ABACUS

A PUBLICATION OF THE
ONTARIO ASSOCIATION for MATHEMATICS EDUCATION

Volume 3 Number 3 March 1976



Event of the Year Event of the Year

Meet Old Friends Make New Friends

Find New Trends

Be Prepared To Go Avoid the Rush Start Early

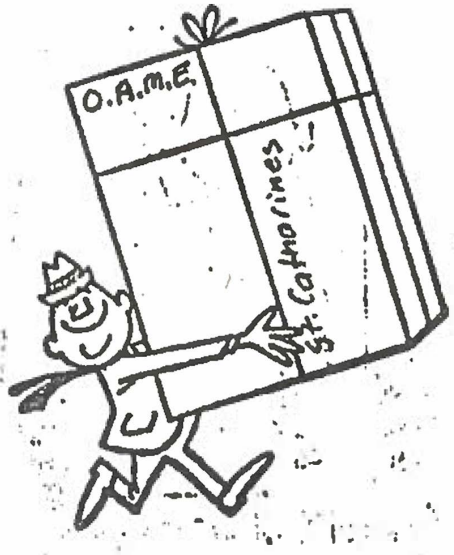
Where: "Third Annual Conference" O.A.M.E.
St. Catharines, Ontario

When: May 14, 15, and 16, 1976

Who: You and You and You and All of us
Mathematics Educators

If you did not receive your pre-registration information and program highlights, contact immediately:

Vic Cicci
College of Education
OAME '76 Conference
Brock University
St. Catharines, Ontario
L2S 3A1



YOUR MEMBERSHIP IN OAME INCLUDES THE ABACUS *YOU CAN COUNT ON IT!*

WRITE TO THE SECRETARY TREASURER

1975 - 76 EXECUTIVE

Joan Routledge,
President,
Box 194,
Aurora, Ont., L4G 3H3

Tom Griffiths,
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Forest, Ont., NON 1JO

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"ABACUS", publication of the Ontario Association for Mathematics Education, is published during the school year, starting with September. Unless otherwise indicated, the contents of "Abacus" are not copyrighted; its articles and information may be quoted or reprinted without formality other than the customary acknowledgment of the source. The deadline for submission of articles, ideas etc. is two weeks before publication date.

Editor: Andy Czempinski, P.O. Box 614, Iroquois Falls, Ontario P0K 1E0

From the Editor:

Frequently one hears that "... mathematics education at the elementary and secondary levels should concern itself with basics and mastery of the subject matter, and that the standards must be improved ..." Yet one finds that there is a lack of agreement on what constitutes "basic mathematics", what one means by mastery and standards. Perhaps we all talk about the same thing, but use different language, and thus have difficulty to communicate. The editorial staff of "Abacus" invites your opinion on this subject, and hopes that you are concerned enough about: basics, mastery and standards to flood the editorial mail with your correspondence. Speaking of "flood", make sure that we all create a flood of mathematics educators in gay (sic) St. Catharines in May, where we can expand and share our ideas about mathematics education.

As you read this edition please note the nomination circular. See you all in May.

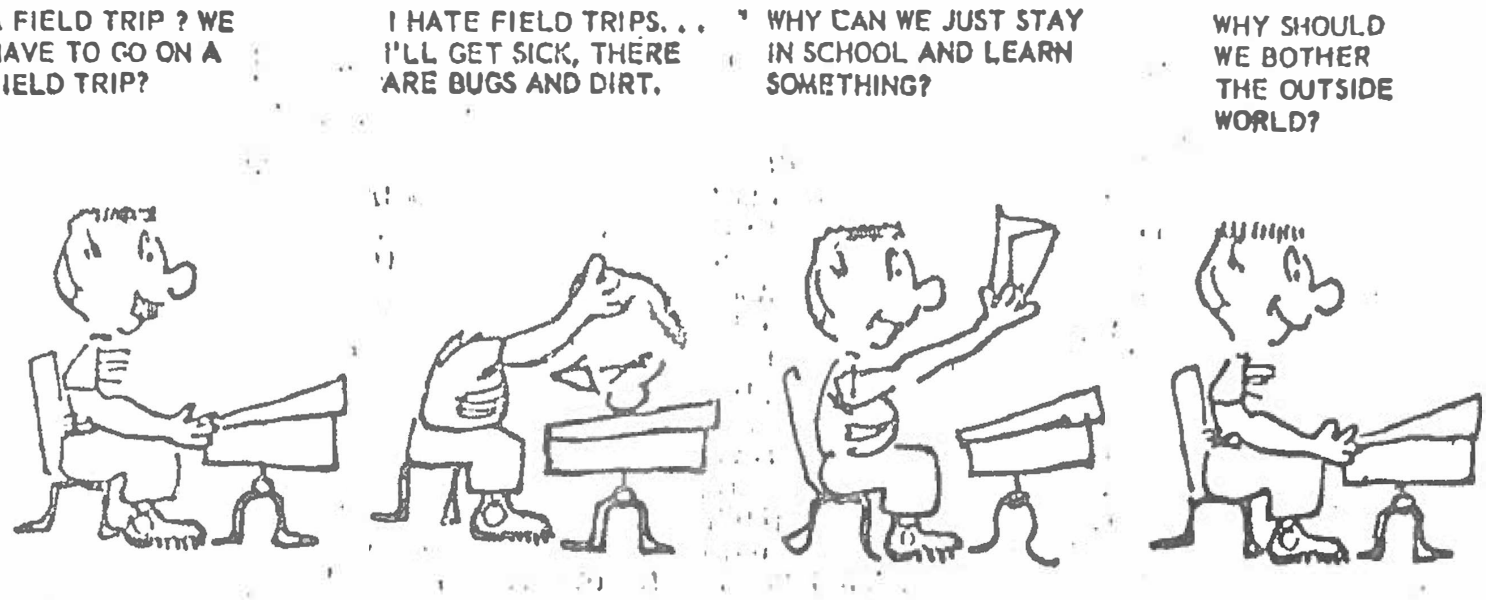
Andy Czempinski

"In the creation, introduction, and support of mathematics programs, neither teachers, educational administrators, parents, nor the general public should allow themselves to be manipulated into false choices between

the old and the new in mathematics
skills and concepts
the concrete and the abstract
intuition and formalism
structure and problem-solving
induction and deduction.

The core of every mathematics program whould contain judicious combination of both elements of each pair ..."

From: "Overview and Analysis of School Mathematics - Grade K - 12", Conference Board of Mathematical Sciences, 2100 Pennsylvania Ave. N:W:, Suite 832, Washington, D.C. 20037.



Sunny days ahead ... here are a few suggestions you may try with your students. (Note: some of these problems are from : Excursions in Outdoor Measurements, D.A. Johnson, J. Weston Walch, Publisher, Portland, Maine 04104)

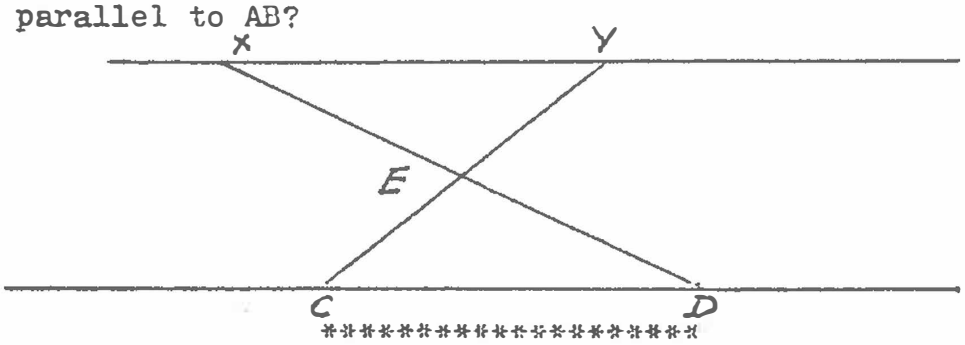
1. A very convenient unit for measuring distances is your PACE. You are carrying your measuring instrument always with you! This is how the Roman soldiers measured distances in Europe more than 2000 years ago. They called 1000 paces one mile. How close to one mile would <u>you</u> travel with 1000 paces? Walk a hundred paces, measure the distance in feet with a tape.
   - Q.1. What is the length of your pace?
   - Q.2. A mile is 5280 feet. How many of <u>your</u> paces are in a mile? Measure the distance of 100 paces in meters.
   - Q.3. What is the length of your pace in meters?
   - Q.4. How many of your paces are in one kilometer?

2. Measuring distance with a wheel.

   Draw a circle on a cardboard with a radius that is 1.9 inches. Divide the circumference of the circle into 12 equal parts. Beginning with one point on the circle, number each point on the circle like a clock. Cut the circle out to form a wheel. Place a pin or small nail through the centre so the wheel will roll on a surface.
   - Q.1. Roll the wheel on a ruler. How far does the wheel roll in one complete roll?
   - Q.2. What is the length of each arc?
   - Q.3. Use this wheel to make measurements of ... your desk? ... doorway? ... your textbook? ... etc.
   - Q.4. In the same way a bicycle wheel can be used to measure distances. Can you design an experiment with your bicycle so you can use it to measure distances ... from your home to school ... on your trips?

3. Establishing two parallel lines (or helping your Dad to make a perfect driveway).

To establish a line parallel to a given line AB, set up stakes at any point C and D on AB. Take any convenient point E. Extend CE and DE until EX = ED and EY = EC. Why is XY parallel to AB?



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Indirect Measurements with the Hypsometer

The hypsometer is a device for measuring angles and inaccessible heights. It is very useful in measuring angles of elevation and depression from 0 to 90 degrees. A plumb line is attached at the centre of a protractor. The measure of an angle of elevation (or depression) is found at the point where the plumb line crosses the protractor scale. The plumb line is always vertical when hanging freely and indicates an angle of zero degrees when the hypsometer is level or horizontal. When the hypsometer is tilted for sighting, the plumb line remains vertical. Angles of elevation are measured from left to right. Angles of depression are measured by reversing the direction of sighting.

The hypsometer is mounted vertically to an upright staff so that it is free to turn. Objects are sighted through peep holes or a soda straw along the top edge of the graph.

There are a variety of models produced commercially, and if you have money in your budget you may order one or more. On the other hand you and your students will have more fun by making it.

Hypsometer Model

Materials: Cardboard or plywood base 16 in by 12 in, graph paper 10 squares to the inch, 10 in by 15 in in size, one quadrant of polar coordinate paper, soda straw, string, cellophane tape, rubber cement, fish line sinker.

Construction: Glue the graph sheet to the plywood base. Trim the polar coordinate paper and glue to the graph paper with its centre at A (see figure). Label the vertical scale AB and the horizontal scale EB, 10 units to the inch as indicated on the figure. With A as center and a radius of 10 inches, draw the sines and cosines arc. Attach the soda straw along line IA with the cellophane tape. Place a piece of string through a hole at A and tie a knot on the back side. Tie the fish line sinker to the string for a plumb line. When the hypsometer is mounted in a vertical position to a staff with a screw at a point J, it is ready for field work.

The hypsometer graph as shown on the next page has the following features:

1. AB represents the distance to the object being measured.
2. EB represents the height of the object and also the percent of the slope. If this scale is divided by 100, the scale becomes a tangent scale.
3. Arc MN is the protractor arc indicating the angle of elevation or angle of depression.
4. Arc KB is the scale for finding sine and cosine values.
5. AI is the line of sight.
6. J is the point at which the base is mounted to a vertical staff.

If AH on the graph represents a plumb line for a certain sighting, the following information can be obtained:

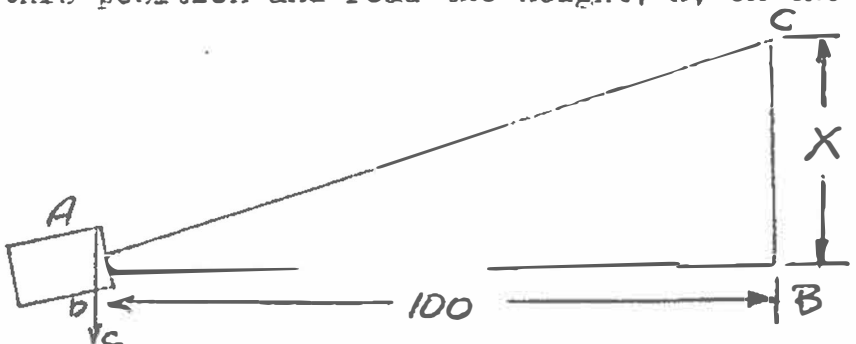
1. The angle of elevation is 35 degrees.
2. If the object is 100 feet from the hypsometer, its height is 70 feet (i.e. HB). If the object is 30 feet away it is 21 feet high. The height is measured by the scale EB directly below the intersection of the plumb line and the 30 mark on the distance scale. Note that this is the height above point J.
3. The tangent of 35 degrees is indicated on BH to be 0.70.
4. The sine of 35 degrees read on the height scale EB, point G, is 0.57. The value of the sine equals the scale measure of the length of DG.
5. The cosine of 35 degrees read on the distance scale AB at G is 0.82. The value of the cosine equals the scale measure of the length of FD.
6. The percent of the slope is 70 as indicated on the height scale EB.

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Now that you have constructed your hypsometer, you may try a few "problems".

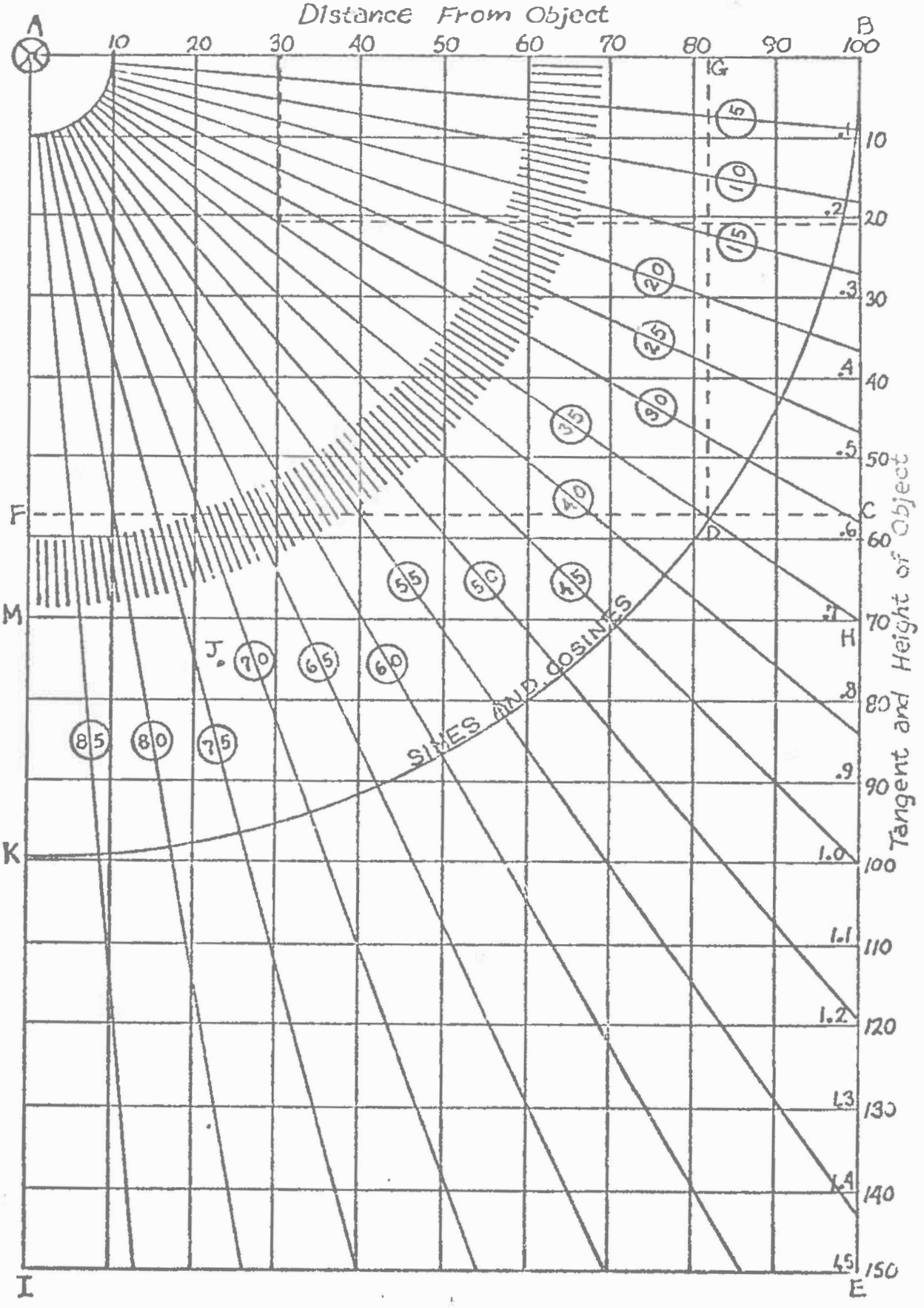
1. Find the height of the school flagpole.

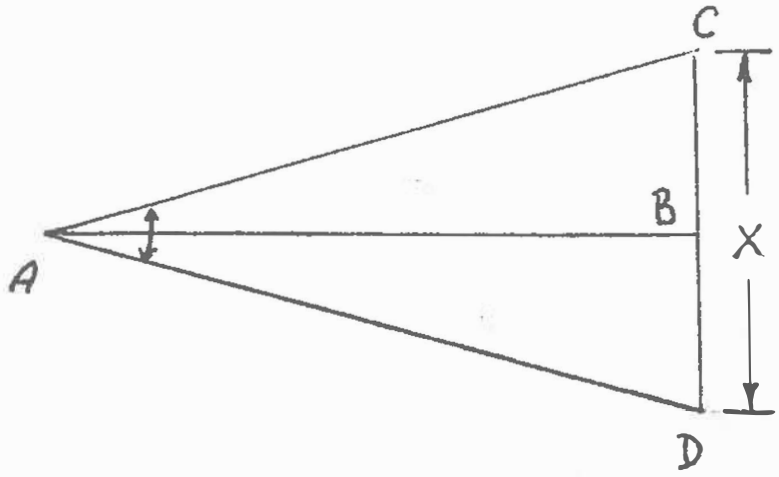
   Place the hypsometer 100 feet from the pole and sight the top of the pole. As soon as the top of the pole is sighted, clamp the instrument in this position and read the height, X, on the EB scale.



2. Find the height of some object, say CD, that is on a slope below the hypsometer.

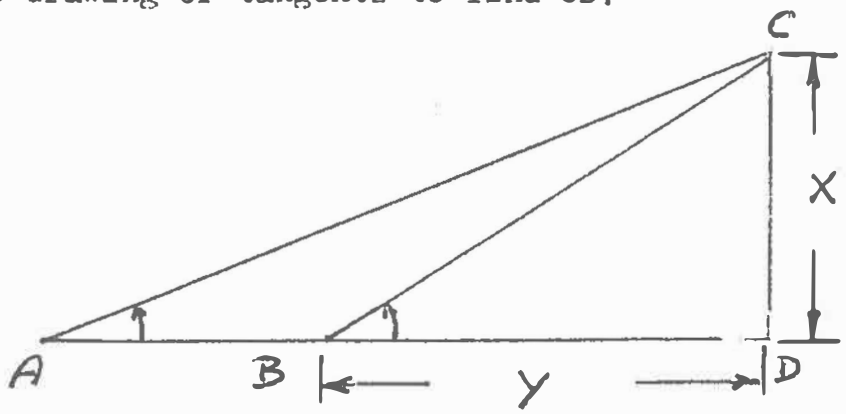
   Measure the angle of elevation and the angle of depression with the hypsometer at A. Measure the distance to the object, AB and compute BC and BD. (see diagram next page)


Distance From Object
A
B
10
20
30
40
50
60
70
80
90
100
G
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1.1
1.2
1.3
1.4
1.5
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
F
C
D
M
H
J.
K
I
E
SINES AND COSINES
Tangent and Height of Object



3. To find the height of an inaccessible building, say CD.

   Sight the top of the building CD across the river or highway by making observations of the inclination at A and B. Be sure that ABD is a straight line, measure AB and compute CD. Use a scale drawing or tangents to find CD.



****

MANY PEOPLE THINK THAT MATHEMATICS INVOLVES CALCULATIONS ALWAYS ...

Here are some simple (???) problems involving mathematics, yet little, if any, calculation.

1. I went to the closet while my wife was asleep, so I left the lights off. I found my shoes and socks, but I must confess they were in no kind of order - just jumbled pile of 6 shoes of three brands, and a heap of 24 socks, black and brown. How many shoes and socks did I have to take with me to be sure I had a pair of matching shoes and a pair of matching socks?

   (4 shoes and 3 socks (... do you agree?)

2. A weather forecast.
   It is raining at midnight. Will we have sunny weather in 72 hours?

   No - it will be midnight again.

For Experts: (Answer in next issue) How many different ten digit natural numbers can be written using each digit from 0 to 9 only once?

From the mail-box:

MAGIC SQUARES

With reference to Frank Ebos' excellent article on Magic Squares in V3, #2, I would like to add a postscript.

Looking at his 3 x 3 magic squares, we notice that, in each case, the numbers are in arithmetic sequence.

(1,2,3,...,9), (2,4,6,...,18), (1,3,5,...,17)

(24,48,72,...,216), (53, 106, 159, ..., 477),

(1/6, 1/3, 1/2, ..., 1 1/2), (-4, -3, -2, ... ,4),

(-5/6, -2/3, -1/2, ... , 1/2).

This, of course, suggests that we could use it for drill in elementary algebra.

For example, using the arithmetic sequence

(x + 3y, 2x + 5y, 3x + 7y, ..., 9x + 19y), we obtain the magic square:

2x + 5y	7x + 15y	6x + 13y
9x + 19y	5x + 11y	x + 3y
4x + 9y	3x + 7y	8x + 17y

whose magic sum is 15x + 33y = 3(5x + 11y). (Note that all 3 x 3 magic squares have a magic sum that is 3 times the middle number. Can you guess what it would be for a 5 x 5 magic square?)

There is a similar pattern for n x n multiplication magic squares where n is odd.

Jack LeSage
Eastview Secondary School
Barrie

Do not overlook: N.C.T.M. Annual Convention
April 21, 22, 23, and 24, 1976

Blast off to

"Atlanta for Kicks in Seventy-Six"

The 54th Annual Meeting of the National Coulcil of Teachers of Mathematics will be held in Atlanta on April 21-24 of this year. The program will feature 425 section meetings conducted by over 500 participants representing 47 states and several foreign countries. This is the largest number of sessions ever planned by NCTM. Conference activities will be centered at the Hyatt Regency, the Marriott, and the Hilton Hotels. The local host is the Georgia Council of Teachers of Mathematics.

A large number of sessions will be available on the elementary, junior high, senior high, and two year college levels. In addition, teacher training sections and research panels are being planned in cooperation with the Mathematics Association of America. Topics of current interest include: use of pocket calculators in the classroom; teaching the metric system of measurement; integrating mathematics with science, social studies, and art; outdoor mathematics; reading in mathematics; real world problem solving; assessment.

Key speakers for the conference include Richard Underwood from the NASA L.B.J. Space Center, Dr. E. Glenadine Gibb, President of NCTM, and a number of nationally and internationally known mathematics educators.

The NCTM is the world's largest organization devoted to the improvement of mathematics education. Professional members and subscribers currently total over 82,000. Conference registration is open to non-members as well as members.

Further information and registration materials are available from: Dr. Rosalie Jensen, Georgia State University, University Plaza, Atlanta, GA. 30303.

++++++++++

Question: Do you know who is the President of N.C.T.M. ? ? ?

Proving $2 = 3$

If $4 - 10 = 9 - 15$

then $4 - 10 + \frac{25}{4} = 9 - 15 + \frac{25}{4}$

$\therefore \left(2 - \frac{5}{2}\right)^2 = \left(3 - \frac{5}{2}\right)^2$

$\therefore 2 - \frac{5}{2} = 3 - \frac{5}{2}$

$\therefore 2 = 3$ Q.E.D.

O.A.M.E.

I nominate _____(name)

_____(professional address)

_____

For the position of President Elect ____

Director ____

Councillor ____

Name of nominator _____

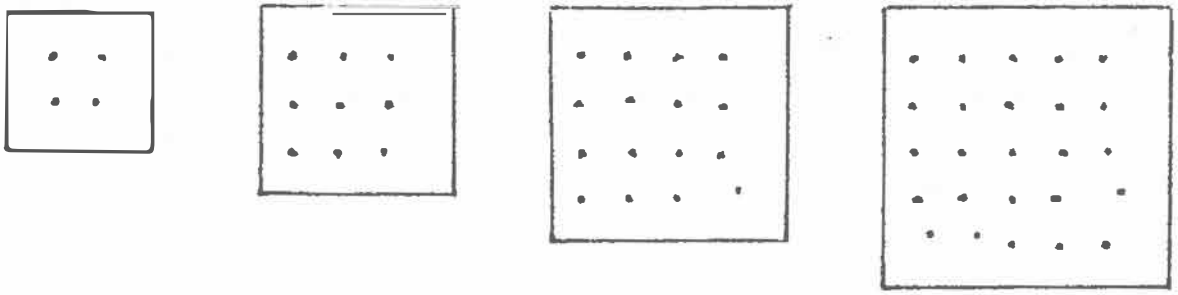
Professional Address _____

_____

Information supporting nomination:

Return to J. Egsgard,
Twin Lakes Secondary School,
Orillia, Ont.
L3V 4Z2

A Geoboard Problem: How many different squares?



1. How many different sized squares can be drawn on a 2x2 geoboard?
2. How many different sized squares can be drawn on a 3x3 geoboard?
3. How many different sized squares can be drawn on a 4x4 geoboard?
4. How many different sized squares can be drawn on a 5x5 geoboard?
5. . . . . IS THERE ANY PATTERN? . . . . . Can you predict? Use the chart below to help you?

Kind of Geoboard	Number of Squares
2x2	
3x3	
4x4	
5x5	

Submitted by:
Neil Williamson.

A. Are you teaching about area ... volume ...?

This problem is not difficult, but it will be found entertaining to discover the simple rule for its solution.

I have a rectangular cardboard box. The top has an area of 120 square inches, the side 96 square inches, and the end 80 square inches. What are the dimensions of the box?

****

B. Everybody knows that: (5 + 5) x (5 + 5) = 100, but can your students arrange four 7's with arithmetical signs so that they shall represent 100?

****

C. Old Fashioned School: In a certain school, where a special feature was made of the teaching of good manners, they had a curious rule on assembling every morning. There were twice as many girls as boys. Every girl made a bow to every other girl, to every boy and to the teacher. Every boy made a bow to every other boy, to every girl and to the teacher. In all there were 900 bows made in that model academy every morning. Exactly how many boys were there in the school?

****

Answers: A 12 x 10 x 8 B. $\frac{7}{7} \times \frac{7}{7}$ C 10 boys

S P E C I A L N O T I C E

THE ONTARIO MATHEMATICS GAZETTE

Volume 15 Number 2 March 1976

SHOULD HAVE READ

Volume 14 Number 3 March 1976

We regret this error and we would ask that in schools where this magazine is kept in the library that you have your librarian make this necessary change on the cover.

Volume 15 Number 1 will be published in September 1976

TRADING POST MAY 14-15-16/76

MEMO TO: People who know of the benefits resulting from teachers sharing their ideas.

FROM: The members of the Projects Committee of O.A.M.E. who are organizing the "Trading Post"

Members of O.A.M.E. council have encouraged us to go ahead again with our concept of a Trading Post. They see such a centre being an effective tool for the interchange of ideas. They see here an opportunity for old ideas to mix with new. For this concept to work we need the co-operation of a large number of people like yourself to back the idea. Please send in material and encourage others to do so. Ask a friend to submit some item you know is good.

Our concept of a Trading Post is as follows:

Purpose:
The purpose of establishing a Trading Post is:
- to share resource material
- to give a wider circulation to available resources that classroom teachers have found effective
- to see what others have done in the areas you are interested in developing - it may prevent you from "rediscovering the wheel again" and may reveal another point of view on the topic
- to provide access to material developed by O.I.S.E., Colleges of Education, Board of Education Curriculum Committees, and individuals or group of teachers
- to function as a clearing house for many projects and interests.

How it works

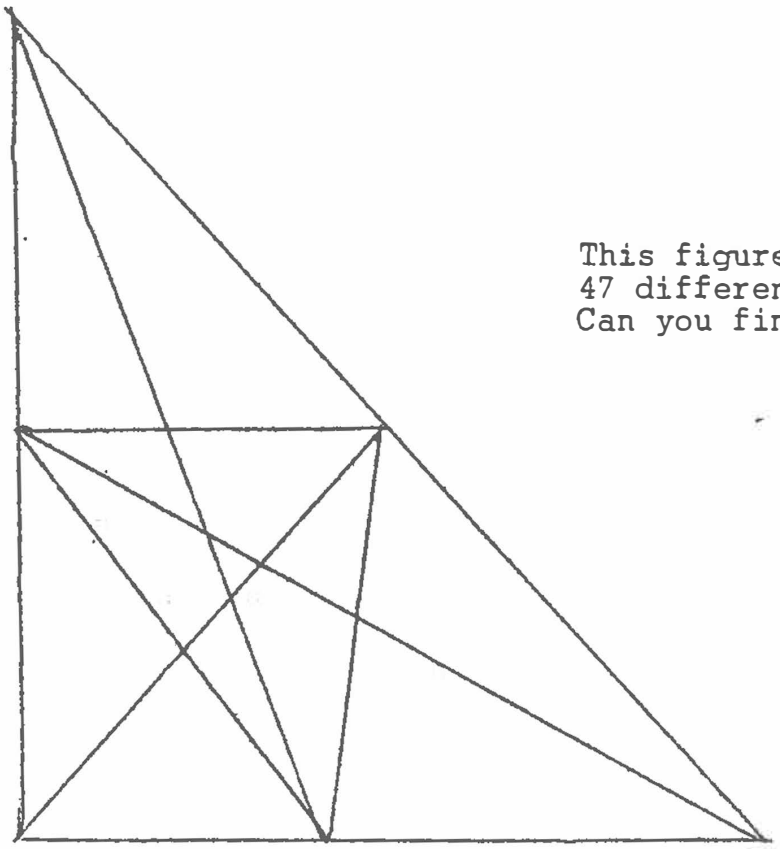
Those who send in 20 copies of their material in advance of the convention are entitled to 20 copies or the equivalent of the available material (8½ x 11 paper is to be used, black type or black ink).

What is acceptable

Material you have used with your classes and found worthwhile. Most of the material should be one, two or three sheets in length if it is to be reproduced on site.

Divisions:
1. Primary Grades 1-3
2. Junior Grades 4-6
3. Intermediate Grades 7-10
4. Senior Grades 11-13
5. Community College
6. University

Mail to: Mr. Don Roberts
Trading Post O.A.M.E.



This figure contains
47 different triangles
Can you find them?

EVERYDAY MATHEMATICS A GRADE VIII STUDENT MUST KNOW

The measurements will change with Canadian conversion to Metric.

Findthe total cost of the following groceries: 8 lb. 4 oz. roast @ $1.18 a lb.; 1 tray of eggs (30) eggs selling @ 99¢ a dozen; 3 lbs. of margarine at 2 lb. for 97¢; 25 lbs. of sugar @ 10 lbs. for $2.79.

A January Sale offers all articles at 30% off. Am I being overcharged if I pay $79.95 for a coat regularly selling for $110.00?

The total cost of the lumber to repair a kitchen: 60 ft. of 1" x 2" trim at 16¢ a foot; 3 - 12 ft. 2" x 4" scantlings at 12¢ a foot; 2' x 2' x 1/2" sheet of plywood when 4' x 8' x 1/2" sheet costs $11.80.

The total cost of fence for a lot 100 feet deep and 59feet wide. Fence is not to go across the front of lot. Wire cost $1.59 a yard and posts placed every 10 feet at $3.79 each. Labour 2 men working an 8 hour day each for 3 days at $8.95 an hour. Other materials cost $36.00

The cost of a loan of $13,000 at the bank for 2 months at 12 1/4% per annum.

M.B.M.

MATHEMATICS LEADERSHIP SEMINAR ASCOT INN, TORONTO, OCT. 20-23/76
Application forms available from OAME office, 247 Bright St., Sarnia.

ANNUAL FINANCIAL STATEMENT AUGUST 31/75

Receipts		Expenditures	
Bal. on Hand Sept. 1/74	$10203.62	O.E.A. Registration	$ 500.00
		NCTM Affiliated Gr.Fees	30.90
Kingston Convention excess of Income over Expenses	4313.61	Telephone	139.63
		Postage	386.48
		Office Expense	1057.05
Gaz. Subscriptions	2665.26	Gaz. Printing & Postage	4856.22
		Abacus " "	839.05
Membership Fees	9349.07	Executive Travel	420.55
		Council Travel	1927.38
Interest	991.57	Insurance	33.00
		Secretary Expenses	387.98
NCTM Sales of Materials	26.20	Gestetner	711.01
		Sec. Honorarium	1000.00
Duplicating Services	16.24	Chapter refunds	489.00
		Nominations committee	28.90
Repayment of Kingston Adv.	500.00	Francaise "	50.00
		Publications	63.80
Repayment of London Adv.	500.00	Sr. Cyclic Rev.	219.51
		Membership	324.27
Refund from COMA	32.00	Projects	119.29
	28597.57	NOMA Grant	70.40
		COMA Grant	145.00
		St. Catharines Advance	1000.00
		London Advance	500.00
		Membership Refund	61.00
		Banking Expenses	11.60
		President's Gift	34.60
		Bal. on hand	13190.95
			28597.57

The accounts of the Ontario Association for Mathematics Education were audited at Sarnia On Oct. 1/75 and found correct

Isabelle Fulcher

D. MacIntyre



YOUR MEMBERSHIP IN
OAME INCLUDES
THE

A B A C U S

YOU CAN COUNT ON IT

Mr. Robert Tuck