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delta-k

THE ALBERTA TEACHERS' ASSOCIATION MATHEMATICS COUNCIL

Volume XXIV, Number 1 October 1984

Mathematics Council, ATA 24th Annual Conference

"Mathematics for the 21st Century"

October 26 and 27, 1984
Red Deer College

. . . and a happy new school year!

The 1984 Conference of the Math Council
of The Alberta Teachers' Association

"Mathematics for the 21st Century"

Keynote Speaker: Dr. Susan Therrien, Edmonton Public School Board

Sessions and Workshops: Content Sessions, Computers in Mathematics, and General Interest Sessions, with a balanced number of sessions for levels K-12

Friday, October 26th, 1984 (1830 to 2300)
Saturday, October 27th (0800 to 1600)
Red Deer College, Red Deer, Alberta

(For more information, call Patricia O'Connell, 342-3405)

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delta-k

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Contents

	2	MCATA Executive
Ron Cammaert	3	From the President
	4	Announcements
	5	News Briefs
	8	Council Profiles

Reports

The Great Circle	10	Future Studies Workshop

Articles

John B. Percevault	11	The Development of Problem-Solving Skills: Some Suggested Activities (Part II)
Gloria M. Cathcart	17	Let's Solve Problems with LOGO
Gordon Nicol	26	Expecting Girls to Be Poor in Math: Alternatively, Chance for a New Start
W. George Cathcart	28	Microcomputer Corner

Useables

Emil Dukovac	30	Go On a Tangram Holiday
Arithmetic Teacher	35	Ideas

EDPRESS

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From the President

Mathematics educators face a series of unique and difficult challenges. Our clients and the public at large are questioning the quality of education being offered to students. Excellence is a word that is heard frequently when outcomes of education are being discussed. However, in our pursuit of excellence we must be careful not to leave a large group of our students behind.

This problem is further complicated by the fact that our society is changing at an increasingly rapid pace in ways we find hard to predict. Children now being born will not graduate until the 21st century. What will the world be like at that time? Will it be much like it is now or totally different? What mathematics skills will students need? What social problems will the teacher have to deal with?

Another major problem we are now facing is the increasing scarcity of resources. At the moment we are in an economic downturn that has caused everyone, educators included, to reassess their priorities and look for more efficient ways to meet these priorities. It is conceivable that this trend will not be a short-term aberration; therefore, we will have to become even more efficient as renewable resources decline.

In order for the Mathematics Council to help you cope with these problems within your classroom, it needs your assistance. We need to have a dialogue among mathematics educators of Alberta concerning the issues affecting mathematics education.

What do you think should be important in mathematics education? What attitudes, knowledge, and skills do students need to acquire in order to live meaningful, productive, and happy lives? What mathematics do students need to know to function in society? How will we ensure that students achieve an appropriate level of competence in numeracy? Some questions that are perhaps even more difficult than these are: How will we define competence in numeracy? What emphasis should there be on problem-solving skills? What role should technology play in mathematics education? For instance, should we teach students how to factor polynomials, or should we simply teach students how to use a graphing program or spread sheet to find roots? Should all students take the same mathematics courses through secondary school, or should instruction be differentiated? If we differentiate, then at what grade level? Has increased accountability been beneficial to teachers or students?

Make your view known. Write to the editor of *delta-K*, Gordon Nicol; write to the current issues chairperson, Louise Frame; write to me; or write to any other Council members. We want to know how the Council can help you.

Ron Cammaert, MCATA President

Announcements

MCATA Monographs in Preparation

Monograph No. 10 on LOGO is being edited by Geoff Butler, of the Department of Mathematics, University of Alberta. Submissions are invited. Call the editor at 432-3988 for more information.

Monograph No. 9 on Motivation, edited by Tom Schroeder of the University of Calgary, is currently being compiled. Call the editor at 284-6173 for more information.

MCATA Monographs Available

The following publications are available (postage paid):

--*An Active Learning Unit on Real Numbers*, 1970. $1.
--*Monograph No. 1*, "Manipulative Materials for Teaching and Learning Mathematics," 1973. $2.50.
--*Monograph No. 3*, "Metrication--Activities, Relationships, and Humor," June 1975. $3.
--*Monograph No. 6*, "Reading in Mathematics," edited by John Percevault, December 1980. $5.
--*Monograph No. 7*, "Problem Solving in the Mathematics Classroom," edited by Sid Rachlin, April 1982. $6.
--*Monograph No. 8*, "Microcomputer Development," edited by Ron Cammaert, September 1982. $6.

Order from: The Alberta Teachers' Association, Barnett House, 11010 - 142 Street, Edmonton, Alberta T5N 2R1. Please make cheques payable to The Alberta Teachers' Association.

News Briefs

Bouquets

Mathematics prize exams are a "rewarding" means of measuring student achievement in mathematics. The exams measure the students' mastery of various mathematical concepts, and results are compared nationally. In three such contests this school year, the following results were recorded:

1. **Pascal Contest (Grade 9).** Only three Alberta junior high schools, all from the Calgary Board of Education, reached the Canadian Team Honour Roll, a roll that includes the top fifty schools in Canada: Simon Fraser Junior High, Branton Junior High, and Sir John A. Macdonald Junior High. In Alberta, seven of the top 12 schools, out of a total of 21 Alberta schools, were from the Calgary Board of Education.

2. **Cayley Contest (Grade 10).** Western Canada High School was the top Alberta school and also reached the Canadian Team Honour Roll. Three of the top 15 schools on the Team Honour Roll for Alberta were Western Canada High School, Sir Winston Churchill High School, and Lord Beaverbrook High School.

3. **Fermat Contest (Grade 11).** Lord Beaverbrook High School was the top Alberta school on the Canadian Team Honour Roll. Two additional Calgary Board of Education schools, Sir Winston Churchill High School and Western Canada High School, also reached the Canadian Team Honour Roll of 50 schools. These three schools were in the top four schools on the Alberta Team Honour Roll.

--*George Ditto,*
Mathematics Supervisor, Calgary Board of Education

Computer Tech Clearinghouse

--The MECC licence is being continued, and new MECC catalogs are available from superintendents and principals. Additional copies are available from ACCESS for $5.

--Dubs of new authorized mathematics courseware videotape demos are available from ACCESS Alberta, Media Resource Centre, 295 Midpark Way SE, Calgary T2X 2A8 (phone 256-1100). This series of demos is intended to supplement the formal Clearinghouse evaluations. Each tape explains its purpose and organization, summarizes the advantages and disadvantages of the materials, and provides a "walk through" and excerpts, and purchase and warranty information. Call for information.

--If you wish to be on the Clearinghouse mailing list to receive reports, evaluations, and information, contact David Wighton, Clearinghouse Manager, Computer Tech Project, 11160 Jasper Avenue, Edmonton T5K 0L2. The next report will be available in the fall of 1984 and will include results of the assessments of software in math, science, business education, special education, word processing, accounting, computer literacy, and library skills. More than 60 titles are to be listed.

Teacher Inservice Grants

The Government of Alberta has announced it will allocate funds to augment teacher inservice effective 1984 09 01. Upon application, local school boards will receive grants of $9 per pupil in Grades 1 to 12 and $5.40 per ECS pupil. Its policy is to "provide support for teacher inservice which contributes to higher quality education for students by improving teacher performance."

According to the plan, "teacher inservice is intended to raise the level of professional performance." The responsibility for implementation will be shared by schools, school boards, the teaching profession (ATA), including individual members, and Alberta Education. Funds to carry out the current level of teacher inservice provided by school jurisdictions are expected to remain constant. The additional funds are to be used to implement new inservice programs.

Government guidelines for implementation of teacher inservice under the plan include the following:

1. From time to time, Alberta Education may suggest teacher inservice needs which should be addressed by local school jurisdictions.

2. Inservice activities associated with locally developed programs (except for ECS) are not eligible for provincial support and shall remain the responsibility of the local school jurisdiction.

3. The activities and expenditures that do not qualify for provincial support are:

   a) sabbaticals;
   b) attendance by individual teachers at conferences;
   c) university credit courses; and
   d) administrative salaries.

4. Alberta Education will provide a grant on the basis of pupils eligible for SFPF support.

5. In planning an inservice program/activity, local authorities should:

   a) involve teachers in planning, implementing, and evaluating;
   b) focus on competencies that go beyond preservice;
   c) emphasize classroom practice and solutions for teacher-identified problems; and
   d) consider consortium-type project organization.

The Association heartily approves of the Government's inclusion of teachers in the planning, implementation, and evaluation process. This is a golden opportunity for local teachers to identify and assess their own needs and to work with local jurisdictions in achieving improved teaching performance.

Included in the Government's procedures are suggested priorities for 1984/85: computer literacy, gifted and talented, and evaluation. Prior to January 1 each year, Alberta Education is expected to identify its teacher inservice priorities for the coming year.

School boards will be required to develop and maintain on file their education plans. These plans should outline their policies, guidelines, procedures, and intended results, and the way these results will be achieved. The Association hopes that teachers are involved in this process and urges them to provide input into the design of local plans. The Association recognizes that inservice needs are best assessed by the teachers involved in the inservice activity.

Influential Mathematician Honored

Professor John G. Kemeny, Professor of Mathematics and Computer Science and President Emeritus at Dartmouth College, received the honorary Doctor of Laws degree and addressed the Convocation of Founders College, York University, on June 21, 1984.

Professor Kemeny was born in Hungary and received his doctorate from Princeton University where he worked as research assistant to Albert Einstein. He was Professor of Mathematics at Dartmouth College from 1953 to 1970 and also served as Coordinator of Educational Plans and Development and as Chairman of Mathematics. He was President of Dartmouth from 1970 to 1981.

Professor Kemeny has served on a number of committees and boards including the National Committee on Libraries and Information Science, the President's Committee on the Accident at Three Mile Island, and the Carnegie Foundation for the Advancement of Teaching.

He has lectured throughout the world and has written books on topics ranging from computer programming to business applications of finite mathematics to the the philosophy of science. Titles include *Man and the Computer, Introduction to Finite Mathematics,* and *Random Essays on Mathematics, Education, and Computers.*

Math Groaner

by Mary-Jo Maas

How many sugar cubes must be placed into each of three teacups so that each cup has an odd number in it? There are 100 sugar cubes, and you must use all the cubes. Teacups cannot be stacked one inside another. Answer: Place one cube in the first, one in the second, and all the rest in the third. Ninety-eight is definitely an **odd** number of sugar cubes to put into a teacup!

Council Profiles

President

Ron Cammaert, Taber

Ron was born and raised in Calgary where he graduated from the University of Calgary with a BSc in mathematics in 1968. After a further year at university to pick up his education courses, he started teaching at Sunalta Elementary-Junior High School in Calgary. His experience in Calgary also included work at John G. Diefenbaker School and Sir Winston Churchill High School. In 1976, he completed his MEd from the University of Calgary. In 1977, Ron moved to Taber to become principal of Barnwell School. In 1983, Ron joined the staff of Alberta Education as Mathematics Consultant for the Lethbridge Regional Office.

Ron has been a member of the Mathematics Council since 1980, serving as director, monograph editor, vice-president, and president. He is married with four children.

Secretary

Mary-Jo Maas, Fort Macleod

Mary-Jo Maas has taught school for six years: one year in Taber, two years at St. Mary's on the Blood Indian Reserve, and at G.R. Davis in Fort Macleod. She presently teaches math, language arts, and science.

Mary-Jo received her BA in mathematics and BEd in 1978 from the University of Lethbridge and her MEd in math problem solving from the University of Oregon in 1983. She has been secretary of the South West Regional of the Council since its beginning in 1979 and has been secretary of the Mathematics Council for a year. She is presently serving a three-year term on the Mathematics Curriculum Coordinating Committee.

Mary-Jo enjoys sports, camping, reading science fiction, growing plants, finding math jokes that are groaners (see a groaner by Mary-Jo elsewhere in this issue), and riding her motorcycle.

Treasurer

Virinder Anand, St. Albert

Virinder has taught for 23 years, all at the senior high school level in Alberta. He holds MA and BEd degrees, as well as a Diploma in Educational Administration (Alberta), and he is a recipient of a Shell Merit Fellowship.

Virinder has been a member of the Mathematics Curriculum Committee, Alberta Education, since 1971. He has also been involved in many ATA committees and offices at the local level. Among the many PD activities in which he has been involved has been holding the office of treasurer of MCATA. During the summer, Virinder taught at Alberta College.

Newsletter Editor

Dr. Arthur O. Jorgensen, Edson

The newsletter editor sends the following propaganda:

I have been associated with MCATA for so long I don't remember when I started. I feel as if I were secretary since the time of Socrates. Fortunately, Mary-Jo came along to relieve me, or I would likely have been in that position until the Second Coming! I have enjoyed the position of newsletter editor.

The area of math education has interested me for a number of years, and I have been involved with it in a number of capacities which have included teacher at the school and university level, conference speaker, and Alberta Education resource person and textbook editor. I am presently employed as principal of Jubilee Junior High School in Edson, a position I have held off and on for the past 20 years. After 35 years in the classroom, however, I am beginning to think seriously of retirement.

Editor's Note: Art was named Edson Citizen of the Year for 1983 (see the report in the *ATA News* of May 14, 1984). Congratulations, Art! In addition, Art has been assistant superintendent of schools and a consultant for Yellowhead School Division No. 12. He was named School Administrator of the Year in Alberta in 1977. We hope he delays his retirement for a few more years yet.

Journal Editor

Gordon Nicol, Desmarais

Gordon was born and raised in Ontario where he studied philosophy, theology, social science, and teaching, receiving his BA, BD, BEd, and MSc. After seven years in the ministry, he took a leave in order to travel, start a business, and develop other opportunities.

After a two-year international development career in the Caribbean and Central America, he returned to Canada. Gordon joined the teaching staff of Northland School Division in 1977. He has been principal of two schools and is presently a Grade 6 teacher in Mistassiniy School.

Gordon is a volunteer community firefighter and member of the Peekiswetan ("Let's Talk") Crisis Committee. A past treasurer of Northland Local 69, he has been on the Math Council for a year. He is married with three children and enjoys photography, hunting, fishing, travel, and computing.

Future Studies Workshop

Last March, a group of math and science teachers participated in the "Future Studies Workshop" held at the Mathematics and Science Centre in Richmond, Virginia. The instructor was Dr. Cathy A. Kass, director of gifted education at Oklahoma City University. One area of emphasis was problem solving during change and transition in education and society. In another area of emphasis, a sociodrama examined the impact of the computer in the classroom and its effects on students, parents, administrators, and teachers.

Participants went on an "excursion into the future" by imagining what each would be doing in the year 2010 and what each would have accomplished in the years since 1984. Students need to develop certain sets of skills in order to meet the challenges of the 1990s. Some of these skills are in the following areas: computers, communication, creative problem solving, inventing, negotiating, planning and forecasting, research methods, self-directed and experiential learning, learning to "play your own game," and knowing how to exit games imposed by others.

Editor's Note: Thanks to *The Great Circle* 16, no. 3 (May 1984), published by the Greater Richmond Council of Teachers of Mathematics for this item. How many of these skills sets can be mathematized and introduced into classroom problem-solving activities?

Tryout

Look for patterns in the answers:

1 X 8 + 9 =	0 X 9 + 1 =
12 X 8 + 9 =	1 X 9 + 2 =
123 X 8 + 9 =	12 X 9 + 3 =
" " " =	123 X 9 + 4 =
" " " =	" " " =
" " " =	" " " =
123456789 X 8 + 9 =	" " " =
	123456789 X 9 + 10 =

—from the South Dakota Council of Teachers of Mathematics *Newsletter*, Fall 1983.

The Development of Problem-Solving Skills: Some Suggested Activities (Part II)

John B. Percevault
University of Lethbridge

John B. Percevault is an Associate Professor at the University of Lethbridge. During 1982-83, while on administrative leave, he worked with Grade 3-6 teachers in Lethbridge elementary schools. This article presents some of the problem-solving skills and strategies that were used in the schools. Activity 1 ("Reading in Mathematics") and Activity 2 ("Developing Models") were given in Part I (see delta-K *23, no. 2 [May 1984]).*

Activity 3: Collect and Record Data

The spatial visualization activities may also be used to develop the skill of collecting and recording data. Choose a particular configuration and record data. The data from Activity 2 is presented in tabular form below.

Diagram	Number of Rows of 3 Objects	Number of Objects
000	1	3
0 000 0	2	5
0 0 0 0 0 0 0 0	3	7
0 0 0 0 0 0 0 0 0	___	___
	___	___

At the point where the partial table includes the first three sets of data, children may mark the rows of three and count the objects. Challenge the children to complete the next two rows. Have them predict the number of rows and the number of objects that would be required. The recognition of the patterns (counting numbers, and odd numbers starting with 3) is a skill. Extending the pattern to answer a question such as the following begins to develop into a problem-solving strategy: "If 21 objects were arranged in this pattern, how many rows each containing three objects would there be?" Children are challenged to find a short way of determining the number of objects used or number of rows required, in at least two ways. At this level, they are using a problem-solving strategy. For further applications, consider:

1. 5 objects per row

--5 objects
--9 objects
--13 objects
--___ objects
--___ objects
--___ objects

2.

Conditions?
What comes next?

3.

Conditions?
What comes next?

Use real materials, make diagrams, collect and record, search for patterns, extend, look for relations, and predict and generalize.

Activity 4: Recording and Listing

A second set of collecting and recording activities follows: activities relating to addition facts. Skills that are involved are listing, organizing data, and diagramming. The problem-solving strategy that may evolve is generalizing a rule or relationship.

Have children list all the sets of two addends that yield a sum of five. The listing would include: 1 + 4, 3 + 2, 0 + 5, 2 + 3, 5 + 0, and 4 + 1 (not necessarily in this order).

Challenge the students to organize the list. Give the cue to let one addend increase or decrease. The organized list is evident:

0 + 5   Commutative patterns
1 + _   (for example, 0 + 5 and 5 + 0)
2 + _
3 + _
4 + _
5 + _

Repeat the activity with the sum of 6, 7, 8, . . .

Encourage students to diagram the facts. A diagram of the addition facts for a sum of 5 is shown below.

0 + 5 = 5
1 + 4 = 5
2 + 3 = 5
3 + 2 = 5
4 + 1 = 5
5 + 0 = 5

Explore the following after the completion of listing and/or diagramming: How do odd and even numbers differ? If one addend is increased by two, what happens to the other addend? [The compensation principle may be expressed thus: If $a + b = c$, then $(a + k) + (b - k) = c$.] How does the number of 2 addend facts for a given sum compare to the sum $(S + 1)$? These questions will always produce a finite list with $S + 1$ members where "S" is the sum.

Activity 5: Listing – Subtraction

Ask students to list two numbers that produce a difference of two. Accept any and all correct responses, such as:

$$\begin{array}{r} 4 \\ -2 \\ \hline 2 \end{array} \qquad \begin{array}{r} 15 \\ -13 \\ \hline 2 \end{array} \qquad \begin{array}{r} 2002 \\ -2000 \\ \hline 2 \end{array}$$

Many students will realize intuitively that the list is infinite. The teacher may wish to develop an organized list, such as:

$$\begin{array}{r} 2 \\ -0 \\ \hline 2 \end{array} \qquad \begin{array}{r} 3 \\ -1 \\ \hline 2 \end{array} \qquad \begin{array}{r} 4 \\ -2 \\ \hline 2 \end{array} \qquad \begin{array}{r} 5 \\ -3 \\ \hline 2 \end{array}$$

Have students examine the list. Ask them if they can state a relationship. [The compensation principle in subraction may be expressed thus: If $a - b = c$, then $(a + k) - (b + k) = c$.] Have the students use the generalization of compensation in addition.

If $2 - 0 = 2$, then is $(2 + 10) - (0 + 10) = 2$?
If $2 - 0 = 2$, then is $(2 + 20) - (0 + 20) = 2$?

Further examples may be explored, such as:

If $32 - 30 = 2$, then is $42 - 40 = 2$?
Is the answer to $34 - 17$ the same as the answer to $37 - 20$? Which subtraction is easier to perform?

An activity such as the one above can be used to introduce the "equal addition algorithm" for subtraction.

Activity 6: Organized Lists in a Problem

Problem: I am thinking of two numbers. The sum of the two numbers is 13. The difference of the two numbers is 3. The numbers are ___ and ___. Obviously, the elementary student could guess and check. However, a student who has a more organized approach could use the skills developed above. Ask such questions as:

What are we to find? Answer: two numbers.
How are they related? (What is the condition?) Answer: They have a sum of 13.
Is there another condition? Answer: Yes, they have a difference of 3.
How many two-addend addition facts are there for a sum of 13? Answer: 14.
Can you develop an organized list? Answer: Hopefully, yes.
How do you want to organize? Answer: Answers may vary.

The following table may be developed with the students:

Sum of 13	Difference	
13 + 0	13	
12 + 1	11	Look for patterns in addends
11 + 2	9	and in difference columns.
10 + 3	7	
______		How does the difference vary?
______		(By 2). Why?
7 + 6	1	
6 + 7	1	
______		
______		
______	Do we need to do the rest of the table?	
______		
______		
0 + 13		

Assume absolute value only at this stage.

Encourage discussion on how the problem was solved. Answers that indicate students realize that one condition (sum of 13) was satisfied first and then checked in the second condition (difference of 3) show the beginning of a problem-solving strategy, because the problem has been divided into two or more problems.

Vary the conditions. For example,

Sum of 14	Difference of 6
Sum of 14	Difference of 3 (This is impossible. Why?)
Sum of __	Difference of __

Have students work in pairs to make up problems for their classmates to solve.

Activity 7: Counting Patterns

Use the hundred board. Have students count and color every second, third, and so on, square. After the first three rows are completed, encourage the students to look for patterns and to use the patterns to complete the coloring of appropriate squares. Counting by twos and fives is suggested as a starting point. The partial pattern for each is shown.

Counting by twos pattern:

1		3		5		7		9	
11									
21				25					
						47			
								69	
				95				99	

Counting by fives pattern:

1	2	3	4		6	7	8	9	
11	12	13	14		16	17	18	19	
21	22	23	24		26	27	28	29	
				65					
				75					
				85					
				95					

Explore the counting by threes pattern:

1	2		4	5		7	8		10
11					16				
					26				
31									40
41					46				50
					56				
61									70
71					76				80
					86				
91									100

The numerals 3, 6, 9, 12, . . . may be arranged in the format:

3	6	9
12	15	18
21	__	__
__	__	__

After students have extended the format, regular patterns may be explored. Each column increases by nine. The sum of the digits in each column is three, six, or nine. This may not be evident for a numeral such as 39, where the sum of digits is 12. However, 12 is found in the column that sums to three.

Further questions may include:

Is 47 a multiple of three (included in the counting by threes table)? Justify your answer.

Can you place 81, 42, and 96 in the appropriate column? Justify your answer.

Find the "counting by nines" on the hundred board and in the table.

The counting by eights pattern is given below:

								9	10
11	12	13	14	15					20
21									
31									
						97	98	99	100
101	102	103	104	105	106	107	108	109	110

Again, encourage students to explore alternate arrangements, such as the following:

8, 16, 24, 32, 40,
48, 56, 64, etc.

See the next issue for activities on organizing data--multiplication, and a sample problem and solution.

Let's Solve Problems with LOGO

Gloria M. Cathcart
Landsdowne School

Problem solving and computer applications are two areas receiving the focus of our attention at this time. In *An Agenda for Action*, published by the National Council of Teachers of Mathematics (1980), Recommendation 1 states that "problem solving [must] be the focus of school mathematics in the 1980s," and Recommendation 3 states that "mathematics programs [must] take full advantage of the power of calculators and computers at all grade levels." In an attempt to correlate problem solving and computer programming in LOGO, both were chosen as the core of a three-month enrichment project for Grade 6 students at Landsdowne School.

A total of 14-16 hours was spent on the project. Students usually had one hour per week of school time plus one-half to three-quarters of an hour of early morning time to devote to the project. Each of the five students in the group had access to an Apple computer, and one printer was available.

Major Objective

The major objective was to have upper elementary pupils provide computer (LOGO) solutions to the problems deemed appropriate, which appear in the elementary mathematics problem-solving curriculum.

Minor Objectives

The minor objectives were as follows:

1. To make a selection of problems from: "Problem-Solving Elementary Math Levels D-F" (Edmonton Public Schools), *Let Problem Solving Be the Focus* (Alberta Education), and other sources, if necessary.

2. To determine the necessary LOGO primitives, procedures, and understanding that are required by pupils prior to tackling the solution of these problems using LOGO.

3. To solve and store solutions to problems.

4. To relate solutions to similar problems or to extend them to more complex problems.

5. To record further LOGO knowledge required and acquired as problems are dealt with.

6. To record unplanned instances in which students learned something new or found new applications for LOGO.

7. To gain some idea of the time involvement necessary to accomplish the above.

Procedures

1. Grade 6 students with no previous LOGO experience were the participants.

2. Charts were prepared to provide students with information on LOGO primitives and their application.

3. Introductory sessions gave students time to explore and discover LOGO turtle graphics, as well as some experience in handling text and numbers.

4. Application of LOGO to the elementary problem-solving curriculum was made.

5. One hour per week of "hands on" time was allotted. This was increased after the third week, at the request of students.

Outcomes

1. A set of LOGO charts.

2. A set of mathematics problems suitable for computer solution.

3. A list of necessary primitives and procedural methods required by students.

4. Computer solutions to the problems.

5. A collection of other problems that relate to LOGO.

6. A guide to the time allotments involved in such a project.

Pupils Involved

A group of five pupils composed the Grade 6 enrichment group. These pupils were selected by the homeroom teacher on the basis of their general achievement and ability. There were two girls and three boys. One boy (I will call him "G") had no computer experience prior to our first session. The other four had all done some programming in BASIC as a part of their computer literacy program in Grade 5.

As was expected, "G" required extra help and some additional time to keep pace with the others. He was much more inclined to work in "IMMEDIATE" mode and had to be encouraged to write procedures so he would have something to save at the end of the session. He was a very bright boy and had a good mathematical understanding of the problems.

Selection of Problems

The following resource materials were used as the source of problems: *Problem Solving Elementary Math Level D* (Edmonton Public School Board), *Problem Solving Elementary Math Level E* (Edmonton Public School Board), *Problem*

Solving Elementary Math Level F (Edmonton Public School Board), and *Let Problem Solving Be the Focus* (Alberta Education).

From the four problem-solving documents, 31 problems were selected as being suitable for solution on the computer using LOGO. It was found that the majority of the problems appeared to be inappropriate for LOGO solutions.

The 31 problems fell into the following categories:

a) pyramid building--four problems
b) ball falls and bounces--three problems
c) mix and match--five problems
d) squares on a checkerboard--four problems
e) handshake--five problems
f) pigs and chickens--six problems
g) miscellaneous--four problems

The problems that were solved by the group are included in Appendix A.

Required LOGO Primitives and Procedural Methods

Before Division II pupils can begin to write LOGO solutions for the problems in our problem-solving manuals, an understanding of and experience with LOGO is required. Approximately seven hours were spent introducing the LOGO language and philosophy, allowing pupils time for discovery. Considerably more time could have been spent in discovery and exploration, but there were some time constraints to this problem solving project. The only session that resembled a formal lesson was the one on the LOGO Editor. Other ideas were presented by way of charts or by challenging pupils to try a primitive and see the results.

As is often done, one of the first shapes drawn in LOGO was the square. Throughout our learning of LOGO we came back to the familiar square to learn and apply our new ideas, primitives, procedures, and variables. The square was used to introduce "REPEAT"; to design our first procedure--"TO SQUARE"; to learn about variables--"TO SQUARE :SIZE"; and to help teach the lesson on the editor.

Material Covered Prior to the First Problem

Primitives	**Activities**
FD BK RT LT CS ST HT REPEAT x [what]	Explore
PU PD PE <CTRL> S <CTRL> L <CTRL> T	Using transparencies of lakes, take the turtle for a walk.
Procedures TO Name (What the turtle is to do) END	Write procedures to make squares and/or triangles and polygons.
Editor ED or EDIT "Name - to enter CTRL C - to close or exit CTRL N, P, B, F, A, E, D, K, ●	

Variables | Use appropriate names

Variables	Use appropriate names
:SIZE	Provides flexibility
:NUM	Provides counters
:COUNTER	

File Handling
SAVE "Name
LOAD "Name
POTS
POPS
ERALL

Launching the First Problem-Solving Task

A total of three to three and a half hours was spent on the first problem. The problem was:

Making a Mountain

> Randy's whole class is making a human pyramid. Seven students are on the bottom layer, six on the next layer, and one student less on each layer above that. How many students are there in Randy's class?

Computer Solution to the Pyramid Problem

1. Understanding the Problem
   a) Understand the mathematics problem
   b) Develop a plan--diagram
                     --simplify
   c) Carry out the plan

2. Developing a Plan
   a) Design a square
   b) Design a row of squares
   c) Move and repeat rows (one square less each time)
   d) Position first square
   e) Count squares and print out total

3. Carrying Out the Plan

4. Looking Back

To become acquainted with the problem, students discussed it and drew a diagram of it. At this point, the mathematical problem could easily have been solved. Pupils appeared to be at Step 3 in Polya's model, but were actually still at Step 1 in terms of finding a computer solution. We must agree, then, that there is value in finding a computer solution beyond just finding the mathematical solution. There is value, for example, in having students find a computer solution and then apply the method to other problems. There is value also in having students think logically and solve the subproblems as the computer solution is being designed and written.

Once the plan started to develop, pupils were anxious to carry it out. Thus, the plan developed as far as Step 2b, and then that part was implemented. This went smoothly, and at the end of the 45-minute period, everyone had succeeded in designing a row of squares on the screen.

The next part of the plan, Step 2c, was obvious. The "what" was obvious, but not the "how"! At this point, there was much traversing between Step 2 and Step 3. Before the hour was done, further LOGO instruction was needed in how to assign a variable to count the blocks in each row. Lots of group discussion took place, and everyone except "G" had a superprocedure that would draw a pyramid with any number of blocks in the base. Step 2c of the plan was now complete.

A half-hour session the next morning was needed to carry out Part 2d of the plan. The SETPOS primitive was introduced and a chart of the screen grid explored. This allowed for proper placement of the first block of the pyramid.

Carrying out Step 2e of the plan required another variable to count the actual number of blocks used. Some time and experimentation were required to locate this counter correctly. The primitive PRINT was introduced and used. The need to set variables in the superprocedure was discussed. There was joy and relief when all worked. (At this point, "G" was the only one who had not completed the procedures.) Students spent some time "looking back," but not a lot of interest or enthusiasm was shown for this step.

An extra half hour was given to "G", during which time he completed his procedures--a worthy piece of work. His was the only one that allowed the user to determine the size of the blocks in the pyramid, as well as their number! His procedures and a graphics dump of his solution are included in Appendix B.

Additional Concepts Students Learned About LOGO and Mathematical Manipulations

Additional LOGO Concepts	**Mathematical Ideas**
MAKE "NUM :NUM - 1	Counting, number patterns
IF :NUM = 0 [STOP]	Four basic operations
PRINT	Coordinate grid system and x, y values
TYPE	Degrees and angles
SETPOS [x y]	Formation of geometric shapes
SETX	
SETY	
WAIT	

Time Allotment

Most students spent 14 to 16 hours on the project, although some students spent more. Seven hours were spent initially on introductory knowledge of LOGO. Three to three and a half hours were spent on the first mathematics problem to be solved. An additional four to six hours were spent on subsequent problems. After solving the pyramid problem students could work on the same problem as another student or work on a problem of their own.

Difficulties Encountered

Need for Many Variables

Right from the beginning, pupils wanted to make their solutions as universal as possible. Considering the time required to write computer solutions, this was a wise decision. Pupils very quickly were involved in handling variables and enjoying the flexibility that resulted. However, they found the task of identifying, defining, and applying necessary variables a bit onerous at times.

Applying an Old Procedure to a New Problem
Trying to adapt an old procedure to fit a new, similar problem appears to be difficult and undesirable. A fresh start, rather than editing the first attempt, was more appealing. Of course, there was much content from the first attempt repeated in the second.

Need for Counters
Using one counter was not that difficult, but having a number of counters did cause some head scratching. Often, more than one attempt at placement was required in order to have the counter function as desired.

Using Recursion
Using tail-end recursion was understood and enjoyed. Using a recursive procedure within a recursive procedure (Could this be called an embedded recursion?) was a challenge. The use of a REPEAT within a REPEAT was previously used.

Conclusions

If at any point along the way the project had been stopped, the students would still have benefited from the project. Much more time could profitably have been spent on the project in furthering the understanding my students and I have of LOGO and problem solving.

Writing computer solutions to the problems chosen definitely provided a challenge to the students with whom I worked. I would not want to tackle this project within similar time constraints with the slower students in the class. However, there are many applications of LOGO that would be very profitable for the average student.

Working through this project has revealed many areas of the mathematics program that are involved in problem solving with LOGO. Further time for exploration in other areas, such as geometry, coordinate geometry, and number patterns, would be beneficial. Throughout the sessions, pupils were enthusiastic and ambitious. After the third hour of classes, an 8 a.m. session was established at the request of the students. During the fifth hour of classes, there was much excitement generated when Mike, a student, discovered that spinning a square filled a circle.

In the eighth hour of classes, when our first problem-solving problem (We had truly solved many problems by this time!) was introduced, we had what was probably our most verbal session. There were times of excitement and of discouragement. The level of the group's interest, enthusiasm, and effort stayed high throughout the project.

Some opinions about the project were given by students. Although neither LOGO nor BASIC was clearly the preferred language in which to program, and although neither was better liked, LOGO was the one seen to relate closer to the rest of the school work. All students enjoyed their work in LOGO. The only dissatisfaction expressed was by one student in regard to a difficult problem. Also, the majority of students stated that they would prefer to work with a partner.

Appendix A

Problems the Group Solved

Pyramid Building. Randy's whole class is making a human pyramid. They put seven students at the bottom, six students on the next layer, and one student less on each layer above that. How many students are there in Randy's class?

A man has 55 concrete blocks. He wishes to build a set of stairs by piling them up so there is no empty space under each step. How many steps will there be in the stairway?

Ball Falls and Bounces. A rubber ball is dropped from a height of 16 m. Each time it lands, it bounces to a height half the distance from which it last fell. The ball is finally caught when it bounces to a height of 1 m. Find the total distance the ball travels.

Mix and Match (Branching). A couple has three children. Each child has two children. How many grandchildren are there?

Willy has four pairs of sweatpants and three different T-shirts in his dresser. How many different outfits can he wear?

Squares on a Checkerboard. How many squares are there in an 8 X 8 checkerboard?

Handshake. The Bear family has a family reunion. Each member of the family arrives separately. As they arrive, they shake the paw of each bear already there. If there are 11 bears in the family, how many paw shakes occur?

Pigs and Chickens. Farmer Brown has some pigs and chickens, 18 in all. If the animals have 48 legs altogether, how many pigs and how many chickens does Farmer Brown have?

Appendix B

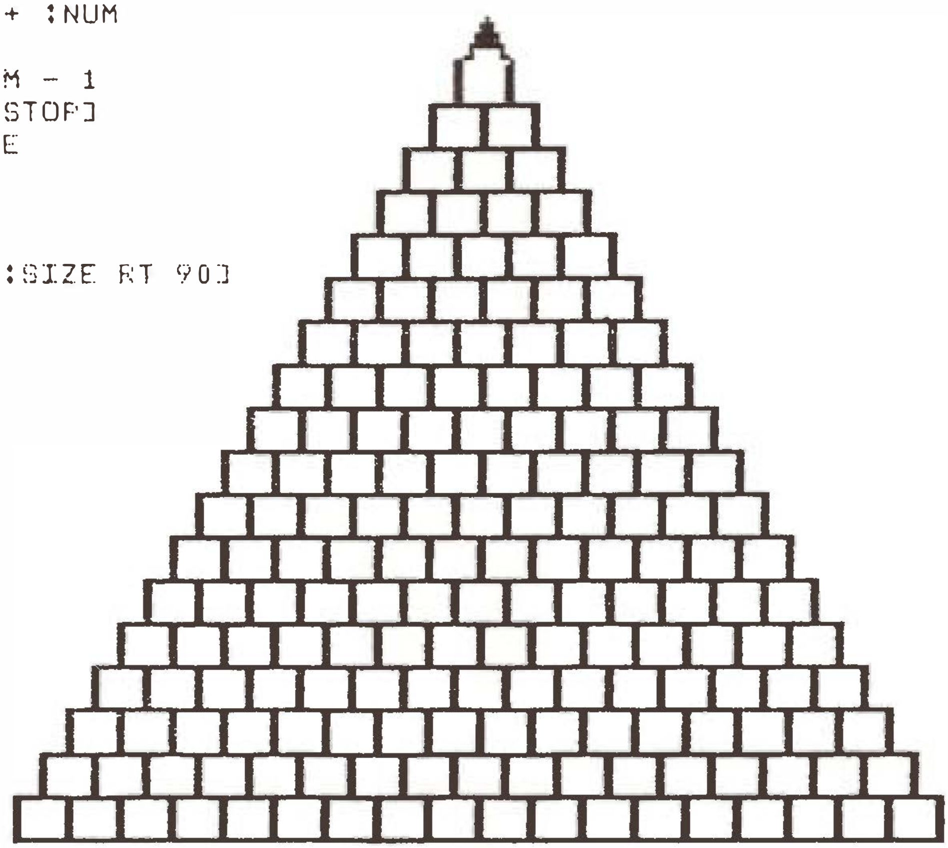
Solution to the Pyramid Problem

NOTE: The solutions to the other problems have not been included so that teachers and their students will have the opportunity to experience the thrill of learning how to develop LOGO solutions.

```
?PO [PYR ROW SQ]
TO PYR :NUM :SIZE
MAKE "BL 0
PU HT
SETPOS [-115 -75]
PD
ROW :NUM :SIZE
ST
END

TO ROW :NUM :SIZE
REPEAT :NUM [SQ :SIZE RT 90 FD :SIZE LT 90]
FD :SIZE LT 90 FD :SIZE * :NUM - .5 * :SIZE
RT 90
MAKE "BL :BL + :NUM
PRINT :BL
MAKE "NUM :NUM - 1
IF :NUM = 0 [STOP]
ROW :NUM :SIZE
END

TO SQ :SIZE
REPEAT 4 [FD :SIZE RT 90]
END
```



```
PYR 18 10
PRINT :BL 171
```

```
?.PRINTER O?PYR 7 25
7
13
18
22
25
27
28
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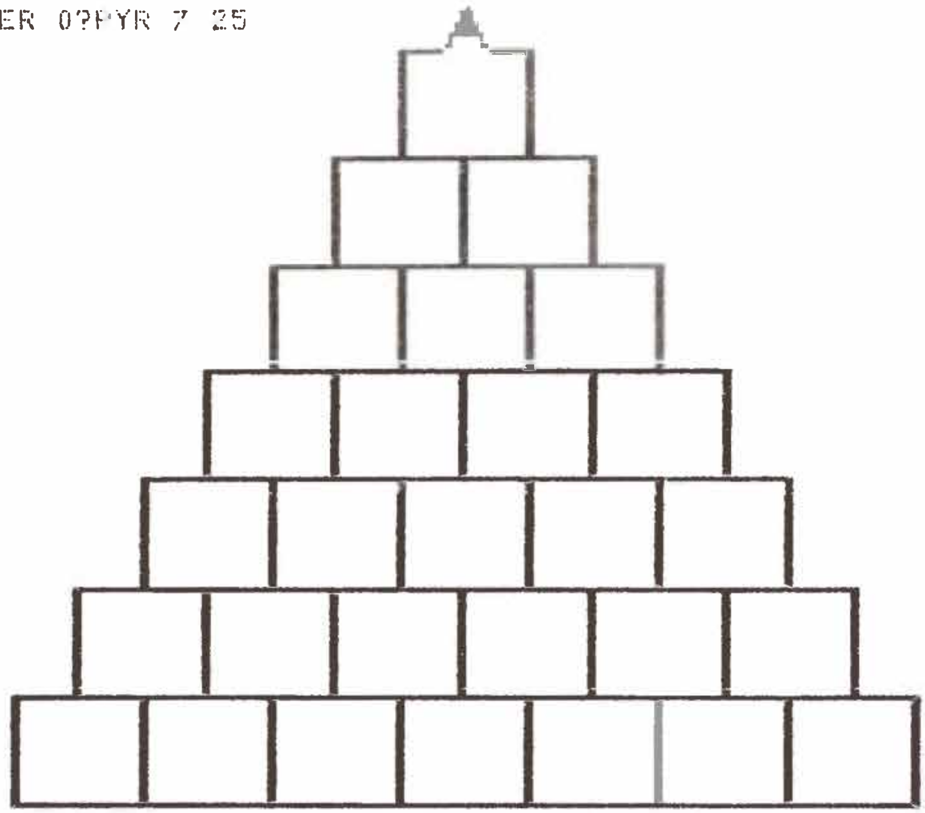
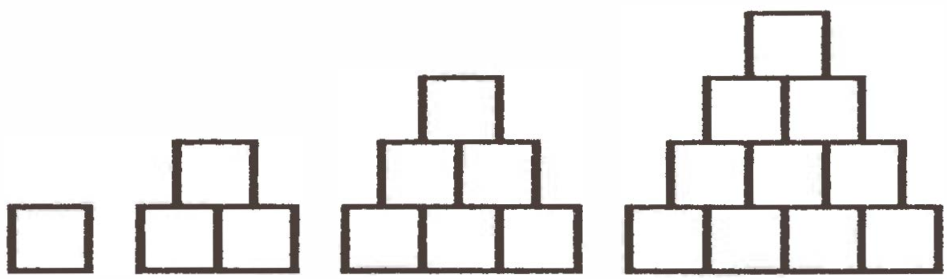
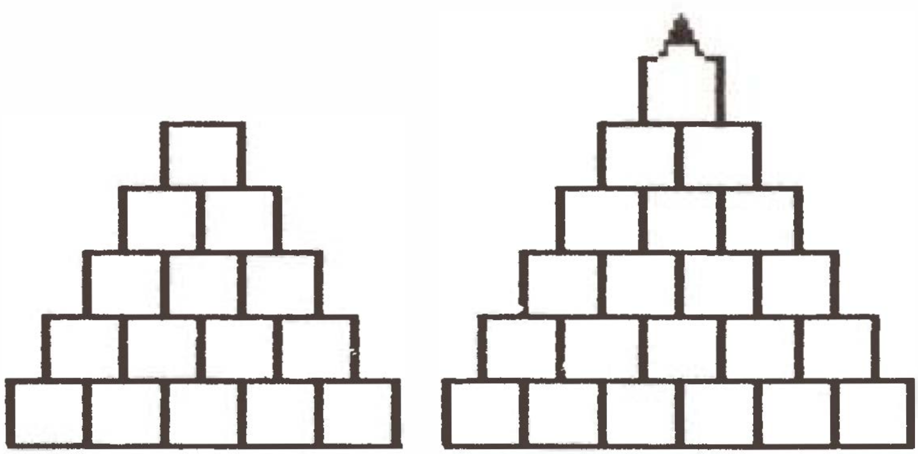






Expecting Girls to Be Poor in Math: Alternatively, Chance for a New Start

Gordon Nicol
Mistassiniy School, Desmarais

Janet Ferguson, federal Minister of Science and Technology, told a conference recently that "half-baked myths about their lack of mathematical ability are responsible for girls dropping out of sciences in high school." Women from across Alberta heard the statement during a three-day conference sponsored by a university organization, Women in Scholarship, Engineering, Sciences and Technology.

The Minister said that during her travels through offices and campuses in Canada, she found "shockingly few women in professional and management positions" and that "girls need more opportunities to play with tools and explore their environments." More than ever, women must understand the impact of technology. "We need to examine our behavior and think about the ideas we're giving to our daughters. . . . Today, every human is living a life that is drastically altered every minute by science and technology," Ferguson said.

In light of these statements and in light of new federal and provincial initiatives aimed at producing realistic and lasting change, this old topic deserves a fresh look. So important a matter is this to the National Council of Teachers of Mathematics that it produced an official position statement on the subject, as quoted below in its entirety:

The Mathematics Education of Girls and Women

> The National Council of Teachers of Mathematics is committed to the principle that girls and women should be full participants in all aspects of mathematics, both as students and as teachers.
>
> Often employment opportunities and continuing educational progress are closed to many young women because of powerful social influences that discourage them from continuing their study of mathematics beyond that required by school policy. Mathematics educators, therefore, must make individual and organizational commitments to eliminate psychological as well as institutional barriers to women in mathematics. Innovative ways must be explored to convince both students and parents of the vital importance of continuing to take mathematics courses so as to keep open both educational and career options.
>
> Each school or school system that does not have an equal proportion of the sexes in its most advanced mathematics classes should examine both its program and its faculty for influences that lead to "math avoidance" by girls and young women. The teacher is in a key role to stimulate and encourage students to continue the study of mathematics. Teachers at all

educational levels must take positive steps and use appropriate learning materials and experiences to overcome the mistaken notion that mathematics is a male domain.

Suitable programs, adequately financed, must be developed to promote the mathematical education of females. Both simple justice and future economic productivity require that we do so without further delay (April 1980).

It's really not enough for us to admit there is a problem, unless we are prepared to commit a significant amount of resources to remedy the situation. NCTM has, in fact, led the way for us by preparing a program called *Multiplying Options and Subtracting Bias*, consisting of videotapes and workshops.

Shirley Hill, former NCTM President, says that two essential conditions for the solution are (a) an increased awareness of the realities and options on the part of young people (both male and female), parents, teachers, counselors, and others who advise and influence them, and (b) intervention with systematic, deliberate programs to change fallacious beliefs and remove barriers to free choice.

The program preface indicates that it is not enough merely to *tell* females about the importance of mathematics in keeping career and life goals open, nor is it sufficient to *ask* females to change their behavior without changing the complex and embedded societal beliefs and forces operating on them. Rather, the handbook points out that the educational environment, consisting of the significant groups of math teachers, counselors, parents, and male and female students, needs changing. *Multiplying Options and Subracting Bias* "was designed and developed to change these significant groups' beliefs about women and mathematics as well as to change each group's behavior.

The 192-page handbook introduces the preparation, rationale, objectives, and format of the workshops, qualifications and selection of facilitators, and the evaluation of workshops, format guides, and facilitator resources. These resources include a validation report of the videotape *Multiplying Options and Subtracting Bias* and selected reprints, including *Sexual Stereotyping and Mathematics Learning* (Fennema and Sherman), *Multiple Levels for Change* (Sells), *Math Anxiety* (Zanca), *Counselling the Math Anxious* (Tobias and Donady), and *The Power of the Raised Eyebrow* (Burton). Also included are an annotated bibliography, *Mathematics/Science Intervention Strategies for Female Students* (Fennema, Caretta, and Pedro), and evaluation instruments.

The program includes a student workshop, a teacher workshop, a counselor workshop, and a parent workshop, each of which includes an overview, activities, frequently asked questions or comments with suggested responses, overhead masters, handout masters, and a 30-minute videotape available in four formats.

Now is an opportune time to provide a full hearing of the subject. Anything less would be unfair, inconsiderate, and perhaps negligent. After all, mathematics is everybody's business.

Microcomputer Corner

by W. George Cathcart

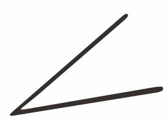
"LOGO and Line Constructions"

1. Write a LOGO procedure that will draw a line of any length specified by the user.

   Example: TO LINE :LEN

2. Use your line procedure along with any other necessary LOGO commands to construct

   a) two line segments, each 60 turtle steps long, which form an angle.



   b) a 50-step line segment that intersects an 80-step line segment.

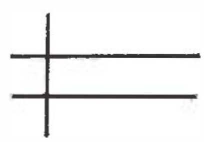
   c) two 100-turtle-step parallel line segements, 40 steps apart.

   d) a 45-step line segment that is bisected by a 75-step segment but not perpendicular to the first.

e) a 40-step line segment that is a perpendicular bisector of an 80-step line segment.

f) two 90-turtle-step parallel line segments, intersected (not at 90°) by a third line segment.

g) two parallel line segments intersected perpendicularly by a third line segment.



3. Compare your procedures with the procedures designed by some of your friends.

Tryout

1. Of five pieces of paper, some pieces are torn into five smaller pieces. Some of these smaller pieces are further torn into five smaller pieces, and so on. Can this process produce exactly 1984 pieces of paper? How?

—Mark E. Saul, Association of Teachers of Mathematics, New York City

2. If Hildegard's age is multiplied by the age of her mother, the product is a permutation of the digits in their individual ages. How old are they? Why is the product of their ages an "interesting number"?

--Source unknown

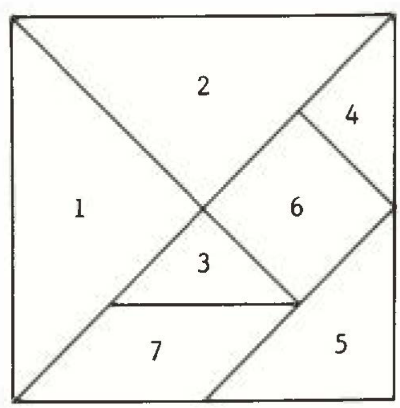
Go on a Tangram Holiday

Emil Dukovac
Kapuskasing, Ontario

A tangram is a puzzle composed of seven parts called tans. Tans are formed by cutting a square and its interior into five triangles, a square, and a parallelogram as shown. The angles of the tans are 45, 90, or 135 degrees. The area of the large triangle is four times that of the small triangle.

Materials

Construction paper with the tan square on it and a pair of scissors to cut out the different tans.



Aims

1. To have some fun.
2. To review some basic geometric shapes.
3. To discover the relationship among the shapes.
4. To review Pythagorus' Theorem.
5. To review perimeter and area.
6. To introduce radicals.
7. To recall the concept of congruence.

Activity 1

Fold a square piece of paper to form the seven tan shapes. This is a good activity for shape recognition. This activity has been successfully done by a mixed class of Grade 7 and 8 students as well as by Grade 9 general and advanced classes.

Activity 2

The objective is to discover the relationship among the shapes and introduce the concept of congruence, equal in all respects.

Note $\triangle 1 \cong \triangle 2$, $\triangle 3 \cong \triangle 4$, $\triangle 5 = 2\triangle 4$, $\triangle 5 = 2\triangle 3$,
$\triangle 5 = 1/2\triangle 2$, $\triangle 5 = 1/2\triangle 1$, $\triangle 3 = 1/4\triangle 2$,
or $\triangle 2 = 4\triangle 3$

Prove that figures 5, 6, and 7 have the same area. Hint: use $\triangle 3$ and $\triangle 4$; with these tans you can build figures 5, 6, and 7.

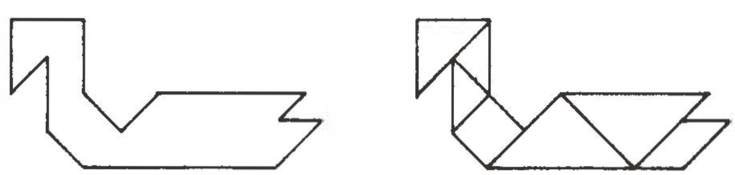
Activity 3

The object of this activity is to have some fun and to give an opportunity to some of the lesser lights to shine in class.

Materials needed: the seven tans and a tangram picture.

The object of the puzzle is to put the seven tans together to form outlines of all sorts. You must use all seven pieces and you may not overlap the tans. Look at the tangram pictures below. How can you arrange the seven tans to form each of them?

I encourage the students to do this activity at the kitchen table with the whole family participating. In this way, the student is back for more puzzles to complete. Some educators would argue that this is an excellent right-brain hemisphere activity.



duck

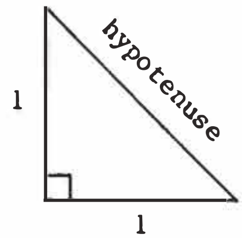
bear

The completed tangram puzzles make for a colorful bulletin board. Once the student has outlined the seven tans, have him or her color them.

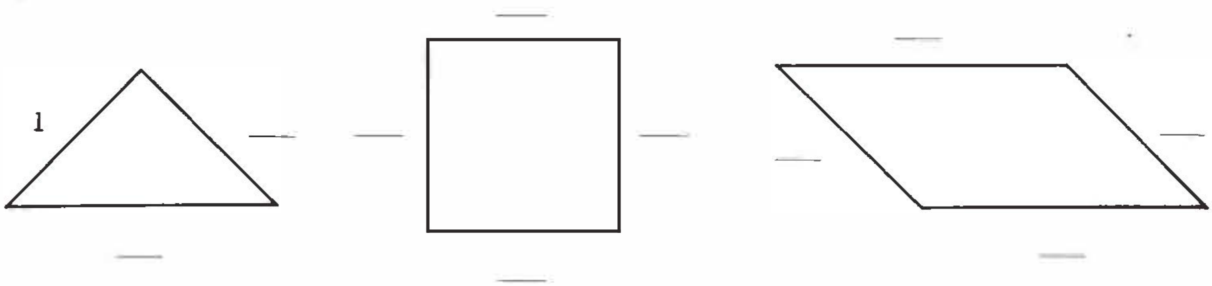
Activity 4

The objectives here are, first, to review Pythagorus' Theorem: for any right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides; and, second, to establish the relationship of the different sides of the tans.

$h^2 = 1^2 + 1^2$
$h^2 = 1 + 1$
$h^2 = 2$
$|h| = \sqrt{2}$
$|h| = 1.414$



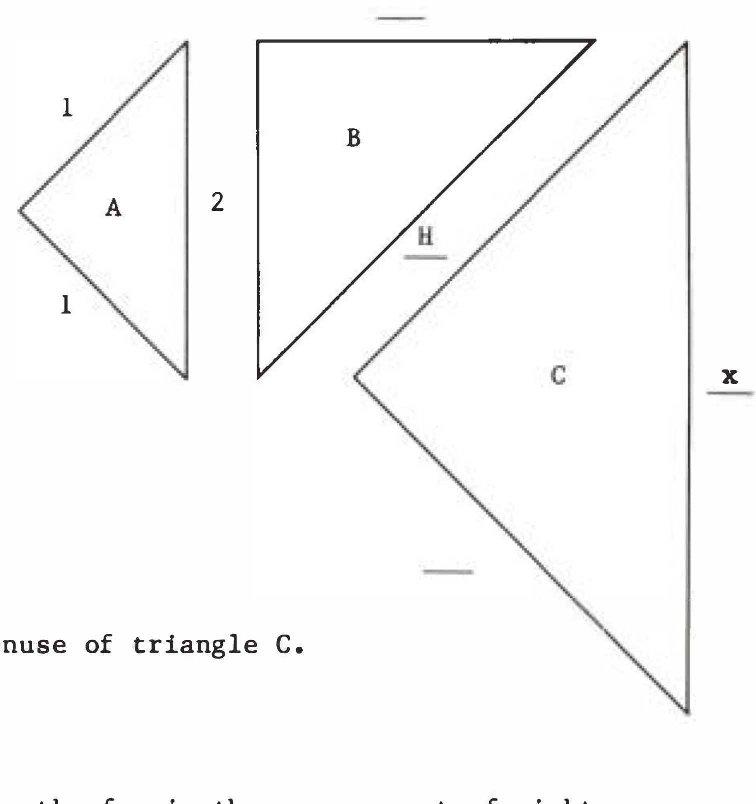
Complete the labeling.



Use Pythagorus to find the hypotenuse of triangle B.

$H2 = \sqrt{2}^2 + \sqrt{2}^2$
$H^2 = 2 + 2$
$H^2 = 4$
$|H| = \sqrt{4}$
$|H| = 2$

Note $\sqrt{2}^2 = \sqrt{2} \times \sqrt{2}$
$= \sqrt{2 \times 2}$
$= \sqrt{4}$
$= 2$



Use Pythagorus to find the hypotenuse of triangle C.

$x2 = 2^2 + 2^2$
$x^2 = 4 + 4$
$x^2 = 8$
$|x| = \sqrt{8}$ ⟶ Read: the length of x is the square root of eight.
$|x| = \sqrt{4} \times \sqrt{2}$ ⟶ Read: the length of x is the root of four, times the root of two.
$|x| = 2 \times \sqrt{2}$ ⟶ Read: the length of x is two roots of two.
$|x| = 2 \times 1.414$
$|x| = 2.828$

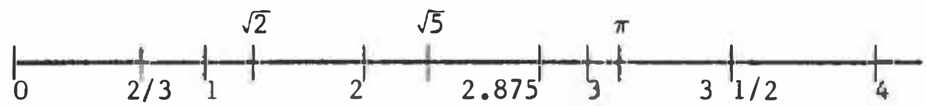
Activity 5

The objective here is to get a feel for irrational numbers. Hold up the small triangle from the ends of the hypotenuse; between your fingers is the length of an irrational number. Is it real? It's between my fingers and I can feel it; you're darn right it's real. It is the square root of two, $\sqrt{2}$.

What are radicals? Radicals are irrational numbers. Place the following on the real number line: 2/3, $\sqrt{2}$, $\sqrt{5}$, 2.875, and 3 1/2.

Irrational numbers

Rational numbers



The irrationals in union with the rationals comprise the reals.

Activity 6

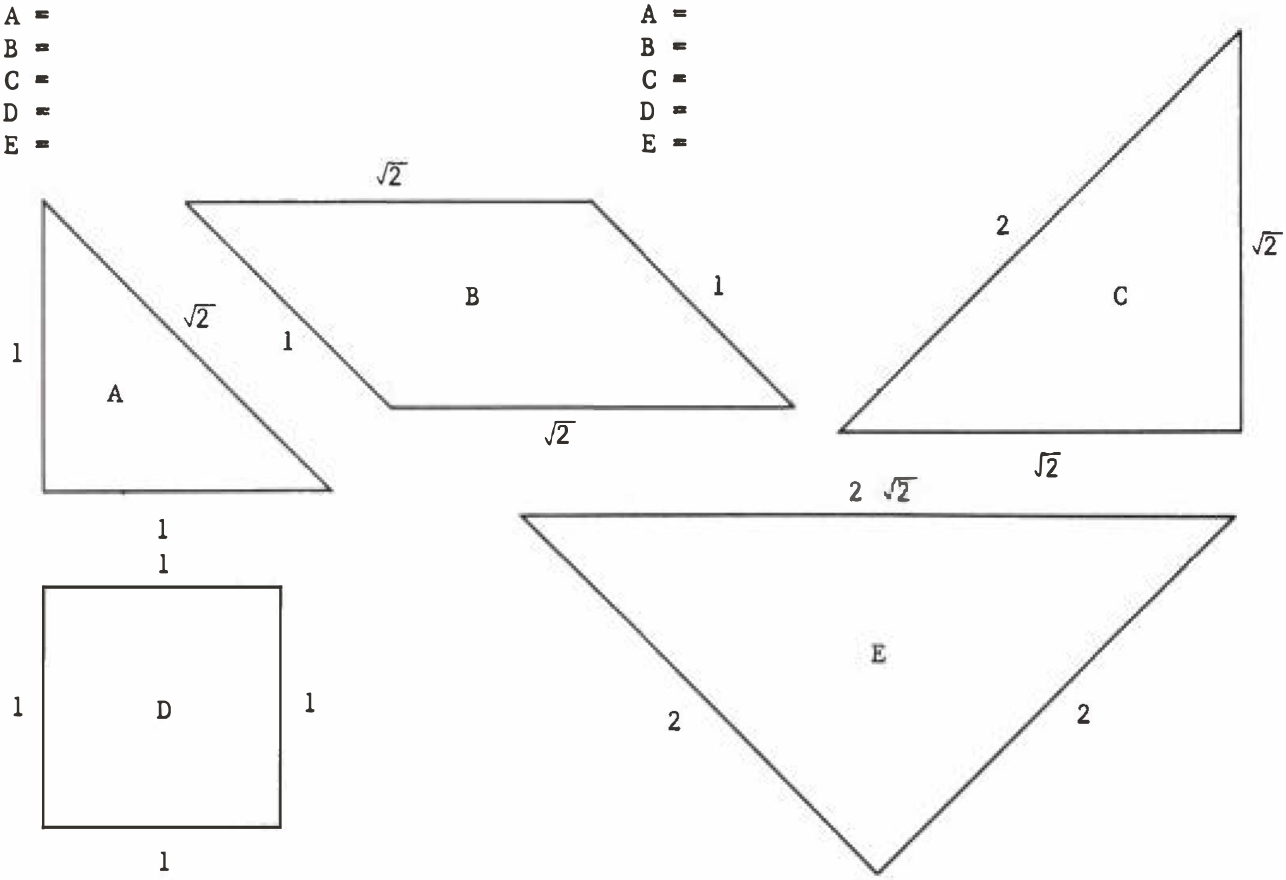
The objective here is to get comfortable with radicals while finding the perimeter and area of the tan shapes. See the figures below to complete the chart.

Perimeter of

A =
B =
C =
D =
E =

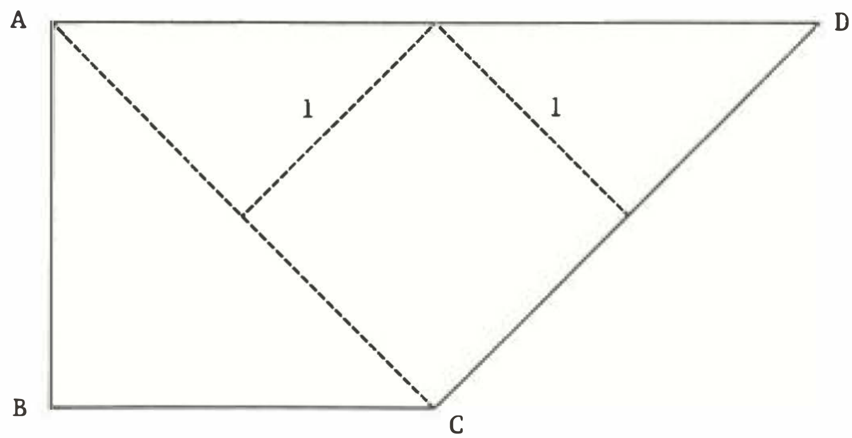
Area of

A =
B =
C =
D =
E =



Activity 7

First, do some mental calculations or manipulations of the shapes below in order to find the area of the figure ABCD. Second, recall the area formula for a trapezoid and use it to verify your answer.



The answer is three. The area of the square is one, the area of the two small triangles is one, and the area of the middle-sized triangle is one; therefore, the area of the trapezoid is three.

Use the formula to verify this answer. The area of a trapezoid is the average of the two parallel sides times the perpendicular distance between them.

$$\frac{AD + BC}{2} \cdot AB = \frac{2\sqrt{2} + \sqrt{2}}{2} \cdot \sqrt{2} = \frac{3\sqrt{2}}{2} \cdot \sqrt{2} = \frac{3 \times 2}{2} = 3$$

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Ideas

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IDEAS for this month reinforces computational skills involving fractions and decimals. These skills are presented in a winter sports setting (the Olympic Games).

IDEAS

For Teachers — Levels 1, 2

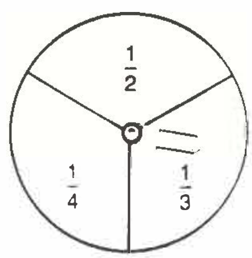
WIN BY A FRACTION!

Objective

To provide practice in recognizing fractional parts

Directions

1. Duplicate a copy of the game board for every two students.
2. Show students how to make a spinner using a paper clip attached to a paper fastener.



3. Have students cut out the bobsled markers.
4. Read the directions with the students.
5. Make sure students understand they must *color* the fractional part indicated by the spinner.
6. Tell students they must color the final flag to win the race.

Going further

1. To get ready for equivalent fractions, make sure that students understand that if the spinner points to 1/2, they may color two-fourths.
2. Have students complete a second run down the hill, filling in fractional parts that were not completed on the first run.
3. Have students continue going back down the hill until all fractional parts are colored. Develop the understanding that two-halves, three-thirds, or four-fourths can complete an entire flag.
4. Change the fractions on the spinner to 1/2, 2/3, and 3/4 and then have the students color accordingly.
5. Increase the fractional parts on the flags to sixths, eighths, and tenths.

(By drawing dividing lines, the 1/3 can be changed to 1/6, 1/4 to 1/8, and 1/2 to 1/10.)

Answers

Answers will vary.

For Teachers — Levels 3, 4

HOW FAR DOWN FRACTION HILL?

Objective

To offer experience in comparing fractions

Directions

1. Reproduce the worksheet for each student.
2. Review the fractional parts shown in the columns under each jumper's number.
3. Read the directions to the students.

Each IDEAS presents activities that are appropriate for use with students at various levels in the elementary school. The activity sheets are so arranged that they can be easily removed and reproduced for classroom use. Permission to reproduce them for such use is not necessary.

4. Discuss how to use the chart to answer the questions for flags 2 and 3.

Going further

1. Have the students list the jumpers' progress in order from least to greatest.

2. Have the students tell how much farther each jumper would have to go to win or to tie with the other jumpers.

Answers

2

a) Jumper 121 went $\frac{4}{5}$.
b) Jumper 119 went $\frac{1}{3}$.
c) Jumpers 118, 120, and 123 went $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$, respectively.

3

118 > 119	119 < 120	123 < 124
121 > 123	122 > 123	

IDEAS

For Teachers — Levels 5, 6

SLALOM SUBTRACTION

Objective

To give practice in subtraction and comparison of decimals, using time and decimal representations of metric lengths

Directions

1. Reproduce the worksheet for each student.

2. Review the directions with the students.

3. Have the students complete the word problems (1–6) after they finish the slalom subtraction examples.

4. You may want to provide the students with slalom times from the most recent winter Olympic Games.

Going further

1. Have students determine the differences in length between the slalom and the giant slalom by visiting a local ski slope or checking a library resource book.

2. Have the class compare race times for running 220 m with the skiing times. Why is the 220m slalom time slower?

3. Have your students make a table of times and winners for a winter Olympic race of their choice. Have them create and solve three problems based on the data they've selected.

Answers

Women's	*Men's*
27	20
1:21	40
1:48	1:40
2:01.5	2:20
	2:40
	3:20

1. 70 m
2. 19.17
3. 6 seconds
4. 1:7.5
5. Women's—50 seconds; men's—1:56
6. Answers derived from results were not available at press time.

IDEAS

For Teachers — Levels 7 and 8

OLYMPIC CALORIE BURNING

Objective

To provide experience in multiplying whole numbers by decimals

Directions

1. Reproduce the worksheet for each student.

2. Review the multiplication of whole numbers by decimal numbers (hundredths).

3. Read through the practice examples with students.

4. Have students complete problems 1–8.

5. Consider allowing the students to use a calculator for this activity.

Going further

1. Have students work examples with calories burned per hour.

2. Have students look up actual times recorded for the three Olympic events and calculate calories burned per kilogram for each event.

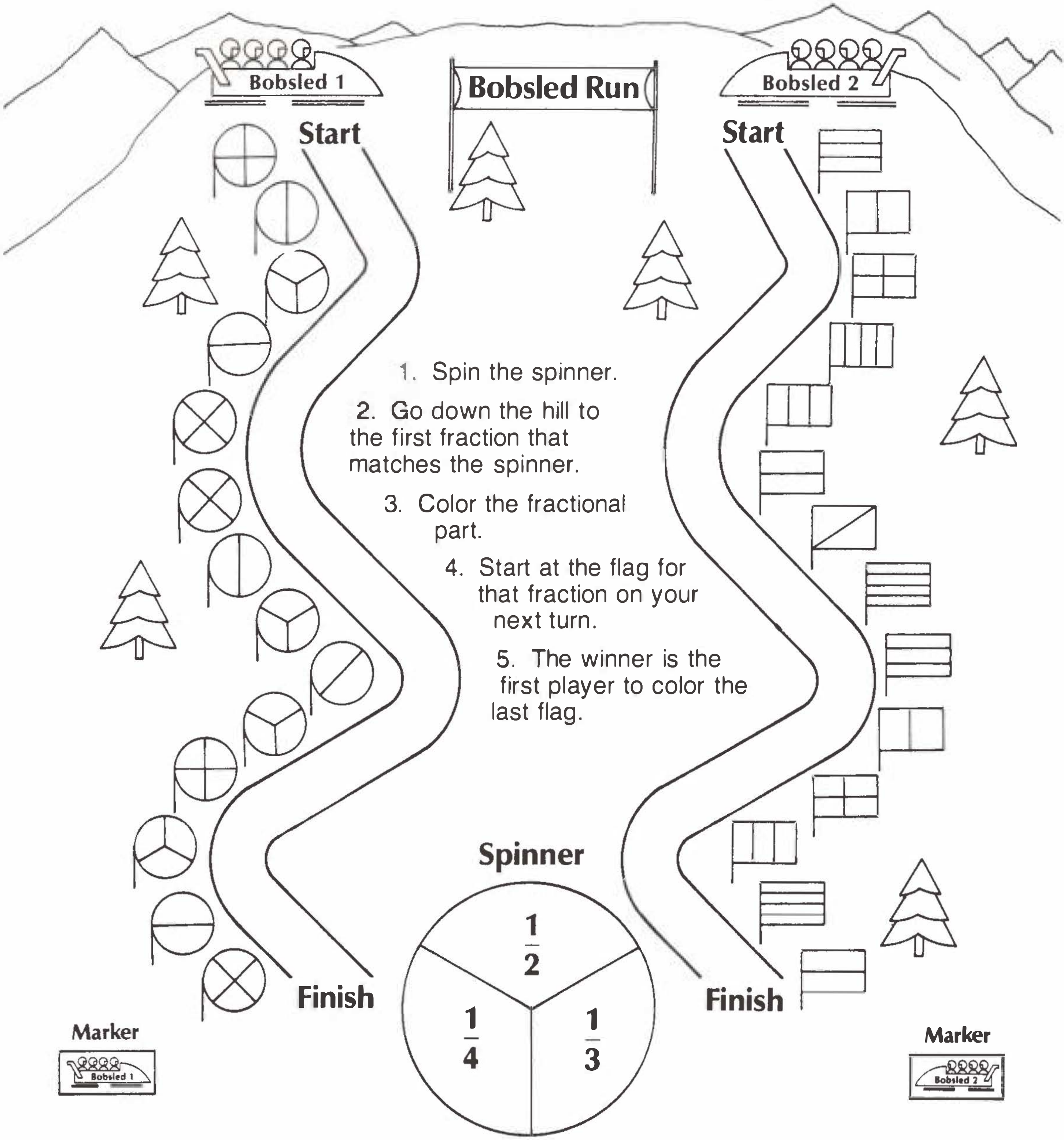
Answers

1. 14.25
2. 10
3. 15.3
4. 80.75
5. 57
6. 616
7. 2086.92
8. 672.52

IDEAS

Name ____________________

WIN BY A FRACTION!

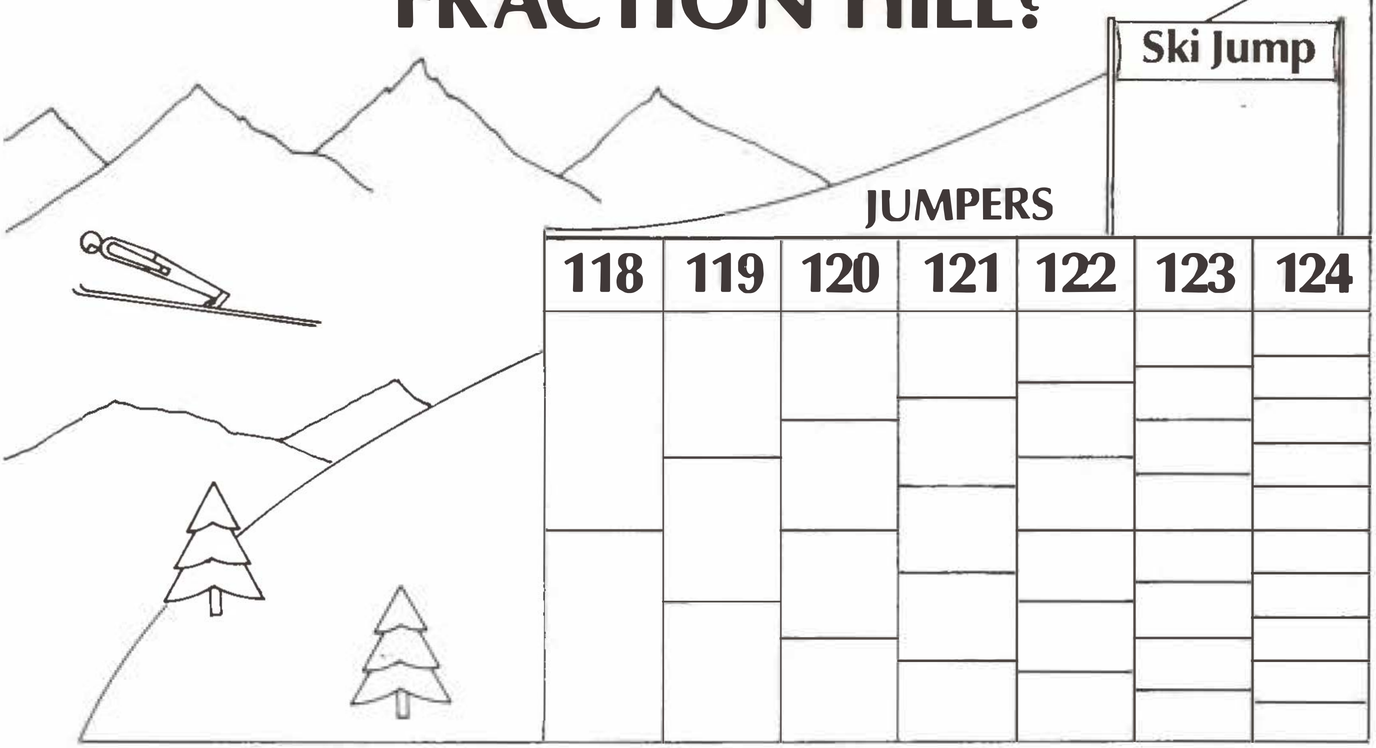


1. Spin the spinner.
2. Go down the hill to the first fraction that matches the spinner.
3. Color the fractional part.
4. Start at the flag for that fraction on your next turn.
5. The winner is the first player to color the last flag.

IDEAS

Name ______________________

HOW FAR DOWN FRACTION HILL?



1 Color the chart to show how far down the slope each jumper went.

118	$\frac{1}{2}$
119	$\frac{1}{3}$
120	$\frac{2}{4}$
121	$\frac{4}{5}$
122	$\frac{4}{6}$
123	$\frac{4}{8}$
124	$\frac{7}{10}$

2 Use your chart to answer these questions:

a) Which jumper made the most progress down the hill? ________ How far? ________

b) Which jumper made the least progress down the hill? ________ How far? ________

c) Which jumpers made the same progress down the hill? ________ ________ ________

How far? ________ ________ ________

3 Write the jumper's distance under the jumper's number. Compare their distances by writing > or < in the circle.

118 119   119 120   121 123   122 123   123 124

__ ◯ __   __ ◯ __   __ ◯ __   __ ◯ __   __ ◯ __

IDEAS

Name________________________

SLALOM SUBTRACTION

Directions:
Fill in the missing times for each slalom run, then complete the questions below.
Assume the skier is traveling at the same rate of speed when moving down the slope.

Women's

Start	
13.5	15 m
______	30 m
40.5	45 m
54	60 m
1:7.5	75 m
______	90 m
1:34.5	105 m
______	120 m
______	135 m
______	150 m
Finish 2:15	

1980 Winter Olympics winner
Hanni Wenzel, Liechtenstein
1:25.09

Men's

Start	
______	20 m
______	40 m
1	60 m
1:20	80 m
______	100 m
2	120 m
______	140 m
______	160 m
3	180 m
______	200 m
______	220 m
Finish 3:40	

1980 Winter Olympics winner
Ingemar Stenmark, Sweden
1:44.26

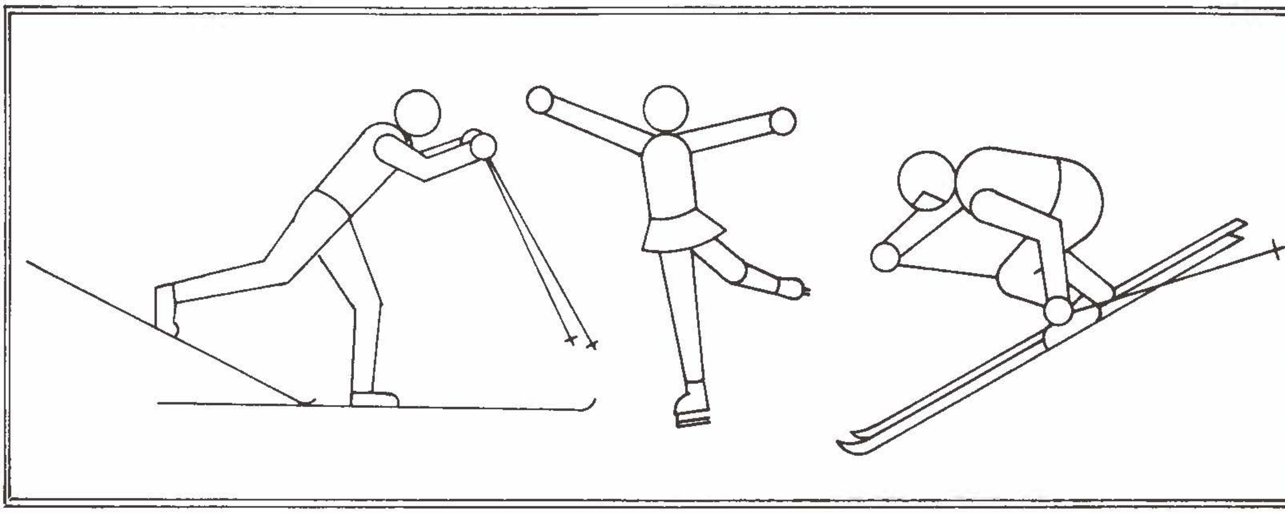
Questions:

1. How much longer is the men's slalom than the women's slalom? __________
2. How much slower was the men's championship finishing time than the women's? __________
3. How much faster was the women's time than the men's for the first 60 m of the slalom? __________
4. What was the women's slalom time for the first half of the race? __________
5. To the nearest second, how much faster were the 1980 winter Olympic times than our times?
   Women's __________
   Men's __________
   (*Note:* sixty seconds in a minute)
6. How much faster or slower were the 1984 winter Olympic times than the 1980 times?
   Women's __________
   Men's __________

IDEAS

Name________________________________

OLYMPIC CALORIE BURNING



Event	Calories used for each kilogram of body weight for 1 minute.
Cross country skiing	0.20
Figure skating	0.19
Slalom skiing	0.17

Complete the chart:

	Event	Weight of participant	Calories used per kilogram per minute	Number of minutes	Total calories used by participant
Example	Figure skating	50 kg	0.19	1	50 x 0.19 x 1 = 9.5.
1.	Figure skating	75 kg	0.19	1	75 x 0.19 x 1 = ____.
2.	Cross country skiing	50	0.20	1	50 x 0.20 x 1 = ____
3.	Slalom skiing	90	____	1	____ x ____ x 1 = ____.
4.	Figure skating	85	0.19	5	85 x 0.19 x 5 = ____.
5.	Figure skating	50	0.19	6	50 x 0.19 x 6 = ____.
6.	Cross country skiing	110	____	28	___ x ___ x ___ = ____.
7.	Slalom skiing	93	____	132	___ x ___ x ___ = ____.
8.	Slalom skiing	86	____	46	___ x ___ x ___ = ____.

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