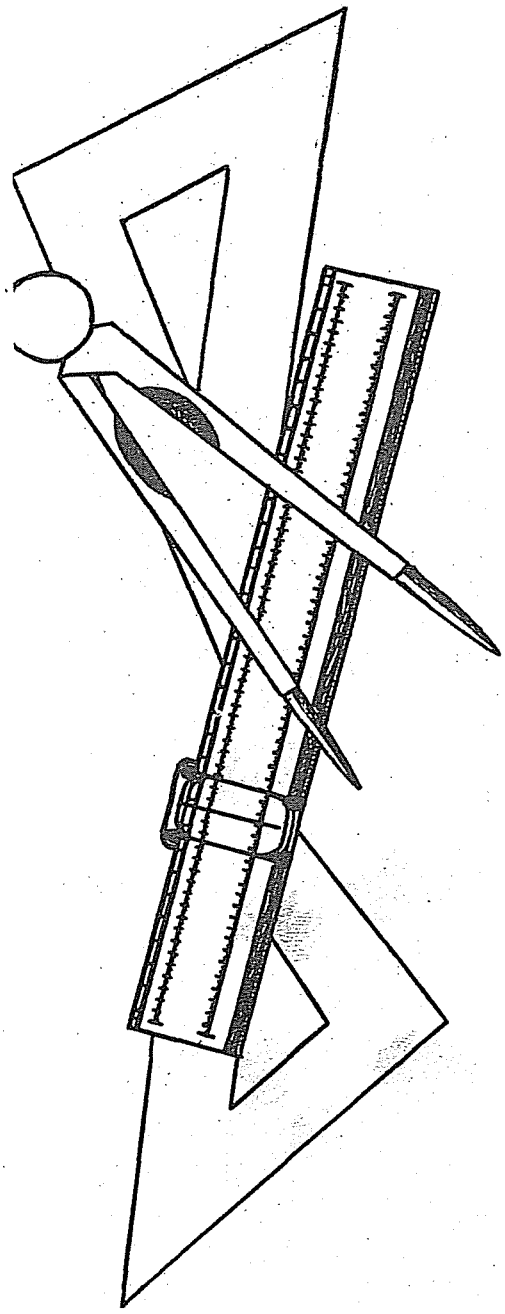
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REPORT FROM THE SECONDARY ADVISORY COMMITTEE

R. M. Wigle, Chairman, Aldershot High School, Burlington

This year, 1970-71, the Secondary Advisory Committee of the Ontario Mathematics Commission undertook an evaluation of the mathematics curriculum in the secondary schools of the province from the point of view of the performance of graduates. More than 90 representatives from the business, industrial and educational communities were asked to respond in the following areas:

1. Please cite specific cases where problems of a mathematical nature were (or were not) handled well by recent secondary school graduates.
2. Please indicate any mathematical problems peculiar to your field of endeavour which will serve as applications of present techniques or will require new skills.
3. Please suggest any topics you would like to see included in future curricula.
4. Please outline any recently developed mathematical techniques which might be introduced at the secondary school level.
5. Comment freely on any areas of concern in the mathematical preparation students are receiving and which do not fit the previous categories.

RESULTS OF THE SURVEY

Responses were received from more than half of the representatives contacted. The response from the educational community (colleges and universities) was proportionally greater than that from business and industry. Direct quotations from, and paraphrases of, the responses are given in the following paragraphs.

1. In response to our request for specific cases of the handling of problems of a mathematical nature we received the following:
   - Basic arithmetic and algebraic manipulations are not handled well in general.
   - Many students have difficulty expressing word problems in mathematical relationships.
   - Facility with trigonometric functions is reduced. (e.g. the readiness on the part of some students to attempt to solve for x the equation sin x = 1.25)
   - Some students displaying an inability to carry out arithmetic operations are also disinclined to use log tables or slide rules.
   - Common fractions, their decimal representation, and percentages are handled poorly.
   - Students generally appear better prepared to cope with abstract ideas.

- Many students appear unwilling or unable to check arithmetic calculations or to distinguish between a reasonable answer and an absurd conclusion.

2. Submission of problems which might serve as applications of the mathematics presently studied included:
   - application of the parabols to highway curves
   - use of graphs in displaying and interpreting data
   - pH calculations, radioactive decay

3. Suggestions for topics to be considered in future curricula included:
   - Statistical techniques, analyses, forecasting, cumulative frequency distributions, standard deviations, etc.
   - Annuities, amortization
   - Mathematical interpretation of insurance contract clauses
   - Computer programming and applications
   - Estimation, as a means of testing the reasonableness of an answer (e.g. Should you complain if the butcher charges you $7.90 for a 3 lb. 12 oz. steak advertised at $1.98/lb?)
   - the slide rule
   - techniques of approximation

- use of electronic calculators
- application of logarithms to multiplication and division in different base systems
- iterative techniques in finding roots of polynomial equations
- elementary surveying as an application of trigonometry
- the absolute value function defined by $y = a|x + b| + c$
- use of mortality tables, amortization tables
- introduction to the principles of accounting
- the "differences" method of finding polynomial functions

4. More recently developed techniques which might be introduced at the secondary level included:
   - use of simulation models
   - many uses of flow diagrams (e.g. solving radical equations)
   - graph theory applied to solving equations
   - linear programming and applications.

5. Concerns not previously expressed included:
   - frequent misuse of mathematical symbols (the "grammar" of mathematics)
   - the absence of the applications of calculus to the

Social Sciences (see Leithold: The Calculus Book - Harper and Row 1971)

- more emphasis on diverse applications of present topics, and better workmanship, should be considered of more importance than the introduction of new topics, for the present
- students should be encouraged to develop a positive attitude towards mathematics, to develop their own exercises
- students should be encouraged to consider "unusual" problems (e.g. Find a formula for the number of hours of daylight for any given latitude on any given date)
- students seem to be " exposed" to more material but lack the opportunity for working with it and developing skills.

In spite of the foregoing some universities expressed the view that today's best are better prepared for university work than those of former years.

SUGGESTIONS TO TEACHERS OF MATHEMATICS FROM THE SECONDARY ADVISORY COMMITTEE

Individual Boards, individual schools, departments and teachers have been granted freedom in the pursuit of their goals to an extent not known before. That we have not

responded more positively and more creatively to this situation is regrettable. Too much time and effort have been devoted to complaining about the inadequate preparation of the students we are expected to meet. This criticism is apparent at all levels of instruction. It would seem an appropriate time to reexamine our roles as teachers and to begin taking positive steps towards righting those situations which have been allowed to develop. Surely we owe it to our students to

1. accept them as they are when we receive them,
2. use the most reliable diagnostic tests available in order to determine their present capabilities,
3. ensure (perhaps by including it in <u>every</u> testing situation) that fundamental skills are mastered and maintained,
4. work with them collectively, and individually, to further their educational pursuits in mathematics and related areas.

This latter responsibility may require

(a) the development of courses within the existing guidelines provided by the Department.

(b) the development of experimental courses to be submitted for approval, and their introduction to meet specific needs,

(c) the development of partial credit courses (below the Grade 13 level) which will provide students with an introductory look at topics which may appeal to them, or

which will meet a particular requirement. (Such things as topics in business mathematics, flow diagrams, introductory surveying, mechanisms, etc. might be considered.)

If order and merit are to emerge from the present situation it will be due, in large measure to the unfailing efforts of teachers dedicated to providing significant learning experiences from their students.

MATHEMATICAL NOTES

THE THREE FACES OF THE MATHEMATICS TEACHER

A. J. Francis

Hillfield-Strathallan Colleges, Hamilton

1. The Teacher 2. The Mathematics Teacher 3. The Mathematician

1. School policy dictated that our Easter Report on the pupils should indicate their present standing (S) as a percentage. This was to be made up from 60% of the Fall-Term mark (F) and 40% of the winter-term mark (W) in each subject. This 60:40 ratio was devised by another member of the Mathematics Department and was based largely on the respective lengths of the Fall and Winter Terms. Now it was simply laziness on my part which made the lengthy process of calculating $S = \frac{60}{100} \cdot F + \frac{40}{100} \cdot W$ for each of my pupils repugnent to me.

How can a Teacher tackle this arithmetic problem?

(i) Arithmetic can be accepted by the traditionally minded as a business which all must go through at times and the problem should be confronted "head-on".

(ii) A slide rule may be used to determine the percentages of the two marks F and W.

(iii) Two graphs could be drawn to map F onto $\frac{60F}{100}$ and W onto $\frac{40W}{100}$. This may be a very good method in the case where F' and W' are not percentages. Suppose the raw score W' for each pupil in the Winter-Term was out of a possible 160 marks then a mapping $\frac{40W'}{160}$ onto W" is a good scheme.

(iv) Another possibility is the sceptical one. Simply average the two marks; $S = \frac{F + W}{2}$ since F and W are very likely to be similar; and add a few marks if F is larger than W!

(v) Some elementary algebra (grade 9 or 10) would simplify the process:

Given $S = \frac{60}{100} F + \frac{40}{100} W$ Reduce fractions

$S = \frac{3\ F}{5} + \frac{2\ W}{5}$ Add like denominators

$S = \frac{3\ F + 2\ W}{5}$.

This is simpler, but still involves large numbers in the determination of S.

(vi) Finally let us consider the Mathematician's approach.

Taking $S = \frac{3\ F + 2\ W}{5}$ Add and subtract 2F in the numerator.

$$S = \frac{5F - 2F + 2W}{5}$$ Distribute $\frac{1}{5}$ over the numerator.

$$S = F + \frac{2}{5}(W - F).$$

The difference (W - F) is usually small and therefore, the whole business can be done mentally after a brief glance at the two marks W, F.

The above process exhibits some knowledge of direction in mathematical thinking which suggests that it be classed at the analytic or near-synthetic level of thinking. In simpler terms it may be that necessity is indeed the mother of invention!

An interesting comment from a non-mathematician (but rephrased for clarity!) might be:

"You were lucky that the coefficients of F and W were of equal absolute magnitude!"

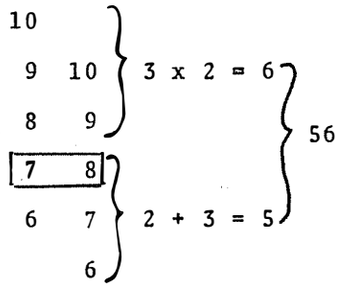
Such a person could easily be fooled by the well known problem of dividing a herd of 19 cows among three sons, $\frac{1}{2}$ to the eldest, $\frac{1}{4}$ to the middle and $\frac{1}{5}$ to the youngest. They borrowed one cow, making 20 and then divided the herd 10, 5, 4 leaving one cow over, which they duly returned!

The sublety lies in the fact that the fractions

$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$ do not have a sum of unity! In like manner if $S = \frac{60}{100} F + \frac{50}{100} W$ and $W = F$, which is entirely possible, then $S = \frac{110W}{100}$ % !

2. The Mathematics Teacher has confidence that the methods and structure of mathematics will lead to the solution to a problem or the explanation for some enigmatic symbolism. Two examples will serve to illustrate this trait.

   (i) Number the fingers on each hand, starting with the thumbs: 6, 7, 8, 9, 10. To find the product 7 x 8 simply arrange the hands with the left finger 7 touching the right 8.



   A non-mathematician may remark "Amazing" or "Very interesting, does it work with other products?"

   The mathematics teacher would first question the result on the grounds that the following is equally true in this particular instance:

PROBLEM SOLVING

A MATHEMATICAL APPROACH TO "INSTANT INSANITY"*

David B. Wing, McArthur College of Education,
Queen's University, Kingston

For anyone unfamiliar with this game, it basically consists of arranging four cubes, whose faces have been painted in any one of four colours, red, green, white and blue, in such a way that, when viewed in a row, from either side or above or below, only one each of the four colours is visible. The colours at either end do not matter, neither does the order within the row.



In the above example, in the finished problem we might have, reading from left to right, the colours, red, white, green and blue visible from the front and blue, red, green and white visible from above. All four colours too would be exhibited when viewed from the other side or from below. Today, I am going to refer to one particular set of cubes, which bought on three separate occasions proved to be identical colour combinations. I hope to be able to show at the very least how the puzzle may be finished, but perhaps more importantly, how it might be tackled in a reasonably intelligent way. Problem solving at the best of times, is not an easy subject to teach. In training teachers of mathematics at McArthur College of Education, I attempt to stress that a new problem for the neophyte teacher affords an excellent opportunity for him or her to make a note of the way the problem was approached and its solution obtained. Perhaps then,

[illegible] students when they

intelligent way of going about the whole thing. The mathematician might ask himself how many ways there are of arranging the blocks, if for example, all 24 faces were painted a different colour. It is not difficult to see that one block could, when placed on a table, be viewed from the side in any of six ways and that for each of these ways, another four positions could be obtained by rotating it about a horizontal axis. Thus there are 6 x 4 ways of positioning the first block. As the order within the row does not matter, all four blocks could be lined up apparently in $(6 \times 4)^4$ ways. However, on reflection, this is too large by a factor of 4, because any one combination of four faces will appear facing forwards, backwards, towards the ceiling and towards the table. Thus the number above must be divided by 4 and this quantity $\frac{(6 \times 4)^4}{4}$ equals 82,944. Does this puzzle then have 82,943 wrong ways of lining up the blocks?

It is immediately seen that all four colours appear on all four blocks. Block 2 is different from the other three in that it has three of its faces coloured red, whereas all the others have two colours repeated. On closer examination, it is seen that the first block is not the same type as the last two, for it has two opposite faces painted green, whereas all other colour pairs on the individual blocks occur on adjacent faces. Thus in this puzzle there are three different types of colour combinations. We don't seem to be too much further ahead other than the fact that no block has any of the four colours missing and that one block has three faces painted all red.

Back to trial and error again. It is easy to arrange the blocks, viewed from the side on a table so that all four colours show up. For example GWRB. If we now rotate all four blocks as one about a horizontal axis through 90^{o}, then

However, it is quickly seen that fig. 6 is incompatible with either fig. 3 or fig. 4.

At this stage, the writer believed that he had finished with this type of puzzle and had shown firstly that there is only one way to do this particular puzzle and secondly that he could confidently do any other problem of a similar nature. Imagine then his consternation when he found another instant insanity puzzle whose front-back schematic diagram is as follows:

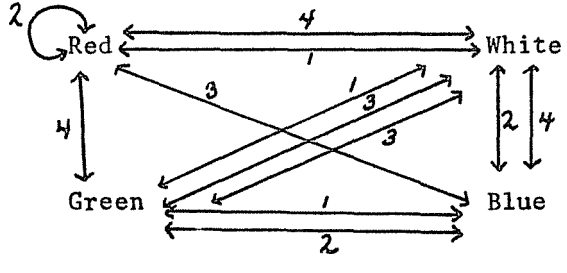


Fig. 7.

Proceeding as before, one picks out the following

arise. How to do this puzzle, and having done it, what difference does it make to the first puzzle? Clearly, we must try a different path. The following two are tried and both fail, one because we can't complete the circuit and the other because it is incompatible with that in fig. 8.

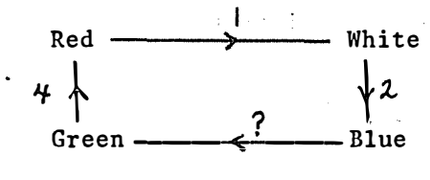


Fig. 9

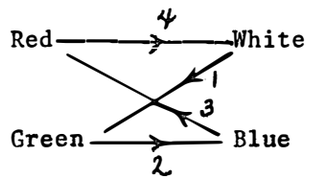


Fig. 10

What now? The one thing we haven't tried is the following which actually produces a solution to the puzzle.

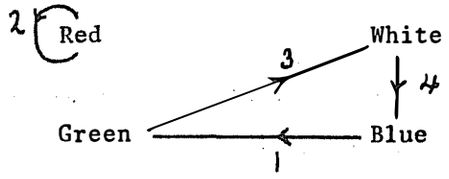


Fig. 11

This combination is compatible with that in fig. 8. As a matter of fact, it is also compatible with fig. 10, so that in this case, there are two distinct ways of doing the puzzle.

Now back to our first puzzle to consider the possibilities of varying the path taken to see if there is more than one solution. There is no green-blue front-back combination

so that paths of the type in figs. 9 and 10 are out. We must now try paths of the type in fig. 11. There are three possibilities, and as it turns out, all are doomed to failure.

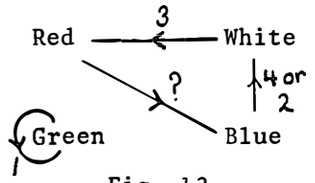


Fig. 12

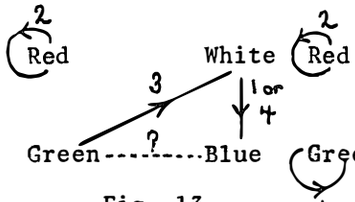


Fig. 13

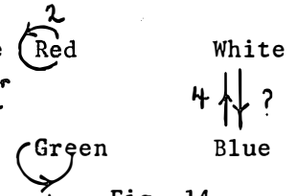


Fig. 14

It does seem then, that there is indeed only one way to do the first puzzle and 32,943 wrong ways of doing it. Furthermore, the method outlined, with slight modifications as suggested by the second puzzle will enable one to solve any instant insanity problem that one cares to invent, and is solvable. The solution too, provides some indication as to how such a puzzle could be created in the first instance. The task of creating such puzzles might well follow that section of work on three dimensional geometry when ones students have actually made the five regular polyhedra. They could make four, 2" cubes, and colour them so that all four colours showed up on all four sets of faces and then colour the remaining 8 faces. It would be interesting to see what types of puzzles they produced.

PROBLEMS AND SOLUTIONS

Edited by W. Fraser

Please direct correspondence for this section to Professor W. Fraser, Department of Mathematics and Statistics, University of Guelph, Guelph, Ontario.

Problems

The first problem below appeared in the eleventh International Mathematical Olympiad held in Bucharest in July 1969, just as did problem 71.03. In both cases ideas required for solving the problems are encountered in high school mathematics.

Problem 71.05

Given $x_1 > 0$, $x_2 > 0$, $x_1y_1 - z_1^2 > 0$, $x_2y_2 - z_2^2 > 0$ show that

$$\frac{8}{(x_1 + x_2)(y_1 + y_2) - (z_1 + z_2)^2} \leq \frac{1}{x_1y_1 - z_1^2} + \frac{1}{x_2y_2 - z_2^2}.$$

Problem 71.06

Find the locus of the point of intersection of two normals to the parabola $y^2 = 4ax$ which are at right angles to

one another.

Solutions

Problem 71.01

Describe a square so that its sides pass through 4 given coplanar points located so that no point is inside the triangle formed by the other 3.

Suppose the 4 given points are P, Q, R, S, and suppose further that P R meets Q S at a point inside the quadrilateral P Q R S.

Draw a circle on PQ as diameter, with centre at E, and draw the radius E X $\perp$ P Q so that X is inside the quadrilateral P Q R S. Repeat the construction using R S as a diameter to get a circle centre F and choose Y on the radius F $\perp$ R S so that Y is inside P Q R S. Then X and Y are points on a diagonal of the required square, whose construction is completed by extending X Y to meet the circles at A and C, then drawing A P, A Q, C S, C R so as to define B and D. A B C D is readily shown to be a square fulfilling the required conditions.

BOOK REVIEWS

Mathematics Enrichment, by R. D. Ripley and G. E. Tait, Copp Clark Pub. Co., 1966, 138 pp.

This book was considered to be good fun by the pupils. It is extremely helpful in building a healthy interest in mathematics, and in creating a desire for exploration and research. The integration of art, science and mathematics was obvious and this led naturally to an integration of mathematics with geography and history too. The section on great creators in Mathematics was a good idea - one usually bypassed in the study of Mathematics in elementary grades.

The book is designed well. It is easy to follow (even for pupils), attractive, well-illustrated and full of interesting things to do.

N. Nickason,
Devine Street Public School.

Mathaction 6, Copp Clark Pub. Co., 1969.

The suggested directions for use of this book make it well worthwhile in an elementary class. The balanced program makes use of a continual developmental approach using

texts, teaching devices and sound fundamental approaches to mathematics plus the stimulus of exploration, fun and creative application of basic skills. The book is thoroughly and clearly set up to make it easily adaptable for a class teacher to use, particularly for an inexperienced teacher with fewer ideas of his own. Directions for games and equipment are complete and easy to follow requiring no expensive equipment but much preparation time. For a teacher specializing in Mathematics the time spent in preparing the equipment would be understandable; a teacher in a non-rotary system trying to spend equal time on several subjects might find the preparation somewhat extensive.

N. Nickason,
Devine Street Public School.

Beginning Algebra, by Margaret L. Lial and Charles D. Miller, Scott, Foresman and Company, Glenview, Illinois, 1969, 300 pp., $7.75.

The book "Beginning Algebra" is excellent as a text. Indeed, little but praise can be found for this work. As a text it is suitable at the level of the Secondary School or College of Applied Arts and Technology in which arithmetic ends and mathematics in its true form begins. The authors have succeeded well in fulfilling the aims set forth in the

Preface.

This book is very readable for the student and study helps such as extensive use of the number line facilitate understanding of the material covered. Notation and symbolism are introduced in such a way that they will aid in the assimilation of higher mathematics such as group theory and yet are well defined prior to their use with examples to fix their meaning well in the mind of the reader. The result is an atmosphere of mathematical maturity thus stimulating the interest of the student. Copious exercises, each of which is preceeded by examples explaining what is sought for and the method of approach to the problem, provide ample opportunity for the student to learn the content material thoroughly; the scope of the examples providing motivation for his efforts.

By way of criticism I would suggest the following. The section concerning 'set theory' would have done well to be placed as a unit in a separate section, if only an appendix. For the student interested in 'set theory' the text does not give an adequate background. Secondly, as a conclusion, perhaps, to each set of exercises, problems requiring the student to formulate his own examples would be very helpful. For instance: "give an example of a trinomial of degree five over the reals" when dealing with polynomials. Thirdly, although motivation is ample in the form of exercises, it would help to provide more adequate motivation before the material is covered.

In conclusion, this book 'Beginning Algebra' would supply a student with an interesting and adequate introduction to the mathematics of Algebra.

P. Robinson,

Topics in Modern Mathematics for Teachers, by A. L. Peressini, D. R. Sherbert, Holt, Rinehart and Winston, New York, 1971, 434 pp., $13.15.

This book is a goldmine for mathematics teachers. The chapter headings are: Set Theory, Number Systems, Theory of Numbers, Binomial Coefficients, Probability Theory, Boolean Algebras, Graph Theory, Complex Numbers, and Geometric Constructions. Amidst these chapters lies a historical background of some of the intriguing problems of mathematics, basic theory, exercises for the teacher, and demonstrations and teaching ideas for classroom presentation.

Each chapter closes with a "Remarks and References" section that realistically appraises the implementation of the topics at the secondary school level, and gives an outline of the uses each of the listed references provides. Perhaps a sample from page 321, the "Remarks and References" for the Graph Theory chapter illustrates:

"We included an introduction to the theory of graphs in this book for several reasons. First of all, even though graph theory is not a standard topic in secondary school mathematics, it provides the mathematical basis for the solution of significant problems and interesting puzzles that secondary school students find exciting. The teacher who is familiar with the graph-theoretic analysis of problems and puzzles such as those considered in this chapter will be in a position to direct a student's natural curiosity toward a worthwhile mathematical experience. Secondly, graph theory is rich in intuitive and geometric content; nevertheless, its methods, conclusions, and emphasis are in sharp contrast to those of Euclidean geometry. This contrast should help one to appreciate the nature and objectives of Euclidean geometry and also the breadth of modern geometry. Thirdly, the portion of the theory of graphs that we have developed in this chapter is elementary in character and is quite accessible to secondary school students. For this reason, it is an excellent source of enrichment material for independent reading projects and mathematics club talks. Finally, the wealth of applications that graph theory has found in mathematics, the physical, biological, and social sciences, economics, and engineering suggest that the subject will find its proper place in the standard mathematics program in the near future."

I heartily recommend this well-written and colourful book as a reference text for secondary school mathematics teachers and as a classroom text for undergraduate "math-teaching-option" courses.

Keith McLean,

Downsview Secondary School.

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Term 1971-1974

E. Baumgart — Eastwood C. I., 760 Weber Street East, Kitchener.

J. L. Boyd — Loyalist C. I., Van Order Drive, Kingston.

K. Dunn — Stratford Teacher's College, Water Street, Stratford.

Prof. A. C. Madget — Department of Mathematics, Laurentian University, Sudbury.

N. Main — Cameron Heights C. I., 301 Charles Street E., Kitchener.

J. Mawdsley — H. B. Beal S. S., 525 Dundas Street, London.

B. McColl — St. Lawrence College of Applied Arts and Technology, Box 6000, Kingston.

J. Molinari — Metropolitan Separate School Board, 146-150 Laird Drive, Toronto 352.

G. Saranchuk — Ontario English Catholic Teachers' Association, 1260 Bay Street, Toronto 185.

Miss R. Sequin	Faculty of Education, University of Ottawa, 1245 Kilborn Street, Ottawa.
N. Williamson	St. Andrew's J. H. S., 131 Fenn Avenue, Willowdale.
M. Wiltse	Eastview S. S., Grove Street, Barrie.
R. Pfaff	General Amherst High School, Box 340, Amherstburg.
R. Robinson	Hamilton Bd. of Education, 100 Main Street West, Hamilton.

ONTARIO ASSOCIATION OF TEACHERS OF MATHEMATICS

FINANCIAL REPORT 1970-71

RECEIPTS

Balance (adjusted) on hand (1969-1970)		$2094.81
1971 Convention - exhibitors	$2150.00	
- registration	1012.00	
- banquet	1785.00	
- program	1132.50	
- IBM grant	1344.00	
	$7423.50	7423.50
O.E.A. Rebates (453 teachers + 51 students)		1296.75
Regional Conference - Kingston (in trust)		302.00
N.C.T.M. Sales		30.27
Bank Interest		16.85
Overpayment of Cheque		1.15
TOTAL RECEIPTS		$11165.33

EXPENDITURES

1971 Convention - registration	$ 193.68	
- hotel rental	1000.00	
- banquet	1676.35	
- luncheon	1344.00	
- speakers	238.30	
- exhibits	182.00	
- program	1023.16	
- hospitality	187.81	
- mechanics	69.65	
- committee	155.08	
	$6070.03	$ 6070.03

Gazettes - OMC commitment	$1000.00	
- postage	304.91	
- envelopes etc.	81.82	
- shipping	29.54	
	$1416.27	1416.27
Teacher Brochure - printing	$ 234.00	
- paper, etc.	189.60	
- postage	187.09	
- keypunching	163.50	
	$ 774.19	774.19
C.A.M.T.		140.00
Letterhead, envelopes, etc.		121.71
Transportation		100.00
Honorarium (Secretary-Treasurer)		50.00
Postage		26.40
Gifts		21.53
N.C.T.M. Fees		6.15
Bank Service Charges		.60
Miscellaneous (posters, binders, etc.)		44.92
TOTAL EXPENDITURES (1970-71)		$8771.80
Bank Balance (May 13, 1971)		3745.08
		$12516.88
Less: O/S/C (1970-1971)	$ 1.95	
O/S/C (1969-1970)	125.00	
O.M.C. Commitment	1000.00	
1969-1970 Commitments	224.60	
	$1351.55	$1351.55
		11165.33
BALANCE FOR 1970-1971		$ 2393.53

NOTES ON MEETINGS

Leadership Seminar in Mathematics

The first Leadership Seminar in Mathematics was held at the Park Motor Hotel, Niagara Falls, Ontario on October 21-24, 1971. It was sponsored by O.M.C., O.A.T.M., O.P.S.M.T.F., F.W.T.A.O., and O.E.C.T.A. In attendance were 115 representatives from 40 different boards of education in Ontario. A staff of 14 represented virtually all levels of academic institutions concerned with mathematics education. The project director was Dr. John Girhiny who can be reached through the O.M.C. office, 1260 Bay Street, Toronto. The participants, in the main, were elementary classroom teachers but highschool teachers, consultants, superintendents and others were also in attendance. The staff were impressed with the calibre of the participants and the participants spoke highly of the staff. It was a strenuous and tiring four days but most profitable. Everyone returned to his or her normal activities Monday morning tired but richer for the experience and eager to pursue the matter further through another seminar (Phase 2) next year. To sum up this seminar one might say - "an unqualified success".

MEETINGS

ANNUAL CONVENTION

ONTARIO ASSOCIATION OF TEACHERS OF MATHEMATICS

University of Waterloo, May 12-14, 1972

Featuring...

Elementary Sessions

3 Workshops: (i) Computer (ii) Math-Science Integration
(iii) Reinforcement through Games

7 one hour sessions

16 ten minute "classroom gems" presentations

Secondary Sessions

8 Panels: (i) Problem solving - a lost art? (ii) Gr. 8-9 transition (iii) Training math teachers. (iv) Prerequisites for CAATS. (v) Under Attack - Administration (vi) Under Attack - 4 year writers (vii) Under Attack - 5 year writers (vii) Prerequisites for University.

10 one hour sessions

32 ten minute "classroon gems" presentations

Cultural Events

Friday Night

Early Bird Reception with hot buffet (for preregistrants only).

Midnight Musical Depreciation Hour.

Saturday

Tour and luncheon for wives.

German-style banquet and dance.

Math Maifest (Oktoberfest in May).

Sunday

First annual O.A.T.M. church parade.

Special Package Prices

For example, $65 per couple gives you registration for you and your wife, a double room for two nights, all meals from Saturday breakfast to Sunday lunch, the Early Bird reception and hot buffet, the tour and luncheon for the wife, the Germany-style banquet and the dance (the Math Maifest). All this and Mathematics too! Other package prices will be announced.

WATCH FOR PREREGISTRATION DETAILS

MAKE UP A PARTY FROM YOUR AREA

BRING A BUSLOAD

PLAN NOW TO ATTEND

ZWIN 1

Le Centre Belge de Pédagogie de la Mathématique

vous invite à participer au

1er Congrès International du ZWIN

Knokke 8-11 Mai 1972

thème: de la maternelle à l'université

FREDERIQUE, Directeur de Recherche au CBPM

"Mathématique moderne à 10 ans"

"Mathématique moderne à 4 ans"

Robert DIESCHBOURG, Professeur à l'Institute Pédagogique de Walferdange (Grand-Duché de Luxembourg)

"Un enseignement de la mathématique moderne pour des enfants mentalement handicapés"

Peter J. HILTON, Professor of Mathematics, CORNELL UNIVERSITY (USA), Visiting Fellow Battelle Seattle Research Center.

"The implications of the modern mathematical theory of categories to problems of mathematical education" (1) et (2)

PAPY, Professeur à la Faculté des Sciences de l'Université de Bruxelles

"Le calcul booléen et le calcul propositionnel" (1) et (2)

Paul VAN PRAAG, premier assistant au Centre Universitaire de l'Etat à Mons

"Polynomes et champs"

Exposé de travaux de jeunes chercheurs du CBPM

Le CBPM se réserve le droit d'apporter à ce programme toute modification qu'imposerait le développement de la recherche.

For further information write R. Petitjean, CBPM, Avenue Albert 224, 118 Bruxelles, la Belge.

LARGEST NCTM MEETING EVER!

The preliminary program for the NCTM 50th Annual Meeting, April 16-19, 1972, in Chicago, has just been finalized. It features the largest number of sessions ever held at an NCTM meeting -- 333 in all.

The convention will be the most personalized ever. There are 109 workshops at all levels (K-12), including 24 computer workshops. Preregistration is suggested as each of the 109 workshops is limited to 24 participants.

For the first time at an annual meeting, there are swap sessions for elementary school teachers at each grade level. There are special sessions for department chairmen, super-

visors, researchers, and math club sponsors.

Another special feature is 8 panels devoted to controversial issues (for example, performance, contracting, computation in arithmetic, geometry). After some of these panels there are rap sessions to provide audience response.

The convention is particularly strong on the following aspects of mathematics education: indivieualized instruction; laboratories, under-achievers and slow learners; methods of teaching arithmetic; games, computers, and concrete materials; applications; and the latest in research.

The annual features are present: talks on mathematics content and methods, psychological aspects of teaching, problems of teacher training, reports of special committees and commissions, and an opening session and banquet with well-known speakers.

The Sunday evening opening session highlights Dr. Edward L. Palmer, Children's Television Workshop, speaking on "The Marriage of Fun and Learning in Sesame Street and the Electric Company, and Some of What We Have Learned." Dr. Palmer is in charge of research on the effects of these television programs.

A Moon-experienced astronaut from NASA will top off the banquet on Tuesday evening.

Wednesday evening the convention closes with the Max Beberman Colloquium: Robert Davis (Madison Project), James MacLean (Open Classroom), and Marion Walter (ESS Mirror Cards) will discuss "What Questions Should We Be Asking"?

It is impossible to detail names of the 330 other sessions, or of the films, or of the 100 or so companies which will exhibit their books and products at this convention. NCTM members will automatically receive a complete program in January. Others may obtain this program by writing NCTM, 1201 Sixteenth Street, N. W., Washington, D. C. 20036.