THE ALBERTA TEACHERS' ASSOCIATION MATHEMATICS COUNCIL

delta-k

(Formerly Mathematics Council Newsletter)

VOLUME XI, NUMBER 3, APRIL 1972

Plan now to attend !

MATHEMATICS COUNCIL

of The Alberta Teachers' Association

Annual Conference and Business Meeting

Red Deer, October 13 (evening) and 14, 1972

NCTM Notes

Two name-of-site meetings will be held in Canada this summer. MCATA members should plan their vacation to take in one of these:

- At Sackville, N.B., August 23-25. Co-hosts: New Brunswick, Nova Scotia, and Prince Edward Island Mathematics Councils.
- At Saskatoon, Saskatchewan, August 23-26. Host: Saskatchewan Mathematics Teachers' Society.

(We have given SMTS our mailing list, so you should be receiving further information about this meeting.)

in this issue

EXECUTIVE, 1971-72

ATTENTION, SUBSCRIBERS: At the recent meeting of the Executive Committee of the Council, it was decided that the subscription rate be $5.00, the same as the membership fee. This would entitle a subscriber to all Math Council publications.

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Learning Arithmetic Facts Can Be Fun

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This year I think I know how the Pied Piper must have felt. The magic word is "arithmetic" and the wonderland is a room filled with numeral cubes, equation cards, math wagons, answer boards, walk-on multiplications tables, and other arithmetic games, gimmicks, and manipulative devices. With a specific arithmetic objective, students are guided through a series of game activities. Motivation is high and participation is often intense. An atmosphere of excitement pervades the room. On top of all this, the students are learning arithmetic concepts and skills.

Do your students eagerly look forward to math time? After working with students in Grades I through VI, in both regular and special education programs, I am convinced that it can be one of the high points of the day. All it takes is some imagination, a little creativity, and daring. Perhaps if I relate some of my experiences, you may be inspired to come up with a new set of ideas for teaching arithmetic. I sometimes use commercial games, but I rely heavily upon my own games and activities, because it is sometimes easier to create a game that meets both my objectives and the needs of my students than it is to find one already made that does the same job.

Let's start with learning the basic facts. Drill can be deadly, yet sometimes it is a necessity. The answer is to vary the drill and make it fun. I frequently use numeral cubes, because they are a manipulative device that students can handle. They provide the element of chance and surprise, yet give teachers some control of the numbers that appear. You can make numeral cubes from tagboard or strips of lumber sawed into cubes.

Let's take a situation in which students are working with the addend 3. The teacher can place 0, 1, 2, 3 on the cube, repeating two of the numbers. Then a large 3 is placed on the table. The student rolls the cube, uses the number which appears, adds it to the 3, and gives the sum. For instance, if a 2 appears on the cube, the student says "2 + 3 = 5".

If the student is working on missing addends, the teacher can place a sum on the table and mark on the cube those numbers which could be one of the addends. The student rolls the cube, uses the number which appears as one of the addends, and then supplies the missing addend to make the equation.

In multiplication, place one of the factors on the table. Then have the student roll the cube for the other factor. Next he should multiply the two factors and supply the product. The next step is to roll two cubes, use the two numbers that appear, and then complete the equation.

Using two cubes is a less controlled situation, because there are two variables. I keep on hand four numeral cubes, two marked 0-5 and two marked 5-10. I can then have students use the two low cubes, one low and one high, or two high cubes, depending upon the level at which they are working or the degree of difficulty they are experiencing.

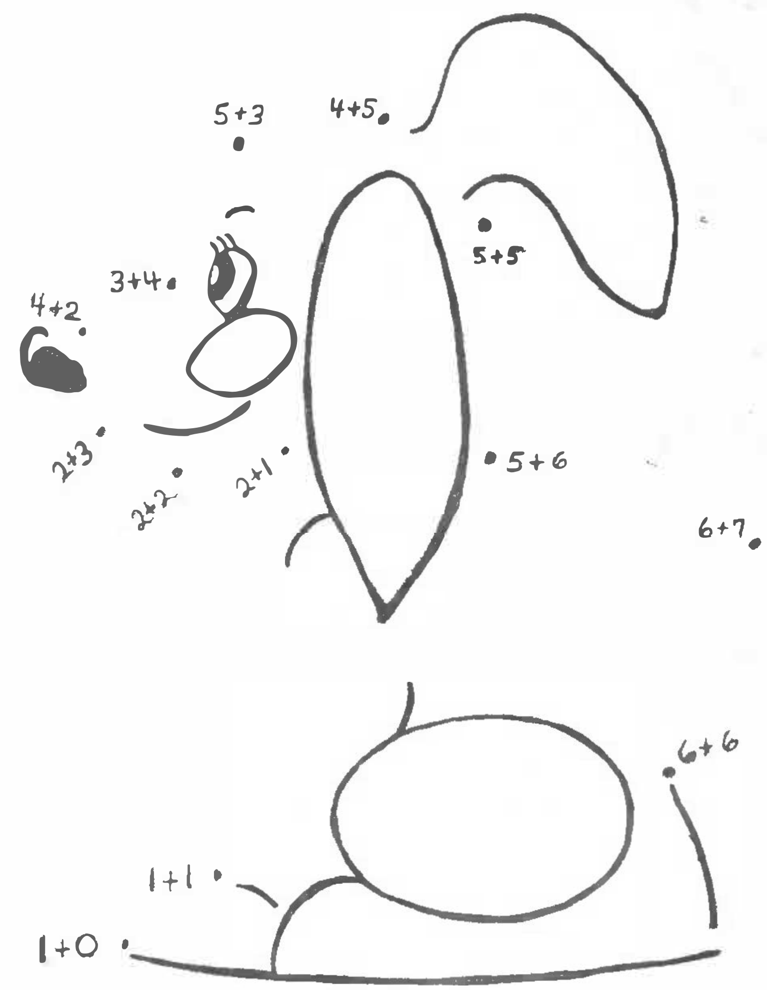
You can devise many different games using numeral cubes. Give a player a point for each correct answer, or give a point only if the answer is given in a certain length of time. Try having the players in a circle with one player standing on the outside. As the players take turns with the cubes, the player on the outside tries to give the answer before the seated player does. If he succeeds, they exchange places. Or try it the other way. Have the winner remain standing. He can then challenge each player in turn. You could also use a team situation. Be sure to have each player say the whole equation out loud, not just the answer. By saying the whole equation he sees it, he says it, and he hears it. The other players also see it and hear it. After a while the answer becomes an automatic response when the equation is given.

Frequently I use numeral cards along with numeral cubes. Many things can be done with a set of 11 cards (numbered 0-10) and a pair of cubes. I am currently working with a group of Grade I pupils who were having difficulty in grasping the concepts of greater than and less than. The cards are placed in a row as on a number line. Two cubes (numbered 0-5) are rolled. One cube is matched with its corresponding number on the cards. The other cube tells the number of cards greater than the one which is matched with the first cube. The child moves the second cube to the correct number of cards to the *right*. The answer is where the second cube lands. For instance, if a 2 and a 5 are rolled, the child could match the 5 cube with the 5 card and move the second cube two spaces to the right to find out that 2 greater than 5 is 7. To familiarize students with the concept of less than, use a red cube (numbered 0-5) and a blue cube (numbered 5-10). Have students match the blue cube with its card and move the red cube to the *left* to find the answer. For instance, if a blue 9 and a red 3 appear, the student should match the 9 cube with the 9 card and move the 3 cube three places to the left. This shows that 3 less than 9 is 6. The child should always try to verbalize what is taking place.

Two provide practice in addition, place the 11 cards face up in front of each student in a small group. These represent the sums. Have each take turns rolling and turning over the card which corresponds to the sum of the two numbers rolled. The person who gets all the cards turned over first wins the game.

With students who know multiplication, I use the cubes as place holders. In this way, if three cubes are rolled and the numbers 2, 5, and 7 appear, they can be arranged to form the numbers 2, 5, 7, 25, 27, 52, 57, 72, and 75. (They can even be used to form three-digit numbers such as 257 and 527.) These numbers now become products, and the cards represent factors. A player's turn begins when he rolls the cubes. It ends after he has turned over all the factors he can find in the products he can arrange with the cubes. In this case he could turn over the 1 card, because 1 is a factor of all the numbers. He could turn over the 2, because $2 \times 1 = 2$; 5, because $5 \times 1 = 5$ and $5 \times 5 = 25$; 7, because $7 \times 1 = 7$; 3 and 9, because $3 \times 9 = 27$; 8, because $9 \times 8 = 72$; and so on. A player may be challenged. If he cannot give the equeation he used in turning over one of the factors, he loses that point, whether or not that card is a factor of one of the numbers arranged using the cubes. Give a point for each factor found. Each time the cubes are rolled, a new set of products can be formed and new factors can be found. This is a good way to introduce division.

How about paper and pencil games? Give younger students dot-to-dot pictures. Instead of numbers to be joined in sequence, place equations whose answers provide the sequence of numbers to follow for the picture. For instance, to go from the start to the first point, the student finds the equation whose answer is 1. He draws his line segment from the start to this point. Next he goes to the point whose equation gives the answer 2. Here's an example.



Puzzle pictures are fun, too. Divide a picture into puzzle pieces. Each piece contains an equation. Instructions may be to color in red all those pieces whose answer is 3; to color blue all those pieces whose answer is 5;

to color yellow all those pieces whose answer is 6; and so on. In two-color pictures (a Halloween pumpkin, for instance) all pieces with even answers are to be one color and all pieces with odd answers are to be another color.

Students of all ages can do graphs. The picture you give on the graph paper and the difficulty of the problems are determined by the age and ability level of your students. Number the spaces, not the lines, on the graph paper. If you want students to fill in the space which is over 3 and up 5, the first pair of equations should have solutions of 3 and 5 in the "over" and "up" columns respectively. You can make your own graphs by drawing a picture on the graph paper and then squaring it off to correspond to the squares on the paper. Then plot your points and make up your problems. If you are working with multiplication and you want an answer of 33, you can use not only 3 x 11, but (4 x 8) + 1, (6 x 6) - 3, (4 x 9) - 3, (5 x 7) - 2, (4 x 4) + 17, 3 + (6 x 5), or other combinations.

How about secret messages? Mark down the alphabet and give each letter a numerical value. Then write out your message using equations whose answers are equal to the letter value you want. For instance, suppose you make a=1, b=2, and so on. If your first word is "Do", your first problem should have the answer 4 and your second problem should have the answer 15. Students would then solve the first equation to get the answer 4 and substitute "D" for the 4. Next they would solve the second equation and trade the answer 15 for an "o". Presto! The first word of the message. I once used this method to ask students if they wanted a party. They had to give me their answer in code. I would accept no verbal or written answer using words. The whole class ended up at the party! I've also used this method to present riddles to a class. After a few chuckles, they began making up their own riddles to give to others. (By the way, "a" doesn't always have to equal 1.)

Here's an example.

Solve the problems to read the message. Substitute the letter that corresponds to each answer. (● means a new word begins.)

A = 1	N = 14
B = 2	O = 15
C = 3	P = 16
D = 4	Q = 17
E = 5	R = 18
F = 6	S = 19
G = 7	T = 20
H = 8	U = 21
I = 9	V = 22
J = 10	W = 23
K = 11	X = 24
L = 12	Y = 25
M = 13	Z = 26

1. (6x4)-1 =
2. $\frac{1}{2}$ x 16 =
3. $\frac{1}{3}$ of 15 =
4. 7 x 2 =
5. 5 x 5 =
6. $\frac{1}{3}$ x 45 =
7. 7 x 3 =
8. 12 ÷ 2 =
9. 3 x   = 27
10.   ÷ 2 = 7
11. 4 x   = 36
12. (4x5)-1=
13. 7 x   = 56
14. (5x4)x1 =
15. $\frac{1}{3}$ x 24 =
16. $\frac{1}{2}$ x 18 =
17. (4x4)+3 =
18. 5x5 ÷ 1 =
19. $\frac{1}{3}$ of 45 =
20. 7x6 ÷ 2 =
21. (3x4)+1 =
22. $\frac{1}{2}$ x 2 =
23. (3x7)+4 =
24. 7 x   = 28
25. 3 x 5 =
26. 7 ÷ 7 =
27. 9 x 2 =
28. $\frac{1}{4}$ of   = 5

For students who need to be active, try making a number chart or a multiplication chart on a large sheet of plastic. Place it on the floor. Then have the student give the answer to a problem, either from flash cards or cubes, and try to hit the answer on the plastic with a bean bag. You can also paint numerals on a large piece of formica from a lumber yard or on a chart which has been laminated with plastic and taped to the blackboard. Have the child try to hit the answer to his problem with a dart attached to a suction cup. These large muscle activities are great for students who need to get rid of excess energy.

In devising a game activity, if you can't think of the problems to use, take the problems from your textbook. You can always adjust the answer by adding or subtracting the amount needed. If a student is having difficulty with a certain concept, the same type of problem can be used in enough ways so that he does not become bored. If your school lacks funds to invest in commercial games, make your own. If you can't seem to get any ideas, look at other games and think of how they can be adapted to arithmetic. (We have some great games of "Equation Rummy" and "Equation Fish" going at times.) If you think you are not creative, think again. Good luck, and have fun!

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What are my RESPONSIBILITIES as a teacher of mathematics?

Lehi Smith
Arizona State University

The overriding responsibility of the teacher of mathematics is to provide the mathematics student with the best possible opportunity to learn mathematics. In satisfying this responsibility, the teacher has the two responsibilities of doing the best job of which he is now capable, and working continually to increase his capacity to do a better job by improving himself and those about him.

Considering these two responsibilities, the responsibility to do the best job possible with present capacities needs little elaboration. But what of the other responsibility? What does the teacher do to increase his capacity for doing a better job? This second responsibility in turn suggests several responsibilities.

Too often, when the mathematics teacher considers the question of increasing his capacities, he looks to the college or university. This need not be the case. Consider each of the following responsibilities having an increased capacity as its end result.

1. *RESPONSIBILITY TO READ PROFESSIONAL JOURNALS*

No other means is so available to the teacher to keep abreast of the newer developments in mathematics education than the professional journal. There is more gained for time spent through this reading than through any other one thing. In the professional journal one finds suggestions for presentation of certain mathematical topics as well as information of new developments and trends. One need not spend the time to read every word of every article, but one should take the time to scan the journals and pick out those articles particularly appropriate for him.

2. *RESPONSIBILITY TO STUDY MATHEMATICS*

The teacher of mathematics should be continually improving his understanding of mathematics. This need not be a crash program. It should be a gradual and continual thing. One may begin by merely acquainting himself with the mathematics taught by the other teachers in his school. The third grade teacher may begin by studying the seventh and eighth grade tests. The high school algebra teacher might study the trigonometry texts. After these are completed, the progress thus begun should be continued. There is no excuse for the elementary mathematics teacher of several years experience to complain that he has never had a course in algebra, or for the experienced high school teacher to complain that he has never had a course in trigonometry. These are things within his grasp. He should reach out and get them.

In the study of mathematics, the teacher has the responsibility to seek help from his fellow teachers, and teachers always have a responsibility to a student of mathematics, even if that student is a fellow teacher. We all have the responsibility to share our knowledge and understanding. There have been instances of high school teachers setting up special sequences of lectures for elementary school teachers, publicizing this, and welcoming all elementary teachers who would come. There have been instances of two or more teachers banding together to support each other and share ideas in working through certain problems to increase their mathematical knowledge and understanding.

Whatever the device, the teacher should be increasing his knowledge continually. In order to be a good teacher, one must first be a good student.

3. *RESPONSIBILITY TO ATTEND MEETINGS*

Few teachers have considered this as being related to their improving themselves as teachers. Yet, it is usually only at these meetings that a teacher has opportunity to meet face to face with the national leaders, those who are instrumental in setting the direction and formulating the policies in this field. It is usually only here that these leaders can be engaged in informal conversation. Nowhere else is such an opportunity so readily available to the classroom teacher.

Meetings should not be considered only as a place where the teacher goes to absorb information, although they would be worthwhile if that were their only function. Of greater importance, the meetings provide an open forum for the exchange of ideas. If a teacher has a particularly good idea, this is a place where it can be expressed. If it is an idea which could influence general policy by expressing these ideas in informal gatherings with some of the national leaders, the teacher stands a better chance of seeing something done than if he keeps the idea to himself and expresses it only to his friends in his own school.

Only at these meetings does one find such a broad cross section of the mathematics teaching population. While this is true of state meetings, it is even more true of national meetings. Through his informal discussions, the teacher can determine what is being done to meet certain problems in other sections of the country. If he has an approach or an idea that should be shared, again it is here that it can be done. It is too easy for teachers to live in their own little worlds. Through sharing their ideas with others, they increase their own perspectives and broaden their own backgrounds.

4. *RESPONSIBILITY TO PREPARE ARTICLES FOR PUBLICATION*

If a teacher has a good idea, it should be shared. Not only does the teacher of mathematics have a responsibility to improve himself, he has also the responsibility to improve other teachers. In writing an article for publication, both of these ends are met.

In the course of preparing an article for publication, the teacher has to clarify and crystallize his own thinking on the topic. He must organize his information, and in so doing may gain new insight into that which he is presenting. Of course, when the material is published and is made available to others, the teacher is satisfying his responsibility there.

In summary, the responsibility of the teacher of mathematics to the student of mathematics takes him far beyond the immediate classroom. This list of responsibilities is by no means complete. Does this mean that the teacher who is not exercising these responsibilities is not a good teacher? No, not necessarily. However, the teacher who is not exercising these responsibilities, while he may still be an acceptable teacher, is not as good a teacher as he could be.

IT behooves each of us to ask ourselves if we are moving toward realizing our full potential as teachers and are giving our students the best we can offer. Are you the teacher who, at the end of 25 years of teaching, has 25 years of experience, or are you the one who has had one year's experience 25 times? Are you a teacher of mathematics, or someone merely holding down a job and holding a job down?

Reprinted from *Mathematics Council*, Newsletter of the Mathematics Council, The New Brunswick Teachers' Association, Vol. 1, No. 1, September 1971.

Flow Charting and Mathematics

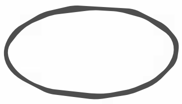
Kenneth L. Proctor
Wasco Union High School

Many pupils experience difficulty or failure in mathematics and other disciplines as well because of their inability to proceed logically in the solution of problems. Much of this inability to solve problems can be attributed to the use of the formalized results of rote learning without having any concepts underlying the facts involved. The situation is further compounded by their frustrating experiences in regard to problem-solving which tends to undermine any confidence in their thinking abilities. Several pupils in slow learner classes have been observed to berate and downgrade themselves and their classmates with expressions such as "dumbie", "dodo", "dumbbell", and many other like expressions. With such a negative self-image and attitude of mind, it seems likely that scant achievement, if any, will be experienced by these individuals.

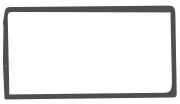
There are, no doubt, many different approaches to eradicating a negative self-image or attitude of mind. The underlying theme in all approaches must be to engage in activities that tend to lead to heightening self-confidence. Flow charting, properly and enthusiastically used, can be an excellent vehicle on which to develop such activities.

A flow chart is a pictorial outline of a sequence of steps to be accomplished to solve problems. It is actually similar to a road map in that it shows the routes from a starting point to an ending point. Any procedure involving a series of operations may be flow-charted. The skill of flow charting has been found to be very valuable, both in mathematics and in everyday life situations. Each flow chart is a linear diagram from start to end and therefore requires the person making it to have a thorough knowledge of all the steps involved.

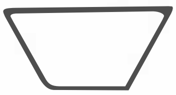
Flow chart symbols have been standardized to facilitate understanding among people who use these charts. Experience has shown that in teaching slow learners the following symbols have proved to be satisfactory:



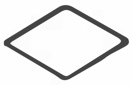
This is a standard symbol for *terminal* and is used to show the start or end of a series of steps.



Operation or annotation. Used to show a step, a specific operation or function.



Printed output. Item or answer that may be printed or written down.



Decision. Used when flow or direction is variable.

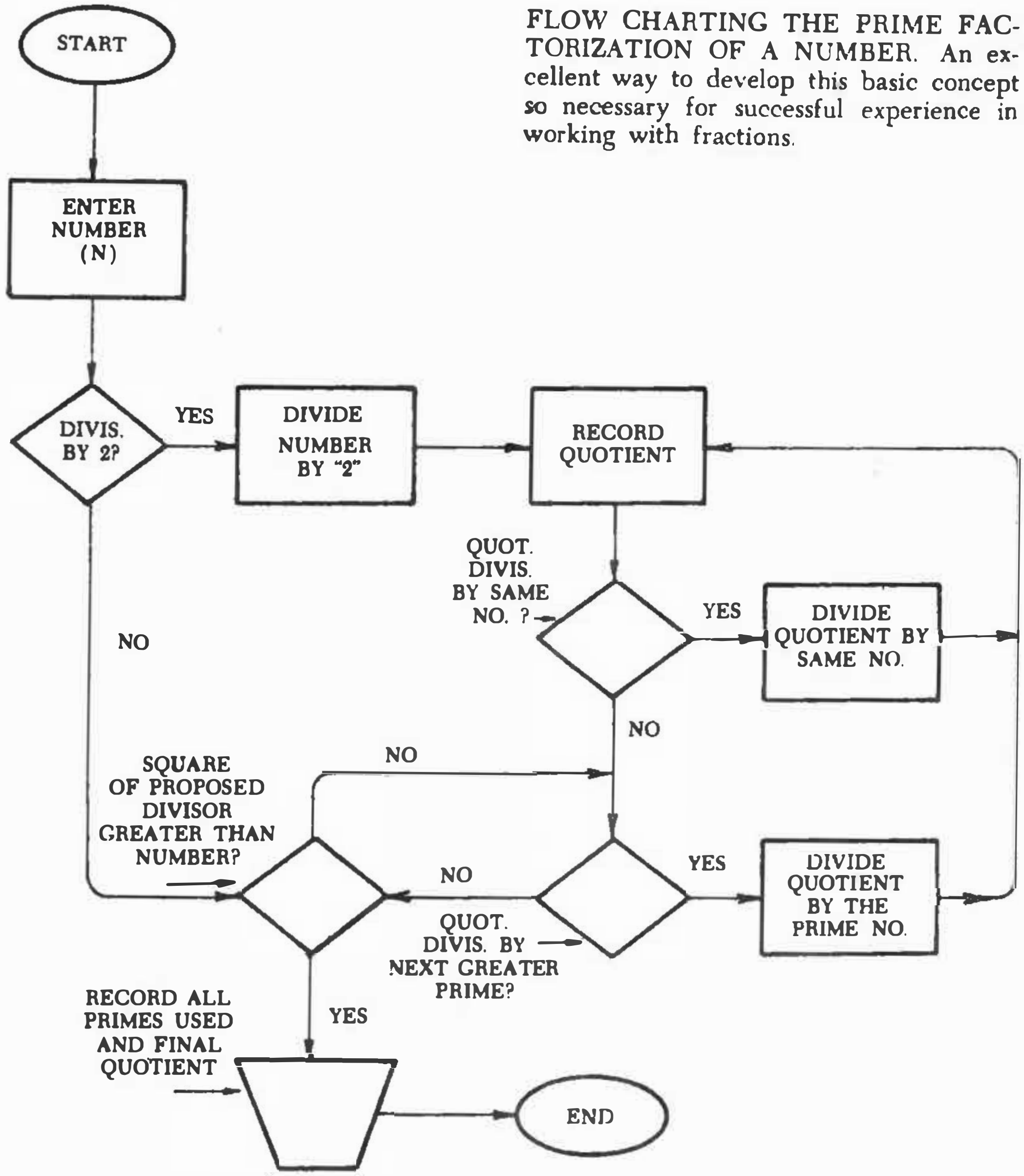
These symbols may be drawn freehand or with the aid of a specially prepared template. Students are more likely to be motivated by using the templates which are available from various business machine companies.

Since flow charting is a pictorial language used to design logic for the solution of problems, the method has significant advantage for teaching mathematics:

1. It assures understanding. If a problem cannot be flow-charted, it is not fully understood.
2. It reduces complex mathematical problems to simpler and more easily understood sections.
3. If the flow chart is correct, the problem solver receives the proper instructions, and a correct answer is more likely.
4. Flow charting introduces your students to symbols and terms that are becoming more common every day in a computerized world.
5. A flow chart is a pre-plan for solving a problem. It saves time and increases motivation for solving more concepts.
6. Flow charting encourages disciplined thinking. It may be used effectively in many subject areas.

Flow charts may be drawn from left to right as a line (horizontal) or top to bottom as in a column (vertical). Either method is acceptable and valid. More important is the need to analyze the problem before beginning. With practice, one will be able to visualize the flow chart before drawing the outline.

FLOW CHARTING THE PRIME FACTORIZATION OF A NUMBER. An excellent way to develop this basic concept so necessary for successful experience in working with fractions.



EXAMPLES: (1)

$$\begin{array}{r|l} 3 & 2385 \\ 3 & 795 \\ 5 & 265 \\ & 53 \end{array}$$

$3 \times 3 \times 5 \times 53 = 2385$

(2)

$$\begin{array}{r|l} 2 & 1496 \\ 2 & 748 \\ 2 & 374 \\ 11 & 187 \\ & 17 \end{array}$$

$2 \times 2 \times 2 \times 11 \times 17 = 1496$

Start with simple non-arithmetical problems at first to learn the technique of flow charting. Pose a simple problem and ask leading questions of the students to solicit from them a step-by-step procedure for the solution of the problem. One problem that has a basic familiarity to many students is "how to sharpen a pencil". In this first attempt, one can usually expect from 12 to 18 steps to be developed by the class. After the steps have been listed, the flow chart can be drawn at the chalkboard or on the overhead projector. (The author constructed a set of template from bristol board for use at the chalkboard.) Encourage the students to participate in choosing the proper flow chart symbols for the various steps. After the students have participated in a class exercise such as just described, it is appropriate to assign a problem or two as homework. The author has used such problems as "how to comb your hair" and "how to get dressed for school". Results have varied from brief four- or five-step procedures to quite elaborate procedures of as many as 52 steps. Several procedures were then selected and transparencies made for the purpose of class discussion concerning completeness, accuracy, and efficiency. It is important to point out that while there are several ways to solve most problems, our goal is to select the most efficient way. Some examples of non-arithmetical problems are:

How to sharpen a pencil
How to get dressed
How to wash your face
How to get a book from your locker
How to get up in the morning
How to tie a necktie
How to shift with a "straight stick"
How to catch a fish
How to open a door
How to brush your teeth
How to wash dishes
How to start a lawn mower
How to fix a sandwich
How to fix a bed
How to change the oil in a car
How to plant a flower

After the students have had some experience making flow charts for non-arithmetical actions, it is well to apply this skill to common arithmetic problems. *Pupil participation is very important* even if the problems may seem long and take time to develop. Time is of less importance compared to understanding of a concept.

This is also a good introductory approach to teaching mathematics students to make mathematical proofs in algebra and geometry. In fact, flow charting will probably make the proving of theorems in algebra and geometry a far more enjoyable task as well as leading to greater achievement. An imaginative teacher will find many opportunities to use flow charting to great advantage in the teaching of most areas of mathematics. Flow charting must not become an end result in itself, but rather it must be utilized as one of the valuable tools or devices that teachers use in the teaching of mathematics students.

Reprinted from *The Bulletin*, California Mathematics Council, Vol. 26, No. 2, Winter 1968-69.

Ideas for Elementary Math Teachers

At the time of year when we go back to school, teachers wonder whether students remember anything they were taught the previous year. Yet we all realize that we forget a great deal of what we have learned if we do not in some way make continuous use of it. Mathematics is no exception! What do we do with students at different grade levels who no longer can give automatic response to the basic facts in addition, subtraction, multiplication, and division, presuming they once could? Some contend that in a modern program of mathematics one no longer needs to provide students with drill. In my opinion, this is not true. It is a mistake. Surely, drill should not come before understanding. If at all possible, drill should be made interesting, exciting, and challenging so that it might be enjoyable and even fun. If one does not like the word "drill", perhaps one could substitute "sustained attack". Regardless of what word one uses, I think that students of mathematics at all levels need some type of practice as a means of fixing ideas. So let us take new courage and work with a will to have those we teach again attain the goal of being able to give automatic response to the basic facts in the different operations. It is a must!

In this article, I certainly do not claim to have ideas which are entirely new, but I do claim to have helpful ideas which I would like to share with you. I also think these ideas will appeal to you as teachers because they can be readily carried out in the classroom without a great deal of preparation and materials. They are simple ideas! My aim is to suggest some ideas for each of the following three operations.

ADDITION

A teacher might use "skip" addition in various ways. For example, he might tell the students to take the number 9 and keep adding 8 until they reach 129. How the students record this would depend upon the skill they have acquired for addition and the grade level.

Some students may make their record like this:

$$\begin{array}{r} 9 \\ \underline{8} \\ 17 \\ \underline{8} \\ 25 \\ \underline{8} \\ \underline{33} \end{array}$$

and so on.

Others might simply write: 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97, 105, 113, 121, 129, or they might record the sums vertically. "Skip" addition often produces beautiful patterns! Have students be on the alert for them. In the above example, notice the digits in one's place in each of the numerals 9, 7, 5, 3, 1, 9, 7, and so on.

To have students require more speed with no loss in accuracy, and hopefully to have them practise on their own outside of school time, a teacher might try this approach. Many teachers have found it successful. Ask the class to take a number, say 18, and keep adding 7. Time them. Let them continue adding for one full minute or whatever time limit you deem appropriate. Then have the entire class stand and recite the answers together. As soon as a student has a wrong answer or no longer has an answer, he should be seated. The student who remains standing the longest is the winner.

Teachers might extend this idea by using "skip" addition with fractions - start with 1/2 and keep adding 1/2. Thus: 1/2, 1, 1 1/2, 2, and so on. Or try one a bit more challenging - start with 1/2 and keep adding 1/3. Why not have students do the same with decimals? The result might just be amazing!

Just one more idea for having students get practice in addition! It is not only interesting but fun. Have the students write the name for some number. Then have them reverse the digits in the numeral that names the number to obtain the name for a second number. Add the two numbers named. Then reverse the digits in the numeral that names the number which is the sum of the first two numbers. Again add the numbers named. Continue this procedure as often as necessary; a number is eventually reached whose name reads the same from both ends. For example, let's try 1971.

$$\begin{array}{r} 1971 \\ \underline{1791} \\ 3762 \\ \underline{2673} \\ 6435 \\ \underline{5346} \\ 11781 \\ \underline{18711} \\ 30492 \\ \underline{29403} \\ 59895 \end{array}$$

If you really want fun, try 98. I would caution any teacher who uses this idea in his classroom to have tried the examples himself previously. Some numbers require many, many, many additions. If the additions do not become too lengthy, teachers might use this idea for races. One way to carry this out would be to select two teams of students. Then let one member of each team work at the board, giving them a certain number; the rest of the class may work the same example at their seats. Each team member endeavors to complete the addition correctly and *first*. The one who does just that earns a point for his team. Why don't you try it with your class? Students do enjoy it!

SUBTRACTION

"Skip" subtraction provides the same practice and patterns as "skip" addition. It can be handled in the same manner.

For example, start with 81 and keep subtracting 7 until you reach 11. It

will look like this:
81, 74, 67, 60, 53, 46, 39, 32, 25, 18, 11.

Or start with 9 and keep subtracting 3/4 until you reach 1 1/2. 9, 8 1/4, 7 1/2, 6 3/4, 6, 5 1/4, 4 1/2, 3 3/4, 3, 2 1/4, 1 1/2.

How about decimal fractions?

Another idea which students find exciting and which can be used in various ways in a classroom is this. Write the names of four numbers in a row, leaving space between (see example below). Take the difference between the first and the second numbers and write its name in the first column; take the difference between the second and the third numbers and write its name in the second column; take the difference between the third and the fourth numbers and write its name in the third column; take the difference between the fourth and the first numbers and write its name in the fourth column. Continue finding the difference in this manner. Eventually a point will be reached where the four numbers named will be equal. For example, take

64	129	95	37	
65	34	58	27	
31	24	31	38	
7	7	7	7	Remarkable, isn't it?

Why not extend this idea and use numbers other than counting numbers! For example,

3 5/8	1/2	7 3/4	9 1/4
3 1/8	7 1/4	1 1/2	5 5/8
4 1/8	5 3/4	4 1/8	2 1/2
1 5/8	1 5/8	1 5/8	1 5/8

You may want to see if your students can discover some simpler way for cases like the one above. Can you?

MULTIPLICATION

Tables of various kinds provide ample and interesting practice, sometimes in more than one operation. Let me exhibit a few, for which I will invent names so as to have a means of referring to them.

There are regular tables like the ones which follow:

x	2	5	3	4
4				
1				
3				
5				

x	9	5	8	6	7
4					
8					
6					
9					
7					

The lower the grade level, the simpler and shorter one would make the table, of course. Incidentally, if you are a teacher of the intermediate grades or if you teach at the junior high level, did you ever have your students construct a table for the one hundred basic facts of multiplication? If you did not, it might be an excellent idea to do so. Then let the students see how many observations they can make by looking at the table carefully. I am certain you will be amazed at the many discoveries they can find.

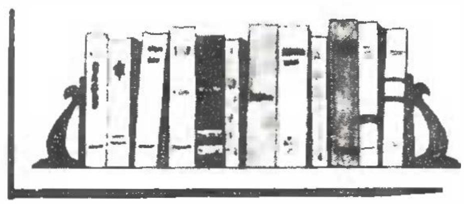
Other than regular tables, a teacher might use what I call "puzzle" tables. These always hold more fascination for students. Examples of such are given below.

×			4
5			
3		9	
	8		16

×		9		
				20
	18	27		15
7			56	
8	48	72		

Reprinted from *Wisconsin Teacher of Mathematics*, Vol. XXII, No. 3, Fall 1971.

Book Reviews



MATHEMATICS A HUMAN ENDEAVOR - a textbook for those who think they don't like the subject, by Harold R. Jacobs. San Francisco: W. H. Freeman and Company, 1970.

The author has been motivated to write this intriguing textbook and teacher's guide because of the boring way in which New Mathematics is being taught. He has found that it is being taught like the Old Mathematics with too much "shoving of abstract symbols" and too much rigor to the extent that mathematics is uninteresting. Because of such unimaginative teaching, students never acquire an appreciation for the power and beauty of mathematics as it is found in every area of life. In this textbook, the author describes such current mathematical concepts as logarithms, polygons, topology, probability and statistics in a very captivating way. He uses cartoons and photographs in abundance to reveal the intrinsic beauty and power of the concept, and he uses diagrams to develop them.

In the author's guide for teachers, he provides a daily lesson plan which includes such things as an attention-getting activity at the beginning of the period that reviews the previous day's lesson. Also included are Ditto masters for producing transparencies and handouts to students.

In summary, this textbook has the potential to make mathematics attractive to students of any grade because of the selection of cartoons, pictures, drawings and their descriptions. The level of mathematics required to do the assignments does not go beyond what is taught in junior high schools. A book such as this can be a real asset to any teacher of mathematics.

Reviewed by Abe Nikkel
Ernest Manning High School, Calgary

MATHEMATICS FOR A MODERN WORLD, by Baxter, Newton and Del Grande. W.J. Gage Ltd., 1970. 356 pp.

This book is the first in a series, the second of which is now being written. The present text, while being marked as a Grade IX text, could certainly be used as a multi-grade text since it deals with most of the topics in the Alberta junior high mathematics program.

The book is aimed at the non-university directed student and consequently contains a minimum of verbiage and symbolism - a refreshing contrast to some of the currently "authorized texts"!

Much emphasis is put on:

- visual presentations,
- drill sections, and
- practical applications (where possible).

Having a total of 24 sections, drill is provided after every four sections while a summary is provided after every eight sections.

With this book, an attempt is made to enable students to do arithmetic, algebra and geometry, and an excellent basis is provided for any Grade X mathematics course in the Alberta program.

Editor's note: The writer's name of this review has been misplaced. May I ask the writer to contact me so that this oversight can be corrected in another edition of this publication. Thank you.

From the Editor's Desk

■ PUBLICATIONS FREE TO ATA MEMBERS:

Mathematical Meanings in Elementary Arithmetic, ATA Problems in Education - Monograph No. 2.

Modern Concepts in Elementary Mathematics, ATA Improvement of Instruction - Monograph No. 4.

These publications are available from The Alberta Teachers' Association, Barnett House, 11010 - 142 Street, Edmonton 50, Alberta. Send your request to T. F. Rieger, c/o the above address.

■ A RECREATIONAL ENRICHMENT MAGAZINE

Pythagoras, a small enrichment magazine containing puzzles, problems, "teasers", and other forms of recreational mathematics for secondary school students, is now available in an English edition as well as the original Dutch version. Since this periodical is meant for a wide cross section of students, the articles in each issue are varied and are coded to indicate the degree of difficulty involved in solution. *Pythagoras* will appear six times yearly; the annual subscription rate is 8/6d. Orders and inquiries should be addressed to Fanfare Educational Publishing Company, Fanfare House, 174 Chingford Mount Road, London, E.4, Great Britain.

(From *NCTM Bulletin for Leaders*)

■ TRIVIA MATHEMATICA

(1) A ham sandwich is better than nothing.
(2) Nothing is better than utopia.
(3) Therefore, by the transitive property of the relation "better than", a ham sandwich is better than utopia.

(Arizona Council *Newsletter*)

■ A GAME FOR THE ELEMENTARY CLASSES

Divide your class into two teams. Team A's appointed leader gives a command to Team B: "1/2 of Team B stand up!" If the right number of that team stand up, Team B scores one point.

Team B will then give Team A a command: "1/4 raise your right hand!", and so on.

If a team gives an impossible command, the other team scores a point. Many variations may be used depending on your own creativity.

GAMES TO TEACH THINKING

This item is an excerpt from an article by Carl Bereiter, Department of Applied Psychology and Curriculum, OISE:

Can you help?

We know that many teachers have good ideas for games. We are prepared to pay from $10 to $150 for game ideas, depending on how fully worked out they are and what use we are able to make of them. The games should require thinking - not just memory, luck, or persistence. We are looking for games that have the nine desirable features listed below. However, they needn't be sitting-still games. We are also interested in active outdoor games that involve thinking.

We prefer games that will not cost the teacher any money or require a large amount of effort to prepare materials. However, a really good game for which material is needed will be considered.

Send game ideas to:
Carl Bereiter,
Department of Applied Psychology,
The Ontario Institute for Studies in Education,
252 Bloor Street West,
Toronto 5, Ontario.

Please don't send along any materials that you will need back because we can't be responsible for returning them.

Some desirable features of a game:

- The game is actually fun. It may not sound like it from the description, but try it with whoever is handy and you will see.
- Rules are very simple to learn.
- Game requires no supervision.
- No special materials are required.
- It can easily be adjusted to the level of competence of the players.
- There is an element of chance so that less capable players are successful part of the time and no one is successful all the time.
- The game can grow with the players. As players get more sophisticated, they start looking for harder sentences when they are leaders (that is, sentences with less predictable sequences).
- It isn't very competitive. No score is kept. Enough motivation seems to come just from winning a turn as leader.
- In addition to whatever value it may have in training thinking skills, it gives practice in something else useful - reading and guessing words from their context.

TRY THIS

The Counting Numbers 1-100 Expressed as Combinations of Four Fours

For example, $1 = \frac{4}{4} + 4 - 4$, $29 = 4! + 4 + \frac{4}{4}$, $36 = 4 \cdot 4 \cdot \sqrt{4} + 4$, and $70 = 4! + 4! + 4! - \sqrt{4}$. How about the others?

(The editor will publish a list of solutions if you will send your classes' efforts to him.)

■ MATH-initions

Weatherman's promise of a good evening: Finite.
Green substance in all salads: Lattice.
Someone who is now with it: X^2.
A tangled fishing line: Rectangle.
Out of gas: Octagon.
A deployment of heavy artillery: Canonical form.
Spring pranks: Matrix.
The painless way to pull a tooth: Number.
Take someone out of an election: Denominator.
Promise of good luck in the future: Hexagon.
Why a Chinaman goes to the dentist: 2:30.
We have a system of linear equations: Use detergents for a solution.
Set: what you do in a chair.
Subset: what you do under a chair.
Proper subset: sitting straight under a chair.
Empty subset: somebody is absent.
Disjoint: place where truck drivers eat.
Element: large animal with trunk.
Binary: two-headed canary.
Rational number: four-day week.
Irrational number: parent with complaint.
Infinite: children in your class.
Fraction: broken bones.
Plane: not fancy.

(This item has appeared in several exchange newsletters.)

■ FROM *THE MATHEMATICS STUDENT JOURNAL*

Teacher: What is $\sqrt[3]{1000Q^3}$?
Student: 10Q.
Teacher: You're welcome.

■ ACTIVITIES FOR ELEMENTARY CHILDREN

1. Pantomiming Angles

Select individual pupils, have them go to the front of the room one by one, and put their bodies in the position of some angle. Have others guess what kind of angle they are representing.

2. Countdown

Have pupils count by 6's, starting with 5. Anyone who makes an error must sit down for the moment, but he can regain his place in the game by supplying an answer when another child cannot think of it immediately. Use more difficult situations as the game progresses.

(This item has appeared in several exchange newsletters.)

NCTM Notes

BUILDING FUND REPORT (CANADA) FEBRUARY 1, 1972

Canadian	19%	$6,640
Alberta	73%	775
British Columbia	18%	810
Manitoba	4%	975
New Brunswick	31%	160
Newfoundland*	107%	85
Northwest Territories*	300%	5
Nova Scotia	0%	215
Ontario	11%	2,325
Prince Edward Island	0%	0
Quebec	5%	1,125
Saskatchewan	42%	165

* Goal Surpassed

(Below is a form for you to make a contribution.)

NCTM BUILDING FUND
1201 - 16th Street N.W., Washington, D.C.

NAME ______________________________

ADDRESS______________________________

______________________, Alberta

Enclosed is ________ (CHEQUES PAYABLE TO "NCTM BUILDING FUND")
(AMOUNT)

Credit Mathematics Council, The Alberta Teachers' Association, in honor of M. E. LaZerte.
