THE ALBERTA TEACHERS' ASSOCIATION MATHEMATICS COUNCIL

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Volume XV, Number 3, February 1976

Drama in the Rationals

by *H.L. Larson*
Retired Supt. of Schools

TIME: January 1966

PLACE: Large Edmonton high school classroom

OCCASION: The writer was one of an inspectional team sent out by the provincial Department of Education to evaluate city schools. This particular episode took place in a Grade X classroom.

CHARACTERS: $\{S_1\ S_2\ S_3\ \ldots\ S_{30}\}$ - all bright students
Teacher (T)
Supervisor, the writer (W)

SCENE 1

T had just concluded a lesson on factoring and polynomials, in which he occasionally made use of some rational numbers, when S_1 enquired: "Mr. T, would you please explain exactly what you mean when you use the term 'negative three-quarters'?"

continued ...

An editor's view of Chuck Allen's remarks at the MCATA annual meeting

WHAT ARE CHILDREN LIKE?

Teachers need to maintain their enthusiasm to create a motivating atmosphere.

Teachers create the atmosphere to motivate or "turn-off" the pupils.

Teachers know what needs to be done. Do we have the ability, wisdom, knowledge, and patience to do it? Does anyone have the talents and gifts to be ideal in all these areas? Use interesting, novel ideas to create activities that will help make basic facts fun to learn. Many ideas were presented at the opening session to show that there are interesting activities without spending money for sophisticated equipment.

Ed Carriger

IN THIS ISSUE

T seemed a bit annoyed at being interrupted by such a mundane question. However, he managed a courteous smile and stepped over to the chalkboard. There he drew a circular figure and explained: "Imagine that this is a whole pie. I shall cut it into 4 equal pieces using two right-angled diameters." The class nodded. It was evident that they were interested in the question and the answer.

The writer, having been trapped by a similar question in his teaching experience, was keenly interested. Mr. T went on: "Now I shall erase these 3 pieces or quarters." Nodding to S_1, he continued: "That represents -3/4!"

S_2, with a vigorous wave of his arm, asked: "Does that mean that the piece left over represents +1/4?" T replied: "Well, what do you think?"

S_3 continued: "If you had erased the whole pie, would what was left represent -1?"

By now, the class was very quiet but very alert. S_4 stated: "If this were true, then 0 = -1." S_2 added: "Yes, and if you had erased 3 pies, would you not have 0 = -3?" S_1 continued: "Therefore, -1 = -3." S_4 concluded: "And, if we extrapolate, all negative numbers are equal to zero!"

Fortunately for Mr. T, the dinner bell rang and, for the moment at least, he was saved.

SCENE 2

TIME: Lunch period

PLACE: Teachers' cafeteria

Mr. T asked apologetically: "Where did I go wrong in that explanation?"

W replied: "Don't feel badly. Many teachers (yes, and authors of textbooks) have made the same mistake by attempting to explain a purely abstract number with concrete examples. All signed numbers, be they rationals or integers, can be depicted physically only by a number line. A number line shows clearly a starting point zero and clearly opposite directions. There are the two basic concepts of signed numbers. If we do a good job depicting integers on a number line, the rationals follow easily.

"When you used the pie as your starting point, you were beginning with the whole number 1. Then you subtracted 3/4, which is a fraction. The quarter pie remaining was another fraction and neither positive nor negative. In other words, you were trying to explain rationals and integers in terms of fractions and whole numbers, all of which are different number systems having entirely different operational rules and representing different concepts.

"Signed numbers are pure abstractions. What you illustrated on the chalkboard was mathematically 1 - 3/4 = 1/4. Each of these numbers represents objects or concrete things which can be illustrated physically. One should be careful never to confuse the operation of subtraction with negative numbers. They are not interchangeable."

Whereupon Mr. T thanked Mr. W and both enjoyed a delicious luncheon.■

Metrication Madness and a Few Cures

by *Elaine V. Alton, Judith L. Gersting, Joseph E. Kuczkowski*
Department of Mathematical Sciences
Indiana University - Purdue University
Indianapolis, Indiana

"The metric system" is a phrase which has in recent months been chanted ever more insistently in our ears like a rising Greek chorus. We see increasing numbers of articles in the newspapers and in professional journals relating to the coming change to the metric system in the United States, the need for this change, and what effect it will have in business, industry, and education. There is widespread concern that this almost inevitable change in our measurement system be accomplished with a minimum of confusion and inconvenience. The role of this country's schools and teachers in educating children to be at home with the metric system has been cited by the National Council of Teachers of Mathematics as well as other groups and organizations. Units on metric measurement have already been incorporated into the mathematics programs of a number of school systems nationwide and are under study in others.

Along with these legitimate concerns and activities has come a veritable wave of commercial products which threatens to inundate us. Metrication has become a commercial bandwagon, an easily definable happening in which many people and groups share an interest, and one for which it is easy to design and produce profitable products. Business and industry are faced with a wide array of calculators and other devices specifically designed for conversion between metric and English units of measurement. In education there is less emphasis on conversion and more on "think metric," yet here also is a bewildering panorama of instructional materials - textbooks, pamphlets, filmstrips, manipulatives and just plain gimmicks - all purporting to aid the teacher in presenting a unit on metric measurement. Teachers and school systems faced with this mounting pile of "stuff" may be led to believe they cannot be doing a good job of instruction because they lack many of the expensive materials and gadgetry. On the other hand, and what may be even worse, they may believe that because of the large amount of materials they have acquired, they must perforce be doing a good job! We all know, however, that gadgetry is not necessarily equated with good instructional equipment.

Many of the commercially-produced materials for teaching metric are excellent. It is important, however, that we identify our objectives in teaching the metric system in order to choose out of the wide range of instructional aids available those which will truly support our objectives.

Specific instructional objectives in a unit on the metric system must be chosen by the teacher to suit his or her own classroom situation, consistent with the requirements of the department and the school system. The authors believe that one overriding consideration should serve as a framework within which to formulate these objectives. This consideration is really a matter of perspective, namely, keeping in mind that the metric system of measurement is just that, one more system of *measurement units*. We have been teaching the principles of measurement and various measurement units in our classes for a long time. We mislead our students if we present THE METRIC SYSTEM as a totally new, awesome, and exotic concept. We tend to forget that children are more adaptable than adults, and can live quite comfortably with, for example, two languages at once. Why not, then, can they not live comfortably with more than one system of measurement?

Of course, we do already teach more than one system of measurement; we teach time measurement and money measurement, for example. This is not quite the same as using two systems of units for measuring the same quantity, but these examples certainly reinforce the important aspects of any measurement system, namely, a standard of reference and the relationships between units within that system. (As an aside, the units of dollar, dime, penny, and mill in the monetary system provide a nice example of conversions within a system based on 10.)

Individual school systems and teachers will decide what respective emphasis is to be placed on metric units versus English units at each grade level, and this emphasis will undoubtedly shift as time goes on. Meanwhile, there is a nice analogy between the two systems of measurement and various systems of numeration. We can do all our arithmetic operations in any base - for example, base 5 or base 10. The latter base is more generally used, but each is a perfectly good system within itself. We do teach conversion from base 5 to base 10 but this is only a means for being able to interpret an arithmetic problem in the more familiar base 10 setting.

In summary, then, let's remember not to make too big a deal out of the metric system but to present it in context as an emerging aspect of a standard part of our mathematics curriculum. This point of view leads us to certain guidelines in the selection of materials to be used as teaching aids no matter what particular instructional objectives are decided upon. These quidelines are listed below, not in any particular order of importance.

1. The materials we use and activities we devise for teaching the metric system should be as uncomplicated and underwhelming as possible and should relate metric units to everyday objects in the child's experience. When first introducing the kilometer, for example, the fact that 1 kilometer is about 9 1/4 times around a regulation baseball diamond is more meaningful to a child than the fact that the mean distance between the earth and the moon is about 384,633 kilometers.

2. Materials should be sought which teach general principles of measurement; within this framework the metric units should be developed as one possible standard. For instance, when introducing the concept of area, we must first present the fundamental idea of covering a region of the plane by an arbitrarily chosen basic unit. This basic unit is, of course, another region of the plane and may be triangular, circular, rectangular, etc. The idea can then be developed that the area of a region is the number of times the basic unit is used to cover that region. Use of standard units such as square centimeter and application of formulas which use linear units come after the basic concept of area is established. Both physical activities which involve the measurement process and pencil and paper activities which emphasize equivalent measures should be utilized.

3. We should be on the lookout for ways to integrate the teaching of metric units into the total school curriculum. Can a science project illustrate the use of the gram as a unit of mass or weight? Can a social studies unit point out business and transportation applications of metric measurement? What about distance in kilometers sneaking into a geography lesson?

4. Instructional aids that emphasize conversion of units within a system rather than between systems of measurement should be chosen. For example, 3 meters = ? centimeters, not 3 meters = ? inches. While we do not convert between the metric and English units, this does not mean that we neglect to present approximate relationships between appropriate units. Thus, we can point out that a meter is slightly longer than a yard and a liter is slightly more than a quart.

5. We want to avoid materials which mislead our students by a careless approach to the prefixes of the metric units. For instance, emphasis on the prefix "deca" meaning 10 times as big, can, if no further explanation is provided, lead the student into the error of converting 20 meters into 200 decameters because his eye picks out "deca" and he thinks of multiplication by 10.

6. In working with equivalent measures, classroom presentations should emphasize that a certain number of a given unit, expressed as an equivalent measure using a larger unit, will be denoted by a smaller number of that larger unit. Thus, 300 millimeters is equivalent to a smaller number of a larger unit, such as centimeter; 300 millimeters = 30 centimeters. Likewise, a specified number of a given unit, expressed as an equivalent measure using a smaller unit, will be shown by a larger number of that smaller unit. Thus, 4 meters is equivalent to a larger number of a smaller unit, such as centimeter; 4 meters = 400 centimeters.

7. We should take advantage of instructional aids which present the sequence of metric prefixes as a logical continuum. Thus, one appropriate instructional goal would be to teach the following sequence of metric units of length: kilometer, hectometer, decameter, meter, decimeter, centimeter, millimeter. We can stress the theme that to convert a measure in one of these units to an equivalent measure in terms of a unit listed to the immediate right, one simply multiplies by 10. Similarly, division by 10 will convert a measure in a specified unit to an equivalent measure in terms of a unit listed to the immediate left of that unit. In addition, it should be made known to students that the millimeter is not the smallest possible unit of length in the metric system nor is the kilometer the largest possible. Presentation of the spectrum of prefixes demonstrates the simplicity of the metric system structure, even though current experience indicates that certain of the metric units will appear more often than other units. Moreover, we cannot foresee the specific metric units that may emerge as appropriate to developing technologies or occupations.

8. We want to be sure that materials we use do not irrevocably tie the metric system to computation with decimals. Some articles have been written which discuss the need to teach decimals before dealing with metric units of measurement, the implication being, of course, that either decimals should be taught at a much earlier grade level or that metric units of measurement should be delayed until the fifth or sixth grade. The fact is that students do not need to know how to use decimals in order to understand the relationships between equivalent measures in the metric system. Practice problems can easily be limited to those in which only whole numbers are involved. For example: 400 centimeters = ? meters; 40 decameters = ? decimeters; choose the larger, 23 decimeters or 2 meters. Problems such as .3 meters = 3 decimeters can be introduced later along with computation with decimal numerals.

The remaining three guidelines apply equally well to selections of teaching materials for any topic, not just the metric system.

9. Once specific instructional objectives have been chosen, care should be taken to select materials which fulfill these objectives as closely as possible. Why waste money on frills to achieve five goals of which only two coincide with the chosen objectives?

10. When searching for ways to present the metric system, existing teaching aids should be employed where feasible. New materials, just because they are labeled "metric," may not be a significant improvement over materials already in the classroom. The Cuisennaire rods which have been used for a wide variety of

activities can also be used to illustrate metric units of length, area, and volume; containers marked in liters and milliliters and scales calibrated in grams are likely to be part of the available science equipment.

11. Teaching materials can often be homemade or acquired with little cost. Perhaps a local bank or hardware store is giving away meter sticks as a publicity item. We can always create homemade games - metric bingo, for example, where a square array of metric measurements is displayed and equivalent metric measurements are called out - which can be produced on ditto sheets. Some canned goods in stores already carry dual labeling and are easily obtained as display items; these are also appropriate for a unit on consumer education.

All in all, in the flurry of newness over teaching the metric system and the competing demands for adoption of instructional materials, the teacher's own common sense remains, as always, the best guide.

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A Plea for Help Sent to Us Through Mr. Hyndman

May 9, 1975

The Hon. L.D. Hyndman,
Minister of Education,
Department of Education,
Executive Building,
10105 - 109 Street,
Edmonton, Alberta
T5J 2V2

Dear Mr. Hyndman:

During the past six years I have been trying to build an independent journal for Canadian students of mathematics. I enclose a complete set of the issues to date. *Student Mathematics* consists of original thinking in mathematics and mathematics teaching by Canadian students.

I an due to retire in June 1976 and have been concerned as how best to ensure the future of this publication. From the outset I wanted this to be a national journal and not a parochial Ontario affair. In this I have had limited success. As you will see, the vast majority of the articles are by students in Ontario. This, I am sure, is not because there is a greater degree of originality in this province, but simply because it is naturally easier for me, living and working in Ontario, to make contact with potential student authors.

These years of unemployment, inflation and salary conflicts have been particularly difficult for such a new venture. However, I am not asking for direct financial aid. I do not believe in grants and free hand-outs. Our total expenses are below $1000 a year and it ought to be possible to sell sufficient copies to interested students to cover this modest sum. If there are not 5000 students in Canada sufficiently interested in mathematics to spend 20 cents a year, we must regard our mathematical education as a total failure.

There are two areas in which help would be appreciated:

(1) Our aim is to print articles from all parts of Canada. It would be most helpful if you would make the existence of our magazine known to schools where mathematics is taught in a stimulating way, and to suggest to them that their students may send us their original work. It should perhaps be stressed that simple discoveries in quite elementary work are welcome; indeed, these are most valuable, since they can be appreciated by a wide body of students and not merely by a few brilliant ones. I can assure you that any work sent from your province will be given adequate prominence in the magazine.

(2) The continued existence of our magazine depends on adequate circulation. We are able to go ahead with confidence if we have standing orders from a sufficient number of schools or provinces. As only one issue a year is appearing at present, the burden is not excessive.

We should be very glad to supply sample copies of the magazine for interested schools to see, if you would let us know how many you would like to have.

We shall be most grateful for any assistance you can give us.

Yours sincerely,

W. W. Sawyer.

W.W. Sawyer,
Professor jointly to the Department of Mathematics and the Faculty of Education,
University of Toronto

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Alberta High School Prize Exams

Applications for the Alberta High School Prize Exams must be received by March 1, 1976. The date of the exam is Thursday, March 18, 1976, and winners will compete in the Math Olympiad on May 7. The registration fee is $1 per student.

Sponsors are the Universities of Alberta and Calgary, the Canadian Mathematical Congress, the Mathematics Council of The Alberta Teachers' Association, and the Nickle Foundation. Persons eligible are Canadian citizens or landed immigrants enrolled in a normal high school program in Alberta or the Northwest Territories.

Principals should forward names, addresses, ages, and grades of students to:

Provincial Exam Chairman
Department of Mathematics
University of Alberta
Edmonton T6G 2E1

Maximization of Areas of Circle-Inscribed Triangles by an Oscillating Algebraic Sequence

by *William J. Bruce*

If a scalene triangle and an isosceles triangle are inscribed in a circle on the same side of a common chord as base, the altitude of the isosceles triangle is greater than the altitude of the scalene triangle and, consequently, the area of the isosceles triangle is greater than the area of the scalene triangle.

In Figure 1, $AB = BC > AC$. If a second isosceles triangle is constructed on one of these equal sides, say on AB, we obtain ΔABC_1. Since C_1 is the mid-point of arc BC_1A, the altitude drawn from C_1 to the base AB of ΔABC passes through the center of the circle and is greater than the altitude from C to the base AB of ΔABC. Thus the area of ΔABC_1 is greater than the area of ΔABC, both on the same side of AB as common base. A third such isosceles triangle can be constructed on BC as base, and so on, to produce a sequence of isosceles triangles each of area greater than that of the preceding one.

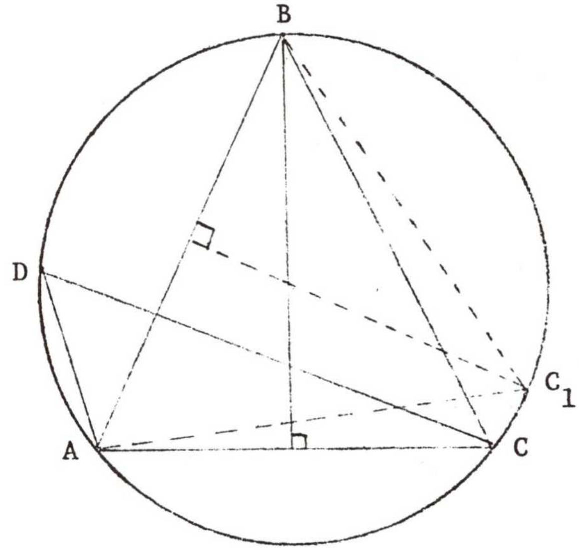

Fig. 1

Note that, should our first isosceles triangle not bound the center of the circle, the second and succeedings one will. Thus, we shall start always with an isosceles triangle that does bound the center, since no loss of generality occurs.

Various sequences are associated with the successive isosceles triangles formed as stated. These include the sequence of vertex angles, two equivalent sequences of lengths of bases, two equivalent sequences of altitudes, and two equivalent sequences of areas. The sequence of vertex angles is the easiest to set up and its limit is elementary. Consideration of the sequence of isosceles

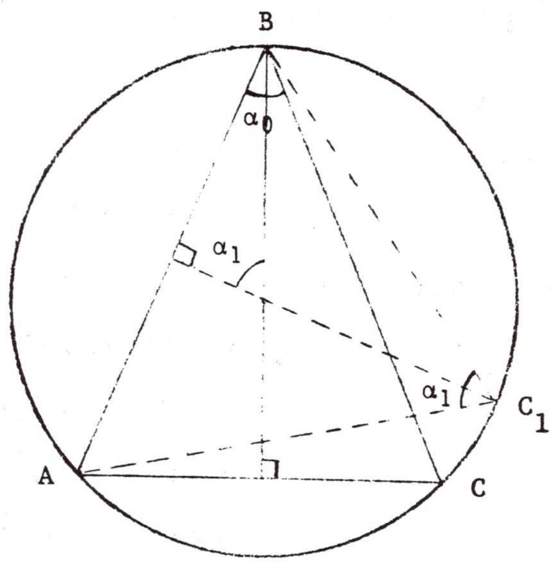

Fig. 2

triangles, shown in Figure 2, yields

$$\alpha_1 = 90° - \frac{\alpha_0}{2} = 60° + (-1/2)\ (\alpha_0 - 60°),$$

$$\alpha_2 = 90° - \frac{\alpha_1}{2} = 90° - \frac{1}{2}[60° + (-1/2)(\alpha_0 - 60°)]$$

$$= 60° + (-1/2)^2(\alpha_0 - 60°),$$

$$\alpha_3 = 90° - \frac{\alpha_2}{2} = 60° + (-1/2)^3(\alpha_0 - 60°),$$

$$\alpha_n = 90° - \frac{\alpha_{n-1}}{2} = 60° + (-1/2)^n(\alpha_0 - 60°).$$

The presence of the factor $(-1/2)^n$ indicates that this sequence oscillates. Since $\lim_{n\to\infty} (-1/2)^n = 0$, it follows that $\lim_{n\to\infty} \alpha_n = 60°$, which shows that the limiting isosceles triangle is an equilateral triangle, the triangle of maximum area.

That the formula

$$\alpha_n = 60° + (-1/2)^n(\alpha_0 - 60°)$$

is correct can be proved by mathematical induction as follows:

1. $\alpha_1 = 60° + (-1/2)(\alpha_0 - 60°) = 90° - \frac{\alpha_0}{2}$,

   which is true by construction.

2. Assume

   $$\alpha_k = 60° + (-1/2)^k(\alpha_0 - 60°)$$

   true. Then

   $$\begin{aligned} \alpha_{k+1} &= 90° - \frac{\alpha_k}{2}, \text{ by construction} \\ &= 90° - \frac{1}{2}[60° + (-1/2)^k(\alpha_0 - 60°)] \\ &= 60° - \frac{1}{2}(-1/2)^k(\alpha_0 - 60°) \\ &= 60° + (-1/2)^{k+1}(\alpha_0 - 60°). \end{aligned}$$

   Hence, if α_k is true, so is α_{k+1}.

3. Since α_1 is true, it follows by the principle of mathematical induction that

   $$\alpha_n = 60° + (-1/2)^n(\alpha_0 - 60°)$$

   is true for every natural number n.

For an equilateral triangle inscribed in a circle of radius r, it is easily shown that the length of its side is given by $\sqrt{3}\, r$, whereas its area is given by $\frac{3}{4}\sqrt{3}\, r^2$. This, then, gives the area of the triangle of maximum area inscribed in any circle.■

Metrical Fun and Games

by *Nancy Clegg Buck*

Reprinted from the *Edmonton Journal*

The name on the dead battery is Willard. It's no reflection on the manufacturer. No reflection on the inventor of the game either.

Willard F. Reese, a professor of science education at the University of Alberta, started inventing games in 1949. Travel Metre is the first one he has marketed commercially and it's laughs a kilometre a minute.

"Where should we go?" my husband asked me.

"Winnipeg," I replied.

In the center of the board is a map of Canada to metric scale. Each centimetre represents 222 kilometres. My husband measured the distance (a 1.5 tape is supplied) and wrote it down.

"Edmonton to Winnipeg: 1200 kilometres."

We then selected our playing pieces which are different colored cubes one centimetre square with a weight of one gram.

Through shaking dice, we moved out of the parking lot and forward along the highway which is divided into outside and inside lanes of 16 squares each.

Things can happen.

When one lands on a square which reads "Take a Metric Card," he selects the top one from a pile of 31, reads the question aloud, and answers it from multiple choice:

"The average height of a professional basketball player is most nearly: 215 cm., 235 cm., 255 cm., or 265 cm."

The correct answer adds 25 kilometres toward one's destination.

It's fascinating. Sometimes we estimate:

"Using a piece of string, measure the distance in cm. around the neck of the person on your left. Estimate the length of this string. Now, if your estimate was within 2 cm. of the actual measurement, add 50 km. to your score."

One can also land on squares which read: "Give way for a road sign." This is a separate pile of 14 white cards which depict international road signs. The player takes one off the top and tries to identify it.

"Canada didn't sign the convention," Dr. Reese explained, "but is moving toward doing so. I wanted the game to introduce not only the metric system but also the road signs people encounter with international highway travel."

Hazards en route (and we're laughing and learning as the kilometres go by) are Jake's Garage and Uncle Harry and Aunt Beth's farm. There are penalties for coffee breaks, dead batteries, flat tires, wrecks, detours and viewpoints.

As far as Dr. Reese knows, it's the first metric board game developed in Canada. It took him about six months. He knows of one in the United States but says it's for children only.

"Actually," he told me, "I don't think we need to worry about children learning the new system. I wanted to invent an interesting game for adults that children can play."

The age group for Travel Metre is from 10 years and up. It utilizes two to five players.

Production of the game presented its share of problems but nothing serious enough to deter Professor Reese.

He had 500 boards printed in black and white and family and friends have added the freehand colored artwork. Metric cards are also illustrated (the dead battery, for example) and international road signs depict authentic colors.

Until May 1, Travel Metre is $8 from Think Metric Associates (being Willard and his wife Barbara), 8452 - 117th Street, Edmonton T6G 2E1, or from Dr. Willard F. Reese, Faculty of Education, University of Alberta, Edmonton T6G 2E1.

After May 1, the game will be produced professionally in St. Albert and the colors on the board and cards plus advertising will raise the price to $10.

Jaron Summers, currently writing the series on metrication for the *Journal*, says that, in his opinion, Travel Metre definitely teaches the various aspects of metrication and is lots of fun to play in the bargain.

In fact, the only criticism Dr. Reese has had is the fact that after playing it many times people learn the answers.

That could be what Willard Reese had in mind when he invented it, although he suggests in the rules that new questions can be created if play value tends to diminish.

"It's flexible to the point that it isn't an educational game in the true sense," he added. "For one thing, people have too much fun playing it."

That's for sure.

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Minicalculators in our Schools 1975

We have just entered the AGE OF THE MINICALCULATOR. Pocket calculators are now appearing in our society with a frequency approaching that of the pocket transistor radio. The price of the basic minicalculator has dropped below $10. In addition, the National Council of Teachers of Mathematics (NCTM) continues to endorse the minicalculator as a valuable instructional aid for mathematics education and to recommend the use of the minicalculator in the classroom:

> With the decrease in cost of the minicalculator, its accessibility to students at all levels is increasing rapidly. Mathematics teachers should recognize the potential contribution of this calculator as a valuable instructional aid. In the classroom, the minicalculator should be used in imaginative ways to reinforce learning and to motivate the learner as he becomes proficient in mathematics.

The position statement above, adopted by the NCTM Board of Directors in September 1974, is still relevant today. As its September 1975 meeting, the NCTM Board of Directors approved a report from the Council's Instructional Affairs Committee that identified nine ways in which the minicalculator can be used in the classroom:

1. To encourage students to be inquisitive and creative as they experiment with mathematical ideas.

2. To assist the individual to become a wiser consumer.

3. To reinforce the learning of the basic number facts and properties in addition, subtraction, multiplication, and division.

4. To develop the understanding of computational algorithms by repeated operations.

5. To serve as a flexible "answer key" to verify the results of computation.

6. To promote student independence in problem solving.

7. To solve problems that previously have been too time-consuming or impractical to be done with paper and pencil.

8. To formulate generalizations from patterns of numbers that are displayed.

9. To decrease the time needed to solve difficult computations.

In an article appearing in the current issue of *Today's Education*, published by the National Education Association, entitled "A Calculator in Their Hands ... The Minicalculator in Our Schools," Dr. E. Glenadine Gibb, the president of the NCTM, stated:

> Creative use of minicalculators after the mathematical understandings have been extracted will establish the minicalculator

as a valuable asset among the collections of instructional devices already found in today's mathematics classroom.

The NCTM, through its Instructional Affairs Committee, its conventions, its affiliated groups, and its official journals, *The Mathematics Teacher* and *The Arithmetic Teacher*, will continue to identify and share imaginative ways of working with minicalculators in the mathematics classroom.

The NCTM Teacher/Learning Center contains materials that provide teachers and parents with concrete ideas on the effective use of the minicalculator. The Council, serving as the communication center for all persons interested in the teaching of mathematics, welcomes visitors (from 8:30 a.m. to 4:30 p.m.) at the Center, which is located in the NCTM Headquarters Office at 1906 Association Drive, Reston, Virginia 22091.

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Help Wanted

NCTM's Metric Implementation Committee (MIC) is collecting ideas for adequately teaching the metric system to those high school students who are not enrolled in mathematics and science classes.

If you have devised a program to reach such students, or if you know of someone who has devised such a program, please send details to the chairman of MIC, Boyd Henry, Department of Mathematics, College of Idaho, Caldwell, Idaho 83605.

Gridmatics

Grades VII - X

These two books contain nearly 200 self-checking grid format puzzle sheets which provide interesting practice in fundamental arithmetic operations. Book One covers addition, subtraction, and multiplication of whole numbers, and briefly introduces addition and subtraction of integers. Book Two deals with addition, subtraction, and multiplication of integers. It helps lay the ground work for algebra by giving practice in simple formula construction, elementary equation solving, and touches on other number bases. The puzzle quality of the gridmatics will make them very popular with your students. Permission is given to reproduce the sheets and the answers are shown in position in nonreproducible blue.

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New Publications

Reprinted from *The Mathematics Teacher,*
January, 1974

Key to Algebra, Integers: Booklets 1-4 (Tj, Ts, S), Peter Rasmussen, Key Curriculum Project, Box 2304, Station A, Berkeley, CA 94702, 1971, 1972, 31 pp. each.

This is a great set of small pamphlets that provide practice in the basic algebraic skills. Although they are called "text-workbooks" and could be used to individualize algebra instruction for general math students, the uses are many and varied. A year ago I purchased a set of *Booklet 3* to review skills in a basic algebra class - it was the best ten dollars I ever spent! The students enjoyed them, and this teacher ended the year with the satisfaction of having the best set of finals I've ever checked. Each booklet beyond the first begins with a brief review of concepts covered in prior booklets. The presentation is in very legible script rather than printing; the examples are explicit and easy for students to follow even without teacher aid, and the practice is sufficient to master the skill. Briefly, *Booklet 1* deals with prime numbers, addition, subraction, and multiplication of integers; *Booklet 2* contains order, phrases, exponents, like and unlike terms; *Booklet 3* has evaluating phrases and solving equations; *Booklet 4* deals with polynomials, the distributive principle, and multiplying and factoring polynomials. Do take a look at these booklets and see how many ways they can relieve your problems with your less able students. - MUNRO

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