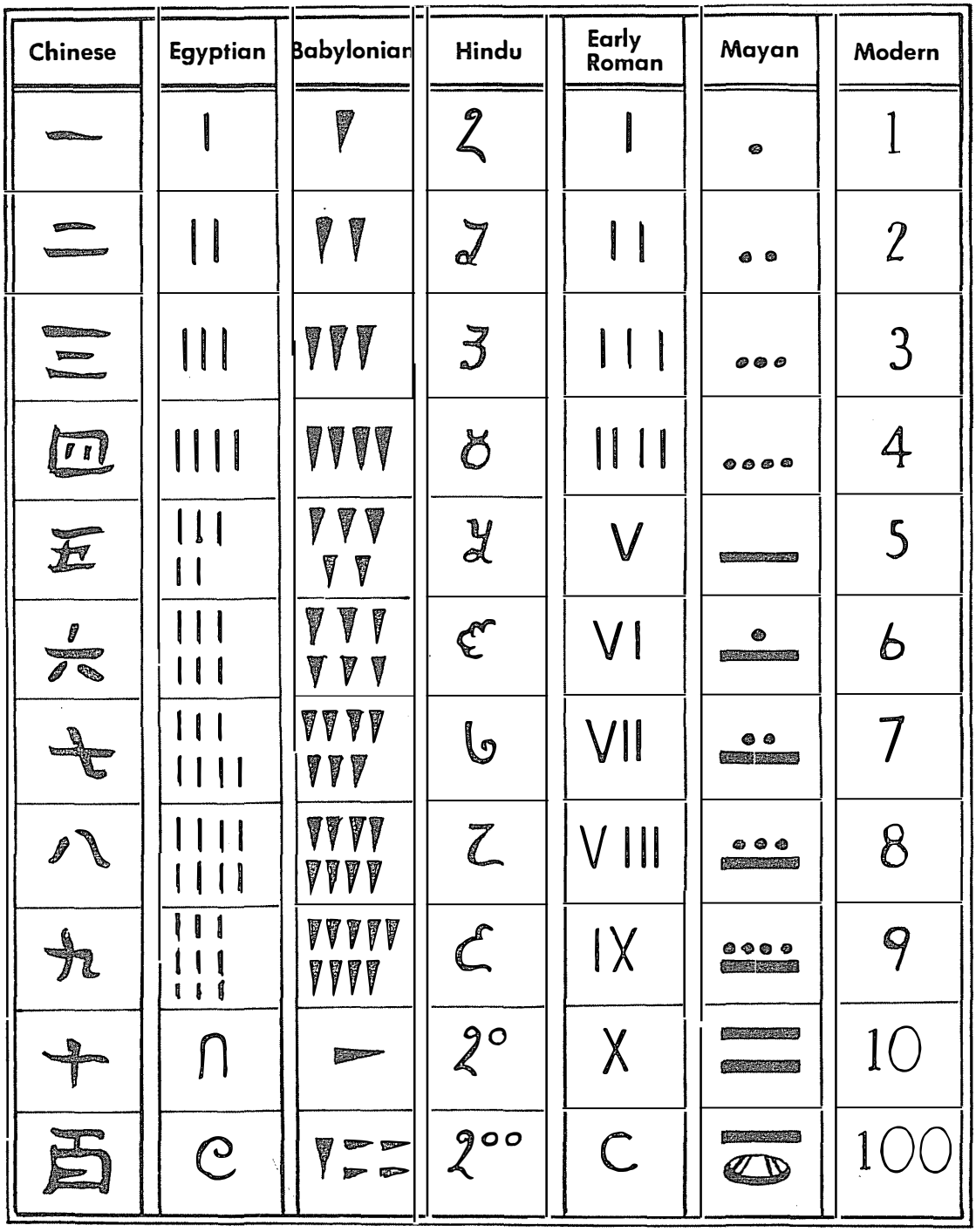
ontario mathematics gazette

VOLUME 25 NUMBER 1 SEPTEMBER 1986



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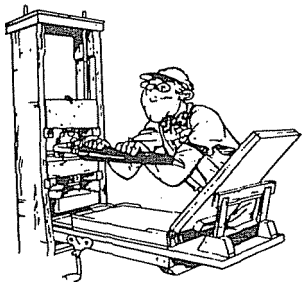
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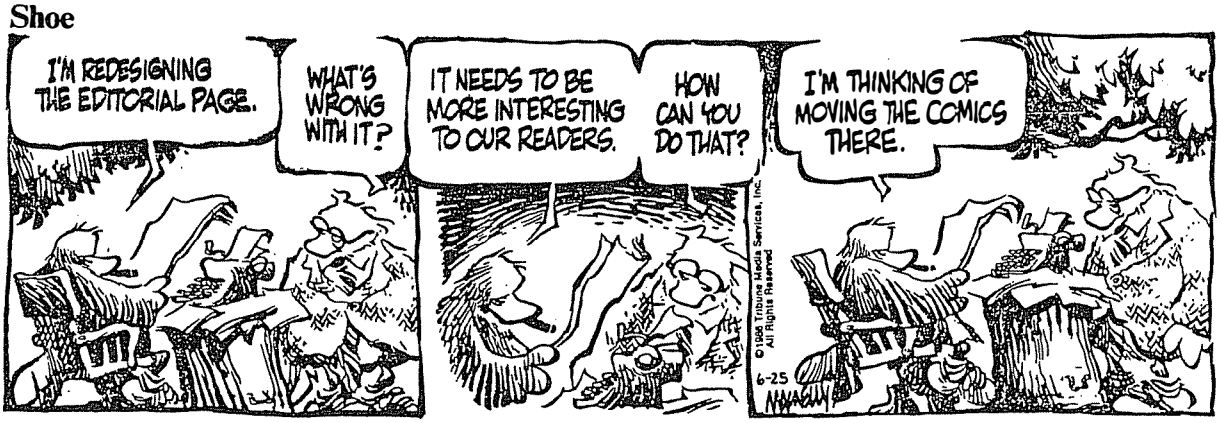
Welcome to the new **GAZETTE!** Those who happen to have glanced at the bottom of the page first might be wondering why the **ex**-editor is writing the editorial. (This is probably putting it mildly - the exact words might be closer to, **"Connelly again!** I thought we got rid of him with the last issue!")

Cliff Gravelle, our new **Gazette** editor, asked if I would write the first editorial, and I happily agreed. Cliff has come "on board" at both an exciting and difficult time. OAME through its Publications Committee has been hard at work looking at its publications and this new **GAZETTE,** with the **ABACUS** as an insert, is the result of that effort. To take on the role of editor is a large task - to take on the role at a time of active change is a much tougher one. I'm confident that OAME's membership will give the new editor support in this challenge.

As many of you know a common "editorial plea" has been for more communication from the membership. I can't resist repeating this plea one more time. Please let us hear from you regarding the "new look" - how do you like it? Are there other things you'd like to see in the **Gazette?** Is the "**ABACUS** insert" an effective way to deliver that material? When did you say you'd submit that article? (oops, sorry, that one just slipped in there!)

Have a good school year, and hope you'll read, use, and enjoy the new **Gazette.**

Ralph Connelly





PRESIDENT'S MESSAGE

by
Dino Dottori

I must first congratulate our editor Cliff Gravelle and the Publications Committee for the new design and format of the Gazette. During the ninety-six year history of O.A.M.E., many initiatives have been taken to reach the field with the best current thinking in mathematics education. This new Gazette, along with the popular ABACUS, which will continue to be prepared and edited by Trevor Brown and Lorna Morrow, sets a new standard which will continue to provide superior service to our members. I am also grateful to the editorial board for including "THE PRESIDENT'S CORNER" because it gives the president the opportunity to share some of the activities of council with the membership.

The executive took office in LONDON with the following mission statement:
"The fundamental purpose of O.A.M.E. is to provide a forum for the exchange of information relating to all aspects of mathematics education in such a manner that all students have the best opportunity to learn mathematics, all teachers and administrators share in the success of the sustained and superior return on their membership."

With this in mind, the council struck six committees for the year 1986/87, and it is through these committees that most of the work of the organization will be carried out. The Membership/Publicity/Promotion and the Publications Committees are ongoing and continue from year to year. In view of recent activity in the province with the Early Primary Education Project and the release of the Provincial Review Report on the Junior Division, it was appropriate to form a Primary & Junior Committee to respond to these reports and to study the OAIP Geometry. As well as looking at the implementation of the new math guideline for grades 7-12/OAC, the Intermediate & Senior Committee is very busy providing representation for O.A.M.E. on The Calculus Review, OAIP Senior Math, Senior General Level Series with TVO, and OISE Advisory. The Women and Math Committee will continue to assist the annual conference as well as the local chapters in developing such strands in programs across the province. Of special interest this year is the formation of the Futures Committee - this group has accepted the mandate to review our entire operation, past and present, and to recommend the directions we should take to continue to develop as an organization into the year 2000.

Most of the central work of O.A.M.E. takes place through the provincial council which is made up of an executive and councilors elected at large as well as the chapter representatives. This year we are very pleased to welcome into the organization a new chapter from Southern Ontario - PAME, the Peel Association for Mathematics Education. We now have 8 chapters known to us as COMA, GOLDEN SECTION, NOMA, PINE RIDGE, GVMA, QSLMA, SAME, and PAME.

The organizers of the "'86 annual" in London, headed by Tom Griffiths and Brock Rochar, are to be commended for inviting us to their beautiful city for an excellent conference. Planning for the '87 conference in Scarborough is well under way, headed by Steve Martin, Paul Zolis and Arn Carefoote. The Leadership Seminar, coming up on October 22-24 has a lot of good classroom ready topics on the program and is a must for the fall calendar.

Looking at the committee plans, this is shaping up to be a very busy year for O.A.M.E. Working together - the executive, a dedicated council, active chapters, with input from the membership at large, we can move forward to accomplish the things that we set out to do.

"THE PEN PROBLEM" - OAME '84, KINGSTON

by

David M. Handley, OAME Councillor '79-'83, '84-'87 and QSLMA President '84-'86

The almost 800 people who received their "puzzle pen" as a part of the registration package at the 1984 OAME conference in Kingston have now had long enough to figure out the solution! (or to use up the ink in the pen!!).

The correct answer, and the prize winners, were revealed at my birthday party (the conference Banquet) on May 11th, 1984; for those not in attendance, we would like to acknowledge the following prize winners: Dave Borrowman, Loyalist Collegiate; Tom Griffiths, A.B. Lucas S.S.; Lew Knetsch and Margo Johnston, Frontenac S.S.

The puzzle imprinted on the side of the pen listed the sequence:
0, 1, 10, 2, 100, 11, 1000, 3, 20, 101, ?, ?,
The next two numbers in the sequence were, of course, 10000 and 12 - the interesting part is to figure why!

Before I offer you an explanation, let me once again thank Peter Battey-Pratt of Ernestown S.S., a former president of QSLMA, for supplying the sequence (although I expect he "borrowed" it from someone else!). Let me apologize to the former editor of the Gazette, Ralph Connelly, to whom I have been promising this article (and a pen!) for the past two years. Now that I am an associate editor of the Gazette, I thought it was definitely time to put pen to paper!

Now, the moment for which you have all been waiting!!

A. If n is the m-th prime, $t_n = 10^{m-1}$. If n is not prime, it should be written in descending powers of its prime factors; then if $n = a^x b^y c^z \ldots$,
$t_n = xt_a + yt_b + zt_c + \ldots$. So if you want the sixtieth term,
$n = 60 = 5^1 \times 3^1 \times 2^2$, and $t_n = 112$

B. An alternative explanation is simply to write the primes in reverse order:

		11	7	5	3	2
and then note the number Example:	32					5
of times each appears in	25			2	0	0
the prime factorization	210		1	1	1	1

There were some very intriguing solutions that did NOT agree with the particular sequence of which we were thinking! John Egsgard said (quite correctly): "there is no UNIQUE answer"; and abbreviated version of his "solution" follows.

If we limit ourselves to a sequence of ONLY 12 terms, then t_{11} and t_{12} can be ANY numbers a,b, given by the formula for t_k where k 1,2,3,...12 and

$$t_k = 0 + 1 \times N_2/D_2 + 10 \times N_3/D_3 + 2 \times N_4/D_4 + 100 \times N_5/D_5 + 11 \times N_6/D_6 + 1000 \times N_7/D_7$$
$$+ 3 \times N_8/D_8 + 20 \times N_9/D_9 + 101 \times N_{10}/D_{10} + a \times N_{11}/D_{11} + b \times N_{12}/D_{12}$$

where $N_n = \prod_{p=1}^{12} (k-p)$, $D_n = \prod_{p=1}^{12} (n-p)$ provided $p \neq n$ for D_n and $k \neq p$ for N_n.

For example the fifth term of the above series would be:

$$\frac{100 \times (k-1)(k-2)(k-3)(k-4)(k-6)\ldots\ldots(k-12)}{(5-1)(5-2)(5-3)(5-4)(5-6)\ldots\ldots(5-12)}$$

John continues; "this can be extended for any finite number, n, of terms - the numerator and denominator will each contain n-1 terms". He adds a final note: "this is a copout, because I could not guess the rule the committee was thinking of". Such sequences as this are suitable for use in Grade 12 (Advanced & General) to show students there are other types of sequences other than Arithmetic and Geometric. I also like to do some work with the Fibonacci sequence.

To leave you with some food for thought - do you know this one?

43, 25, 29, 85, 89, ?, ?, ...

If you have seen it before it presents no problem; but when you look at it for the first time, it appears ridiculous!!

If you would like the solution, OR a 1984 OAME PEN (limited supply still available at $1, postage included!!) write to the author at Belleville Collegiate, 230 John Street, Belleville K8N 3G1.

SOLVING "DIFFICULT" PROBLEMS IN GRADES 7 AND 8

by

Jack O'Neill

The following problem involves simple arithmetic operations but with large numbers. Presentation of problems like this one to students will involve them in logical thinking processes and in organizing their work.

The problem is a **long** one and I allow the students to solve it alone or in groups of two or three. Give them a week to complete it (not all class time).

Don't show them how to do any parts (then it would just be arithmetic and not a problem).

Don't expect too many students to get a totally complete and correct result, but do expect most students to take many of the factors into account that lead to a correct solution.

Students will most likely exhibit a variety of ways of organizing the many parts. The answer provided here is only one such organization.

Calculators can and should be used. A valuable lesson that you can teach the students is that multiplication questions that result in an answer that is too large for the calculator display can still be done on a calculator.

e.g. 72 B.P.M. × 60 min. × 16.5 hr. × 7 days × 52 weeks × 70 years
Simply input the following numbers into the calculator:
7.2 × 6.0 × 16.5 × 7 × 52 × 7.0 = 1 816 214.4
Now allow for the 10 × 10 × 10 that was not entered and you get the correct result,
1 816 214 400 beats.

A feature of this problem is the appearance of numbers in the billions and the procedure of rounding off to the nearest million.

THE PROBLEM:

Calculate the total number of heartbeats for each of the following individuals for their life time.

Is it true that Healthy Harry, even though he lives many years longer than the other two, and even though he regularly exercises to a heartrate of 175 beats per minute, will have the lowest total heartbeats per life time? (Exercise specialists say that if you strengthen your heart by regular exercise, then it will not have to beat as frequently during the rest of the day and during sleep to do its work.)

Healthy Harry
lived to 80th birthday
exercise - from 14th birthday to age 80:
45 minutes per day, 4 days a week
75 minutes per day, 2 days a week
2 hours , seventh day of each week
normal pulse: 60 b.p.m. (beats per minute)
exercise pulse: 175 b.p.m.
sleeping pulse: 50 b.p.m. - 8 hours per day

Lazy Larry
lived to 65th birthday
exercise - from 18th birthday to age 65 - ran to catch bus to work 5 mornings a week
- 2 minutes each day
normal pulse: 80 b.p.m.
exercise pulse: 200 b.p.m.
sleeping pulse: 75 b.p.m. - 7 hours Monday to Friday
4 hours Saturday
5 hours Sunday

Ailing Annie
lived to 70th birthday
no exercise
normal pulse: 72 b.p.m.
sleeping pulse: 64 b.p.m. - 7½ hours per day

THE ANSWER

Ailing Annie

heartbeats while sleeping:
64 b.p.m. × 60 min. × 7.5 hours × 7 days × 52 weeks × 70 years = 733 824 000 beats

heartbeats while awake:
72 b.p.m. × 60 min. × 16.5 hours × 7 days × 52 weeks × 70 years = 1 816 214 400 beats

Total Lifetime Beats:
1 816 214 400
\+ 733 824 000
2 550 038 400 beats in a lifetime

Healthy Harry

heartbeats while sleeping:
50 b.p.m. × 60 min. × 8 hours × 7 days × 52 weeks × 80 years = 698 880 000 beats

heartbeats while exercising:
(45 min. × 175 b.p.m. × 4 days) + (75 min. × 175 b.p.m. × 2 days) + (120 min. × 175 b.p.m. × 1 day)
= 78 750 exercise heartbeats in 1 week
78 750 × 52 weeks × 66 years
= 270 270 000 exercise heartbeats in a lifetime

heartbeats while awake but not exercising:
(i) **age 0 to 14:** 60 b.p.m. × 60 min. × 16 hours × 7 days × 52 weeks × 14 years = 293 529 600 beats

(ii) **ages 14 to 80:**
16 hours × 7 days = 112 hours per week awake
45 min. × 4 days + 75 min. × 2 days + 120 min. × 1 day = 7.5 hours of exercise per week
112 hours - 7.5 hours = 104.5 hours of normal pulse per week

60 b.p.m. × 104.5 hours × 60 min. × 52 weeks × 66 years = 1 291 118 400 beats

Total Lifetime Beats:
698 880 000
270 270 000
293 529 600
\+ 1 291 118 400
2 553 798 000 beats in a lifetime

Lazy Larry

heartbeats while sleeping:
(i) **Monday to Friday:** 75 b.p.m. × 60 min. × 7 hours × 5 days = 157 500 beats

(ii) **Saturday, Sunday:** 75 b.p.m. × 60 min. × 9 hours = 40 500 beats

Total sleep beats in a week:
157 500
\+ 40 500
198 000 beats

198 000 × 52 weeks × 65 years = 669 240 000 beats

heartbeats while exercising:
200 b.p.m. × 2 min. × 5 days × 52 weeks × 47 years = 4 888 000 beats

heartbeats while awake but not exercising:

(i) **ages 0 to 18:** 168 hours in a week - 44 hours asleep = 124 hours
80 b.p.m. × 60 min. × 124 hours × 52 weeks × 18 years = 557 107 200 beats

(ii) **ages 18 to 65:** 168 hours in a week - 44 hours asleep - 1/6 hours exercise = 123 5/6 hours
80 b.p.m. × 60 min. × 123 5/6 hours × 52 weeks × 47 years = 1 452 713 500 beats
[on my calculator 123 5/6 = 123.83333]

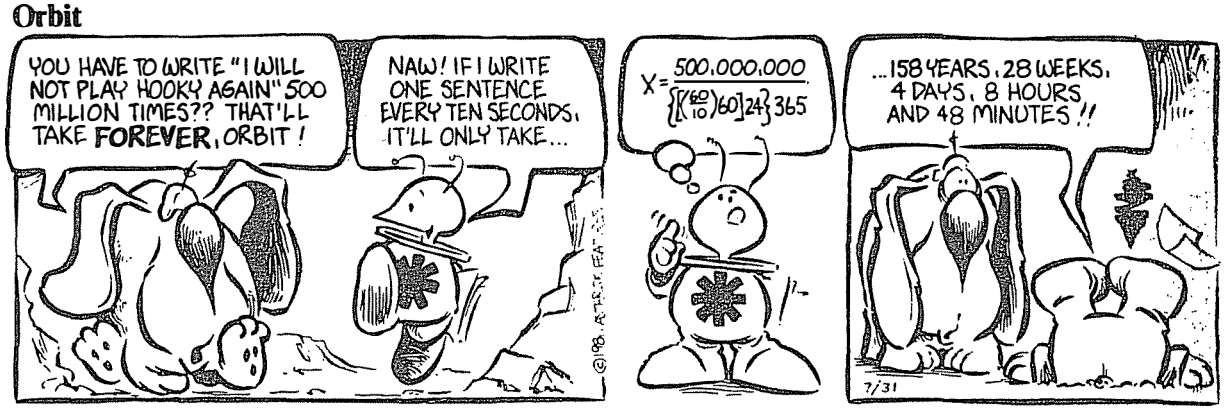
Total Lifetime Beats:

669 240 000
4 888 000
557 107 200
+ 1 452 713 500
2 683 948 700 beats in a lifetime

** Note that students who multiply × 365 days will get slightly different (by 5 or 6 million only) answers from those who multiply × 7 days × 52 weeks.
Accept either, but discuss same with the class.
I suppose ideally, we should use × 365 days and also allow for leap years!

When discussing answers, round them off to nearest million!
To change the answers here to those that would be obtained using × 365 days rather than by × 7 days × 52 weeks, just multiply by 365/364.

SUMMARY: Healthy Harry - 2 Billion 554 Million
Lazy Larry - 2 Billion 684 Million
Ailing Annie - 2 Billion 550 Million



GET SMART(IES)

by
Todd Romiens
Assistant Co-ordinator
Math & Computer Assisted Instruction
Windsor Board of Education

Here is a lesson with which I have had a great deal of success from grade 4 to grade 9. It reviews some number ideas as well as introduces statistics.

Materials - 1 box of smarties for each child - 1 chart to record data - coloured pens

Distribute the smarties, 1 box to each student. Don't let them eat any yet! Have each student count the number of each colour smartie in his/her box and record that number on the chart provided. Once this is done the smarties may be eaten!

FIGURE 1

ORANGE	GREEN	RED	PINK	TAN	BROWN	YELLOW	PURPLE
TOTALS							

Have students make a bar chart of each colour in their box. Provide some colour - use the same colour bar as smartie if possible. Next a circle graph of each person's box can be made.

Now data can be collected from each student in the class and added to the chart. New bar charts and circle graphs can be drawn from the total data and compared to the data from each box.

Questions such as the following can be discussed:

a) What colour is most prevelant?
b) What is the average number of smarties of each colour?
c) What is the average number of smarties in each box?
d) Why do you expect differences in numbers of smarties in each box to occur?

Students are particularly interested in this lesson around lunchtime.

a OVER b OVER c

by
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Division of fractions by fractions is a process that causes a great deal of confusion amongst students at all levels. Those who do not fully understand the process resort to all sorts of memory tricks that usually lead to the incorrect answer. When faced with

$$\frac{\frac{a}{b}}{c}$$

there is a great deal of confusion and panic. The symbol as written is not well defined. It is not clear which of the following is meant:

(1) $\dfrac{\frac{a}{b}}{c}$ or (2) $\dfrac{a}{\frac{b}{c}}$

and even if the student knows which is meant, there is no guarantee of correct computation.

Most high school students have at least a smattering of BASIC.
In BASIC, the expression

a/b/c m e a n s $\dfrac{a}{bc}$

There is no doubt about the meaning. It is part of the syntax of BASIC. The correct syntactical decomposition of the expression is

(a/b)/c

and so is the same as (1) above. However, the expression

a/(b/c)

is syntacically different. It is the same as (2) above and means

$a\cdot(c/b)$ or $\dfrac{ac}{b}$

The situation with $\dfrac{\frac{a}{b}}{\frac{c}{d}}$ is even worse than that described above.

There are so many different possibilities, namely

(3) $\dfrac{\frac{a}{b}}{\frac{c}{d}}$; (4) $\dfrac{\frac{a}{b}}{\frac{c}{d}}$; (5) $\dfrac{\frac{a}{b}}{\frac{c}{d}}$; (6) $\dfrac{\frac{a}{b}}{\frac{c}{d}}$

In BASIC, the expression a/b/c/d is well defined and means

$$\frac{a}{bcd}$$

But, which of (3) through (6) are the same as

(a/b)/(c/d) ; (a/(b/c))/d ;
((a/b)/c)/d ; a/((b/c)/d) ;

and which is

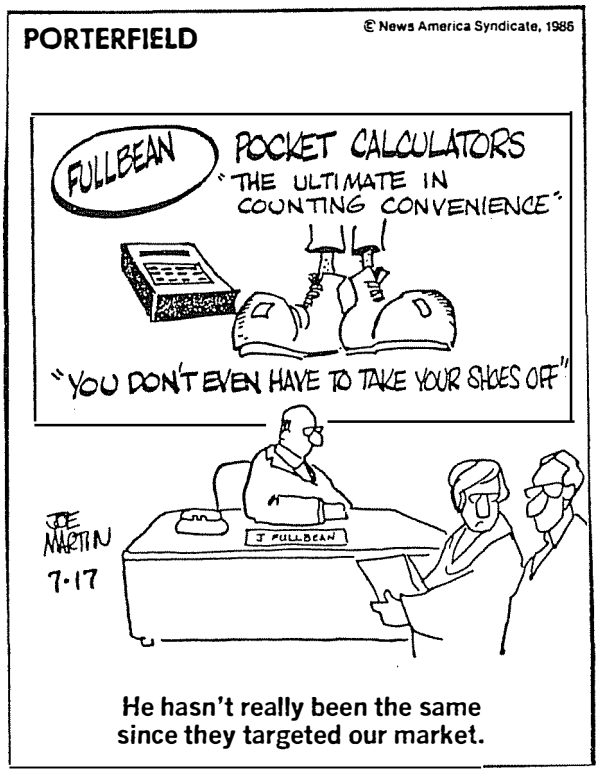
$\frac{acd}{b}$ $\frac{a}{bcd}$ $\frac{ac}{bc}$ $\frac{ad}{bc}$

Note that these are all different, and that there are other incorrect combinations possible.

What can be done to help eliminate this confusion? My suggestion is the appropriate use of brackets. This can be considerable help here as it can in many other situations. We then re-write the expressions (3) through (6) in the forms

(3) $\dfrac{\left(\frac{a}{b}\right)}{\left(\frac{c}{d}\right)}$; (4) $\dfrac{\left(\left(\frac{a}{b}\right)\right)}{\frac{c}{d}}$; (5) $\dfrac{a}{\left(\left(\frac{b}{c}\right)\right)}$; (6) $\dfrac{\left(\frac{a}{\left(\frac{b}{c}\right)}\right)}{d}$

This determines the order in which the divisions are done and so helps to eliminate errors.



WEIGHTED AVERAGES MEAN TICKET PRICE

by
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We have all looked at examples dealing with average salaries of workers in an office or players on a team where some salaries are earned by a number of people. Students have then seen that the average salary can not be simply calculated by adding up the individual salaries. In fact, some salaries have to be counted more than once -**weighted.** In carrying out the calculations, students have seen that there can be a great deal of difference in the mean depending on the weightings. The following example can illustrate the effect on weighting.

	A	B
SALARY	**NUMBER EARNING THAT SALARY**	**NUMBER EARNING THAT SALARY**
$95 000	1	7
85 000	1	7
75 000	1	7
65 000	2	7
55 000	1	7
45 000	6	7
35 000	13	7

In case A, the individual salaries need to be weighted; that is $65 000 needs to be taken twice, $45 000 taken 6 times and $35 000 taken 13 times. The average is then $46 600 (I believe).

In case 2, the student may recognize that this can be done much simpler than case A. Why?

This often ends the section on Weighted Averages; in fact there are not all that many questions unlike this. I would like to suggest a little different pair of follow-up examples; data for local sports team arenas or convention centre/auditoriums could be substituted.

EXAMPLE 1:
The ticket prices and numbers of seats at that price for the Vancouver Canucks are given below:

SEAT	TICKET PRICE	FREQUENCY
RED	$17	8803
BLUE	$14	4060
GREY	$11	2726
WHEELCHAIR	$11	24

a) What is the total number of seats in the arena?
b) When there is a sellout, what is the total amount of receipts?
c) What is the mean ticket price?

EXAMPLE 2:
Repeat example 1 for the information for the Toronto Maple Leafs.

SEAT	TICKET PRICE	FREQUENCY
GOLDS	$22	2251
REDS	$19	5178
BLUES	$13	1374
GREENS	$11	3591
GREYS	$ 7	3788

OPTIMIZING THE WAIT FOR THE BUS

by
Christian T.L. Janssen
Department of Finance & Management Science
University of Alberta

My morning bus is scheduled to leave our stop at 7:40 a.m. During the winter months, however, it is generally not on schedule. The departure time varies from 7:36 to 7:46 with an even distribution of times in between. My walk to the bus stop takes exactly 3 minutes without variation. I do not want to come too early, as waiting for the bus during the Edmonton winter is uncomfortable. Coming too late, and missing the bus, however, is also serious. The next bus is twenty minutes later. So what is the optimal time to arrive at the bus stop?

Arriving too early, and have to wait for the bus, is associated with a discomfort of D per minute, and missing it with a discomfort of 8D. Missing the bus typically means returning home and making a new attempt for the next bus, which, however, is always on time. The associated discomfort is thus equivalent to an eight-minute wait. (Walking in cold weather is not as bad as standing still.)

There are always other travellers getting on at my stop. If there is no one waiting, it is a sure sign that the bus has left. Hence, when I arrive at the stop, there is never any doubt whether I have missed it.

Let X denote the departure time of the bus in minutes from 7:36, its earliest time. Then $f(x) = 1/10$ if $0 \leq X \leq 10$. Let A denote my arrival time in minutes from 7:36. The task is to find A so as to balance the expected discomfort from arriving too early against that from arriving too late.

If I am early, then $X > A$, and the discomfort equals $(X - A)D$. If I am late, then $X > A$, and the discomfort is 8D. For a given value of A the likelihood of X exceeding A is the integral of f(x) from A to 10, and that of X being less than A the integral from 0 to A. Multiplying the probability with the associated discomfort gives the expected discomfort.

Setting the expected discomfort from coming too early (left hand side) equal to that of coming too late (right hand side) gives

$$D \int_A^{10} (X - A)(1/10)dx = 8D \int_0^A (1/10)dx$$

Carrying out the integration, and noting that D and 1/10 drop out, gives

$$100/2 - A^2/2 - 10A + A^2 = 8A$$

$$A^2 - 36A + 100 = 0$$

$$A = 18 \pm (324 - 100)^{1/2}$$

$$A = 3.033, (A_2 = 32.967)$$

Hence, I should reach the bus stop at 7:39, that is, leave home at 7:36, confident that over the course of the winter my expected discomfort will be minimized.

A GEOMETRIC FIGURE RELATING THE GOLDEN RATIO AND Pi

by
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Editor's Note: This article comes from the May Edition of the ***Mathematics Teacher.*** *This excerpt is reprinted with the author's permission.*

Twenty-three centuries ago Euclid wrote proposition 11 of book 2 of the *Elements,* which proved that a given line segment can be divided into two parts so that the area of the rectangle whose length is the whole line segment and whose width is the shorter of the two parts is equal to the area of the square whose side is the other part (fig. 1).

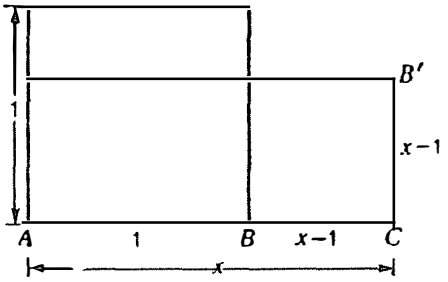


Fig. 1 $x^2 - x - 1 - 0$ has the solution $x - \Phi$.

The golden ratio can be obtained from this proposition by letting the length of the entire segment equal x and the part included in the square equal unity (fig. 1). From the proposition we obtain the following:

$$\begin{aligned} (AC)(BC) &= (AB)^2 \\ x(x - 1) &= 1^2 \\ x^2 - x &= 1 \\ x^2 - x - 1 &= 0 \end{aligned}$$

This equation has the positive solution

$$(1) \qquad x = \frac{1 + \sqrt{5}}{2} \approx 1.618033989 \ldots,$$

which is called the golden ration, Φ. The interesting properties

$$\Phi^2 = \Phi + 1$$

and

$$\Phi^{-1} = \Phi - 1$$

can be derived directly from equation (1).

The length and width of the golden rectangle of ancient times were in the ratio of $\Phi:1$. The three-dimensional counterpart of the golden rectangle is the rectangular solid called the golden cuboid, whose length, width, and height are in the ratio $\Phi:1:\Phi^{-1}$. See figure 2.

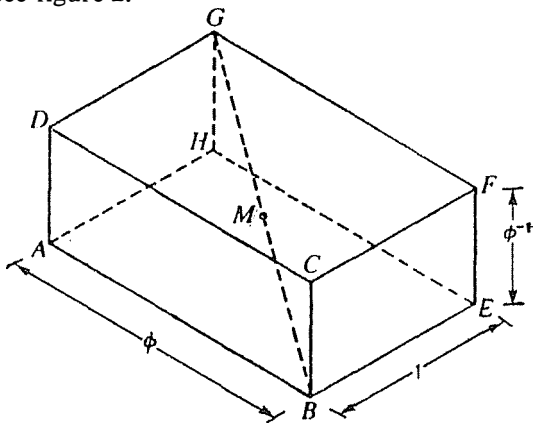


Fig. 2. The ratio of the surface area of the golden cuboid to that of the sphere that circumscribes it is $\Phi:\pi$.

The surface area of the golden cuboid can be found by substituting Φ, 1, and Φ^{-1} for the length, width, and height, respectively, in the formula for the surface area (SA) of a rectangular solid (where L = length, W = width, and H = height):

$$SA = 2LW + 2LH + 2WH$$

For this cuboid, we have

$$SA = 2(\Phi \times 1) + 2(\Phi \times \Phi^{-1}) + 2(1 \times \Phi^{-1}),$$

and since $\Phi \times \Phi^{-1} = 1$ and $\Phi^{-1} = \Phi - 1$, the surface area becomes

$$SA = (2 \times \Phi) + (2 \times 1) + 2(\Phi - 1).$$

Simplifying further, we obtain $SA = 4\Phi$, an intriguing mathematical fact for the golden cuboid.

We are now in a position to prove the following statement:
Theorem: *The ratio of the surface areas of the golden cuboid to that of the sphere that circumscribes it is* $\Phi:\pi$.

Proof. Consider the golden cuboid with vertices A, B, C, D, E, F, G, and H shown in figure 2. All the internal diagonals $\overline{AF}$, $\overline{BG}$, $\overline{DE}$, and $\overline{CH}$ are of equal length and intersect at an internal midpoint M. From geometry we know that all the internal diagonals of a rectangular solid are congruent and meet in a common midpoint that bisects them all.

The length BG can be found by substituting into the formula for finding the length of an internal diagonal of a rectangular solid:

$$d = \sqrt{L^2 + W^2 + H^2}$$

Thus:

$$\begin{aligned} BG &= \sqrt{\Phi^2 + 1^2 + (\Phi^{-1})^2} \\ &= \sqrt{(\Phi + 1) + 1 + (\Phi - 1)^2} \\ &= \sqrt{\Phi + 2 + \Phi^2 - 2\Phi + 1} \\ &= \sqrt{\Phi + 2 + (\Phi + 1) - 2\Phi + 1} \\ &= \sqrt{4} \\ &= 2 \end{aligned}$$

Because M is the midpoint of $\overline{BG}$, MB = 1 and MB is the radius of the sphere that circumscribes the golden cuboid. The formula for the surface area of a sphere is

$$SA = 4\pi r^2,$$

where r designates the radius.

The surface area of a sphere of radius 1 is then

$$SA = 4\pi(1)^2,$$

or simply

$$SA = 4\pi.$$

Hence, the ratio of the surface area of the golden cuboid to that of the sphere that circumscribes it is $4\Phi:4\pi$, which becomes $\Phi:\pi$ when the 4s are canceled. The proof is complete.

Thus, a relationship is established between the irrational Φ and the trascendental π.

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INTEGRATING THE CALCULATOR INTO THE CURRICULUM

by
Dave Hunter, Mathematics Consultant
Ottawa Board of Education

The Ministry Guidelines for Mathematics (1986) indicate the following aims for Grade 7 and 8 mathematics:

1. To develop a positive attitude toward mathematics;
2. To develop an appreciation for the place of mathematics, and its widespread applications, in our culture;
3. To develop problem solving abilities;
4. To develop facility in communication skills involving the use of the language and notation of mathematics;
5. To develop facility in the appropriate use of the calculator;
6. To consolidate and extend skills in arithmetic, algebra, measurement and geometry;
7. To participate in those experiences which will lay a foundation for the development of the more abstract features of mathematics in later grades.

It is the opinion of this writer that the calculator can be used as a vehicle to help achieve most or all of the above aims. In particular, the teaching of geometry in the intermediate grades should be experiential in nature, and geometry should be used as a vehicle to develop many of the objectives of the courses. To give a specific, and rather simple example, the attached exercise on the "Properties of a Right Angled Triangle (2)" demonstrates the following objectives:

(a) the students estimate the lengths of the sides;
(b) the student measures the lengths of the sides;
(c) the variation in measurement is recorded and discussed, allowing students to use bar graphs and averages, fostering a discussion of why there is variation in the first place;
(d) the calculator is used to compute the averages and square the measured lengths;
(e) the measurements lead to a discussion of significant digits, rounding off, and determination of the number of significant digits in the squared values,
(f) the student is asked to establish a rule to explain the relation between the squares on the sides of a right angled triangle (truly a problem solving situation if the student is not familiar with the relation).
(g) an application of percents can be incorporated in a discussion of percentage error.

Thus we see that throughout this entire exercise, the student is actively involved in constructing, estimating, measuring, and using the calculator to verify and compute awkward calculations.

There are many situations in teaching geometry where this approach can be used. The following is only a partial list of such situations:

1. Showing that the area of a triangle is half a rectangle on the same base;
2. Deriving the general formula for the area of a triangle;
3. Demonstrating various properties of right triangles:
   (a) the perpendicular drawn from the vertex to the hypotenuse is the mean proportional between the segments of the hypotenuse;
   (b) the median drawn from the vertex of the right angle gives the centre of the circumscribed circle;
   (c) the diagonals of the squares drawn on the sides of a right angled triangle themselves form a right angled triangle;
4. Showing Heron's formula for the area of a triangle;
5. Showing that the areas of similar triangles are proportional to the squares on the corresponding sides;
6. demonstrating the development of the ratios of the sides of the 30, 60, 90 triangle;
7. showing that the medians of a triangle trisect each other;
8. proving that the diagonals of a rhombus bisect each other at right angles;
9. showing that the sum of the squares on the sides of a rhombus is equal to the sum of the squares on the diagonals;
10. establishing the formulas for the perimeters and areas of all the regular geometric figures.

The above examples illustrate the tremendous scope for the use of the calculator to generate many of the concepts of geometry and at the same time reinforce many of the other objectives of the course.

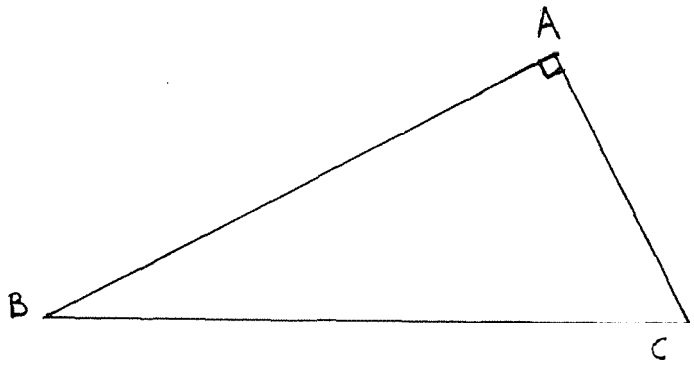
Current research tells us that we tend to require our students to abstract too early in mathematics. Also, students learn in many different ways. By teaching geometry in the above manner, the students are given the opportunity to participate in concept formation by visualizing concrete structures that they have created on paper. Verbalization of the concept comes **after** the experience, rather than before, and thus should be more meaningful. An integral part of the whole activity is the fact that students will be constantly communicating with one another and this process allows for the expression of different learning styles. It will be very simple for the teacher to extend the activity

to include some writing of definitions and thus contribute to language across the curriculum.

In short, the writer believes that the above approach should be mandatory in all intermediate mathematics classroom.

PROPERTIES OF RIGHT ANGLED TRIANGLES (2)

Exercise 2: In each of the following right angled triangles, estimate, then measure the lengths of the sides to the nearest mm and then use your calculators to determine each of the indicated values.



	INDIVIDUAL ESTIMATES	ACTUAL MEASURES
a =	_____	_____
b =	_____	_____
c =	_____	_____

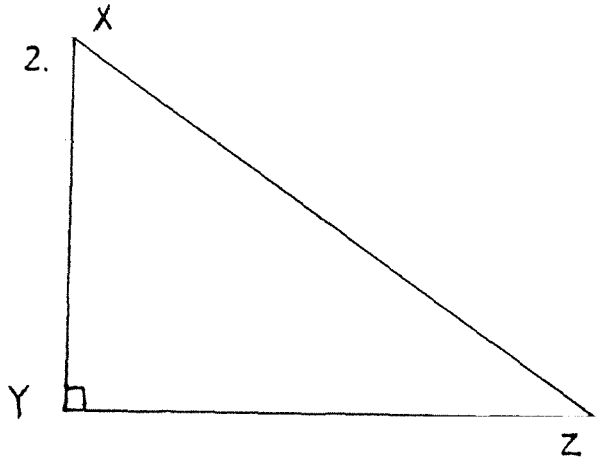
USE CALCULATOR: a^2 = _____

b^2 = _____

c^2 = _____

$b^2 + c^2$ = _____

2.



	ESTIMATE	MEASURES
x =	_____	_____
y =	_____	_____
z =	_____	_____

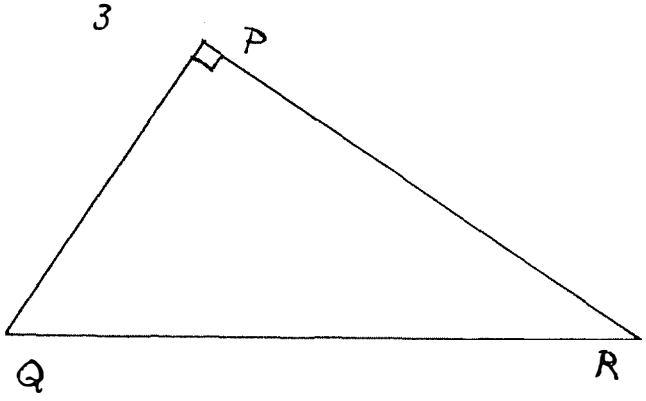
USE CALCULATOR: x^2 = _____

y^2 = _____

z^2 = _____

$x^2 + z^2$ = _____

3



	ESTIMATES	MEASURES
p =	_____	_____
q =	_____	_____
r =	_____	_____

USE CALCULATOR: p^2 = _____

q^2 = _____

r^2 = _____

$p^2 + q^2$ = _____

CONCLUSION: The sum of the squares on the two sides about the right angle is equal to the square on the hypotenuse.

PROPERTIES OF RIGHT ANGLED TRIANGLES (2)
SUMMARY OF DATA

Triangle 1.

a		b		c	
MEASURED VAL.	f	MEASURED VAL.	f	MEASURED VAL.	f

CLASS AVG. _____ CLASS AVG. _____ CLASS AVG. _____

Triangle 2.

x		y		z	
MEASURED VAL.	f	MEASURED VAL.	f	MEASURED VAL.	f

CLASS AVG. _____ CLASS AVG. _____ CLASS AVG. _____

Triangle 3.

p		q		r	
MEASURED VAL.	f	MEASURED VAL.	f	MEASURED VAL.	f

CLASS AVG. _____ CLASS AVG. _____ CLASS AVG. _____

1. Draw bar graphs showing the distribution of student measurements.
2. Discuss the reasons for the variations.
3. Why do we not obtain the exact results according to Pythagoras?

PROPERTIES OF RIGHT TRIANGLES (2) CONT.

STEP 1. In the space below, construct a triangle ABC with sides a = 6.0 cm, b = 8.0 cm, and c = 10.0 cm.

STEP 2. Estimate the size of each angle to the nearest degree.
$\angle A$ = _____ $\angle B$ = _____ $\angle C$ = _____

STEP 3. Measure each of the angles to the nearest degree.
$\angle A$ = _____ $\angle B$ = _____ $\angle C$ = _____

STEP 4. Compute: a^2 = _____, b^2 = _____, c^2 = _____

STEP 5. Compute: $a^2 + b^2$ = _____ and c^2 = _____

CONCLUSION?

OCTAGONAL SUMS AND RATIOS

by
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Mathematics teachers are interested in situations that can be used for drill and practice using either paper and pencil or a calculator. It is ideal if these situation give rise to pattern discovery in settigs involving finite mathematical notions.

One of these settings involves the addition table as shown if Figure 1.

Figure 1: Addition Table

+	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

Figure 2 displays the interior of an extended addition table. Nested octagons have been drawn on the table. For each octagon.

1) Find the sum of the vertices (V).
2) Find the sum of the entries which lie on the perimeter (P).
3) Find the sum of the interior numbers (I).

see following page for figure 2

Figure 2

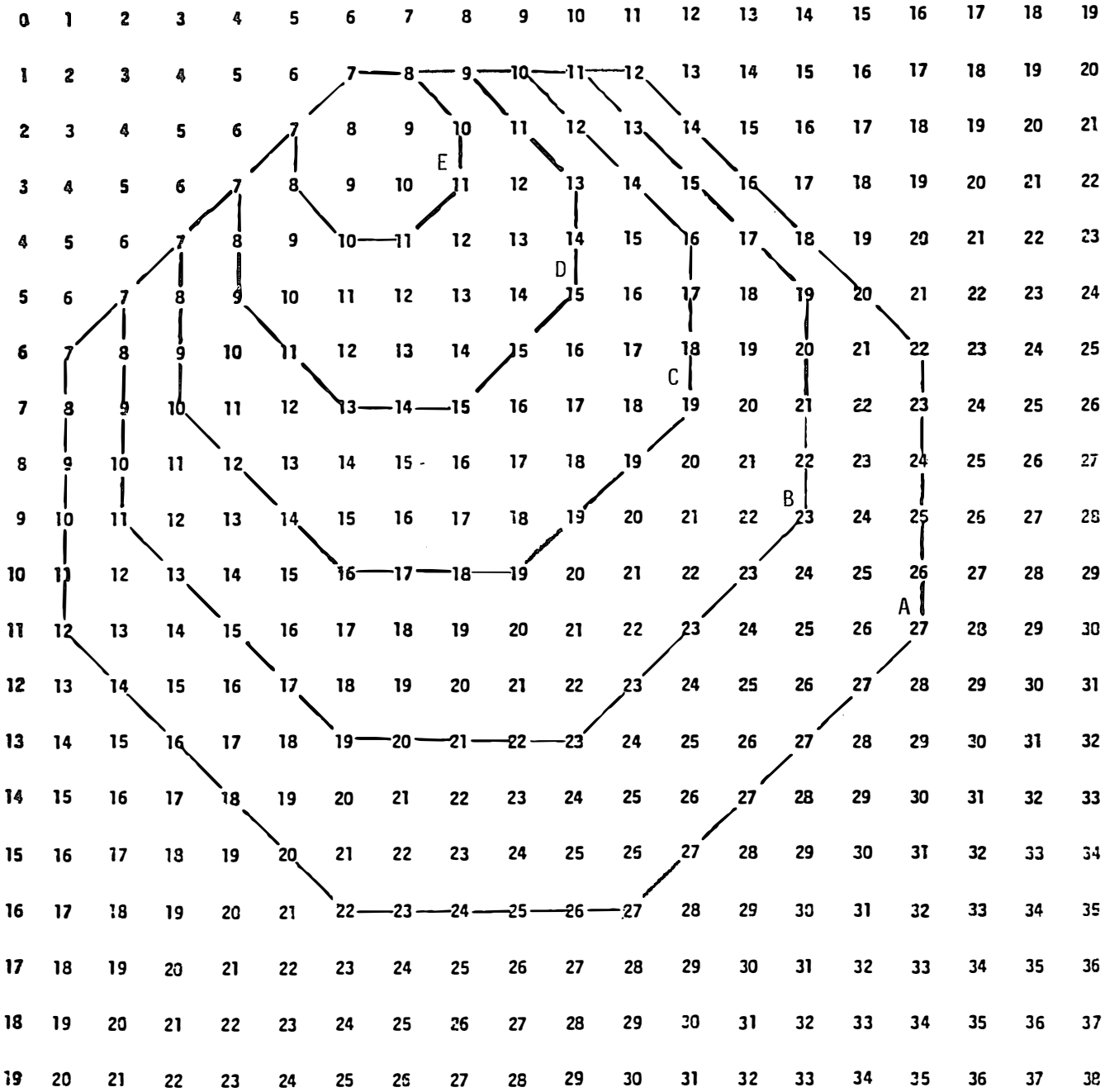


Table 1 reports the sums, together with the number of entries that were summed. In each case the sum is listed first with the number of entries in each sum in parentheses.

Table 1

Octagon	V(#)	P(#)	I(#)
A	136(8)	680(40)	2652(156)
B	120(8)	480(32)	1455(97)
C	104(8)	312(24)	676(52)
D	88(8)	176(16)	231(21)
E	72(8)	72(8)	36(4)

To identify patterns, find $\frac{V, P \text{ and } V.}{I \quad I \quad P}$ In each case, the ratios are the same as the ratios of the numbers of entries

which were summed. For example, in octagon D:

$$\frac{V}{I} = \frac{88}{231} = \frac{8}{21}$$

$$\frac{P}{I} = \frac{176}{231} = \frac{16}{21}$$

$$\frac{V}{P} = \frac{88}{176} = \frac{8}{16}$$

Draw other sets of nested octagons on Figure 2. Do the ratios still hold?

Will the pattern hold if nested octagons are drawn on an extended subtraction table? On Figure 3, octagons A through E have been drawn in exactly the same positions as they occupied on Figure 2. Again, find the same sums and ratios as in the previous activity.

Figure 3

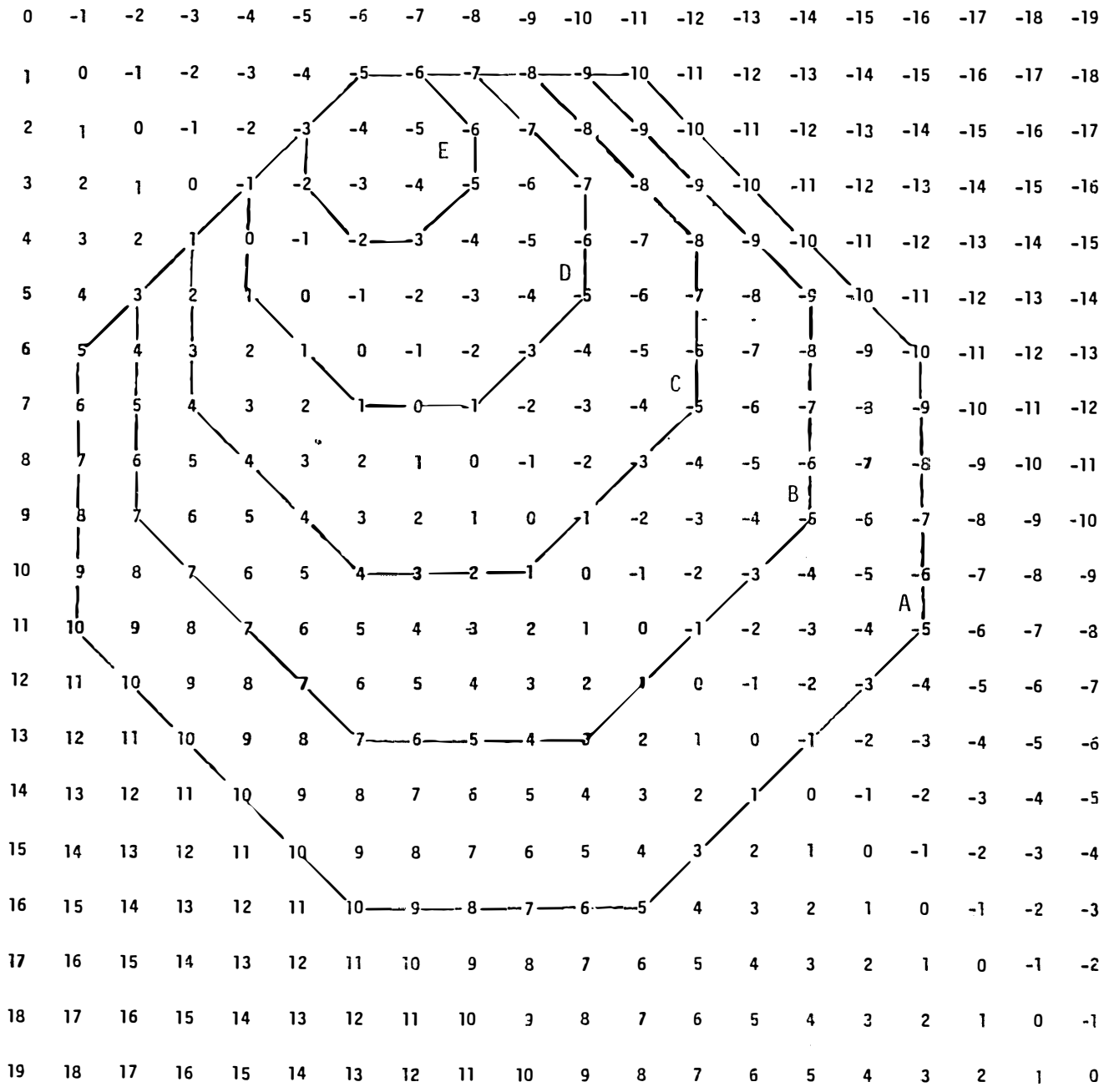


Table 3

Octagon	V(#)	P(#)	I(#)
A	0(8)	0(40)	0(156)
B	-8(8)	-32(32)	-97(97)
C	-16(8)	-48(24)	-104(52)
D	-24(8)	-48(16)	-63(21)
E	-32(8)	-32(8)	-16(4)

Note for octagon D:

$$\frac{V}{I} = \frac{-24}{-63} = \frac{8}{21}$$

$$\frac{P}{I} = \frac{-48}{-63} = \frac{16}{21}$$

$$\frac{V}{P} = \frac{-24}{-48} = \frac{8}{16}$$

The same ratio patterns hold, except when the sum is 0 since division by 0 is impossible. What would your students do in this case?

Challenges for the reader:

1) Draw other geometric shapes on Figures 2 and 3. Find sums and ratios. Do the patterns still hold?
2) Draw nested octagons on an extended multiplication table. Compute the sums and ratios. Do the patterns still hold?

Good news—bad news



"One potato, two potato, three potato, four..."

THERE'S MORE TO KNOWLEDGE THAN COMPUTER LITERACY

by
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A LUDDITE'S COMPUTERS

"No child who is without computer skills will play a productive role in the future." The newly appointed superintendent of schools of a rather large Ontario city had just made such a statement. He seized this opportunity to speak for the first time to his staff of elementary school teachers. I was the keynote speaker waiting my turn. Somewhat startled and embarrassed by his words, I heard him go on to say that now that the city's entire school system was thoroughly computerized (whatever that meant) the schools would be running much more smoothly and more efficiently..and the number of computers in each "appropriate" class would quickly reach the saturation point.

What utter nonsense! and choosing his maiden speech in which to humiliate himself. His position, however, is a commonly heard one. The admonition comes in a variety of packages, but the thrust is always the same: anyone without computer knowledge and skills will make no contribution to society and will clearly be without any hope of finding gainful employ.

Many things about such talk trouble me. Before you dismiss me as some latter day Luddite, let me say that I am not! I definitely appreciate running water, toilets that flush, and many more of our modern conveniences; but to argue that the advent of computers will now take the human species into the land of milk and honey is myopic at best and downright silly at worst.

Many topic areas in the Arts/Sciences of our liberal arts universities are now requiring some form of "computer literacy" for a B.A. degree. Such literacy is often seen as a substitute for a foreign language requirement.

Obviously much of the appeal of computers (and those lights burn all night long in terminal rooms across our campuses...) is that it is REAL training for a place in the new technocracy which places computers at the center of the society. It also means that what we had feared for some time has now come to pass: universities are in the business of training people. It is merely duplicating the training offered at many vocational institutes; computer training is seen as the most practical of all pursuits. But as education begins to focus once more on the practical, we forget the ultimate goals of a liberal education. We focus on the means to a job outside the university.

It is true that computers are being introduced into millions of jobs...but surely these jobs, as a function of computer assistance will become intellectually less and less demanding and more soul destroying. And even though many jobs may be eliminated, the service sector will remain completely unaffected. To substantiate this I refer to **The New Manufacturing: America's Race to Automate,** a report submitted to and ignored by President Reagan (Business/Higher Education Forulm, 1984). Based on the most recent projections of the Bureau of Labour Statistics, the report identifies those occupations that will provide the greatest number of new jobs by 1990: secretaries - 700,000; nurses aides and hospital orderlies - 508,000; janitors - 501,000; salesclerks - 479,000; cashiers - 452,000; nurses - 437,000; truck drivers - 415,000; and on and on. Well down the line were computer programmers, computer operators, systems analysts, electrical engineers, etc.

Our computerphilia represent reductionism in the extreme, the North American lust for the quick fix, our worship of the shortcut.

Or perhaps it is the love the magical, the effortless transformation. We are surrounded by people who want to get rich quick, who want fast but dangerous diets, who seek religious and medical quackeries promising cosmic consciousness in a 20-minute meditation break or a cure with one pharmacological fix. That youngster sitting at a computer terminal feels himself transformed into Duka's Sorcerer's Apprentice," now instantly able to manipulate the powers of the world. I would argue that such power wielded with such velocity should make us all very cautious indeed.

In a very instructive essay, **The Transformations of Man,** Lewis Mumford traces several cultural epochs through which humankind has moved. Mumford first describes "archaic man" - earthbound, worshipping gods of vegetation, in tune totally with the rhythms of the seasons, securing his future by clinging tightly to the past. Then came "civilized" mand, whose society was characterized by social divisions and role specializations, externalized laws and codified behaviours, hierarchical authorities, and institutional energies. The third stage belonged to "axial man", who purified his animal nature and emphasized the spiritual values we recognize today, especially the value of the individual.

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Mumford argues that unfortunately all of this is behind us. Our world (the "new" world) came with the Renaissance, reducing external limitation on human power and exalting human potential. Under the influence of rationalism, empiricismm, and scientific methodology we are now "technological men." But here, technique has become virtually all and our humanness lost Mumford writes: "In the post-historic scheme, man becomes a machine reduced as far as possible to a bundle of reflexes, rebuilt at the to the needs of other machines." The victory of this style of life may effectively do away with any serious reason for remaining alive.

Jorge Luis Borges once said: "Thinking, analyzing, extrapolating are not anomalous acts; they are the normal respiration of intelligence." My impression is that many millions of students across our great Dominion sitting before a computer terminal are as close to suffocation as they will ever be. They are pressing buttons and the computer does all of those things that Borges suggests are "the normal respiration of intelligence." Indeed we should all be taking "crash courses" in cardiac pulmonary resuscitation.

Given the overwhelming importance of the computer today, we tend to forget that the art of thinking is not intellectual (technological) art but a moral art. The moral arts may not flourish in an age of computer literacy. This may be what Thomas Huxley meant when he said of North America: "I cannot say that I am in the slightest degree impressed by your bigness or your material resources as such. Size is not grandeur and territory does not a nation make. The great issue about which hangs a true sublimity and terror of overhanging fate is what are you going to do with all these things?" Albert Einstein might have answered: "Our age is characterized by the perfection of means and the confusion of goals." Robert Merton might say: "We are a civilization committed to the quest for continually improved means to carelessly examined ends." If our ends remain unexamined something perilous may happen...I remember (Melville) Captain Ahab saying: "All of my methods are rational; only my ends are insane."

Why have the "hawkers" of computer literacy, hardwares and softwares been so successful while many of the practical claims for such a literacy are either nonsense or worse? Douglas Noble has a few answers for us (**The Underside Of Computer Literacy**): "The makers of the 'information society' have perpetrated the computer literacy movement in order to ensure public acquiescence in their grand design." This is done by first introducing people to the computer and this introduction deludes them into thinking that all computers are user-friendly (this a fundamental part of the mystification process). Secondly, "as computers become more and more user-friendly there is an increase in people who are more and more computer friendly." Thirdly, computer literacy helps "insure public acquiescence by psychologizing" and dissent. Anyone who even questions the computerization of all facets of society, is referred to as "computer phobic," and/or stigmtized as a Luddite, and promptly sent for suitable treatment.

The significant message is that computers are central to our developing society. Learning about them is essential. I remember my octogenarian parents after reading John Naisbitt's **Megatrends** and deciding then and there "We had best get busy and take a computer course." Their collective wisdom would shame any so-called computer scientist...but at 80 years of age they still fear being rendered obsolete and being left behind by all others who are hurrying into computer oblivion.

I am reminded that of this propaganda simply diverts us from the central challenges of our collective lives: to mature, to become and active member of the informed electorate, to accept responsibility for the many choice we make.

I personally remain unconvinced that some broadly computer literate society will bring us any closer to resolving the urgent paradoxes of our time. One can only conclude that all the talk of "the transfer of information," the transformation of society through broad computer literacy is really greatly exaggerate. As Noble concludes: "...the relative unimportance of computer knowledge must be stated plainly and often so that people will see that the picture of the future woven into the 'computer literacy' tapestry remains essentially a fiction."

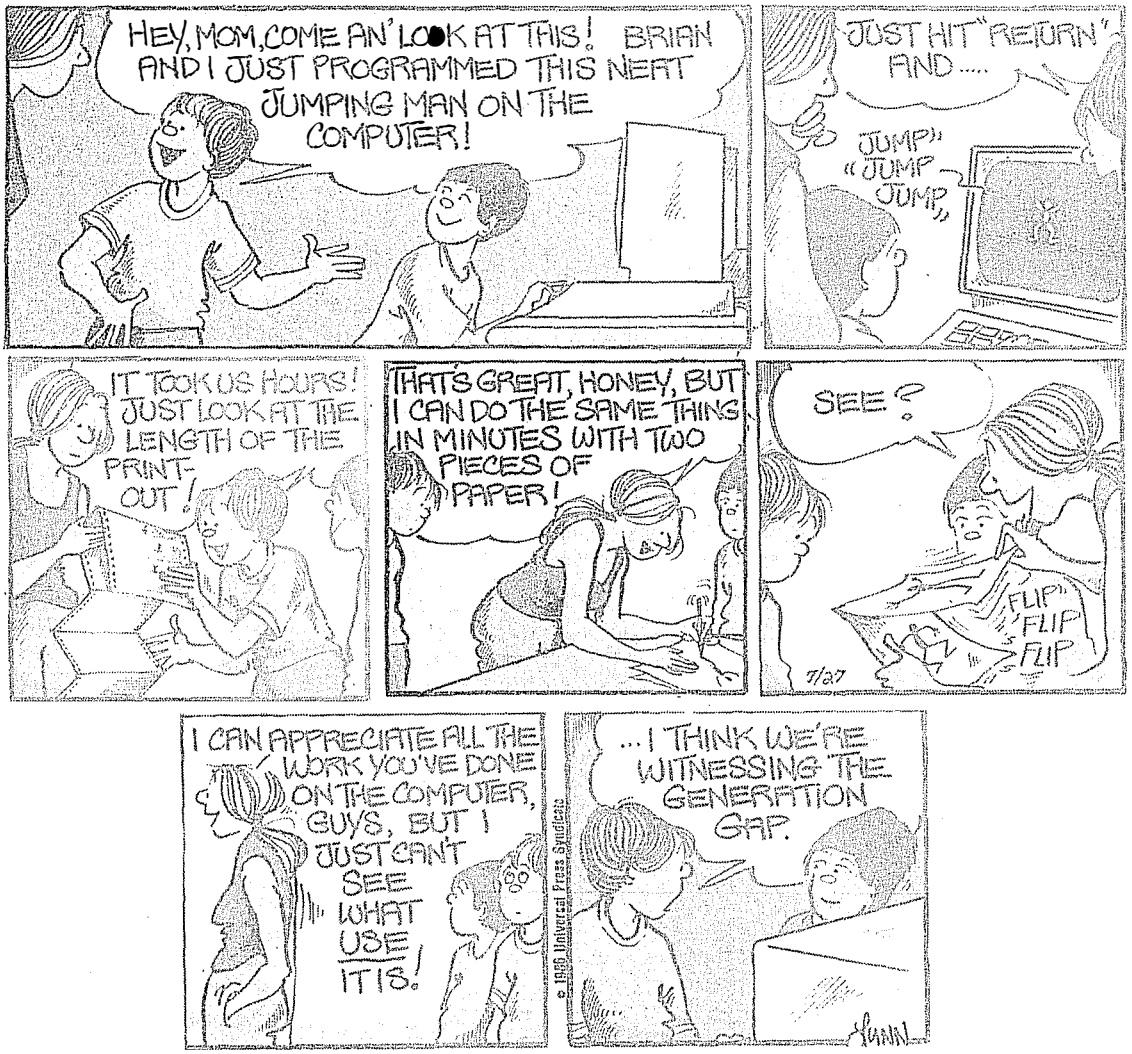
J. David Bolter, author of **Turings Man: Western Culture in the Computer Age,** is less concerned about the fiction but is more concerned about conspiracies. In a society based on (1) ruthless exploitation of natural resources, and (2) on the dream that man can "raise himself above the status that nature seems to have assigned him," the computer will simply serve as another weapon in man's war AGAINST nature. More prosaically, it will serve as a means of producing greater corporate profits, probably the most basic reason for the computer "hype" to which we are constantly exposed.

In a fascinating and critically acclaimed book, Sherry Turkle (**The Second Self: Computers and the Human Spirit**) argues that in the early days of the computer, people hoped that the electronic technology could be captured by the counterculture. "Personal computers became the symbols of hope for a new populism in which citizens would band together to run information resources and local government." Instead, computers encouraged centralization and greater bureaucracy. Instead of humanizing industry, the personal computer came to serve as an

escape from industry for hobbyists and for professional programmers who sought to achieve in the privacy of their homes the control they could no longer exercise at work. Sherry Turkle reminds us that "People will not change unresponsive governments or intellectually deadening work through involvement with their machines at home."

Warren Martin **(Alternative to Irrelevance)** has said: "To live is to choose, and if not to choose, then to be chosen. We are, in a way, condemned to be heroic in that we are required by the fact of life to face alternatives and make choices. Life does not proceed of itself. In some way, by certain values, we affirm life or deny it, we affirm loving or we deny it, we affirm humanity or we deny it. We must begin here and this gives us our foundation." Obviously, we must try to extend the existing pragmatic goals beyond the urgings of our technocracy; we may end up doing only what we can and nothing more.

So let us be a little more sensible about computer literacy. Let us use our computers as much as we can to serve fundamental human needs; but let us keep a balanced perspective. Computer literacy is a noble goal, but surely it is not the new Holy Grail.



PROFESSOR SOLVES 63 YEAR OLD RIDDLE

Editor's Note: This article is reprinted with the author's permission, Western News, May 8, 1986.

Western mathematician Victor Snaith has two very good reasons to regard 1986 as his best year professionally.

Not only will he become a Fellow of the Royal Society of Canada, the country's most prestigious learned academy, but he is also about to gain widespread recognition for solving a mathematical riddle which has defeated the world's mathematicians for 63 years. Snaith has found the answer to a problem originally posed in 1923 by Emil Artin, a German mathematician at the University of Hamburg.

Snaith, an expert in the geometry-related branch of mathematics known as topology, "just chanced upon the solution" to a complex riddle in number theory, a field far removed from topology. He came upon the right formula about six months ago while developing some new material for a graduate course in topology. Since that time, he has played his cards close to his chest, obtaining corroboration of his formula from renowned mathematicians at other institutions, but he will soon publish in an appropriate scholarly journal.

"I suspect this will be quite contentious among number theorists and they aren't going to like the fact that they'll have to learn some topology in order to find out what the answer is. But this kind of cross-discipline discovery happens all the time in science," he said.

Snaith's field of topology is often referred to as "qualitative geometry" or "rubber sheet geometry." It's the study of the properties of geometric forms that do not change under certain geometrical transformations such as bending and stretching.

Topology's answer to Artin's riddle is difficult for non-mathematicians to grasp, but then so is the question.

It's intimately linked to number theory, or arithmetic, the oldest branch of mathematics.

"Number theory is a really fundamental piece of science, but it's changing. Most people don't realize that mathematics is rolling along and evolving just like any other science. They tend to think of the subject as something the ancient Greeks carefully made, a nice entity that hasn't changed," said Snaith.

Many famous number theory problems deal with trying to figure out how numbers "factor," or how a number can be broken down into the component numbers which can be multiplied together to produce it. Everything that is at all technological, especially computers, has number theory beneath it, Snaith said. "Trap-door codes," highly effective, almost unbreakable codes, are closely related to number theory. They're based on knowing how to write a very, very big number as the product of two "prime numbers"; a prime number is one that really doesn't split into factors at all, having just itself and the number one as factors.

The taxing number theory riddle Snaith solved goes back to the work of 19th century mathematician Julius Dedekind who brought calculus to bear on the problem of factorisation. He invented the "zeta functions," a systematic family of functions which holds the secrets of factorisation in it many, distinct factorisation schemes. For instance, one zeta function analyses factoring into whole numbers while another keeps track of factorisation when the square root of two is used.

In 1923, Artin did what mathematicians commonly do - he introduced a further complication, which led to the 63 year old riddle. He invented the Artin L-function, an attmept to understand all the ways in which zeta functions of factorisation are inter-related. He mastered a few illustrative examples but left the larger riddle unsolved: What is the formula which accounts for all the inter-relationships between the zeta functions of factorisation?

In the intervening decades, several famous mathematicians have studied special cases of L-functions in an attempt to find a solution for the general case. "But when you see the right way to do it, you find it's easier to apply it to the whole thing than to do a piece," said Snaith. After he realized he had found the answer to a longstanding problem, he worked out an even simpler proof of the formula using topology.

"It was easy to see that it holds true all the time."

Prof. Richard Kane, a fellow topologist in Western's Department of Mathematics, said the cross-discipline technique of his colleague's discovery will be intriguing for mathematicians around the world. Mathematicians often use algebra to understand geometry and its subdisciplines like topology, he said, "but very little has gone the

Faculty of Education
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London, Canada
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1986 07 29

Mr. Clifford Gravelle, Editor
Ontario Mathematics Gazette
Brock University College of Education
St. Catharines, Ontario
L2S 3A1

Re: Gordon R. Magee

At the annual meeting, May 10, 1986 the assembled members stood for one minute in silence to remember Professor Gordon R. Magee, a former Head of Mathematics and Astronomy at the University of Western Ontario, a scholar and a gentle man.

Dr. Magee died April 2 in his 84th year. He was a full time faculty member from 1927 to 1967, retiring that year but continuing to teach part-time until 1973. He graduated from Western with a Gold Medal in Honours Mathematics, completed a Master's Degree at the University of Chicago in 1926, and earned his Ph. D. from Chicago in 1933 while teaching at Western.

During the depression years, Dr. Magee guided the department through some very thin times. At about the same time he became involved with the Ontario Department of Education at Queen's Park and became Examiner in Chief for the Grade 13 Trigonometry course, a post he held for some 15 years.

Dr. Mageee was active in the Royal Astronomical Society of Canada, the Canadian Mathematical Association (he attended its inaugural meeting), the Mathematical Association of America and a founding member of the Ontario Association of Mathematics Educators. In 1967 he was awarded the Canadian Government Centennial Medal "in recognition of valuable services to the nation".

For those of us who were former students, colleagues and friends, Gordon will be remembered as a modest, quiet-spoken, gentle man. He was helpful as a teacher, patient at all times and respected by both his colleagues and students.

Marian and Gordon Magee were to be found at annual conventions, usually surrounded by their friends, always with happy greetings and good feelings. Marian predeceased her husband. Both will be missed.

As John Del Grande stated at the meeting "it is good to remember our roots". Gordon R. Magee was a part of the beginning of this organization.

Yours truly,

Bob Smith

Robert Smith
Associate Professor
Mathematics
Division of Curriculum Studies



Problems

by

Clifford J. Gravelle

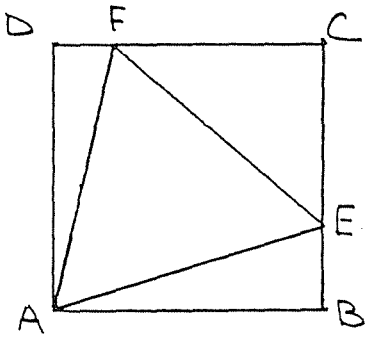
This issue's problems come from **Creative Publications** entitled **Eureka -- Math Enrichment,** which covers a wide range of mathematical topics and levels of difficulty. Because it is designed to pull together many different topics in mathematics, it can "provide both a review of previous work and an introduction to a new topic, as well as a motivation to learn new techniques needed to solve more specialized types of problems." Happy problem solving?

1. Show by substitution that

$$\frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

are roots of $ax^2 + bx + c = 0$.

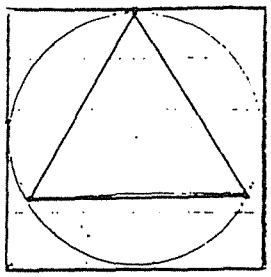
2. Find the length of the equilateral triangle AEF inscribed in square ABCD.



3. What values of x satisfy the equation? $17^{(6x^2 + x - 35)} = |-1|$

4. What is the area of a regular dodecagon that is inscribed in a circle with radius r?

5. A circle is inscribed in a square and an equilateral triangle in the circle. If the radius of the circle is r, find the ratio of the area of the square to the area of the triangle.



Answers on Page 40

OPEN LETTER

Open Letter To: Curriculum Branch,
Ministry of Education

From: Mr. J-P Ginestier

Subject: MATHEMATICS, Intermediate and Senior Divisions, 1985

I have learned, over the years, that an impulsive, explosive reaction when confronting an adverse situation is not always the most productive way of obtaining a reasonable compromise.

Undoubtedly, working 'from the inside', and making polite suggestions to the right people at the right time is, in general, the better way.

While the OS:IS curricula have been under preparation, I have done all I could to be heard through the regular channels; talked to colleagues, my Department Head, other Mathematics Heads in Toronto, my Board, talked and written lengthily to the Mathematics Project Committee.

Now the new Curriculum Guideline document has become available. Certainly, a lot of thought has gone into its elaboration. However, while pointing out that I have not had the time to study it in detail, I feel I must immediately raise a cry of alarm.

It appears that the Ministry has not really heard what is perceived by teachers of advanced courses in secondary mathematics in Ontario: standards are being eroded, and this has been going on for quite some time. Many of today's students simply do not acquire confidence in the use of techniques to manipulate quantities - and this is to the detriment of their performance in all areas of mathematics, not to mention physics and other sciences; somehow, there has been a lack of emphasis on the students' exposure to the understanding and use of these basic skills.

Now it seems that, with the implementation of the new guidelines, Ontario students following advanced mathematics courses will **not see any trigonometry whatsoever** until grade 12, if they opt along that path; even worse, if they choose to take grade 11 advanced math followed by the 'Finite Mathematics' OAC, they will graduate **without ever having been exposed to trigonometry.**

Thus Ontario will become possibly the only educational jurisdiction in the world which has no trigonometry in its advanced mathematics courses, until the last year of secondary school (in optional courses only).

Until now, trigonometry had been introduced as an optional topic as early as grade 10. And, surprisingly, it **is** included in the new grade 10 **general** level curriculum guidelines.

In general the drop in emphasis on precisely the basic necessities which are in great need of reinforcement is frightening - but the lack of trigonometry is quite incomprehensible. Most mathematics educators would agree that trigonometry is one of the most directly useful topics at an introductory level; it has the further advantage of being very accessible, well understood by students despite its novelty to them, when taught step by step.

No doubt those students taking physics, for example, will continue to need the tool of basic trigonometry. I suppose the teaching of it will fall upon already hard-pressed physics teachers.

Language across the curriculum is being implemented increasingly in Ontario, but there seems to be little evidence of numeracy across the curriculum. Instead of helping other departments reinforce the basic knowledge required to handle quantities, we mathematics teachers may be put into a position of fighting against our own guidelines to attempt to maintain some competence in our advanced students.

Secure as we are within the borders of the most populous province in Canada, we have a tendency to assume that our educational standards are among the highest in the world. Perhaps this may have been true at one time - but if we don't keep our eyes and ears open to the outside, it will certainly not remain so - if indeed it is still the case today.

Mathematics is so distinctively a non-local area of curriculum that the most fruitful route in developing program-

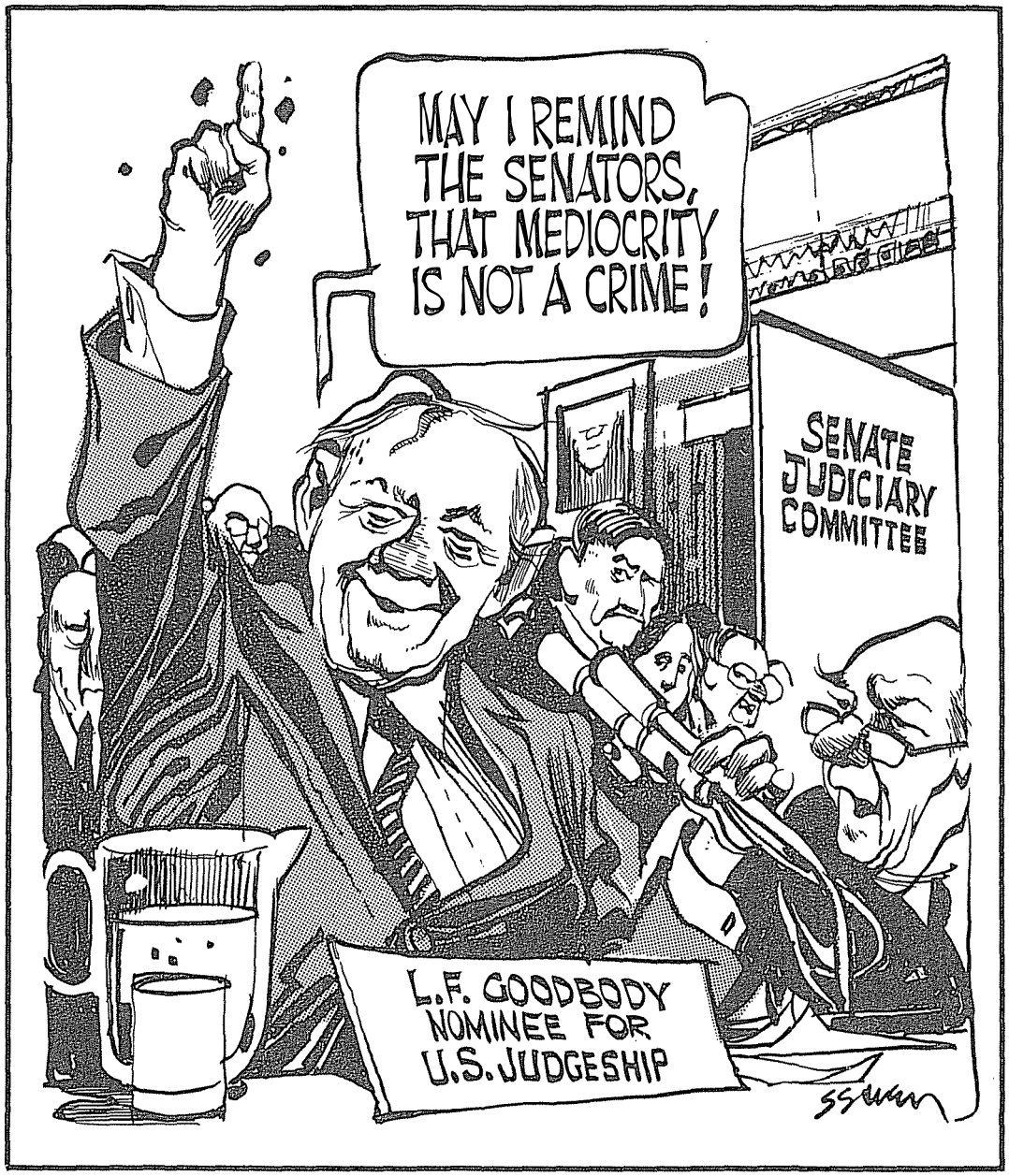
mes would be for educational authorities all over Canada - and even beyond - to contribute to the building of a common core. Each locality writing its own mathematics curriculum is a futile exercise, like re-inventing the wheel - each jurisdiction builds its own, locally-flavoured and quite unecessary imperfections to the curvature of the wheel.

I hope that publishers, who might now be preparing books to cover the new Ontario requirements, will realise that their grade 10 and grade 11 books will suffer serious losses of sales outside Ontario, unless they retain the trigonometry element.

Let me insist that, by taking the successful progress of my students as my major guiding light, I shall continue to try to impart to those students the basic tools of mathematical thought, including elementary trigonometry, and hope that the majority of my colleagues will tread the same path.

My fondest hope is that the Ministry will come to realise that it has overlooked this basic, necessary ingredient of any advanced mathematics course, and reinstate it, at least as an option, before too much damage is done.

Yours very sincerely,
J.P. Ginestier



By David Seavey, USA TODAY

WHAT'S GOING ON

NATIONAL COUNCIL OF

Teachers of Mathematics

NCTM CANADIAN REGION PLANS A BUSY YEAR

NCTM is sponsoring a regional meeting in Edmonton, Alberta, October 16-18, 1986. It will be held at the Westin hotel in Edmonton. The program looks to be an exceptionally strong one, and many exciting events are planned.

NCTM is also sponsoring a regional conference in Halifax, Nova Scotia, August 19-22, 1987. Planning is already well under way for that conference as well, and all indications are that it will be a superb meeting. It is being held at the new Halifax Sheraton, on the waterfront (overlooking the harbor and, at that time, the Bluenose II will be anchored there.) This is a rare opportunity to combine a great conference experience with a great holiday experience.

For more information on either or both of these conferences, contact NCTM directly or contact Dr. Ralph Connelly, College of Ed., Brock University, St. Catharines, Ontario L2S 3A1, (416) 688-5550, Ext. 3351.

The Educational Materials Committee of the National Council of Teachers of Mathematics announces that the 1989 Yearbook will be "Elementary School Mathematics: Issues and Directions", and will be edited by Professor Paul Trafton of National College of Education. The yearbook Advisory Panel is now seeking manuscripts for the yearbook. They are interested both in substantive papers addressing issues or directions in teaching of elementary school mathematics and in relatively short papers relating classroom practices to these issues and/or directions. Guidelines for the preparation of manuscripts are available from the General Editor, Albert P. Shulte, Oakland Schools, 2100 Pontiac Lake Road, Pontiac, MI 48054.

LIFE MEMBERSHIP

To qualify for Life Membership in OAME/AOEM a candidate shall: (i) have ten or more accumulated years of membership in OAME/AOEM, and (ii) have demonstrated outstanding leadership in Mathematics Education locally and provincially, and/or contributed in a significant way to Mathematics Education in general and in OAME/AOEM in particular.

If there is someone you wish to nominate for life membership in OAME/AOEM, you should submit his/her name and any information supporting the nomination to:

Dave Davidson, Life Membership Committee
7 Ferguson Road
Collingwood, Ontario L9Y 2Z9

Nominations should be submitted to Dave by November 15, 1986.

the grand valley mathematics association

G.V.M.A. PUBLICATIONS

Handbook of Trigonometry (1975)	$2.00
Solutions to the Handbook of Trigonometry (1978)	$2.50
A Handbook of Geometry (1979)	$3.00
Survey Test in Mathematics (1979)	$1.00
"Mathematics For Life" (1983) (a resource package for grade 12 general level consumer and business mathematics)	$7.00
"Mathematics For Life" Problems Supplement (1983)	$1.50
Recreational Math Problems for High School Students, Books I and II (Revised 1984)	$3.00
50 Grade 13 Calculus Problems (1984)	$1.50
Grade 10 Sample Exams (1984)	$1.50
*Mathematics For Everyday Life (1985)	$5.00
Living With Math (Mathematics for Work and Home) (1985)	$7.50
Grade 11 General Business Math Resource Package	$9.00

*In the first week of July, 1984, G.V.M.A. brought together three teams of teachers to create readily implementable resources for the new grade 11 basic and general level courses. The basic level materials, "Living With Math", and "Math for Everyday Life", were first published in 1985 and were very well received. The general level material was expanded and polished by a fourth team in July, 1986. It should be available by November, at the latest. While designed to meet the requirements of the new ministry guidelines, these three booklets contain a wealth of resource materials which can be used effectively in basic and general mathematics courses in any grade level from 9 to 12.

Grade 9 Sample Exam Bank (exam questions based on the core material in the new general and advanced level ministry guidelines)	$3.00

To receive these publications, send your order and payment (cheques or money orders made payable to the "Grand Valley Mathematics Association") to:

Mr. R.G. Scoins
Faculty of Mathematics
University of Waterloo
Waterloo, Ontario
N2L 3G1

McCARTNEY SCHOLARSHIP

Mona and Morley MacGregor and S.R.A. are pleased to announce that Guiseppe Russo of Sudbury was selected as winner of the John G. McCartney Scholarship for the year 1986-87. The judges were Mrs. Debra Heaton of Sarnia and Mr. Jack LeSage of Barrie. The presentation of the award will take place in Sudbury in late July.

Details of the presentation will appear in the December Gazette.

LEADERSHIP SEMINAR

Memo To: Teachers of Mathematics

From: Paul Lessard
Past President of O.A.M.E.

Re: Mathematics Leadership Seminar, Mathemagics
Wednesday Evening to Friday at 3:00 p.m.
(October 22 - 24, 1986)
Ramada Inn, Airport West
5444 Dixie Road
Mississauga, Ontario

I am bringing this elementary math conference, **Mathemagics** to your attention for several reasons.

* **Motivational** theme - The Magic of **MATHEMATICS**
* **Consideration** of several Ministry initiatives

  - the philosophy of the Formative Years
  - the spirit of Provincial Reviews in Junior Division Education
  - the essence of the support document - Shared Discovery
  - the opportunities created by Partners in Action
  - process components of Intermediate and Senior math guidelines

* **Utilization** of several initiatives from Boards around the province.

  Primary Focus
  Geometry Across the Grades
  Junior Division Contest
  Problem Solving/Enrichment
  Intermediate Contest

* **Accessibility**

  Cost effective $176 in '86
  Mail cheque payable to O.A.M.E. along with your name and address to:

  Mr. Morley MacGregor
  247 Bright Street
  Sarnia, Ontario
  N7T 4E9

* **Highlights**

  Many teachers/consultants from several boards will be sharing their creative talents during this provincial seminar.

This conference will be of interest to:
a) Teachers who have a special interest in mathematics
b) Principals and vice-principals who would like to influence the math programs in their schools
c) Teachers who are serving on board committees or family of school committees in mathematics
d) Chairman/Heads of Mathematics who would like to provide leadership to their feeder schools
e) Enrichment/Gifted Resource Teachers - Divergent Thinking
f) Special Education Resource Teachers - Problem Solving, Resources

It is the Conference Committee's hope that this 2 day conference of mathematics sharing will help create magic for the many students we influence.

* **Ways and Means**

- Federation Grants, local and provincial
- In-school Professional Development Funds
  - offer to come back and be a workshop leader for your board
- Ask for your Principal's Support
- Check with Subject Councils, Advisory Committees/other Board Committees
- Check with your local chapter of O.A.M.E. This may be a worthwhile activity to highlight the elementary influences of your chapter.

Ontario Association for Mathematics Education
Association Ontarienne pour
L'Enseignement des Mathematiques

Invites you to their

15TH ANNUAL
MATHEMATICS LEADERSHIP CONFERENCE

on

Wednesday Evening, Thursday, Friday, October 22, 23, 24, 1986

at

The Ramada Inn Airport West
5444 Dixie Road, Mississauga, Ontario

CONFERENCE SPEAKERS

- Doctor Zed
- Michael Gough
- Robert Robinson
- Joan Moore
- Ron Sauer
- Michael Campanella
- Judy Adams
- George Knill
- Frank Clifford
- Dino Dottori
- Ron Scolns
- Carolyn McCann
- Jack O'Neill
- Marg Collins
- J. Symington
- Julian D'Angela

CONFERENCE HIGHLIGHTS

- Pre-Conference Social
- Shared Discovery
- Enrichment
- Geometry
- 7 Keynote Speakers
- 10 Small Workshops
- Computers in the Maths
- Major Publishers' Display
- Elementary Math Contests
- Giant Puzzle Corner - Prizes
- Make and Take

"Join your Colleagues"
in
MATHEMAGICS

CONFERENCE REGISTRATION

$176 in 86

The registration fee of $176.00 includes:

- Shared Accomodation 2 nights
- 5 Meals over 2 days
- 2 Complimentary Socials
- and 10 Sessions on Mathematics Education

(Complete Conference Program will be mailed to you.)

Mail cheque payable to **O.A.M.E.**
along with your name and address to:
Mr. Morley MacGregor 247 Bright Street,
Sarnia, Ontario
N7T 4E9

REGISTER NOW **Fee $176.00**

Name .....

Mailing Address .....

.....

School Board .....

For further information call **Paul Lessard,** President of the Ontario Association for Mathematics Education
(416) 525-2930 ext. 233.

SCARBOROUGH '87

14TH ANNUAL O.A.M.E. CONFERENCE: "Of Mice and Math...", Scarborough Association for Mathematics Education is pleased to host the fourteenth annual conference of the Ontario Association for Mathematics Education at Centennial College, Progress Campus, on Thursday 7 May to Saturday 9 May 1987. We hope that you will count yourself in on the fun and sharing of ideas. Everyone (S.A.M.E., Centennial College, local hotels and businesses, Scarborough Board of Education, City of Scarborough) is working hard to try and make this year's conference the best one yet.

EASY ACCESS: Centennial College is easy to get to whether driving or using public transportation. It's virtually all highway driving, no big city street gridlock. Simply drive along highway 401 and exit at Markham Road south, turn left at the first stop light and you're at Centennial College. If you are flying, it may be more convenient to fly into Oshawa airport and drive back to Scarborough than to fly into Pearson International airport and drive all the way across the top of Metro (Jim Whitley, Queens University, has information on Inter City Airways which will provide group flights from Ottawa to Oshawa and from the North to Oshawa).

IDEAL LOCATION: The location is ideal for our purposes because Centennial College, Howard Johnson's, and the Cultural Centre are the only buildings on a cul-de-sac and we are using all three. Relax Inn and Venture Inn are most convenient, merely short walks, across Markham Road from the Convention Headquarters. Centennial College has dining facilities available, as well as the local hotels, and there are many fine dining establishments nearby; such as, The Keg and Chi-Chi's restaurants. For fitness buffs, there is a fine jogging trail behind Centennial College down through the ravine and parkland travelling all the way over to Scarborough College, University of Toronto. Families will appreciate the close proximity to Metro Toronto Zoo, Scarborough Town Centre Shopping Mall, Ontario Science Centre, Bluffers Park. Scarborough is the seventh largest city in Canada and offers a unique mixture of urban and rural lifestyles within a few kilometres of Centennial College. Scarborough offers something of interest for everyone.

PREFERRED DAYS: Notice that the conference is again starting on Thursday and finishing with meaningful, interesting presentations on Saturday afternoon (about 3 p.m.) - many people expressed a preference for these days.

EXCELLENT FACILITY: Centennial College is eager to host our conference and is providing convenient access for the handicapped, registration site, classrooms for workshops, computer facilities and faculty, exhibit areas and easy loading ramp, audio-visual equipment, free parking, food services. The staff at Centennial are enthusiastic, cooperative partners in this conference.

EXCELLENT ACCOMODATIONS: There is a convenient hotel nearby to suit all tastes in accomodation. Howard Johnson's, Relax Inn, and Venture Inn are all within walking distance of Centennial and offer rooms at about sixty dollars per night. Holiday Inn (Warden) and the posher Ramada Renaissance (Kennedy Road offer rooms at about ninety dollars per night; they are only a five-minute drive along the highway from Centennial. For a super holiday, stay at the Guild Inn on the Scarborough Bluffs; you'll get a pleasant blend of rustic charm and modern day conveniences on the shores of Lake Ontario and just 10 minutes drive from the Convention site.

COOPERATIVE CITY: Mayor Gus Harris will declare May 3-10, 1987 **"Mathematics Awareness Week"** in the City of Scarborough. John Morand, the Economics and Development coordinator is busy ensuring that delegates enjoy their stay in Scarborough.

GREAT PROGRAM: Peter Crippin, Shirley Fairfield, and Murray Major are all busy preparing our 1987 program; there will be a pleasant blend of tried and true veteran seminar leaders that mathematicians have demanded to hear again as well as enthusiastic, new talent from the Metro East area. You will be pleased to note that Scarborough will again offer the **"Trading Post"** that was so successful in Sudbury, 1985. Our Scarborough Board of Education is also arranging tours of some of our special facilities and programs; such as, the computer lab, vocational and occupational schools, gifted programs for secondary school (Woburn CI) and for elementary school (Churchill Hts), CAD/CAM demonstration of microcomputers and tech, robotics lab at Centennial College.

GREAT HOSPITALITY: Enjoy yourself at the 14th conference. We have the traditional receptions on Thursday and Friday afternoons, the Thursday night sock hop, the Friday president's banquet, breakfasts for Friday and Saturday mornings and are in the process of negotiating a salad bar luncheon for Friday and a Saturday afternoon BBQ to wind up a super convention, plus MATHEMATICS NORTH (look out Sudbury/Ottawa).

GREAT SUPPORT: Local merchants have been super in their support of this conference. Remember all the prizes that Scarborough presented in London 1986? S.A.M.E. says thanks to (1) CHI-CHI'S MEXICAN RESTAURANT, 1221 Markham Road, for a dinner for two won by Lorraine Hughes, Brighton; (2) THE KEG RESTAURANT, 60 Estate Drive, for a dinner for two won by Isobel Wilkinson, Willowdale; (3) RELAX INN, 335 Milner, for one night's accomodation for two won by Joe Tonin, Welland; (4) HOWARD JOHNSON'S, Markham Road and 401, for a weekend's accomodation for two won by Bill Murray, Cayuga SS; (5) SAME for one free OAME '87 registration won by M. Steele, Guelph; (6) LAINIE ANKENMAN for three Math Mice won by Mary Kelly, London, D. McCann, Hamilton, and L. Gallagher, Toronto. Make sure that you attend Scarborough '87 so that you have a chance at even more of these great prizes!

ATTRACTIVE CARDIGANS: Many conventioners at London stopped by our Scarborough Booth and inquired about purchasing the cardigans our team was wearing. Anyone who wishes may purchase one of these attractive white cardigans, crested with SAME / Scarborough '87 / OAME; simply indicate your desire to do so when you register, indicate your size and prepay ($30); the cardigan will be available when you pick up your registration package.

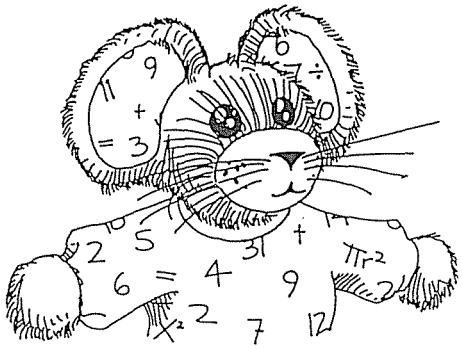
ADVICE AND INFORMATION: If you have any questions or advice to offer, please contact our conference chairmen: STEVE MARTIN, Danforth Gardens PS, 20 Santamonica Blvd., Scarborough, M1L 4H4, telephone 416-265-1411; PAUL ZOLIS, Math Centre, St. Andrews Jr. PS, 60 Brimorton Drive, Scarborough, M1P 3Z1, telephone 416-431-5644.

ARNIE CAREFOOTE
Publicity Chairman
OAME '87

ALBERT CAMPBELL CI

Ontario Association for Mathematics Education

14th Annual Conference



Of Mice and Math...

May 7 - 9, 1987

Centennial College of Applied Arts and Technology
Progress Campus, Scarborough, Ontario

Hosted by the SAME *Scarborough Association for Mathematics in Education*

MATH CAN BE CHALLENGE — BUT FUN, TOO
Award-winning London Teacher Dispels Myths

by
Laura Medcalf
of The Free Press

If there are 100 people in a room and everyone shakes hands with everyone else, how many handshakes would take place?

That was one of the questions London mathematician Tom Griffiths posed to a University of Western Ontario classroom of elementary school teachers last year. The teachers were there to earn a credit and to learn that teaching today's math can be challenging and fun.

"The 'new math' has a reputation of being hard. An awful lot of elementary teachers are arts orientated, and have anxieties themselves about math. Unless a child has a teacher who is comfortable with math he will develop an anxiety early on," Griffiths said.

Griffiths is well aware that the discipline he loves so well causes many to cringe. He has been involved in the Canadian field of mathematics for 20 years, an accomplishment recognized in June when he received the University of Waterloo's Rene Descartes Foundation award.

A native of England, Griffiths, 47, began teaching in Forest before moving to London and Lucas in 1976, where he is developing math courses for the gifted education program. He has been a councillor with the Ontario Association for Mathematic Education since 1970, playing a part on the provincial curriculum team, Grades 11 and 12, in 1969. With a number of textbooks to his credit and five more in the works, he has no doubt been cursed for imposing the dreaded "new math," first implemented in 1966, on unsuspecting students, teachers and parents.

But there is nothing really new about the new math — only the approach.

Griffiths said schools are now teaching the basic concepts of math — emphasizing understanding and skill development — and integrating all maths, such as geometry and algebra, in one year instead of studying only one subject one year and another the next.

"Thos divisions of the maths were false divisions. Many things are very much the same, say between algebra and geometry. It was always more a division of convenience."

Another division in mathematics is the difference in skill potential between boys and girls.

"We had a provincial conference in the city in May, with over 1,000 teachers attending, and we discussed that topic a great deal. Everyone I talked to came to the conclusion that we didn't know if it was biological or cultural, but we also came to the conclusion that we must assume it is cultural. If we don't know we must assume they have the potential and encourage them. Frankly, I think we have to turn the elementary teachers, especially the female teachers, and the parents on to math," Griffiths said.

Though many parents claim ignorance of math and many more are simply intimidated by it, Griffiths said that is no reason not to become interested in a child's studies.

"Parents should become involved with the kids. They don't have to actually understand it or do the work for the kids. The kids can teach the parents. The best way of learning something is to teach it to someone else. I have never had a case where a kid hasn't improved with that (parental) interest."

Griffiths said most children need time to learn math and he's critical of teaching the subject by the semester system.

"I use a crude analogy: The human being needs to use the bathroom regularly throughout the year. It's no good using it twice as long for half the year. The human mind absorbs at a certain rate. You can't cram in twice as much in half the time. Skill subjects take a natural period to develop, it needs a maturing time."

There are children who are exceptionally talented in math, and Griffiths has taken a special interest in them. He coached last year's Canadian Mathematics Olympiad team and is assistant coach for the 1987 team. He also is interest in implementing a city-wide gifted education program similar to the one he designed for Lucas and South Secondary School and would donate his time to teach gifted children after school hours.

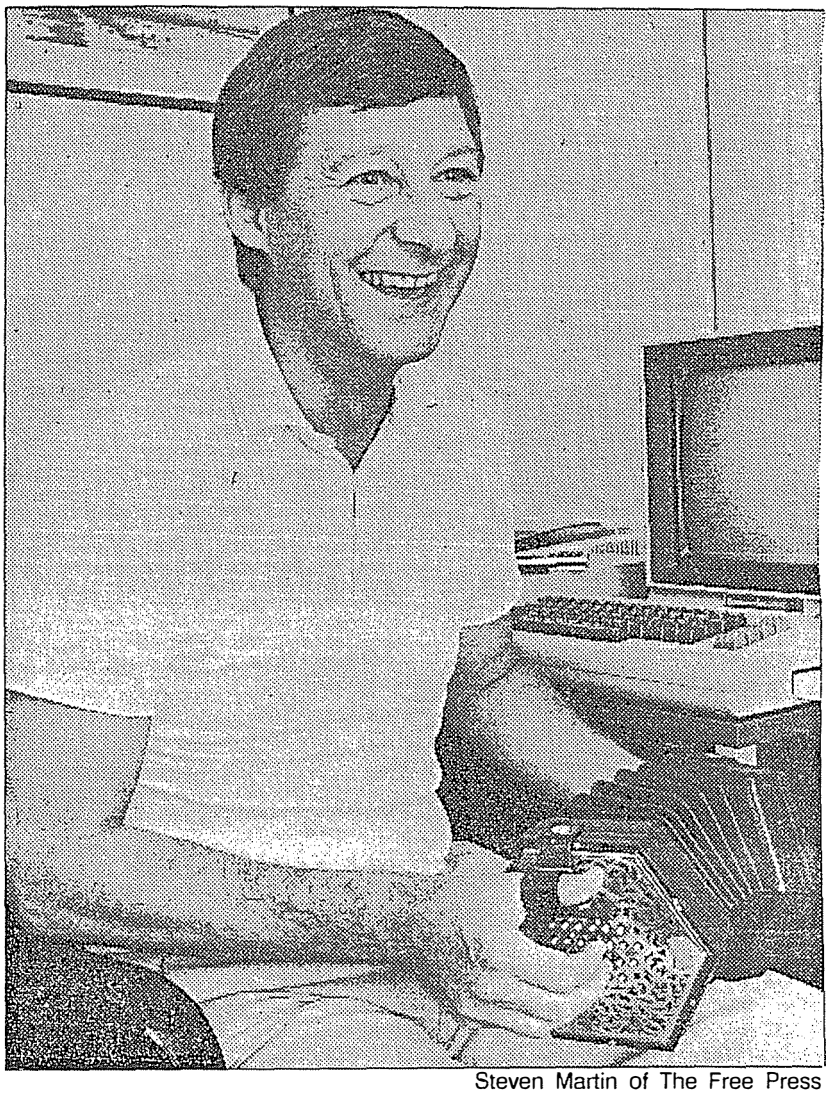
"There is a lot of potential out there; it just has to be tapped," he said.

Griffiths is not only a gifted mathematician; he also is a gifted musician. Having flirted with classical guitar, he now plays a mean trumpet, as well as playing the concertina. ("Beethoven was also a mathematician.")

He also builds model sailing ships, directs the Home County Folk Festival, and with his wife Dorothy, dances the traditional English Morris dances.

"Many people don't realize how much they use math in their lives and how much fun it can be. Puzzles and problems, chess, cards, dominoes. It's all math."

For those who decided to have a little fun with the problem that opened this story, the answer is 4,950 handshakes. The formula is YYY = X/2 (100-1), with X equalling the number of people in the room. Or think of it this way — one person is in the room and another arrives and shakes his hand. That is one handshake. Another person enters and shakes their hands. That's two more shakes, three in all. Another person enters and you have four more shakes, seven in all. Continue until you reach your 99th person and the total will be 4,950.



Steven Martin of The Free Press

London mathematician Tom Griffiths proves that the worlds of math and music blend nicely to make beautiful music. The A. B. Lucas Secondary School teacher brings the enthusiasm he holds for music to his career in mathematics.

ANSWERS TO THIS MONTH'S PROBLEMS

1. $$a\left(\frac{-b+\sqrt{b^2-4ac}}{2a}\right)^2 + b\left(\frac{-b+\sqrt{b^2-4ac}}{2a}\right) + c = 0$$

$$a\,\frac{(b^2 - 2b\sqrt{b^2-4ac} + b^2 - 4ac)}{4a^2} + \frac{-b^2 + b\sqrt{b^2-4ac}}{2a} + c = 0$$

$$\frac{2b^2 - 2b\sqrt{b^2-4ac} - 4ac}{4a} + \frac{-b^2 + b\sqrt{b^2-4ac}}{2a} + c = 0$$

$$\frac{2(b^2 - b\sqrt{b^2-4ac} - 2ac)}{4a} + \frac{-b^2 + b\sqrt{b^2-4ac} + 2ac}{2a} = 0$$

$$\frac{b^2 - b\sqrt{b^2-4ac} - 2ac}{2a} + \frac{-b^2 + b\sqrt{b^2-4ac} + 2ac}{2a} = 0$$

$0 = 0$

Use same procedure on $\frac{-b - \sqrt{b^2-4ac}}{2a}$

2. $2(a - \sqrt{x^2 - a^2})^2 = x^2$

$\left[\sqrt{2}(a - \sqrt{x^2 - a^2})\right]^2 - x^2 = 0$

$\left[\sqrt{2}(a - \sqrt{x^2 - a^2}) + x\right]\left[\sqrt{2}(a - \sqrt{x^2 - a^2}) - x\right] = 0$

$\left[\sqrt{2}(a - \sqrt{x^2 - a^2}) - x\right] = 0$

$\sqrt{2}\,a - \sqrt{2}\sqrt{x^2 - a^2} - x = 0$

$-\sqrt{2}\sqrt{x^2 - a^2} = x - \sqrt{2}\,a$

$2(x^2 - a^2) = x^2 - 2\sqrt{2}\,ax + 2a^2$

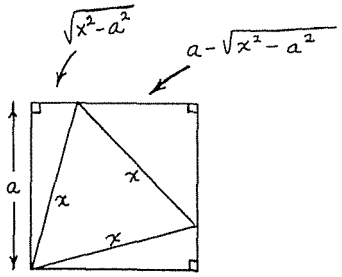
$x^2 + 2\sqrt{2}\,ax - 4a^2 = 0$

$$x = \frac{-2\sqrt{2}\,a \pm \sqrt{(2\sqrt{2}\,a)^2 - 4(1)(-4a^2)}}{2}$$

$$x = \frac{-2\sqrt{2}\,a \pm \sqrt{8a^2 + 16a^2}}{2}$$

$$x = \frac{-2\sqrt{2}\,a \pm 2\sqrt{6}\,a}{2}$$

$x = a(\sqrt{6} - \sqrt{2})$



3. $17^{6x^2 + x - 35} = |-1|$

$17^{6x^2 + x - 35} = 1$; but $17^0 = 1$, then

$6x^2 + x - 35 = 0$; $(2x + 5)(3x - 7) = 0$

$x = -5/2$ or $7/3$

4. Area = $3r^2$

In the figure at right:

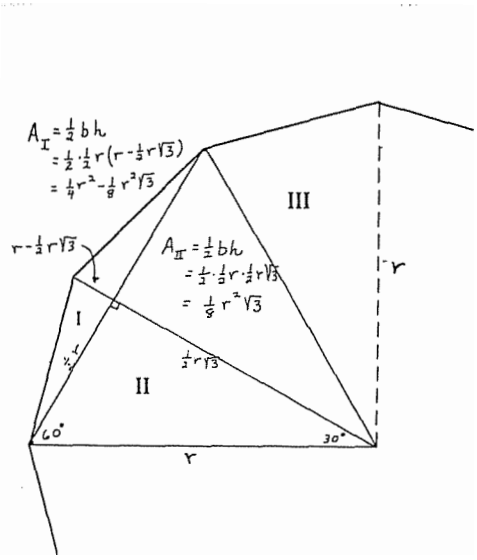
$A_I + A_{II} = A_{III}$

$\frac{1}{4}r^2 - \frac{1}{8}r^2\sqrt{3} + \frac{1}{8}r^2\sqrt{3} = A_{III}$

$\frac{1}{4}r^2 = A_{III}$

$(12)(A_{III}) = A_{dodecagon}$

$3r^2 = A_d$

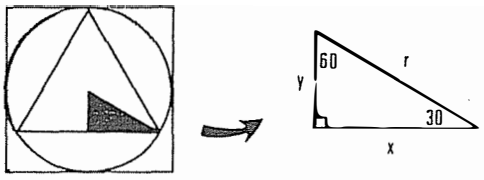


5. $\frac{16\sqrt{3}}{9}$ or approximately 3.08

Using the "30-60" right triangle relationships shown in the figure below, we obtain:

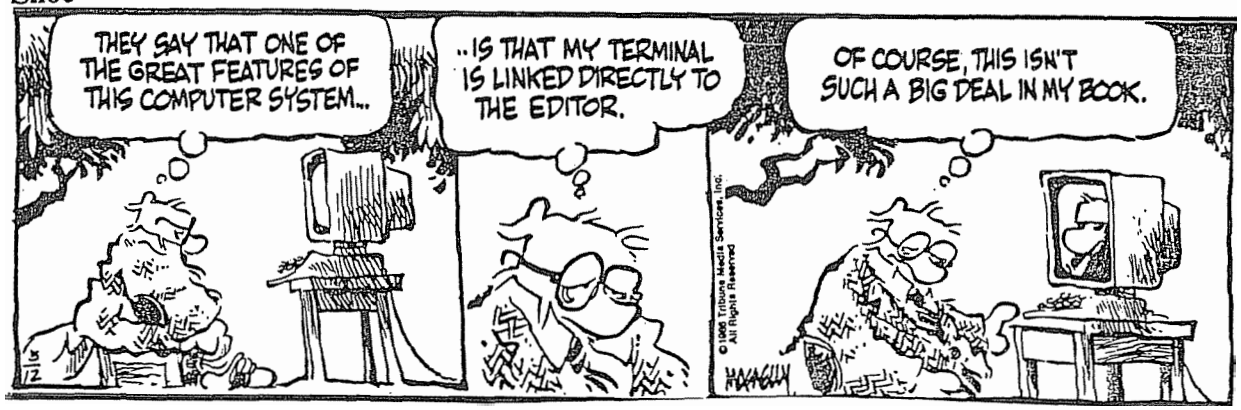
$\frac{x}{r} = \frac{\sqrt{3}}{2}$, $x = \frac{\sqrt{3}\,r}{2}$

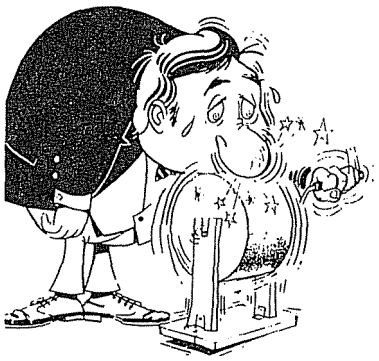
and $\frac{y}{r} = \frac{1}{2}$, $y = \frac{r}{2}$



then, $\frac{\text{area square}}{\text{area triangle}} = \frac{(2r)^2}{\frac{1}{2}\sqrt{3}\ r\ \frac{3}{2}\ r} = \frac{4r^2}{\frac{3\sqrt{3}\ r^2}{4}} = \frac{16}{3\sqrt{3}} = \frac{16\sqrt{3}}{9}$

Shoe





COUNCIL COMMENT

by
Bob Robinson

Editor's Note: Council Comment appears in an issue of the ***Gazette*** *following an OAME/AOEM Council meeting. Your comments are welcome and should be addressed to the Editor.*

CHAPTER REPORTS

COMA (Carleton-Ottawa Mathematics Association)
AMOC (Association Mathematique D'Ottawa-Carleton)

The Publisher's Display was well attended by teachers from Kindergarten through post-secondary. It was held from 3:00 p.m. to 7:00 p.m. The food was great, the new mathematics books were well received, and teachers had a chance to talk to each other in a relaxed atmosphere. The publishers like this event because their books are the focal point.

The new president is Jerry Lunney who paid tribute to the past president, Duff Butterill, whose leadership over the past two years has helped the rejuvenation of COMA/AMOC.

COMA's next function will be a math conference at Chaffey's Lock on 1986 09 19 and 20. A subcommittee has been formed to plan an after school event in November consisting of workshops, dinner, and a speaker.

GOLDEN SECTION (Niagara Region including Hamilton)

This chapter is concentrating on the organization of our Annual Meeting in Niagara Falls in 1988.

GVMA (Grand Valley Mathematics Association)

The latest publications from GVMA are sample exams for Grade 9 General Advances programs based on the new Ministry guidelines.

During the first week in July, a team of teachers will be meeting at the University of Guelph to create a much needed resource package for Grade 11 Mathematics for Business and Consumers. This will complete the task that began two years ago when a similar project created resources for the two Grade 11 Basic programs (Math for Work and Home; Math for Everyday Life). This publication should be ready in the fall.

The fall general meeting will be held at Eastwood C.I. in Kitchener on Thursday, 1986 11 06 with registration beginning at 4:00 p.m.

For registration and program information, contact:
Tom Rajnovich, Bluevale C.I.

NOMA (Northern Ontario Mathematics Association)

NOMA's fall conference is scheduled for Friday evening and Saturday morning on 1986 09 26-27 in Sudbury.

NOMA is working on the details to offer one or two scholarships in mathematics for (a) graduating secondary student(s) in Northern Ontario. As well, they are considering an incentive and reward for excellence in mathematics for graduating Grade 8 students.

PINE RIDGE (Oshawa, Peterborough area)

A mini conference was hosted on 1986 04 15 at Vanier High School in Oshawa. There were ten workshops and 122 people attended. A regional P.A. day is being planned for 1986 11 14.

Pine Ridge has contributed funds for the medals presented to the winner of various mathematics contests. They have also awarded money to two teaches from their scholarship fund.

QSLMA (Quinte-St. Lawrence Mathematics Association)

They held their "spring celebration" at Queen's University. The theme of the meeting was newspaper mathematics. QSLMA's membership has increased. The new president is Doug Evans from Smith Falls. Their fall meeting is scheduled for 1986 10 17 at Jones Falls.

SAME (Scarborough Association For Mathematics Education)

SAME continues to be a vibrant, growing chapter with a broad membership both geographically and across grade levels from Junior Kindergarten to Grade 13 as well as C.A.A.T. and University representation.

A dynamic team of individuals is eagerly engaged in the planning of the 1987 annual OAME conference. The public relations team, in their distictive white sweaters, did a terrific job at the London conference and returned bubbling with enthusiasm to tell the program and hospitality teams of the high expectations delegates have for the Scarborough '87 conference.

SAME has small teams committed to the successful organization of their 1986 10 21 P.D. dinner meeting at Maplewood V.S.; three newsletters (one each term); publishers' P.D. afternoon sessions for each division on 1987 02 14.

The president of SAME is Arnie Carefoote who, along with five other Executive members and seventeen councillors, makes Scarborough an extremely active chapter of OAME.

PAME (Peel Association For Mathematics Education)

Our newest chapter is experiencing "birth pains". They are working hard to increase membership and are giving particular emphasis to getting members from the ranks of the elementary teacher. They are planning a fall meeting.

ANNUAL MEETINGS

1986 The Council congratulated Tom Griffiths, Brock Rochar and the entire London "crew" for an excellent annual meeting. The financial report is still to come in but over 1,000 people attended.

1987 Scarborough is excited and getting the rest of us excited about their forthcoming "annual". It will be held from Thursday afternoon through Saturday noon on 1987 05 7-9. They anticipate an excellent mathematics program along with splendid social activities. We all are looking forward to a more detailed report in October.

1988 The 1988 "annual" will be held at the Brock Hotel Complex in Niagara Falls on Thursday through Saturday, 1988 05 5-7. The keynote speakers are in place. Mini courses are being planned as well as other social functions. Any suggestions for "new faces" as speakers should be directed to Don Roberts.

1989 We are awaiting a formal application from a region but further investigations are being made at this time.

NCTM

Council reappointed Ralph Connelly as the NCTM representative.

There are two upcoming NCTM regional meetings in Canada. The first is in Edmonton, 1986 10 16-18; the second is in Halifax during the summer of '87 on 1987 08 19-22.

Council was informed that there is now an NCTM Catalogue with prices in Canadian funds.

COMMITTEE REPORTS

Primary and Junior Committee

J. Symington (Executive Liaison), Susan Stuart (Chair), Eileen Collins, Lonnie Hudson, Ann Kenny, Roland Morrow, David Rasmussen, Ron Sauer.

The committee has chosen two priorities for this year:
1. Study of the OAIP Junior Geometry.
2. Response to the Early Primary Education Project.

The committee plans to request a Ministry official to speak to the Council about OAIP implementation and services/support available to school boards. The relevancy of the OAIP Junior Geometry items will also be discussed.

The committee will prepare a first draft of a response to the Early Primary Education Report.

Women and Mathematics Committee

Dino Dottori (Executive Liaison), Elaine Harvey (Chair), Jeff Shifrin, Jim Whitley, Lorna Wiggan.

The committee reviewed and evaluated the Women and Math strand presented at the London OAME Conference.

The following are this committees' priorities:
1. To help co-ordinate a Women and Math strand for the OAME Annual in Scarborough.
2. To identify competent women for possible nomination to Council (only 7 out of 40 councillors are women).
3. To discuss the feasibility of conducting a half day to full day session in mid-winter for those interested in Women and Math issues.
4. To provide the editor of the **Gazette** with at least one article per issue pertaining to a topic of concern to Women and Mathematics.

Futures Committee

Paul Lessard (Executive Liaison), Paul Pogue (Chair), Dave Davidson, George Knill, Peter Lenczweski, Jerry Lunney.

The following tasks were discussed:
1. Document the history of OAME and its roots.
   Note: Anyone wishing to offer information or assistance should contact Paul Pogue.
2. Develop a long range plan regarding scholarships, awards, etc.
3. Review the operation of the organization and make recommendations to Council.
4. Devise a plan to provide an OAME "package" to schools and/or school boards to help teachers teach mathematics.
5. Discuss the feasibility of conducting a secondary mathematics seminar for Secondary Heads, Assistant Heads and other Mathematics personnel.

The OAME has sent some money to the Canadian Mathematical Society to be used to help cover expenses for students going to the International Mathematical Olympiad.

Membership/Publicity/Promotion Committee

Mickey Sandblom (Executive Liaison), Betsy Friar (Chair), Robin Hill, Robert Jones, Steve Martin.

The committee is going to revise the OAME flyer to update the information.

The idea of an institutional membership will be investigated.

There will be an attempt to increase our communication with the Universities and Community Colleges.

There will be further discussion regarding a Certificate For Excellence in Math Award, and publicity posters.

Intermediate/Senior Committee

Mary Lou Kestell (Executive Liaison), Doug Henderson (Chair), Arnie Carefoote, Enzo Carli, Chester Carlow, Ed Haines, Bill Leigh, George McNabb, Kumar Pasricha.

1. We will have representation on the following Ministry of Education Committees, namely Calculus Review Committee and OAIP Senior Committee.
2. Three people will be selected to work on a Senior General Level mini-series for TVO.
3. Representation will be provided for an OISE Advisory Committee for assessment practices of high school mathematics teachers.
4. Members of the committee will see that sheet articles pertaining to the implementation of the new guidelines will be sent to the Editor of the **Gazette.**

Publications Committee

Ralph Connelly (Executive Liaison), Bob Robinson (Chair), Dave Handley, Tom Griffiths, Sam Privica, Stuart Telfer, Jack Weiner.

The new editor of the **Gazette** is:

Cliff Gravelle
Faculty of Education
Brock University
St. Catharines, Ontario
L2S 3A1

This committee is excited about the new format for the **Gazette.** We hope you like it. Your comments should be sent to the Editor. We are asking all of the readership to seriously consider sending articles for publication in this refereed journal. The following are our deadlines:

Issue	**Article to Editor Deadline**
September	end of first week in July
December	end of first week in October
April	end of first week in February

There continues to be a need for elementary level articles as well as submissions in French. The committee will discuss using "Guest Editors" and will revise the current editor guidelines.

FUTURE OAME/AOEM MEETINGS

Executive	**Council**
September 5	
	October 18
November 21	
	February 14/87
April 3/87	
Leadership Seminar	October 22-24
1987 Annual In Scarborough	May 7, 8, 9 (1987)

ONTARIO ASSOCIATION FOR MATHEMATICS EDUCATION
1986-87 EXECUTIVE AND COUNCILLORS

Past Pres. - Paul Lessard

Pres. - Dino Dottori

Pres. Elect - Ralph Connelly

Director - Mary Lou Kestell

Director - Michael Sandblom

Director - J. Symington

Councillors Term Expiring 1987

Handley, David

Hill, Robin

Hudson, Lonnie

Leigh, William

McNabb, George

Sauer, Ronald

Wiggan, Lorna

Rasmussen, David

Councillors Term Expiring 1988

Carlow, Chester

Collins, Eileen

Davidson, Dave

Friar, Betsey

Griffiths, Tom J.

Harvey, M. Elaine

Henderson, Douglas

Morrow, Roland

Pravica, Sam

Robinson, Robert

Shifrin, Jeffrey

Councillors Term Expiring 1989

Carli, Enzo

Knill, George

Lunney, Jerry

Martin, Steve

Pogue, Paul

Stuart, Susan

Weiner, Jack

Chapters and Representatives

COMA, Lenczweski, Peter

GOLDEN, Haines, Edward

GVMA, Telfer Stuart

NOMA, Kenny, Ann

PAME, Jones, Robert

PINE RIDGE, Pasricha, Kumarrthgate

QSLMA, Whitley, J.A.

SAME, Carefoote, Arnold

OAME Office - M&M MacGregor, 247 Bright St., Sarnia N7T 4E9 519-337-8382

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