graph to come up when the program is run, add in the last two lines shown on the screen.



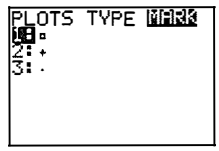
To do this, press STAT PLOT (2^{nd} and y=). Use the first sub-menu and press ENTER on the first option Plot1.



This command will be pasted into your program. Press STAT PLOT again and this time, move over to the TYPE menu. Select the first option, Scatter. Again, this will be pasted into your program. Add in the lists that are needed for x and y values, namely L_1 and L_2.



Finally, this command requires a mark. Press STAT PLOT once again and move over to the final menu, named MARK. Select your favourite. I would recommend the third choice as there are a large number of data points.



The final line in the program is the standard Zoom 9 command that creates a window to accommodate the data. Your program is now ready so press QUIT to save the program and return to the home screen.

Although it would be great if all students were able to create their own set of data, in a test situation you don't want to be looking at individual results. Taking a few minutes to load in the program is well worth the time.

If you are teaching MPM 2D this year and want a copy of the program, please contact me at fred.ferneyhough@peelsb.com or dybydx@home.com. ▲

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.

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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, and
- 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 from consideration.

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The Life Membership Award is given to recognize a person who has contributed in a significant way to OAME/AOEM; demonstrated outstanding leadership in mathematics education; and has 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: Stewart Craven

Intended Award (please check one)

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

Nominee's 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's Information:

_____

Name of Nominator

_____

_____

School, Organization, or Business Address

Telephone Number ( ) _____

Fax Number ( ) _____

Home Address_____

_____

Home Phone ( ) _____

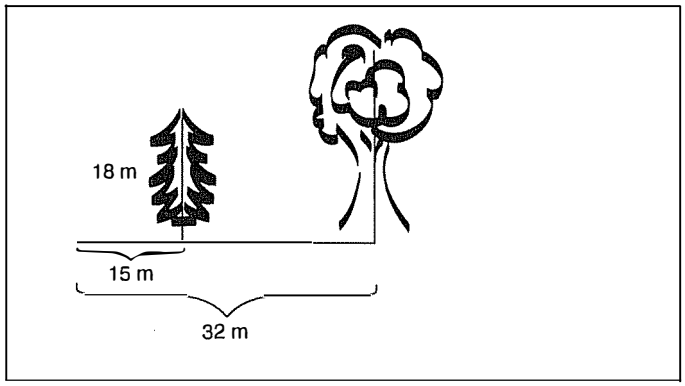
▲ Math Trail: Cumulative Assessment for Grade 10 Applied Students (Proportions, Similar Triangles, and Trigonometry)

JACQUELINE HILL

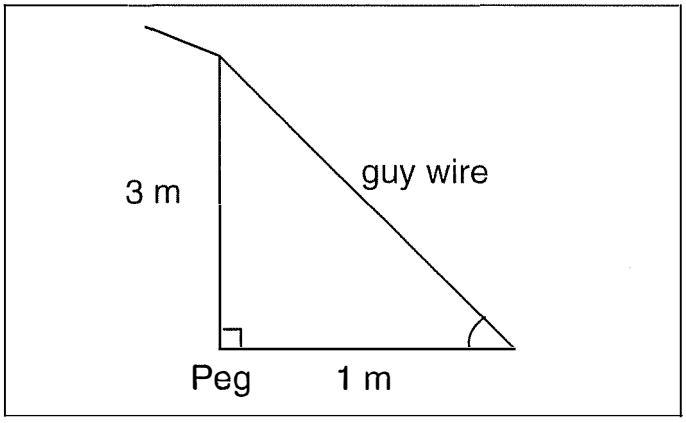


Jacqueline Hill teaches grades 9-OAC mathematics at Port Perry High School. This past year, she taught 10 Essentials, 10 Applied, 10 Academic, and 10 Gifted. She was on the profiles writing team for the 11U course, and was on the writing teams that wrote scope and sequences for the Durham Board for both the new grades 9 and 10 courses. Jacqueline truly enjoys the challenge to make mathematics fun.

1. Determine the perimeter of the school yard. If you were asked to make a scale drawing, what scale would you use? What are your criteria for making the scale drawing? Draw a scale diagram of the lot, building, and parking area.
2. Use your clinometer to find the height of the flagpole.
3. Suppose the dimensions of a coniferous tree has a height of 18 m. Find the height of the deciduous tree behind it. Choose a second method to solve for the height of the deciduous tree.



4. A new town is being formed. What mathematics is involved in the construction of a new school? Write a letter to the Mayor justifying your preference for the site location of the school, as well as the landscaping features you require and the approximate cost.
5. The population of our school is _____. The number of students who are bussed is _____. The percent of bussed students is _____. On any given snow day, 80% of the bussed students are not at school. What is the approximate number of students in the school on any given snow day? What is the approximate number of people in the school on any given snow day? Be sure to state all assumptions used in your calculations.
6. What is the number of vehicles in the parking lot? What is the number of cars? What is the number of trucks? How many red cars are in the lot? What is the approximate number of red cars in town?
7. A marching band of 70 individuals is playing at the lacrosse game. At the end of their performance, they march into a tent at the end of the field. They will be having their dinner served under the tent. Using the internet or other resources, find the best buy for the tent. Given the tent that is displayed, find the angle between the guy wire (rope) and the ground, and the length of the rope required to tie it to the tent peg.

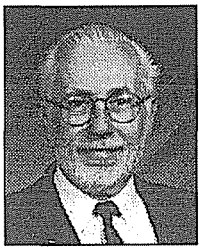


Marking Rubric: Knowledge/Understanding questions #2, #3, #5, #6; Thinking/Inquiry #1, #4 (landscaping); Communication #4, #7 (factors for choice); Application #3, #7 ▲

"There is no branch of mathematics, however abstract, which may not some day be applied to phenomena of the real world."
Nikolai Lobachevsky (1793-1856)

▲ Putting on a Math Fair at a Boys' School

ARTHUR WENK
ST. ANDREW'S COLLEGE



Arthur Wenk has taught senior mathematics at St. Andrew's College for the past twelve years. At the 2001 OAME conference in Scarborough, he presented a dozen calculus programs for the TI-83 calculator. (The programs are available on the TI web site at ftp://ftp.ti.com/pub/graph-ti/calc-apps/83/math/calculus/)

For the past three years, my OAC Finite Mathematics classes at St. Andrew's College have put on a Math Fair for the rest of the school. Each group of three or four students produces a poster, explaining some aspect of mathematics, and organizes an activity.

The posters, displayed on tables in the middle of the gymnasium, are judged on clarity, creativity, and accuracy. At. St. Andrew's College, students have the opportunity to develop sophisticated computer graphics skills, evident in one of last year's posters which displayed scenes from the movie, "The Matrix", to illustrate the concept of conditional probability. (Under the general rubric, "Knowledge Changes Probability", students asked what is the probability that a bullet would strike the main character, given the probability of him dodging it.) One of this year's groups used photos of Regis Philbin and myself in a question-and-answer format derived from "Who Wants to Be a Millionaire?" to explain the principle of compound interest in financial investment.

The activities, set up in booths around the periphery of the gymnasium, invite visitors to perform tasks susceptible to measurement:

- How many basketball shots can you make in 30 seconds?
- How many push-ups can you do in 60 seconds?
- How far can you hurl a medicine ball?
- How many points can you score in a game of Mini-Putt?

Each participant's performance is recorded on a Sticki-Note and pasted on the wall to form a giant histogram, which in the case of the most popular activities, soon takes on a nice approximation of normal distribution.

Some of the activities required a different display, as in the case of the Coke versus Pepsi taste test. Participants stated their cola allegiance, and then indicated which beverage they preferred in a blind taste test. The four possible cases were nearly evenly represented: likes Coke, prefers Coke; likes Coke, prefers Pepsi; likes Pepsi, prefers Pepsi; likes Pepsi, prefers Coke.

Some of the activities showed real imagination on the part of the organizers:

- How fast can you don a large shirt, tie, slacks, and jacket over your regular clothes?
- How many chocolate-covered almonds can you transfer from one container to another in one minute using chopsticks? (Participants were allowed to eat the nuts they transferred, which made this the most popular activity among the middle school students.)
- How well can you retain nonsense words in a memory test?
- How many times can you keep a hackysack airborne with your feet?
- How fast can you type, using a laptop computer with the capacity to record the number of words typed in a minute?

A math fair, in addition to showing ways in which math can be fun, gives lower-grade students a glimpse of some of the topics that they will encounter in their final year of high school and offers a nice break in routine a few weeks before final examinations.

A number of web sites contain useful information for the poster portion of the fair:

http://www.zbths.k12.il.us/academics/mathdept/mathlinks.htm
http://www.oise.utoronto.ca/~jisekebarnes/comp/mathsites.html
http://forum.swarthmore.edu/probstat/probstat.html
http://forum.swarthmore.edu/dr.math/tocs/discrete.math.high.html
http://forum.swarthmore.edu/dr.math/faq/faq.pascal.triangle.html
http://forum.swarthmore.edu/dr.math/problems/funk5.25.96.html
http://forum.swarthmore.edu/dr.math/problems/burtin2.11.99.html

▲

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A-"FAIR" BETWEEN MATHEMATICS AND SCIENCE

SUSAN K. SMITH
BRAMALEA SS



Susan Smith has been a mathematics and physics teacher for seven years, and is currently on staff at Bramalea Secondary School. She is also a textbook reviewer for various publishers and "Teacher Resource" writer of upcoming Grades 11 and 12 Workplace Mathematics textbooks. Susan enjoys the creative side of teaching, and sharing resources among teachers.

I am a big advocate of integration. I suppose my tendency towards this started in my year at the Queen's University Faculty of Education seven years ago. We spent two weeks with secondary teachers of various disciplines, and were asked to choose a topic in which all of our subjects would somehow connect. This seemed rather difficult at first, but once we chose a topic, it was amazing to see how many connections we made to our various disciplines. We then had to present our projects. My favourite was "The Olympics". It is obvious how physical education ties in with the Olympics: the variety of sports, strength, stamina, and endless years of practice! The marketing involved in every Olympic game uses business skills; artistry and drama are evident in the opening and closing ceremonies; various languages and cultures are manifested; the history of the Olympic games is indeed rich! And mathematics? The scoring and statistical analysis, as well as historical trends and records set for various games are observed.

This simple, yet effective two-week task at the faculty certainly set the stage for my teaching career, and helped me to realize that subjects should not be taught in isolation. In fact, Plato (427 - 347 B.C.) tried to pass

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on to his students at the Academie (est. 387) the heritage of a Socratic style of thought and mathematical learning to the achievement of abstract philosophical truth (www.philosophypages.com/ph/plat.htm). In his times, mathematics, science, astronomy, religion, and philosophy were not perceived as separate entities. Unfortunately, our modern view of education has digressed from this "school" of thought (pardon the pun!).

A few years ago, I initiated a course in my former school called "Mathematical Physics". Approximately 80 students signed up, so three sections were created. It was an integrated Grade 12 Advanced course in which students receive two credits approved by the Ministry of Education: one Grade 12 Advanced Mathematics credit and one Grade 12 Advanced Physics credit. This course ran all year (from September to June) and instruction took place for 75 minutes daily. Since there was no textbook for the course, I wrote a manual for students called "When Math meets Physics". I attempted to show students how math and physics link in every unit.

For example, in grades 9 and 10 math, students learn about the general equation of a linear function $y = mx + b$, where m represents the slope of a line and b is the y-intercept of the line. These same students then walk into a science class and learn the **same** equation with different variables and constants, such as $v_f = v_i + a\Delta t$. This equation shows that for constant acceleration of an object, a is the slope of a velocity-time graph and thus $a = \frac{v_f - v_i}{\Delta t}$, where v_f is the final velocity and v_i is the initial velocity of the object. Here's the problem: Students have no idea that it is the same equation as $y = mx + b$. Perhaps we assume too much when we think that students make these connections.

In my integrated course, I guided the students to make these links ... and wow, I could really see "lightbulbs turning on" in their minds! I received e-mails from some of the students who were in this integrated class a year later when they were taking O.A.C.'s. One student wrote,

> *"I really enjoyed the math/physics course last year. I really think you should teach it again someday. I felt proud to be in it. We learned a lot more than taking the two subjects separately, as my friend did. We even got to do the astronomy unit! I think it's better to know **why** you have to learn math. The course answered the ever-popular question of why we even need math. It has definitely helped me in my O.A.C.'s this year; I still use your manual too!"*

I am aware of a few secondary schools in the Ottawa Carleton DSB that offer an integrated O.A.C. Calculus and Physics course. It has been a great success for over ten years. Most states in the U.S. are currently witnessing a movement towards integrated curriculum in school reform programs. A new book is scheduled for publication by NCTM in 2002 on the topic of integrated mathematics. There are some excellent dialogues with varied opinions by teachers and faculty members at www.nctm.org/dialogues/2001-01/.

In theory, to offer an integrated mathematics program in every school would be ideal. The logistics and practicality of it, however, are a different story. Unless the teacher has a background in both mathematics and science, he/she probably would not feel comfortable teaching both subjects integrated together at the secondary school level. Also, scheduling problems could also occur with this integrated approach, especially in semestered schools.

Nevertheless, there is a superb opportunity in virtually every high school math course to expose students to mathematical connections with other disciplines. In grades 9 and 10, this can be done as their culminating activity, and in the senior grades, I have introduced it in their I.S.U. (Independent Study Unit). Remember the good 'ole Science Fairs you used to do in high school that some students still participate in? Well, why not extend the science fair to mathematics?

A few years ago, I tried it with a Grade 12 Advanced Math class of mine. Since a large portion of the grade 12 content is trigonometry, I decided to have a "Trig Fair" in my classroom for three classes. Students worked in pairs and chose a topic of interest from a list I gave them.

A few topics extended to exponentials and logarithms. Every group had to choose a different topic from the list below. The topics were:

1. **Architecture**:
   - Solar homes and angling of solar panels
   - Building stairs or ramps and determining steepness
   - Awnings/overhangs and the best combination of heat and light efficiency
   - Blueprints
2. **Surveying**:
   - Use of trigonometry in equipment design and function
3. **Crafts**:
   - Use of trigonometry in quilt patterns, tiles, and stained glass windows

4. **Navigation**:
   - Use of trigonometry in rescue missions
   - A sextant's uses
5. **Construction**:
   - Building bridges and the trigonometry used in triangular supports
   - Peaks of houses and rafters
   - Triodetic domes like the Ontario Place Cinesphere
6. **Astronomy**:
   - How the telescope works and finding light reflection angles
   - Calculations of distance in space
   - Historical links between astronomy and the development of trigonometry
   - Rythmic pulsing of a quasar
7. **Towers**:
   - Angles of elevation and depression from lighthouses, watchtowers
8. **Sports**:
   - Using trigonometry to improve your skill at billiards and golf
9. **Medicine**:
   - A look at periodic functions through the testing of blood pressure using a sphygnomanometer
10. **Physics**:
    - Time dependence of sound waves using an oscilloscope, frequency generator, microphone, and tuning forks
    - AM-FM frequencies
    - Standing waves and why the Tacoma Bridge collapsed
11. **Economy**:
    - Where and how trigonometry fits into economic cycles
12. **Nature**:
    - Tides
    - Numbers of hours of daylight
    - The population rise and decline of the snowshoe rabbit
13. **Psychological Patterns and Biorythms**
14. **A Booming Exponenetial Population Growth: Will our Planet Survive?**
15. **Business: The Rule of 72 in Compound Interest**
16. **Radioactive Decay and Carbon Dating in Archeology**

Students were then given one month to prepare: 1) a visual display board (as in the Science Fair) including any research, experiments, data, worked examples, and pictures pertaining to their topic; 2) a pamphlet that summarizes their information (with multiple copies for other students), and 3) an oral presentation. It is evident how this evaluation fits well with the new curriculum's assessment strategies. It crosses over to all four assessment categories: Knowledge/Understanding (worked examples), Applications (with other disciplines), Thinking/Inquiry/Problem Solving (in the creation of original questions), and Communication (creating a pamphlet, giving an oral presentation, and keeping a journal to highlight progress throughout the term). A rubric specific to the assessment of this culminating task can be found on the following page.

On the days of the "Trig Fair", students set up their projects, and while half of the class stood by their projects, the other half walked around and acted as judges listening, to their peers' presentations – group by group. (This took a lot of pressure off of students having to present in front of the whole class.) Judges were given a marking scheme, and the mean average of all the judges' marks for a group represented 30% of their final I.S.U. mark. My evaluation accounted for the remaining 70%. This fair proved to be a great success, and the following year, I invited other classes, parents, and the community to share in the experience.

I later extended the idea of the Science Fair into an O.A.C. Calculus class, which proved to be even more successful! There are so many rates of change and maximum/minimum problems that connect with other disciplines, such as:

1. Medicine and Pharmaceutical research (e.g., the growth rate of cancer cells)
2. Statistics, Actuarial Science, and Life Insurance
3. Nuclear Physics (e.g., radioactive decay and half-life)
4. Economics and Finance (e.g., compound interest rates)
5. Design of sports equipment and Sports Technology (e.g., angles of golf clubs, maximizing speed, and trajectories of various balls)
6. Planes, Trains, and Automobiles (and rescue missions at sea!)
7. The Spread of Rumors (a simulation activity on the TI-83+ calculator can be done)
8. The Growth rate of a Bean plant (students actually grow one!)
9. Carbon Dating in Archeology
10. Weather patterns and rates of change
11. Forensic Science ("Who done it?")
12. Newton's Law of Cooling (e.g., comparing coffee cups, pizza boxes)

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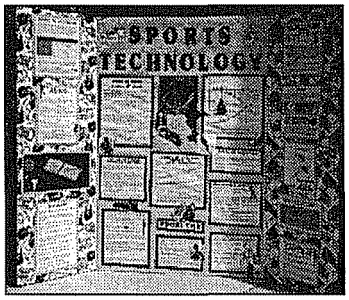
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CATEGORIES	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Knowledge/ Understanding	• chooses to include very simple examples • performs very simple algorithms on worked examples pertaining to topic • demonstrates little understanding of basic concepts • depth and quality of information lacking • lack of knowledge reflected in presentation	• chooses to include more sophisticated questions • performs algorithms inconsistently on worked examples • demonstrates some understanding of basics • depth and quality of information satisfactory • some knowledge of topic reflected in presentation	• chooses to include questions that are at grade level • performs algorithms accurately on worked examples • demonstrates considerable understanding of basics • a good quality of information and in-depth research of topic • considerable knowledge of topic reflected in presentation	• chooses sophisticated questions that involve higher level thinking • performs algorithms efficiently and accurately on worked examples • demonstrates thorough understanding of basics • superior quality of information and in-depth research of topic • excellent knowledge of topic reflected in presentation
Application	• applies concepts and procedures to solve simple problems relating to topic • worked examples have little relevance to topic • makes few connections between the topic and material taught in the course	• applies concepts and procedures to solve more complex problems relating to topic • worked examples have some relevance to topic • makes some connections between the topic and material taught in the course	• applies concepts and procedures to solve complex problems relating to topic • worked examples have substantial relevance to topic • makes considerable connections between the topic and material taught in the course	• applies concepts and procedures to solve complex problems relating to topic and asks further questions as a result • worked examples have complete and total relevance to topic • shows strong connections between the topic and material taught in the course
Thinking/Inquiry/ Problem Solving	• creates and solves simple original questions relating to the topic • applies problem solving steps with limited capability	• creates and solves moderately complex original questions relating to the topic • applies problem solving steps with moderate capability	• creates and solves more complex original questions relating to the topic • applies problem solving steps with considerable capability	• creates and solves complex original questions relating to the topic • applies problem solving steps with a high degree of capability
Communication	• written and verbal explanations are incomplete or need clarity • inappropriate terminology used • presentation is not complemented by visual display • a weak display of content and layout on pamphlet • weak organization of material on display and in presentation • an inconsistent plan of action outlined in journal	• written and verbal explanations are often clear, but need precision • some terms and symbols appropriate • presentation somewhat complemented by visual display • a fair display of content and layout on pamphlet • moderate organization of material on display and in presentation • a moderate plan of action outlined in journal	• most verbal and written explanations are clear and accurate • appropriate terms and symbols used often • presentation considerably complemented by visual display • a good display of content and layout on pamphlet • considerable organization of material on display and in presentation • a consistent plan of action outlined in journal	• all verbal and written explanations are clear and accurate • appropriate terms and symbols always used • presentation well complemented by visual display • an excellent display of content and layout on pamphlet • well organized material on display and in presentation • a consistent and well explained plan of action outlined in journal

The most impressive display board was done by Sandy and Kim, who chose "Sports Technology" as their topic:



One of the most creative worked examples I encountered throughout the years was by two students of mine, Ryan Lim and Claire, who chose "Newton's Law of Cooling" as their topic. Here it is, exactly how they submitted it!

Analysis:

Officer Brent decided to calculate how old Suspect 1's coffee was first. The reason why he chose Suspect 1's coffee is because the temperature was the median of the three.

Using K for Styrofoam from Claire and Ryan's Data: $K = -0.0276$

Using Newton's Law of Cooling:

$$T = A + (T_0 - A)e^{kt}$$

Suspect 1:

$$42 = 23 + (90-23)e^{-0.0276t}$$
$$42 = 23 + (57)e^{-0.0276t}$$
$$\frac{42-23}{57} = e^{-0.0276t}$$
$$\ln\left(\frac{21}{57}\right) = \ln e^{-0.0276t}$$
$$\ln\left(\frac{21}{57}\right) = -0.0276t \ln e \quad (\ln e = 1)$$
$$\frac{\ln\left(\frac{21}{57}\right)}{-0.0276} = t$$
$$t = 36 \text{ min}$$

Suspect 1 bought his coffee 36 minutes ago. The real suspect had to have bought his coffee less than 24 minutes ago.

Officer Brent decided the suspect must have been Suspect 3 or Suspect 4.

He feels it is Suspect 4 because the difference in time between Suspects 4 and 1 is greater and coffee takes a long time to cool.

Suspect 4:

$$T = A + (T_0 - A)e^{kt}$$
$$53 = 23 + 57e^{-0.0276t}$$
$$\frac{53-23}{57} = e^{-0.0276t}$$
$$\ln\left(\frac{30}{57}\right) = \ln e^{-0.0276t}$$
$$\ln\frac{30}{57} = -0.0276t \cdot \ln e \quad (\ln e = 1)$$
$$\frac{\ln\frac{30}{57}}{-0.0276} = t$$
$$t = 23 \text{ minutes}$$

Brent's instincts were correct. Suspect 4 is the only person who bought her coffee less than 24 minutes ago.

The criminal is Suspect 4!

In my experience of these fairs, it is certainly a fun way for students to see mathematical connections in their everyday lives and other disciplines. I have never seen students get this excited about mathematics before! It is a real success and I encourage you to try it in your own math classes. I know I will be trying it in my new school this semester with my O.A.C. Calculus class. I invite you to a "mini-version" of their fair at the 2002 O.A.M.E. Conference. See you at the fair! Until then, feel free to contact me with any questions or comments at: dcsks@pathcom.com. ▲

▲ PHOTO MATH – A NEW WAY OF PICTURING MATH

RON LANCASTER



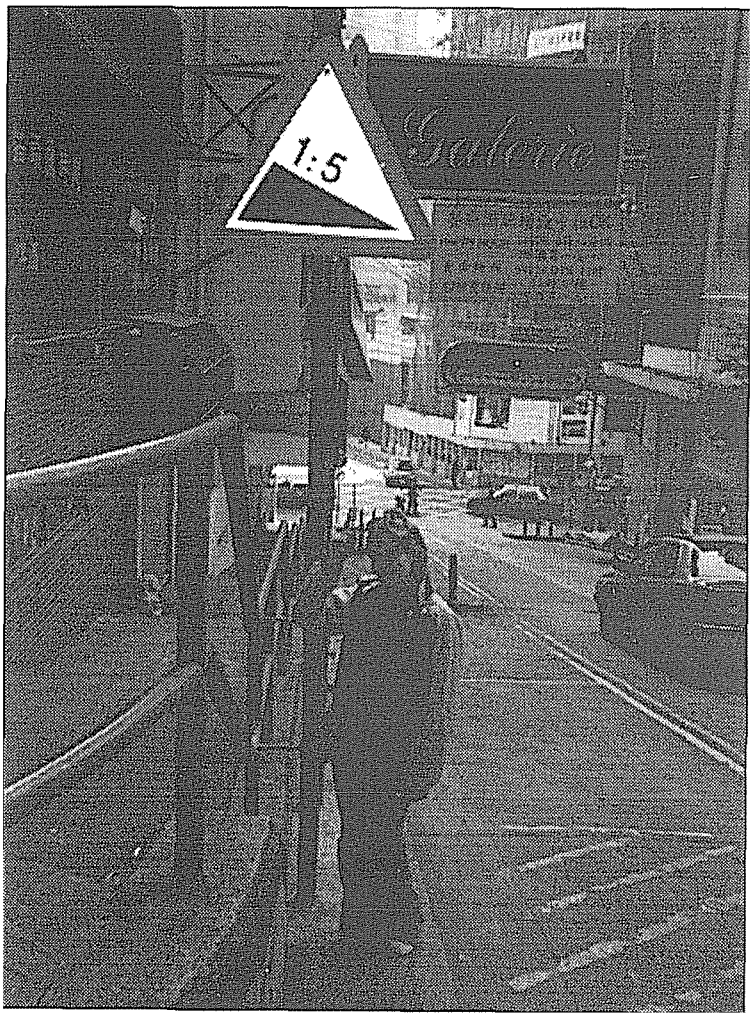
Ron Lancaster is a middle and high school mathematics teacher, currently working throughout North America and Asia as an Independent Mathematics Consultant.

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

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

"Some mathematics has been created out of necessity to solve practical everyday problems. But more often than not, mathematical ideas arise as the mathematician's imagination and curiosity wander in their search to understand how mathematical things work." Theoni Pappas

Photograph #1



Congratulations to Casey Coombs, a student at Parkside Collegiate Institute in St. Thomas, Ontario. During a recent family trip to Asia, Casey appeared in this photograph with a sign in Hong Kong. Upon her return to Canada, she gave a copy of it to her mathematics teacher, Larry Jeffery, who then sent the photograph to the *Ontario Mathematics Gazette* for use in this column. On the back of the photograph, Coombs wrote the following note to her teacher:

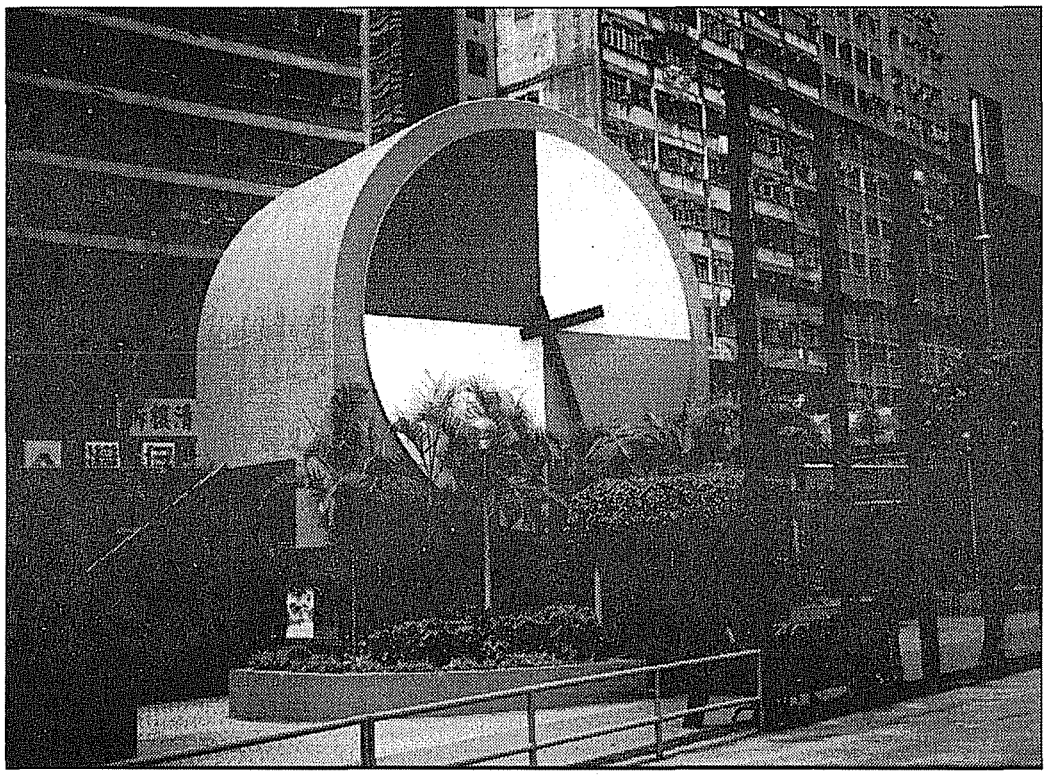
I was sitting having breakfast in Hong Kong when I looked outside and said, "My God, that's slope!" I thought I'd never see it used in the real world ... only had to travel to Hong Kong before I could use it!

The photograph is rather dark, but the author hopes that this wonderful picture will inspire students and their teachers to see mathematics everywhere and to submit their images for possible publication in future issues of the *Ontario Mathematics Gazette*. Good for you, Casey!

The author of this column was in Hong Kong around the same time as Casey and took a number of photographs, including some of signs similar to the one that Casey found. Some of these photos appear on the next few pages along with mathematical questions related to the images. As always, readers are encouraged to develop and submit their own questions related to any of these photographs, particularly the one taken by Casey.

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Photograph #2



This huge clock is located near the entrance to a hospital in Hong Kong. The clock is so large that it can easily be seen by joggers far up the mountain running on Bowen Road.

(a) What percentage of the face of the clock is taken up by each colour used in the design?

(b) At noon hour, the minute and hour hands on this clock (or any clock for that matter) are on top of each other. Between one minute after noon and one minute before midnight, how many times will these hands be on top of each other?

(c) Find the exact times of day when these hands coincide.

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Photograph #3



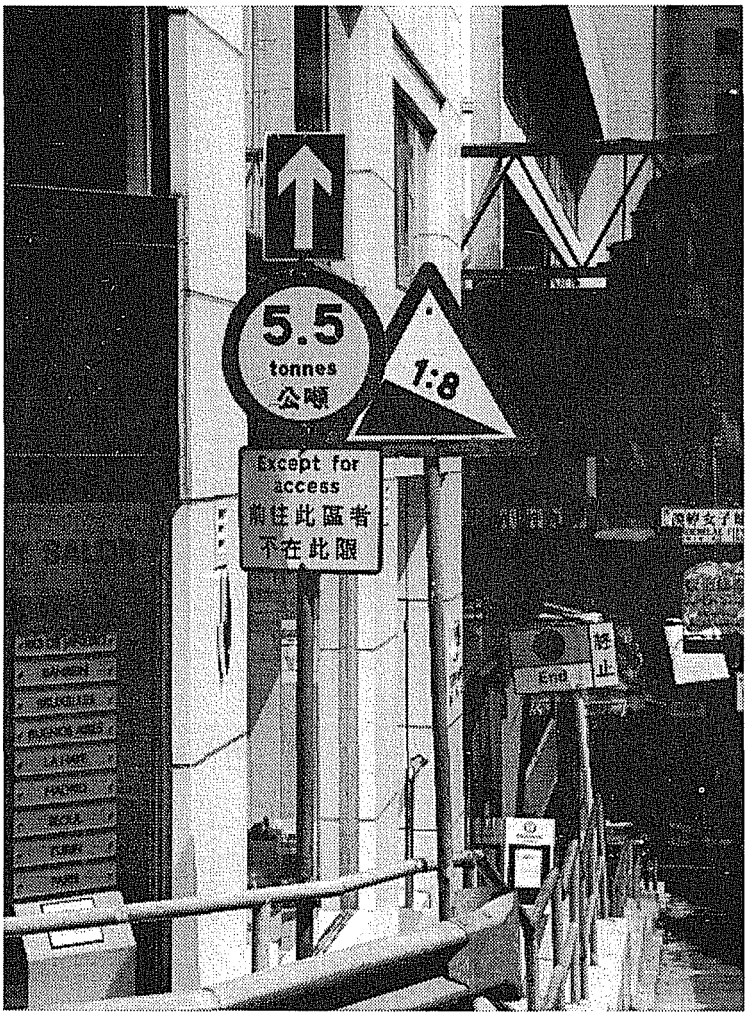
This is a typical sign that one often sees in Hong Kong. It displays the cost of renting an apartment. This particular sign was located on MacDonnell Road in the Mid-Levels area of the city.

(a) Without making any calculations or creating any graphs, study the relationship between the price, represented by P, of an apartment (in millions of Hong Kong dollars) and size, denoted by S (in square feet). If all of these apartments were in the same general area, would you expect the relationship between P and S to be linear?

(b) Plot the graph of P versus S. Use the method of finite differences to analyze the data and then use your results to find a formula for P in terms of S. Compare your results with your thoughts from part (a).

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Photograph #4



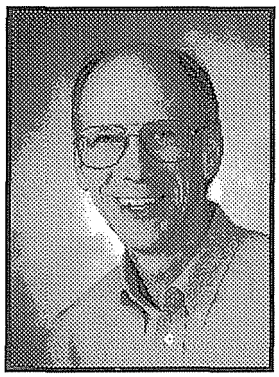
This photograph was taken on a street that leads down into the Central area of Hong Kong, not too far from the area where Casey took her photo.

(a) What information is being conveyed to drivers through the ratio that appears on the sign?

(b) How is the ratio related to the triangle that appears below the ratio?

(c) If the first term of the ratio was changed from 1 to 2, what effect would this have on the street? What would the effect be if the second term of the ratio was changed from 8 to 9?

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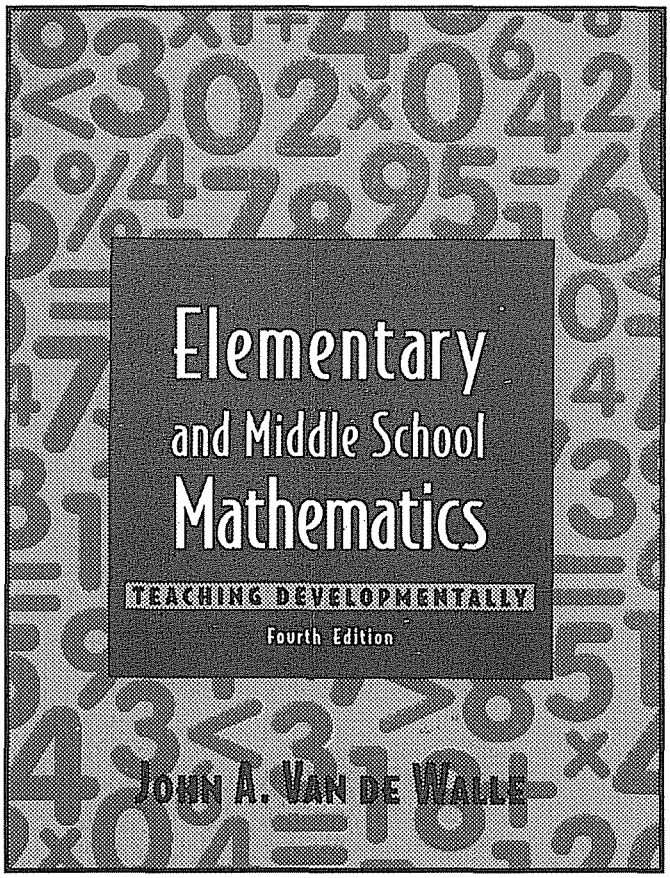
Lynda Colgan, Ph.D.
Assistant Professor
Queens University

Van de Walle provides teachers with the knowledge and skills to help students gain mathematical understanding, communicate such understanding and feel confident in their ability. Through a blending of the theoretically sound with the practically useful, he also gives teachers a solid conceptual framework for their own teaching and learning of mathematics.

Lyn Vause
Course Director
York University

I have used Elementary and Middle School Mathematics as the main text in many mathematics education courses. The reasons for my choosing this textbook are many: its developmental approach which addrsses in a non-technical way how students learn mathematics; its excellent and very practical teaching strategies and ideas; its section on evaluation and assessment which examines the issues and finally, how to use technology intelligently in the mathematics classroom.

Trevor Brown
Toronto District School Board



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▲ Connecting Measurement and Probability: A Multi-Level Activity



BONNIE H. LITWILLER
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PROFESSORS OF MATHEMATICS
UNIVERSITY OF NORTHERN IOWA
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Mathematics teachers are always interested in situations in which surface areas and volumes of non-standard polyhedra can be determined. Another important mathematics topic involves computing probabilities in non-standard settings. It is a serendipitous circumstance when an instructional setting lends itself to both.

A set of DIME Blocks (Spectrum Education Supplies, Ltd.) consists of 27 polyhedra in nine shapes with three colours each (red, yellow, and blue). Figure 1 depicts the nine shapes.

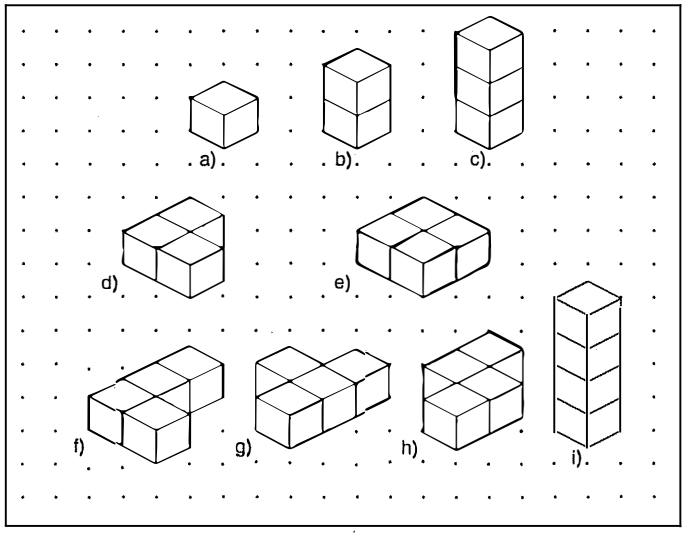


Figure 1

Using the blocks of Figure 1, verify the following results. Let block a be defined as having one unit of volume, with each of its six faces having one square unit of surface area.

Block	Volume	Surface Area
a	1	6
b	2	10
c	3	14
d	3	14
e	4	16
f	4	18
g	4	18
h	4	18
i	4	18

The setting for the remainder of this article involves withdrawing two blocks consecutively and randomly from 27 polyhedra, each set being a different colour among R, Y, and B. We will determine probabilities of various coincidences. The problem will be addressed in two settings. In setting I, the first block is replaced before the second block is selected. In setting II, the first block is not replaced. Setting I allows the same block to be drawn twice, whereas setting II prohibits that.

Setting I: With Replacement

1. What is the probability that both blocks have the same colour?; that is, find P(same C). The total number of ways in which two blocks may be drawn with replacement is, by the Fundamental Principle of Counting, 27 • 27 = 729. Sorted by colour, the blocks can be described as follows:

Colour	Number of Blocks
R	9
Y	9
B	9

The same colour can be achieved in three ways.

- Both blocks are red. The first block could be any of 9; the second block may also be any of the same 9. By the Fundamental Principle of Counting, the total selection may be made in 9 • 9 or 81 ways.
- By the same reasoning, a pair of yellow blocks may also be drawn in 9 • 9 or 81 ways.
- Similarly, two blue blocks may be drawn in 81 ways.
- The total number of ways in which 2 blocks of the same colour can be drawn is:

$$\underbrace{9 \cdot 9}_{\text{Red}} + \underbrace{9 \cdot 9}_{\text{Yellow}} + \underbrace{9 \cdot 9}_{\text{Blue}} = 81 + 81 + 81 = 243$$

Thus, P(same C) $= \frac{243}{729} = \frac{1}{3} \approx 33\%$.

This probability can be deduced without the computation shown above. Whichever colour block is drawn first, there is a $\frac{1}{3}$ (9 out of 27) chance that the second block will be the same colour.

2. Find the probability that the 2 blocks have the same volume, P(same V).

Volume	Number of Blocks
1	3
2	3
3	6
4	15

To compute the number of ways in which two blocks of the same volume can be drawn, proceed as follows, similar to the method of problem 1:

$$\underbrace{3 \bullet 3}_{v=1} + \underbrace{3 \bullet 3}_{v=2} + \underbrace{6 \bullet 6}_{v=3} + \underbrace{15 \bullet 15}_{v=4} = 279$$

Thus, P(same V) $= \frac{279}{729} \approx 38\%$

3. To find the probability that 2 blocks have the same surface area, P(same SA), we proceed similarly to problem 2.

Surface Area	Number of Blocks
6	3
10	3
14	6
16	3
18	12

Thus, P(same SA) $= \frac{3 \cdot 3 + 3 \cdot 3 + 6 \cdot 6 + 3 \cdot 3 + 12 \cdot 12}{729}$

$= \frac{207}{729} \approx 28\%.$

Problems 4 through 7 combine the above characteristics.

4. Find P(same C and same V).

The analysis involves the following sorting process:

Double Characteristic	Number of Blocks	Double Characteristic	Number of Blocks
C = R and V = 1	1	C = R and V = 3	2
C = Y and V = 1	1	C = Y and V = 3	2
C = B and V = 1	1	C = B and V = 3	2
C = R and V = 2	1	C = R and V = 4	5
C = Y and V = 2	1	C = Y and V = 4	5
C = B and V = 2	1	C = B and V = 4	5

P(same C and same V) $= \frac{3(1 \cdot 1) + 3(1 \cdot 1) + 3(2 \cdot 2) + 3(5 \cdot 5)}{729}$

$= \frac{93}{729} \approx 13\%.$

5. What is the probability that the blocks are alike both in colour and surface area? By the same method as problem 4,

P(same C and same SA)

$= \frac{3(1 \cdot 1) + 3(1 \cdot 1) + 3(2 \cdot 2) + 3(1 \cdot 1) + 3(4 \cdot 4)}{729} = \frac{69}{729} \approx 9\%.$

6. What is the probability that the blocks are alike both in volume and surface area? Sorting the blocks by this double characteristic yields:

Double Characteristic	Number of Blocks
V = 1 and SA = 6	3
V = 2 and SA = 10	3
V = 3 and SA = 14	6
V = 4 and SA = 16	3
V = 4 and SA = 18	12

The probability of matching both characteristics is then

P(same V and same SA)

$= \frac{3 \cdot 3 + 3 \cdot 3 + 6 \cdot 6 + 3 \cdot 3 + 12 \cdot 12}{729} = \frac{207}{729} \approx 28\%.$

Note that the probability for P(same V and same SA) is the same as that for P(same SA). The reason is that if 2 blocks in this set have the same surface area, they also have the same volume. Thus, there is no difference between the conditions "same SA" and "same V and same SA". Consequently, P(same SA) = P(same V and same SA).

Note that not all blocks having the same volume also have the same surface area (e.g., blocks e and f). Thus, P(same V) ≠ P(same V and same SA).

7. P(same C and same V and same SA)

$= \frac{3(1 \cdot 1) + 3(1 \cdot 1) + 3(2 \cdot 2) + 3(1 \cdot 1) + 3(4 \cdot 4)}{729} = \frac{69}{729} \approx 9\%.$

The probabilities for problems 5 and 7 are identical, for the same reasons discussed in problem 6.

Setting II: Without Replacement

The solution for the seven problems will differ in a major way from those of Setting I. When a block of a particular characteristic is withdrawn on the first draw, that block is no longer available for the second draw. Consequently, if there are n blocks of a particular characteristic available on the first draw, there are only n – 1 available for the second draw. The total number of ways in which 2 blocks of a given characteristic can be consecutively withdrawn is then n(n – 1). Observe that if n = 1, then n – 1 = 0, making two consecutive withdrawals impossible for a block that occurs only once. Applying the revised procedure to the seven problems of Setting I yields the following probabilities (without replacement):

1. P(same C) $= \frac{3(9 \cdot 8)}{702} = \frac{216}{702} \approx 31\%.$

2. P(same V) $= \frac{3 \cdot 2 + 3 \cdot 2 + 6 \cdot 5 + 15 \cdot 14}{702} = \frac{252}{702}$

$\approx 36\%.$

3. $P(\text{same SA}) = \dfrac{3\cdot2+3\cdot2+6\cdot5+3\cdot2+12\cdot11}{702}$

$$= \frac{180}{702} \approx 26\%.$$

4. P(same C and same V)

$$= \frac{3(1\cdot0)+3(1\cdot0)+3(2\cdot1)+3(5\cdot4)}{702} = \frac{66}{702} \approx 9\%.$$

5. P(same C and same SA)

$$= \frac{3(1\cdot0)+3(1\cdot0)+3(2\cdot1)+3(1\cdot0)+3(4\cdot3)}{702} = \frac{42}{702} \approx 6\%.$$

6. $P(\text{same V and SA}) = \dfrac{3\cdot2+3\cdot2+6\cdot5+3\cdot2+12\cdot11}{702}$

$$= \frac{180}{702} \approx 26\%.$$

Note that this is the same probability as that of problem 3 by the same reasoning as in Setting I.

7. $P(\text{same C and same V and same SA}) = \dfrac{42}{702} \approx 6\%$

since the characteristic of volume provides no new information.

Observe that for each problem, the probability in Setting II is less than the probability in Setting I. How can you rationalize this?

Extension:

Find probabilities involving the "or" disjunction. For example, in Setting I, find the probability that if 2 blocks are consecutively withdrawn, they share at least one of the C or V or SA characteristics. That is, find P(same C or same V or same SA). Use the probability formula: P(same C or same V or same SA) = P(same C) + P(same V) + P(same SA) - P(same C and same V) - P(same C and same SA) - P(same V and same SA) + P(same C and same V and same SA). Then,

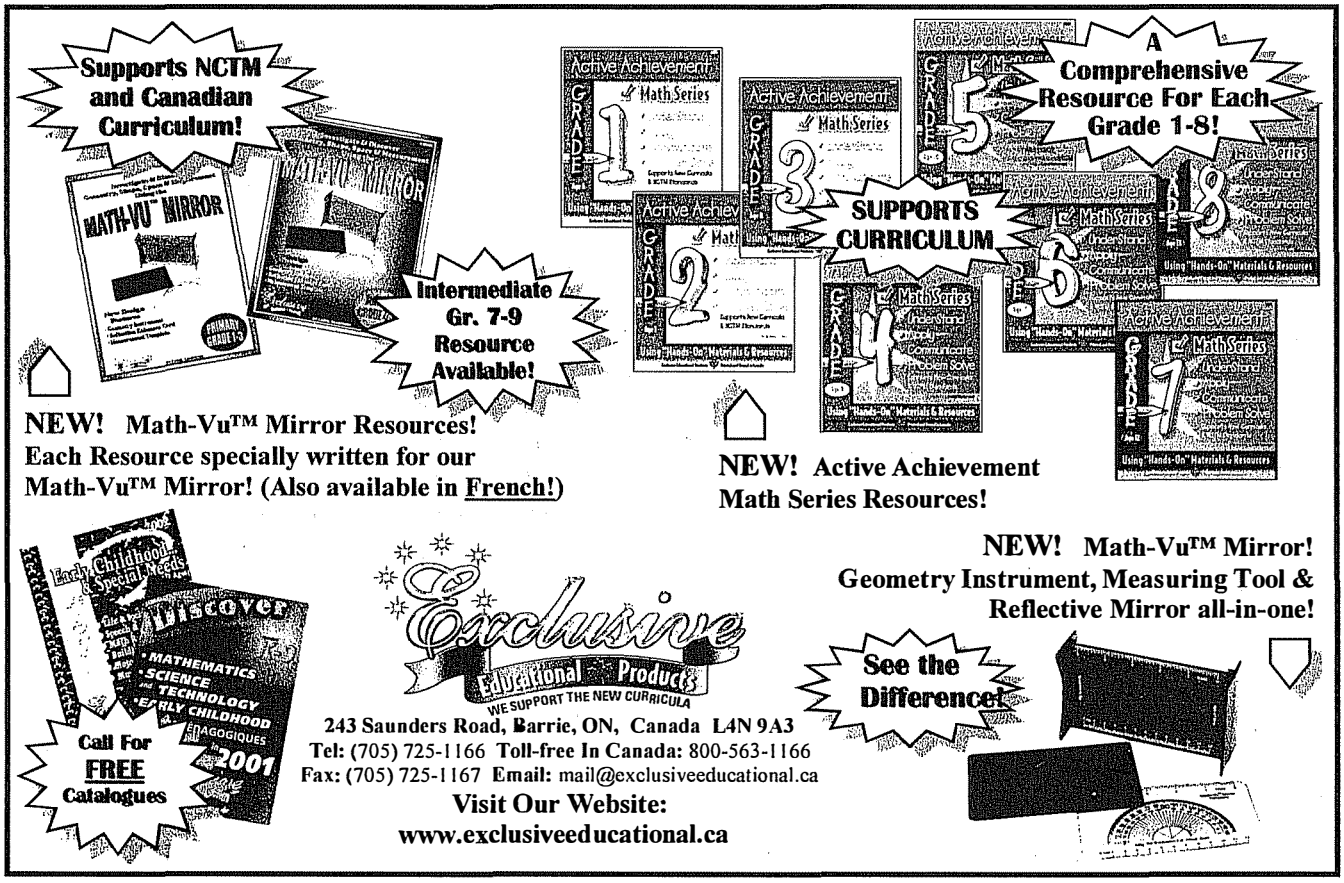
$$\frac{243+279+207-93-69-207+69}{729} = \frac{429}{729} \approx 59\%$$

for Setting I. The reader and his/her students should complete this problem by performing the appropriate calculations in Setting II.

It is noteworthy that this simple set of blocks can be used both for volume/surface area calculation and as the basis for a series of challenging probability questions.

Challenges:

1. Redo the problems of this article using more colours and more shapes.
2. Withdraw 3 blocks consecutively and find various probabilities. ▲



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▲ Connecting Mathematics Through Creative Writing: Goldilocks

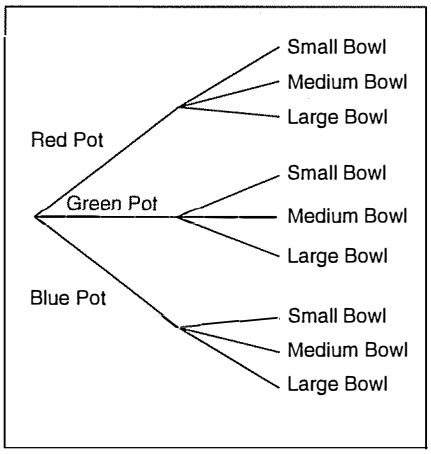
WAYNE ERDMAN



Wayne Erdman has been teaching for 24 years and is active in the mathematics education community. He is the head of mathematics at Eastern High School of Commerce in Toronto, is vice president of the TEAMS chapter of OAME, and is an author with Coles Publishing and McGraw-Hill Ryerson. He believes that students will take a genuine interest in mathematics when it is connected to their own interests and real world examples.

Goldilocks was an adventuresome little girl. One day, when she was out for a walk in the woods, she came upon a house. She wondered if anybody was home. When she knocked, there was no answer, so she tried the door anyway. It was not locked so she crept inside. As soon as she closed the door, Goldilocks smelled something wonderful and it made her feel very hungry.

Into the kitchen she went. She discovered there was porridge in 3 pots (one red, one green, and one blue) on the stove. There were 3 empty bowls (one small, one medium, and one large) on the table. Goldilocks wanted some porridge but realized that there were so many choices available to her. She could have porridge from the red pot in a small bowl, or a medium bowl, or a large bowl. Or she could have ...



There were so many decisions to make. There were 3 x 3 = 9 different ways Goldilocks could serve herself porridge. But what if ...

As you can see, a simple children's story can be rewritten to involve permutations or combinations, and to illustrate difficult decision-making.

YOUR ASSIGNMENT

Rewrite a children's story to involve permutations or combinations. The mathematics should be an integral part of the story line, perhaps illustrating difficult decision-making or large numbers of choices to be made. Use diagrams to illustrate the choices to be made. Keep in mind that this is a *children's* story, so make the story line and illustrations simple, although the problems encountered should be relatively complex in nature.

Total Time: 1 week

Instructional Setting

This is a story-writing activity which involves illustrating and explaining permutations or combinations in a children's story setting. The activity should be assigned following the units on permutations and combinations.

Record of Classroom Activity

This activity may be done in pairs.

Students need to develop ideas around children's stories. A visit to the local public library would be beneficial.

Students need to understand that the objective is to incorporate a mathematical problem into the story and the character(s) must solve or overcome it.

Students may initially try to rewrite the story using the formulas and formal language of the textbook, rather than illustrating the concepts.

You may wish to have the students submit a rough draft for initial consultation.

General Assessment Rubric:

Note that, as this project was published for the western provinces, this rubric is tied to the Western Provinces Grade 12 Mathematics Expectations, but could easily be adapted to Ontario's Finite Mathematics (OSIS) or Math for Data Management (OSS) expectations.

(Mathematical Processes: Problem Solving, Reasoning, Connections, Communication, Visualization)

Level 1

The student demonstrates limited understanding of the problem by:

- developing a plot that is difficult to understand
- incorporating combinatorics with minimal connections to the story line
- making little or no use of mathematical illustrations to support the story line
- developing illustrations containing major errors
- making little or no plot development involving the importance of the problem to the character's situation
- showing limited understanding of the relationship between problem development and communicating the problem

Level 2

The student demonstrates limited understanding of the problem by:

- developing the plot to be easily understood by the reader
- incorporating combinatorics to some extent into the story line
- making limited use of mathematical illustrations to support the story line
- developing illustrations containing minor errors
- making some plot development involving the importance of the problem to the character's situation
- showing some understanding of the relationship between problem development and communicating the problem

Level 3

The student demonstrates general understanding of the problem by:

- developing the plot to be easily understood by the reader
- incorporating combinatorics fully into the story line
- making full use of mathematical illustrations to support the story line
- developing illustrations containing no errors
- making full plot development involving the importance of the problem to the character's situation
- showing clear understanding of the relationship between problem development and communicating the problem

Level 4

The student demonstrates thorough understanding of the problem by:

- developing the plot to be easily understood by the reader
- incorporating combinatorics fully into the story line, some in more than one way
- making in-depth use of illustrations to support the story line
- developing illustrations containing no errors
- making comprehensive plot development involving the importance of the problem to the character's situation
- showing in-depth understanding of the relationship between problem development and communicating the problem ▲

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▲ Mathematics and Quilts: Making the Connection

JOANNE HARRIS



Joanne Harris teaches grades 7 and 8 mathematics at Centennial Middle School in Georgetown. She is an avid quilter and loves the action of a great hockey game. She is always on the lookout for ways to make her mathematics program more relevant for students.

A quilt can be regarded as an object to keep you warm during the winter or as a work of art that often demonstrates mathematical concepts in its design. The planning and construction of a quilt, whether for warmth or for art, involves the accurate use of measurement skills, the correct use of number sense skills, and in many cases, the creative use of geometry skills.

Tessellations

A *quilt* is often referred to as a tessellation in cloth. According to the *Nelson School Mathematics Dictionary,* a *tessellation* is an arrangement of plane figures, usually of the same shape and size, to cover a surface without gaps or overlap. A jigsaw puzzle is a form of tessellation. The finished puzzle covers a surface and has no gaps, unless you have lost a piece. It does not follow the rules for a regular tessellation which must cover a surface that goes on forever with no overlaps and no gaps. A regular tessellation must also use regular polygons and each vertex must be identical.

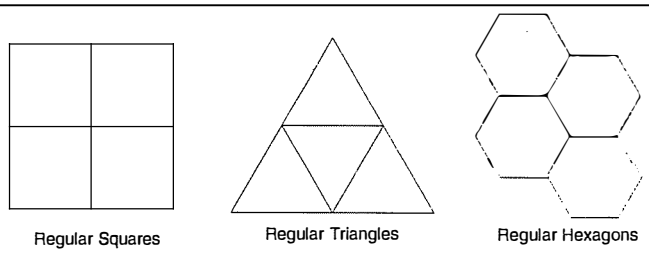


Figure 1

Only certain shapes will create a tessellation. These shapes include triangles, squares, and hexagons. At each vertex in the tessellation, the sum of the angles where the triangles, squares, or hexagons meet must total 360°. Shapes such as pentagons or hexagons will not tessellate since they either have a gap around the vertex or they overlap.

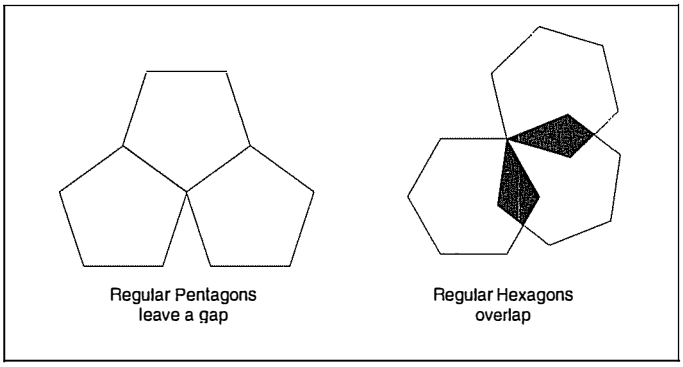


Figure 2

By combining two or more different regular polygons, it is possible to create a more complex tessellation. The sum of the angles around the vertex must equal exactly 360° and the pattern or sequence of shapes used must remain consistent. The designs created by combining two or more different regular polygons can be more visually pleasing than the designs created by using only one regular polygon.

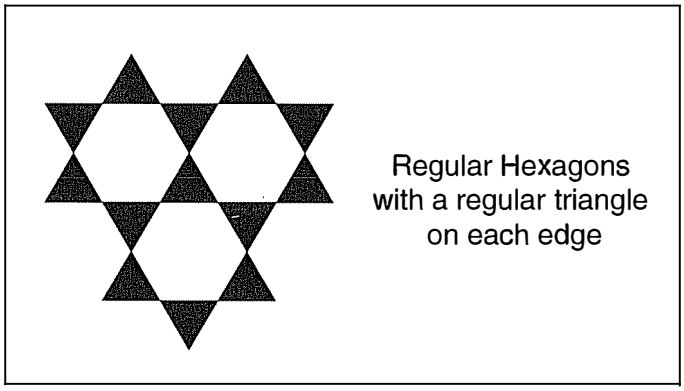
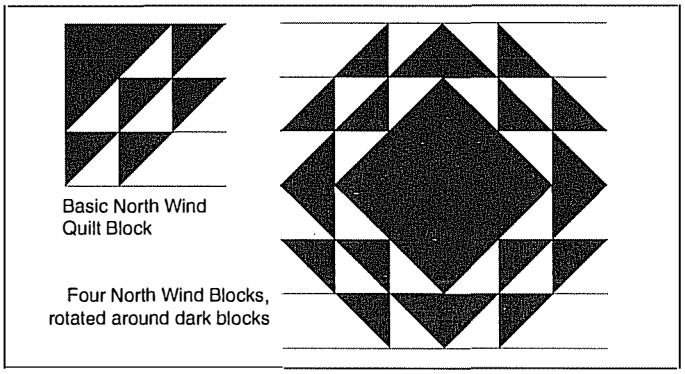


Figure 3

Simple quilts are made by joining pieces of fabric to make the total quilt. By looking specifically at the design created in the quilt block, it is possible to introduce geometric concepts such as translation, rotation, or reflection. In most examples, a single quilt block will not demonstrate the geometric or visual effects. It occurs when the geometric or visual effects become apparent when you combine a number of blocks.



Figures 4 and 5

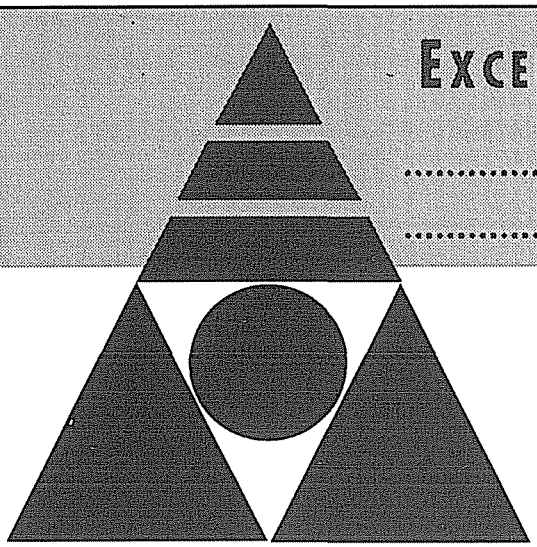
Expectations

In the Patterning and Algebra strand of the *Ontario Curriculum, Grades 1-8 Mathematics* (1997), grade 1 students are to "talk about a pattern rule." Pattern rules related to quilts can be as simple as "light, dark, light, dark" or "the block is right side up, then it is on its side, then it is upside down, and finally it returns to right side up." Colour is another aspect of quilt design used to create patterns. Students could describe how the colour changes from "dark blue to light blue." Grade 2 students are to "recognize that patterning results from ... using a translation (slide, flip, or turn)." A quilt with a repeated block will provide an excellent real world example of this. Grade 4 students are to "describe patterns encountered in any context (e.g., quilt patterns...)."

In the Geometry and Spatial Sense strand of the Ontario Curriculum, grades 1 and 2 students are asked to "recognize symmetry in the environment" and "demonstrate an understanding of a line of symmetry in a two-dimensional shape...." Grade 3 students are expected to "identify transformations, such as flips, slides, and turns (reflections, translations, and rotations), using concrete materials and drawings." Junior students in grades 4, 5, and 6 are asked to "demonstrate an understanding of translations, reflections, and rotations," then to "describe the effect of a translation, reflection, and rotation," and finally to "visualize and describe the effect of translations, reflections, and rotations (more than one transformation)." These are a sampling of the specific expectations that could be addressed by referring to quilt block patterns.

Quilt Block Patterns

Basic quilt block outlines can be found in quilting magazines and books available from the public library or from a huge number of web sites available on the internet. An entire unit called, "Pieces of Mine: The Mathematics of Quilting" can be found at



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NOMINATIONS FOR OAME/AOEM BOARD OF DIRECTORS 2002-2003

Each year, elections are held for a President-Elect, a Vice President (3 year term), and 6 to 9 Directors (3 year term) of OAME/AOEM. Nominations for these positions are to be submitted by 4:00 p.m., January 18, 2002, to:

Mary Howe, Past President

Include the nominee's qualifications with the Nominations Form. A nominee must be a member of OAME. By March 2002, the Nomination Committee will publish a slate of candidates, including qualifications, for consideration by the membership. Voting will be by mail, and is open to all OAME/AOEM members. The election results will be released at the Annual General Meeting of the OAME/AOEM in Barrie, May 2002.

NOMINATION FORM

I nominate: _____

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

Nominee's Address: _____

_____

Telephone: H ( ) _____ W ( ) _____

Nominator's Name : _____

Nominator's Address: _____

Telephone: H ( ) _____ W ( ) _____

http://www.ael.org/eric/voices/math.htm. This unit uses quilt blocks as a basis for the study of symmetry and tessellations. The eight activities and handouts are available for download from the web site. A second web site that teachers will find useful is, "A Quilters Coloring Book" located at http://www.geocities.com/Heartland/Acres/6982/lcbarn.html. This site features over 20 basic blocks. Each block is shown on its own and then the outline of the block is repeated many times to make a quilt arrangement; this outline is in a blackline master. Students can also create their own block designs using a software-drawing program. They can then create virtual quilts by reflecting, rotating, or translating their single blocks.

Symmetry

A sampler quilt is one that is created so that each block is different. The blocks are often united by a colour theme or a specific technique, but they can also be just that, a sampler. If you have access to a sampler quilt or a photo of a sampler quilt, have students identify each block on the quilt using a grid pattern; for example, top row, first block A1, top row, second block A2, etc. Then, have the students study each block and identify characteristics such as the number of lines of symmetry found in each block.

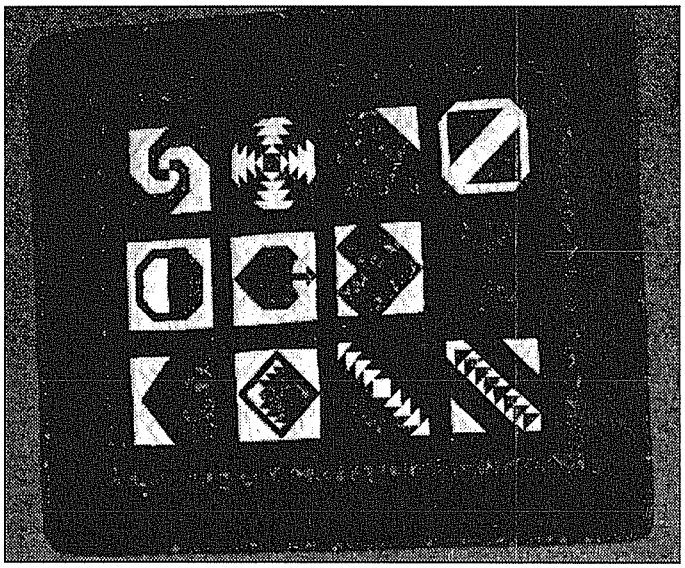


Figure 6

The *Nelson Canadian School Mathematics Dictionary* states that "symmetry in geometry is the property of being balanced about a point, line, or plane." A simple Log Cabin quilt consists of many similar blocks that have been reflected, translated, or rotated to create a specific pattern. Have your students start with the upper left hand block, and using that block, identify if each other block compared with the original block has been translated, rotated, or reflected. To identify the blocks, consistently identify them as if they were on a grid.

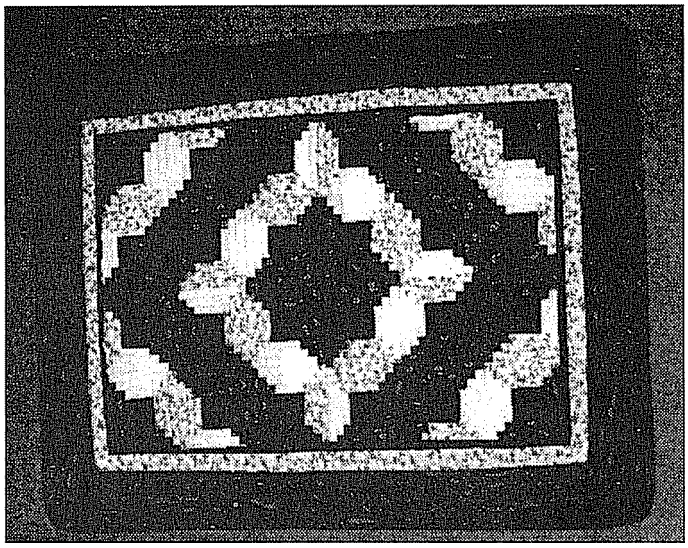


Figure 7

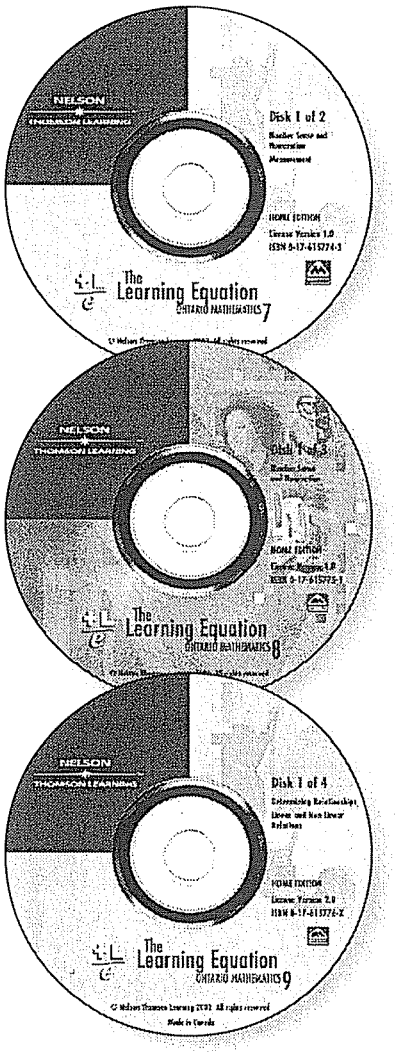
The Log Cabin block is combined in many different patterns of light and dark. Students could be challenged to find as many different ways to put the blocks together in visually pleasing designs and then asked to describe what they have done to the original block to create the designs.

Creating Quilts as Class or Individual Projects

The task of creating a quilt calls upon students to demonstrate skills in number sense, measurement, patterning and algebra, geometry and spatial sense, and problem solving. Successful quilts made by professional quilt makers demonstrate careful attention to detail, good design choices, and accuracy both with cutting and sewing. It is possible to find either quilters or quilt guilds in most geographic areas of our province. Individuals who quilt or members of guilds are often pleased to have the opportunity to pass on some of their knowledge and skills to the next generation with the hope that they may take up this rewarding hobby. Some classes might choose to make a large class project where each student contributes a block and their design might be based on two-dimensional geometric shapes. The finished quilt can be kept at the school or be given away. Older students may choose to create their own quilt. If a Family Studies program exists in your school, try to connect with that teacher for suggestions regarding the choice of

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fabrics and perhaps even use some of their facilities. Students who require community service hours may consider making their quilt and contributing it to Project Linus. This group collects and distributes small blankets (knit, crochet, or quilted) to children who have experienced a tragedy or who are seriously ill. There are several chapters throughout our province. A visit to their web site www.projectlinus.org will give you the information you need to get in touch with the chapter nearest to you. Construction of a simple quilt is well within the capabilities of most middle school students, and with assistance, to many junior school and younger students.

Getting Started: Design Considerations

Teachers who are new to quilting may be surprised by how much mathematics is used. In the summer 2001 issue of *Quilt* magazine, the lead story on the cover was, "'Start With A Square': Quilts For Beginners". Another article in the same issue was titled, "The Parallelogram". The Internet also has a significant amount of information that would be useful to a teacher planning to use quilts as an application of real world mathematics.

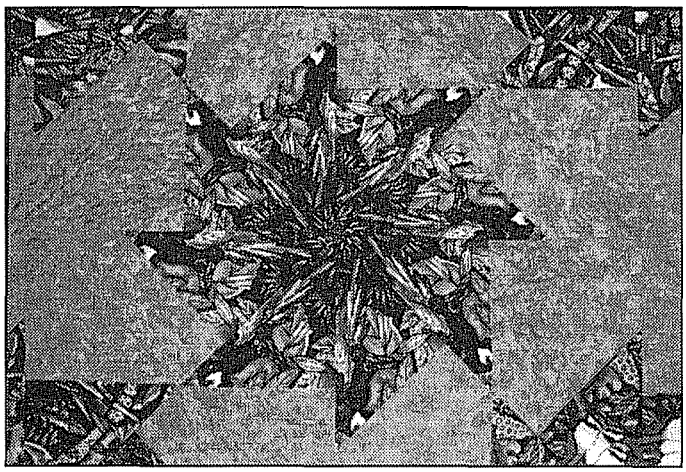
During the 2000-2001 school year, I placed a new mini-quilt in my classroom on the first school day of each month. My intention was not only to improve the décor of my classroom and personalize the room to some extent, but also to provide my students with an example of patterns that was not strictly numbers. As my personal preference in a quilt is a geometric design, as opposed to an applique design, I have several quilts from which to choose.

Studying quilts made by experienced quilters allow students to identify a tessellation made with a variety of shapes, such as a combination of hexagons and triangles.

Getting Started: Equipment and Technique Considerations

Today's quilters use modern methods to improve speed and accuracy when cutting pieces and when sewing the quilt. A rotary cutter, Omnigrid ruler, and a self-healing cutting mat are now considered tools of the trade. The use of these tools allow the quilter to cut squares, triangles, parallelograms, etc. quickly, accurately, and consistently. Teachers could use these tools to prepare fabric for students' use. The blade of a rotary cutter is extremely sharp and should only be used by people trained in its use. Seam allowance guides attached to the sewing machine make the job of having an accurate seam allowance much easier. A second quilting technique that is now popular is paper piecing. This technique allows the quilter to achieve extremely accurate points and to incorporate very small pieces into a design. Bethany Reynolds, in her book, *Magic Stack and Whack Quilts*, introduces another technique that can be used to create kaleidoscope effects. In this technique, the quilter "stacks" six or eight repeats of a fabric design, making certain the pieces are exactly on top of each other, and then cuts (whacks) through all the layers at one time; this gives the quilter six or eight pieces that have the same shape and design. When these pieces are sewn together, the design rotates around the vertex to create a kaleidoscope effect.

Figure 8



Getting Started: Problem Solving Considerations

To solve problems that are related to quilts and quilting, students need to have competency with basic number sense and measurement skills, used in conjunction with a variety of problem solving strategies. If the problem relates to the actual design in the quilt then a sound understanding of transformational geometry is required. A realistic problem that students (and quilters) would encounter is as follows: What is the minimum amount of fabric required to add a 15 cm border around a quilt that measures 115 cm by 160 cm? The "draw a diagram" strategy works well for this problem because it reminds students that once the border has been sewn onto the sides of the quilt, the end length has changed. Another issue that needs clarification is whether or not the finished or cut size of the border is 15 cm. If it is the finished size then the border pieces need to be cut 18 cm wide to allow for seams to be sewn on each side. Altogether, you need 160 + 160 + 145 + 145 or 610 cm of border.

Since fabric is sold in pieces that average 110 cm in width, the total length of fabric needed for borders (610 cm) needs to be divided by 110 cm to determine how many strips of fabric 18 cm wide you require. Because it works out to 5.54 strips, you have to round up to 6. It must be rounded up even if it works out to 5.22 strips. Students should be asked why. Once you know how many strips are needed, multiply the strip width by the number of strips you need 18 x 6 = 108 cm. Since fabric is sold in metres, the number of centimetres of fabric needs to be changed to the number of metres of fabric (108 cm = 1.08 m). This amount is then rounded to 1.1 m, as most stores will only cut the fabric to the nearest tenth of a metre. Solving some of the real problems that quilters encounter provide students with the opportunity to apply a variety of problem solving skills in realistic situations. The complexity of the problem solving task can be varied with the level of the student.

Summary

Mathematics and quilting are connected. From the quilters' perspective, the use of mathematics begins when they start to determine the size of the project, the area to be covered is measured, the ratio of length to width is taken into account, and the quantity of fabric needed to cover the area is calculated. Design considerations can bring in a number of geometric concepts. A mathematician can appreciate the geometry used in the design as well as the measurement and number sense skills that have gone into creating a quilt.

References

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Kratovil, D. (2001). The parallelogram. *Quilt, 23*(2): 62.

Ontario Ministry of Education and Training. (1997). *Mathematics: The Ontario Curriculum: Grades 1-8.* Toronto: Queen's Printer for Ontario.

Reynolds, B. (1998). *Magic Stack and Whack Quilts.* Peducah Kentucky: American Quilter's Society.

Wright, J. A. (2001). Start with a square: Quilts for beginners. *Quilt, 23*(2): 38.

Zaslavsky, C. (1990). Symmetry in American folk art. *Arithmetic Teacher, 38*(1): 6-12.

http://www.coolmath.com/tesspag1.htm

http://www.coolmath.com/tesspag2.htm

http://www.ael.org/eric/voices/math.htm

http://www.geocities.com/Heartland/Acres/6982/lcbarn.html ▲

▲ Assessment Corner: Making Connections with Assessment

CHRIS SUURTAMM



Chris Suurtamm is currently teaching in the Faculty of Education at York University. She is also an experienced mathematics teacher. She is committed to helping teachers with the implementation of new curriculum and assessment practices. Her involvement includes Course Profile writing, EQAO reviewing, research in assessment, workshop leader, and author with Nelson Thomson Learning.

Sound mathematics assessment needs to make strong connections. This is done in several ways. First, a good assessment program makes effective links between instruction and assessment. It also connects the "big ideas" of mathematics, and includes assessment tasks that connect to the "real world". A sound assessment plan also includes students in the assessment process so that they can make better connections to their own learning.

Connections Between Assessment and Instruction

For assessment to contribute significantly to all students' mathematics learning, it should be an integral part of the instructional program. To ensure deep, quality learning of mathematics, assessment and instruction must be integrated so that assessment is a routine part of the continuous classroom activity rather than an interruption or a test at the end of a unit. Previously, students saw assessment as an event that was not well connected with what they did in class every day. However, learning is more meaningful when assessment is integrated.

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Research indicates that making assessment an integral part of classroom practice is associated with improved student learning. Black and Wiliam (1998) reviewed about 250 research studies and concluded that the learning of students, including low achievers, is generally enhanced in classrooms where teachers include attention to formative assessment in making judgments about teaching and learning (NCTM, 2000, p. 22).

An assessment plan that is well aligned with mathematics instruction is built around tasks that are similar (both in content and structure) to instructional tasks. Both instruction and assessment plans provide a balance of activities that address: knowledge and understanding; application of concepts and procedures; problem solving and inquiry, and communication.

Instruction and assessment can be linked in a variety of ways. For instance, if students have a variety of tools available for instruction, they should have the same tools available for assessment. If students are placed in a variety of class groupings for instructional activities such as whole class, individual, groups, pairings then they are also able to do assessment activities in similar groupings. Variety and balance are key components in both instruction and assessment.

Connecting the Big Ideas of Mathematics

It is impossible to predict exactly what mathematical knowledge students will need in their lives. However, along with providing students with the skills of mathematics, teachers can provide students with a connected, conceptual understanding of a wide range of mathematical "big ideas" which they will endure. Often, mathematics is taught in small, organized units and then assessed. It is important to help students draw the connections between units or courses of study rather than teaching and assessing units in isolation. Further, as teachers work to develop summative assessments that determine whether or not students have connected the "big ideas" of the course, it is important to precede these with summative instructional activities to help students make those connections.

A well-aligned instructional and assessment scheme will consistently develop students':

- knowledge and understanding of the important ideas of the course;
- capacity to make connections among mathematical ideas;
- ability to use a variety of representations of mathematical ideas;
- capacity to make and test conjectures, and
- ability to make and justify conclusions orally and in writing.

Assessments that Connect to Students

Students can connect to their own learning when they are included as active participants in the assessment process. This can be done in several ways – giving choice of tasks, having students help create or refine the assessment criteria, or using self-assessment as part of the assessment package. Feedback from assessment helps students in setting goals, assuming responsibility for their own learning, and becoming more independent learners. Presenting scoring guides and rubrics to students when the assessment task is presented helps students to understand the nature of the task and the characteristics of a quality response. Similarly, classroom discussions in which students present and evaluate different approaches to solving complex problems help students to develop a sense of the difference between an exceptional and an ordinary response. Through the use of good tasks and the open discussion of criteria for good responses, students can develop both the capacity for self-assessment and reflection of their own work as well as the work of others. In this way, teachers share the ownership for assessment, students see what teachers value, and students have the opportunity to express their own values. Expectations are more clearly defined and students have a stronger sense of being involved in their own learning.

Assessment Tasks that Connect

An assessment plan includes authentic tasks that are made richer by their connections to the work of the "real world". These could be similar to tasks that nurses, engineers, software designers, consumers, shopkeepers, bankers, or mathematicians might have to consider. However, this is not to say that the tasks are all every day, real world tasks but that the tasks reflect authentic problems.

When people talk about authentic tasks or real tasks, they often think of real world, everyday, practical tasks. Learning or assessment tasks can be quite fanciful, abstract, or weird. The really important thing is that each task gives students the opportunity to use their knowledge and skills in real/authentic ways; that is, in the same ways that good problem solvers do in that real/authentic world outside of school (Flewelling, 2000, p.13).

Assessment should connect to what people do in the real world — solve problems, make sense of the world, understand relationships, and deal with issues from several perspectives. But ultimately, the activities should engage students in meaningful mathematics.

> *What is important about mathematical activities, whether in a real world setting or not, is that they deal with key mathematical relationships, as mathematics is in its core the knowledge and study of relationships. It may be that in a search for mathematical beauty we may need first to experience significant mathematics in a mathematical context. Then perhaps we can recognize mathematical beauty in real-life contexts... (Gadanidis, 2001, p. 1).*

A rich task is contextual, multi-stage, authentic, and non-routine. It focuses on process rather than simply product. It brings together several aspects of learning such as knowledge, application, problem solving, and communication. A rich task provides students with the opportunity to show what they know and can do. Such a task may be done individually, in small groups, or a combination of the two with some whole class discussion of the task also incorporated. The task does not necessarily need to fit within a class period.

What Does This Look Like in a Classroom?

Teachers need to provide all students with opportunities to demonstrate clearly and completely what they know and can do. The types of assessment tasks that teachers use convey to students what kinds of mathematical knowledge and performance are valued; more than simply a test is needed. Assessment evidence needs to be gathered from a variety of sources since different forms of assessment serve different purposes. For example, a quiz may indicate a student's knowledge and understanding. Performance tasks or projects may better illuminate students' capacity to apply mathematics in complex or new situations. Observations and conversations in the classroom can provide insight into students' thinking, and teachers can monitor changes in students' thinking and reasoning over time with reflective journals and portfolios. A broad range of assessments is required.

Summary

Several connections have been made. Assessment is an integral part of the assessment program rather than an event at the end of a unit. It reflects the mathematics that students need to know and be able to do. It focusses on students' understanding as well as on their procedural skills. High-quality assessment and instruction also helps students to make connections between the "big ideas" of mathematics that in turn deepens their understanding of mathematical concepts. And of course, good assessment also helps students to connect to their own learning, self-assess, and to develop responsibility.

Useful Assessment Resources

Flewelling, G., & Higginson, W. (2000). *A Handbook of Rich Learning Tasks.* Kingston, ON: Centre for Mathematics, Science, and Technology Education.

Gadanidis, G. (2001). Mathematical beauty. *Math Mania, 6*(3): 1.

National Council of Teachers of Mathematics. (1995). *Assessment Standards for School Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics. (1999). *Mathematics Assessment: A Practical Handbook.* Reston, VA: NCTM.

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics.* Reston, VA: NCTM. (see http://standards.nctm.org/ for electronic version)

Schoenfeld, A., Burkhardt, H., Daro, P., Ridgway, J., Schwartz, J., & Wilcox, S. (1999). *High School Assessment.* NY: Dale Seymour Publications. (see http://www.educ.msu.edu/MARS/tasks/ for samples) ▲

"Mathematicians and artists are engaged in the ultimate creative activity – creating something out of nothing. We need to do more than simply understand the affinity these two disciplines share for each other. We need to incorporate their *modus vivendi* into our lives. For how else are we to define the good life and live it with grace if we leave the creative act and appreciation of beauty to specialists?" — Howard Levine

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"Bees...by virtue of a certain geometrical forethought...know that the hexagon is greater than the square and the triangle and will hold more honey for the same expenditure of material."

Pappus of Alexandria (c. 320 A.D.)

▲ OAME/NCTM DECEMBER 2001 REPORT



FRANCES SCHATZ

I begin with a quote from NCTM's President Lee Stiff on the events of September 11, 2001:

On behalf of the many thousands of teachers, the Staff, and the Board of Directors of the National Council of Teachers of Mathematics, I offer my heartfelt prayers for the victims of the recent attack on the United States of America. I pray, too, for their families and friends during this period of national sorrow brought about by the merciless acts of a few. All of us at NCTM share the sadness and the outrage caused by this blatant disregard for the sanctity of life.

NCTM is dedicated to the creation of a better life for all the students we serve in the United States and Canada. As a volunteer-based organization, our members know well the meaning of commitment and sacrifice. In this spirit, I ask all of us to rededicate our lives to provide a high-quality mathematics education for every child, confident that our work is an important part of creating a greater understanding of the world in which we live.

By the time you read this report, NCTM members will have received their NCTM member login and password. This will give NCTM members e-resources, access to journal archives, student math notes, mathematics education dialogues, and Illuminations.

Delegate Assembly Update

Resolution 1: Be it resolved that the Board of Directors return to the policy of one complimentary speaker registration for NCTM annual conferences.

Action: Presenters register for the full conference at a fee that reflects a 40 per cent discount.

Resolution 2: Be it resolved that the NCTM Board of Directors contact conference committees to make every attempt to avoid scheduling NCTM regional conferences that conflict with state or provincial conferences.

Action: NCTM will contact its state and provincial affiliates to determine their traditional conference dates.

NCTM has a call out for manuscripts for the 2003 Focus Issue: "Proportional Reasoning" in *Mathematics Teaching in the Middle School*. How have you helped your students understand the notion of "equivalent ratios" without relying on cross multiplication? What models can be used to help students analyze and solve problems involving geometric similarity and scale factors, including measurements of length, area, and volume? These are two ideas to stimulate thinking about this topic. Your manuscript should be no more than ten double-spaced pages, with figures or photographs included at the end. Send six copies for review to NCTM by January 30, 2002. If you have ideas for a manuscript and would like to discuss them, contact Kathleen Lay at klay@nctm.org.

NCTM membership is an investment as mathematics and science technologies grow. The current individual NCTM membership is $68 US plus $ 18 US for postage for a total of $107.50 CAD. For this price, you can choose one of the journals *Teaching Children Mathematics* (K-6), *Mathematics Teaching in the Middle School* (5-10), or *Mathematics Teacher* (8-OAC), and you qualify for 20% discount on NCTM educational materials and special products. Remember to pay your membership by cheque in Canadian funds to take advantage of the 25% exchange rate cap (this does not apply to credit cards). As your Ontario representative, I keep at least one title of the popular books and products available for shipment when I receive payment. Please remember that each new individual membership with NCTM generates $5 US for OAME. Also, NCTM publications or supplies ordered through me will generate 20% of the total price for OAME work here in Ontario.

Four new books have just been added to NCTM's *Navigations Series*. Navigations is a brand-new collection of resources that translate the *Principles and Standards for School Mathematics* into action. Last year, the Navigations Series started with Algebra. The newest arrivals are *Navigating Through Geometry:* PreK-2, grades 3-5, 6-8, and 9-12. For information about availability from your NCTM rep and Canadian price, please e-mail or write to me.

Important Dates to Mark on your Calendar:

- 80th Annual Meeting, "Realizing the Vision of School Mathematics," Las Vegas, Nevada, 21-24 April 2002. Note that the dates are from Sunday evening to Wednesday
- Regional Meeting, Montreal, Quebec, 15-17 August 2002
- Regional Meeting, Regina, Saskatchewan, 17-19 October 2002 ▲

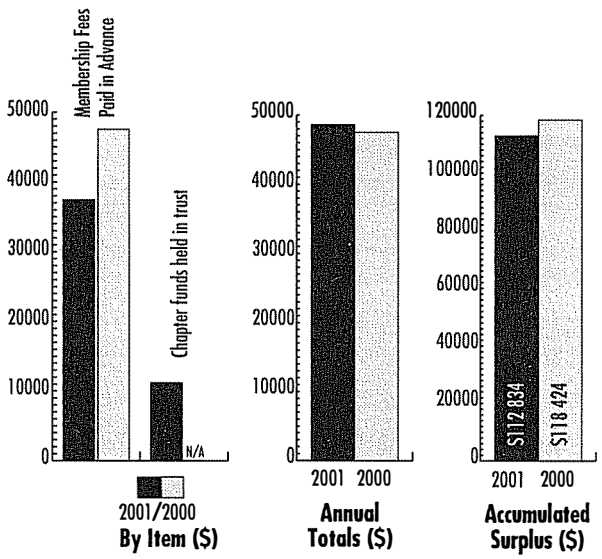
FINANCIAL STATEMENT

Notice to Readers

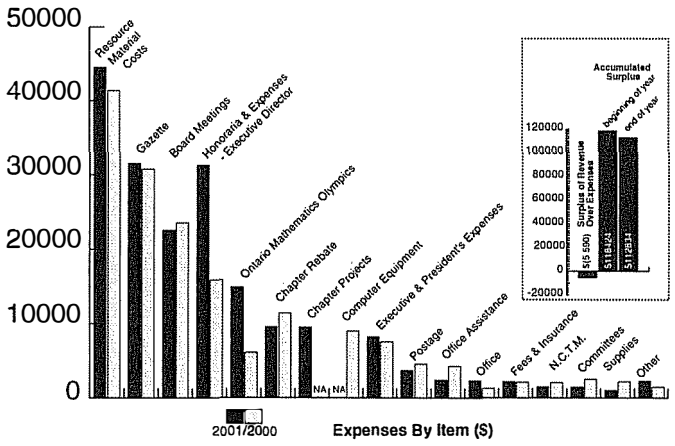
I have compiled the Balance Sheet of Ontario Association for Mathematics Education (Association Pour L'Enseignement Des Mathematiques) as at August 31, 2001 and the Statement of Operations and Accumulated Surplus for the year then ended from information provided by the Directors. I have not audited reviewed or otherwise attempted to verify the accuracy or completeness of such information. Readers are cautioned that these statements may not be appropriate for their purposes.

Markham, Ontario, September 19, 2001
ROBERT M. DAVIES Chartered Accountant.

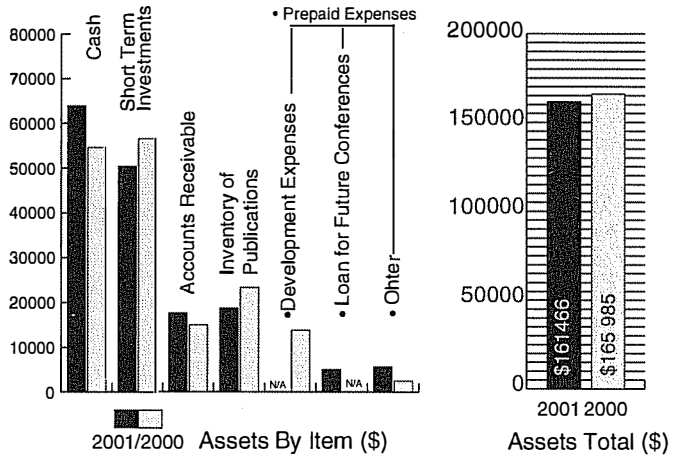
Liabilities & Surplus 2001 / 2000



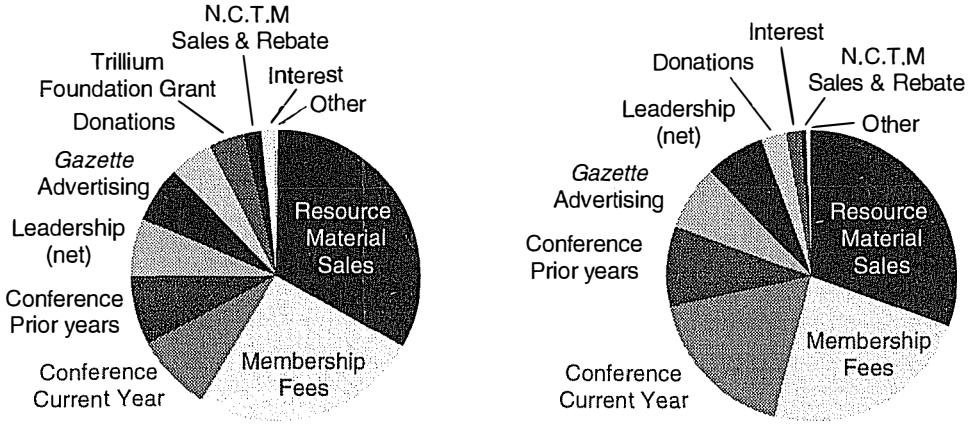
Expenses 2001 / 2000



Current Assets 2001 / 2000



Revenue 2001 / 2000



2001 ($173 369) **2000 ($214 947)**

▲ Directors' Dialogue



MARILYN HURRELL, NWOAME
THUNDER BAY, ON

This is a short edition of *Directors' Dialogue* due to the later than usual OAME board of directors meeting from October 19-20, 2001. The rest of the report can be found on the OAME web site, www.oame.on.ca.

CHAPTER NEWS

CHAMP: Rep Irene McEvoy: A group of four Caledon Elementary PS students participated in the Ontario Mathematics Olympics (OMO) 2001 and had a wonderful time. OMO'2002 trials will be held in April. Fall chapter conference, "Math 4U", took place on November 20.

COMA: Rep Mary Bourassa: This year's mini-conference took place on November 17, 2001 at the University of Ottawa with featured sessions for both elementary and secondary teachers. The chapter will be hosting a number of forums later this school year and running the regional Math Olympics. COMA is very pleased that one of its teams finished first at the OMO'2001 in Thunder Bay. COMA is developing a web site; watch for it!

GOLDEN: Rep Elizabeth Pattison: No Report

GVMA: Rep Paul Fennell: GVMA's fall conference was held on November 8 at Eastwood CI in Kitchener. At the conference, GVMA recognized the invaluable contributions of retiring executive members Ron Scoins and Jack Weiner. Ron has been an executive member of GVMA since the chapter formed in 1972 and Jack joined the executive in 1983.

ISOMA: Rep Carly Ziniuk: ISOMA's highlight of the last year was the great learning and excitement displayed at the Math Olympics by its Middle School students. Their e-mailing list is an effective way to communicate with its members who span the province.

MAC²: Rep Jon Rae: Much of the past year was spent focussing on planning for the upcoming OAME conference, "The Year of the Palindrome", set for May 2, 3, 4, 2002 at Georgian College in Barrie. You can find more information at http://smcdsb.edu.on.ca/Secondary/Oame2002/index.htm.

NOMA: Rep Heather Boychuk: NOMA's fall conference was held on October 12 and 13. It was a great success, with workshops for both elementary and secondary teachers. In all, there were 250 delegates, presenters, and publishers. Welcome to new Executive members Sue Melville, Pauline Therrien, Bill Sherman, and Sue MacRury. NOMA hopes to hold a regional OMO in the spring.

NWOAME: Rep Rona Doyle: NWOAME met on November 7 to plan "post OMO 2001". A Dinnerlude/mini-conference is planned for early in 2002. Elections will be held and Math Awards 2002 was discussed.

PINE RIDGE: Rep Jacqueline Hill: The Pine Ridge Chapter is busy planning for the 2003 Annual OAME Conference. All committee chairs are in place and committees are being formed. A lovely location, in the heart of Durham, has been secured at Durham College. The dates are May 8, 9, 10, 2003. A spring mini-conference may take place.

QSLMA: Rep Wendy Gallant: On September 13, about a dozen members gathered to revamp the chapter. A new Executive was formed: President, Robert Sher; Treasurer, Tom Chapman; Secretary, Neil Hopkins, and OAME Rep, Wendy Gallant. A mini-conference took place on December 6, including a primary speaker, Rachel Hansen, who presented "Math in a Bag, A Homework Package" and an intermediate speaker, David Stocks, who presented a workshop using the *Geometer's Sketchpad* software.

SAME: Rep Sumintra Koowar: No report.

SWOAME: Rep Frank Di Pietro: A Dinnerlude mini-conference in planned for early February. Speakers have been recruited for sessions dealing with the use of Profiles, Assessment and Evaluation, Use of Technology (TI83+, GSP, Fathom), Preparation for the Grade 12 Math Courses, and more. A campaign to increase membership has been undertaken.

TEAMS: Rep Pat Margerm: Note that the chapter is now called "Toronto Educators Association for Mathematics". Plans for the chapter conference is set for February 7, 2002 at Leaside High School. Collaborating with the SAME chapter last year to organize a successful local OMO was a positive experience. We look forward to working with them again.

WOMA: Rep John Ferguson: After a successful 2001 spring conference, plans are underway for a spring 2002 conference. Tom Griffiths continues to provide enrichment sessions for area students as they prepare for various math competitions. Plans are underway to host OMO'2003. The Executive, led by new president Ann Michel Standing, is making membership a priority for 2002.

Y⁴MA: Rep Rosey Mastrofrancesco: The fall conference was postponed. Membership is a priority and flyers were mailed to math heads in the York Region in an effort to have schools sign up for department memberships. A web site is being developed.

CLOSING REMARKS:

Here is a trivia question that may require you to dig out your *Ontario Mathematics Gazette* from 1996: In what year did the current editor of the *Abacus* join OAME?

Merry Christmas!

Marilyn Hurrell

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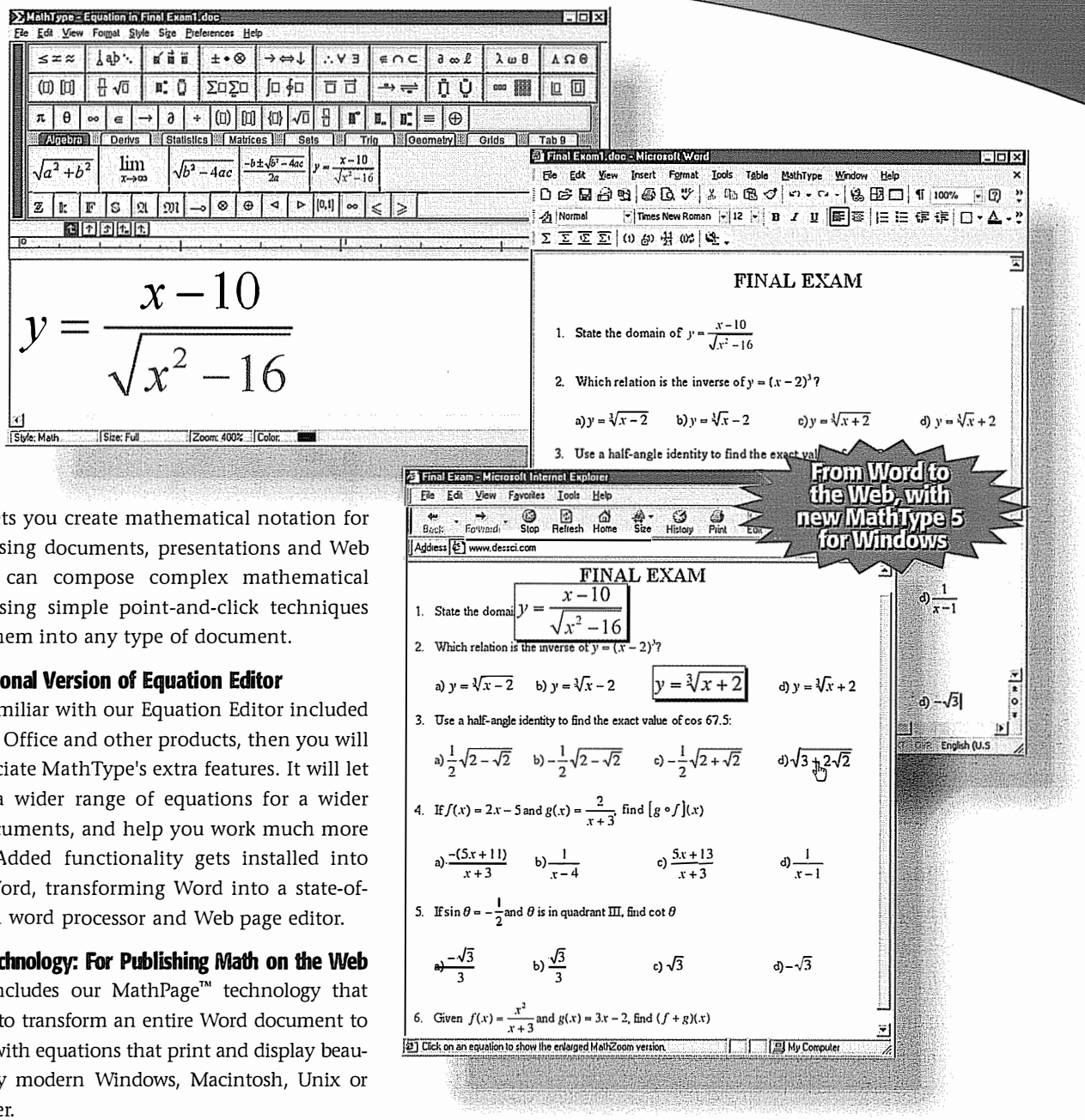
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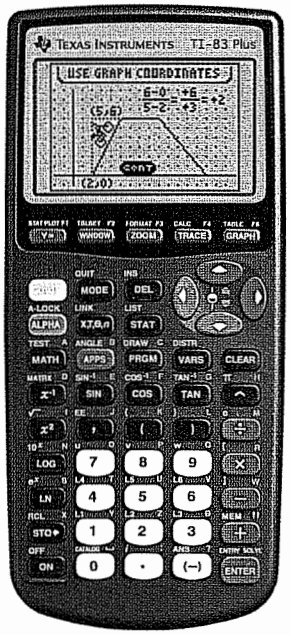
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