Classroom Activities

Compiled by Betty Morris

The following activities were part of a collection of activities available at the NCTM Canadian Regional Conference held in October 1994. These activities were submitted by teachers or found in *The Arithmetic Teacher*.

The Geochart

This interesting calculator activity uses an unfamiliar version of a familiar item.

On the geochart, make a 2×2 square. Look at the sums of diagonal corners. What is the difference in the sums? Look at the products of diagonal corners. What is the difference in the products? Repeat the process for a different 2×2 square.

Repeat the process with 3×3 squares. Do the same for 4×4 squares and 5×5 squares. Can you generalize the pattern to $n \times n$ squares?

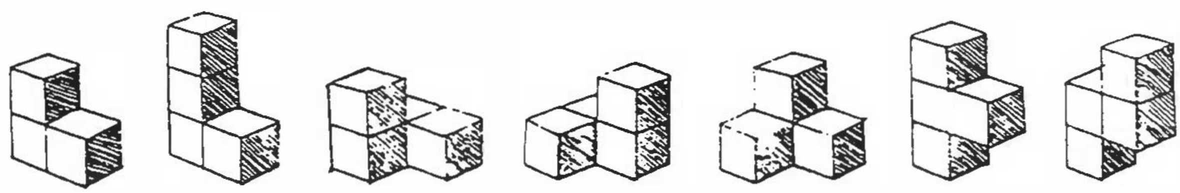
Use the geochart as a model of the first quadrant grid. When looked at in this way, it is easy to see extensions into negative numbers. Can you extend the patterns to include negative numbers? What if some numbers were positive and some were negative?

The Geo Hundreds Chart

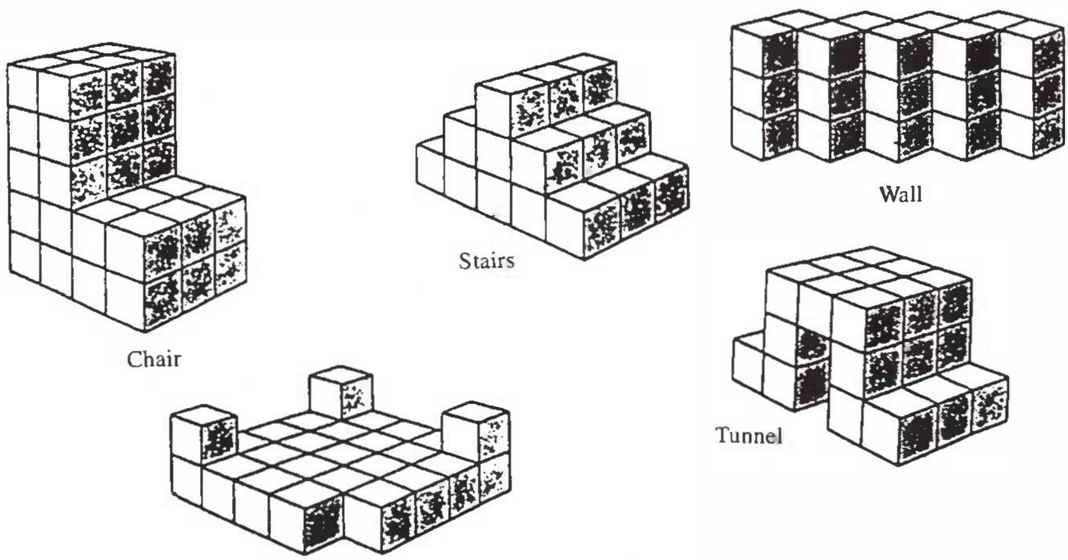
09	19	29	39	49	59	69	79	89	99
08	18	28	38	48	58	68	78	88	98
07	17	27	37	47	57	67	77	87	97
06	16	26	36	46	56	66	76	86	96
05	15	25	35	45	55	65	75	85	95
04	14	24	34	44	54	64	74	84	94
03	13	23	33	43	53	63	73	73	93
02	12	22	32	42	52	62	72	82	92
01	11	21	31	41	51	61	71	81	91
00	10	20	30	40	50	60	70	80	90

Soma Cubes

Concept: Geometry
Grade Level: 4–12
Materials: sugar lumps
Directions: Glue sugar lumps together to form the seven Soma pieces.



Suggestions: The Soma cube, invented by Danish writer Piet Hein, is probably the most successful three-dimensional version of tangrams. By taking all the irregular shapes that can be formed by combining no more than four cubes, all the same size and joined at their faces, Hein found that these shapes can be put together to form a larger cube. A few of the other shapes that can be made are shown below:



More information and illustrations of many possible structures that can be made from the seven Soma pieces may be found in *The Second Scientific American Book of Mathematical Puzzles and Diversions*, by M. Gardner (New York: Simon & Schuster, 1965), 65–77. [Reprinted in paperback in 1987 by the University of Chicago Press.]

Centi-Metric

Concept:	Measurement—metric
Grade Level:	3–6
Number of Players:	2–4
Materials:	gameboard ruler deck of 64 cards (see list below) 1 marker per player
Object:	To measure centimetres and reach finish
Rules:	1. Place shuffled cards face down. 2. In turn, players draw a card and follow the directions. Measure lines to the nearest whole centimetre. 3. The winner is the first to reach finish.

Directions: Follow illustration to make gameboard. Around the border of the board, draw segments of the following lengths:

A. 5 cm	B. 12 cm	C. 8 cm	D. 2 cm	E. 19 cm
F. 24 cm	G. 10 cm	H. 15 cm	I. 6 cm	J. 7 cm

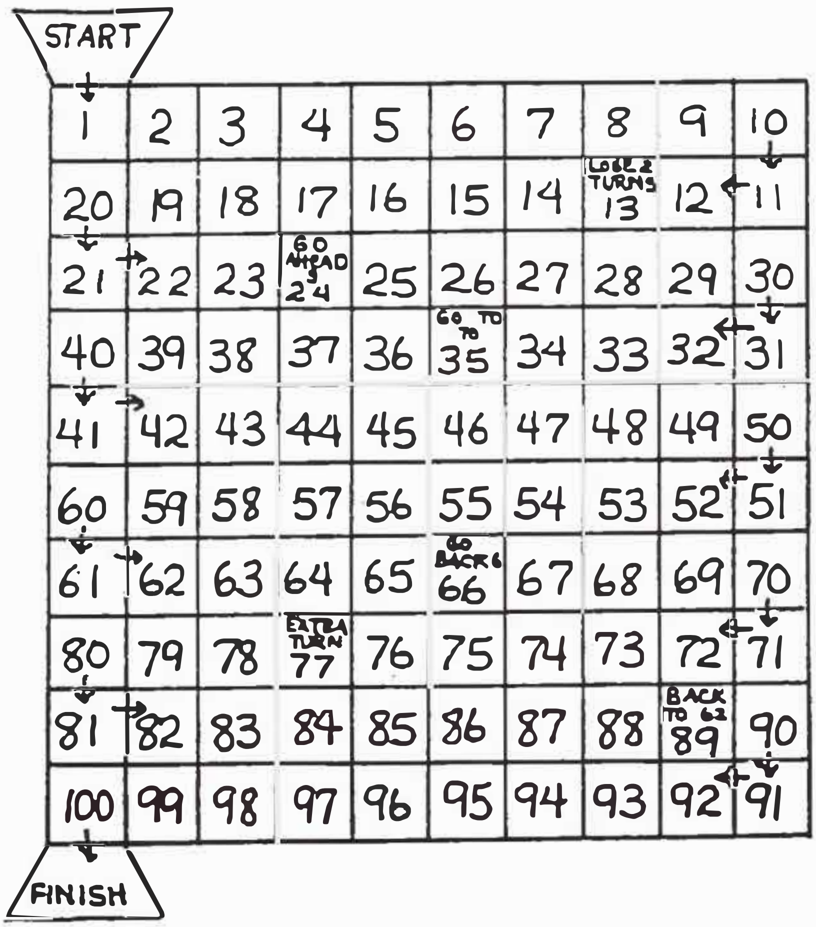
Make the indicated number of cards with the following directions:

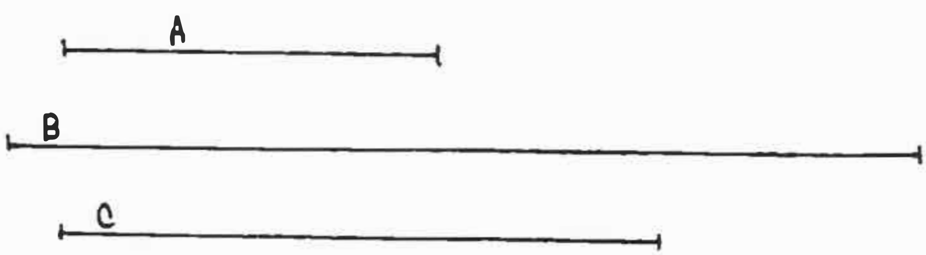
3 Measure A and move forward that amount
1 Measure A and move backward that amount
3 Measure B and move forward that amount
1 Measure B and move backward that amount
3 Measure C and move forward that amount
1 Measure C and move backward that amount
3 Measure D and move forward that amount
1 Measure D and move backward that amount
3 Measure E and move forward that amount
1 Measure E and move backward that amount
3 Measure F and move forward that amount
1 Measure F and move backward that amount
3 Measure G and move forward that amount
1 Measure G and move backward that amount
3 Measure H and move forward that amount
1 Measure H and move backward that amount
3 Measure I and move forward that amount
1 Measure I and move backward that amount
3 Measure J and move forward that amount
1 Measure J and move backward that amount
5 Take an extra turn
5 Lose one turn
1 Move to square 37
1 Move to square 60
1 Move to square 85
1 Return to start
1 Exchange places with leader
1 Move to leader's square
1 Move to square of person in last place
1 Measure C and move forward twice that amount
1 Measure D and move backward 3 times that amount
1 Pick someone (not you) to get an extra turn

1 Pick someone (not you) to lose one turn
1 Move forward the difference between A and G
1 Move forward the difference between F and E
1 Move backward the difference between J and I

For Teachers

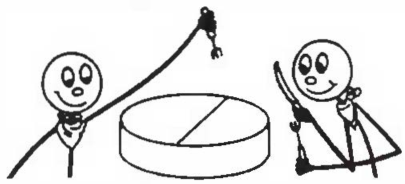
Levels: 2, 3, 4
Objective: To investigate patterns in a geometrical partitioning experiment
Directions:
1. Duplicate a worksheet for each student.
2. Make sure students understand the directions.
3. When all students have had the chance to investigate this problem, discuss with the entire class the patterns they found.



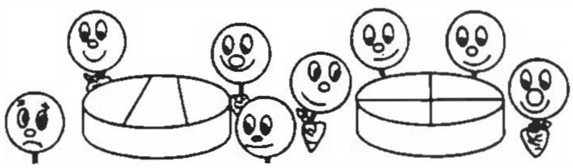


There's More Than One Way to Cut a Cake

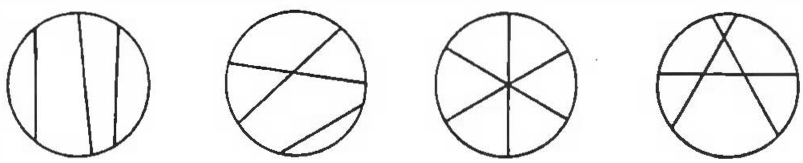
If you cut across a cake with 1 straight cut, you'll have 2 pieces.



If you use 2 straight cuts, you can do it so you'll have either 3 pieces . . . or 4 pieces.

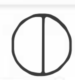
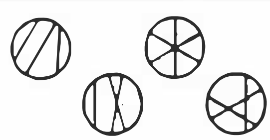


With 3 straight cuts, there are 4 different ways to cut the cake:



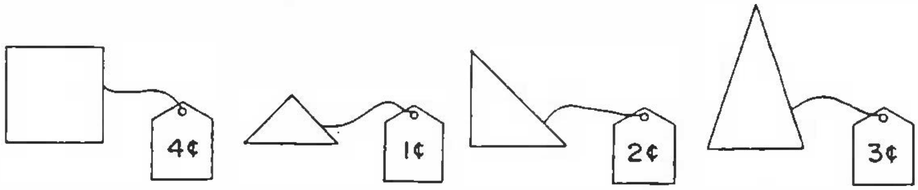
*Remember, every cut must be straight and across the cake.

Investigate this cake cutting pattern. Record what you find in the table below. Continue the table on another paper.

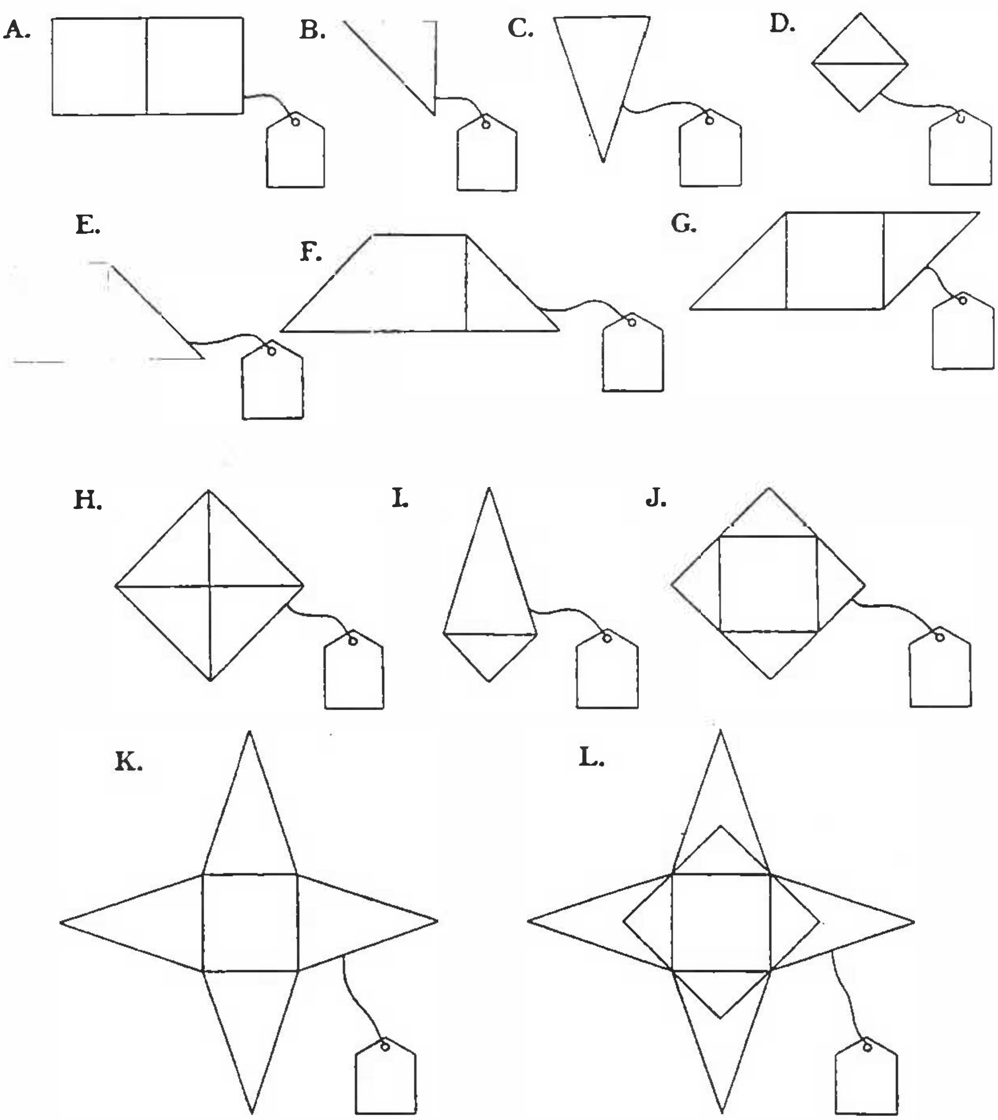
How many cuts?	Drawing	Pieces	How many ways?
1		2	1
2		3 4	2
3		4 5 6 7	4
4			

Can you predict what is the greatest number of pieces you could get from 10 cuts? Try it and see!

Congruent Polygons



How much are these?



For Teachers

Objective: Experience with identification of congruent polygons

Grade level: 1, 2, 3, 4, 5, 6, 7 or 8

Directions: Remove the student worksheet and reproduce a copy for each student.

For Grades 1 and 2:

1. Discuss the square and triangles shown at the top of the page. Be sure to discuss their cost.
2. Discuss the cost of the first four or five examples and fill in the tags.
3. Let the students do the rest of the examples on their own.

For Grades 3, 4, 5, 6, 7 and 8:

1. Have the students study the polygons at the top of the page and complete the price tags for the other polygons.
2. After they have completed the worksheet, discuss the relation between those polygons that are the same price. The area concept should come out in the discussion.

Comments: Fundamental to the development of many area concepts is the idea of conservation. In this case, the area of the polygon does not change as we move it around or place it with other polygons. The use of price provides a different focus on area and forces students to consider area in a different way. A variety of approaches to the development of a concept broadens the concept for some students and develops understanding for students who didn't see the idea before.

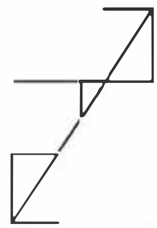
Answers: A. 8 B. 2 C. 3 D. 2 E. 6 F. 8 G. 8 H. 8 I. 4 J. 8 K. 16
Anticipate both 16 and 20 as answers for L.

Corner to Corner

If you have a rectangle like this,

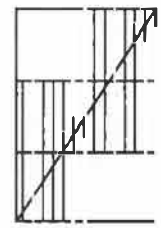
3 by 2

and you draw a diagonal,



3 by 2

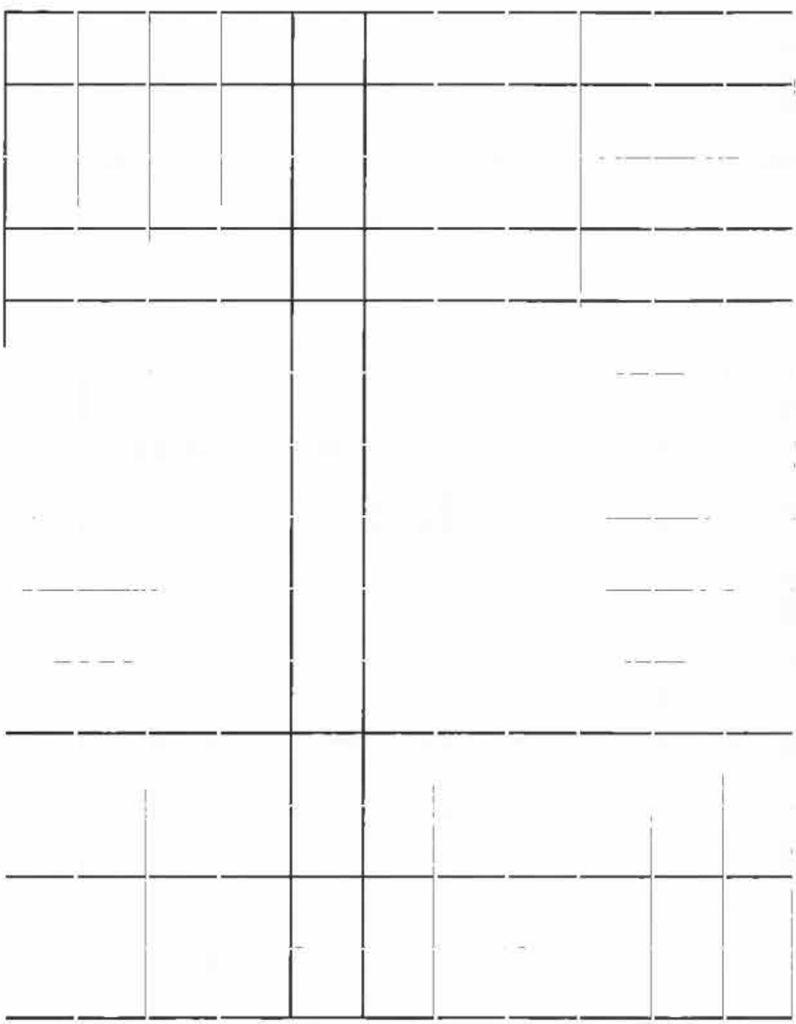
the diagonal goes through 4 squares.



3 by 2

Investigate this diagonal pattern for other rectangles.

Use the squares below to draw rectangles. Use a straightedge.



Dimensions	Squares Cut with Diagonal

For Teachers

Objective: To investigate number patterns from a geometrical experiment

Level: 3, 4, 5, 6

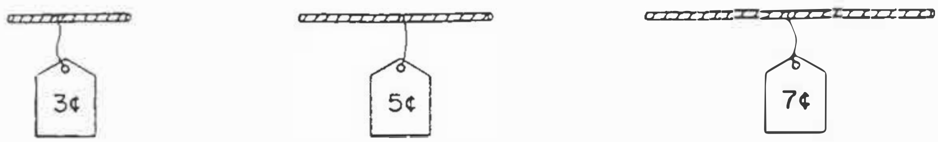
Directions:

1. Duplicate a worksheet for each child.
2. Make sure they understand the directions. It would be helpful to have additional squared paper available.
3. Organizing the data makes it easier to investigate the patterns. One suggestion for doing this is to look at all the rectangles that have one dimension kept the same:

Dimensions	How many?
2×1	2
2×2	2
2×3	4
2×4	4
2×5	6

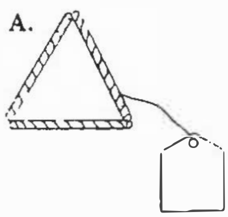
You may want to have different groups of students try the experiment keeping a different dimension constant.

Perimeter and Edges

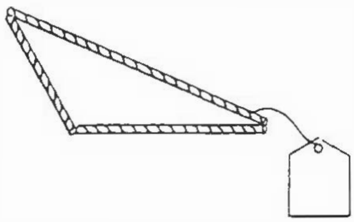


How much are these?

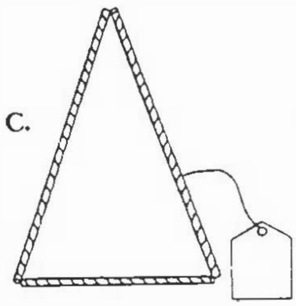
A.



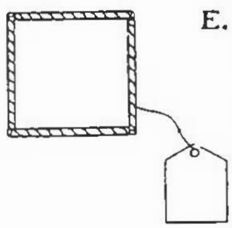
B.



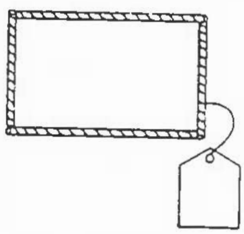
C.



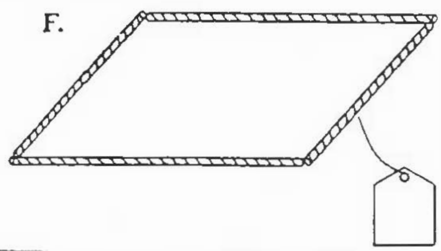
D.



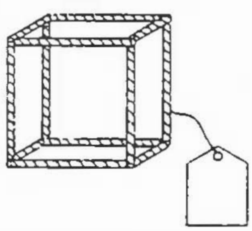
E.



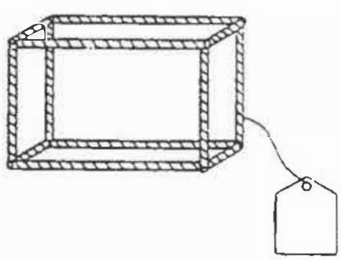
F.



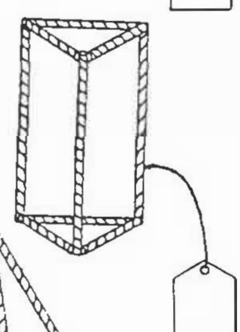
G.



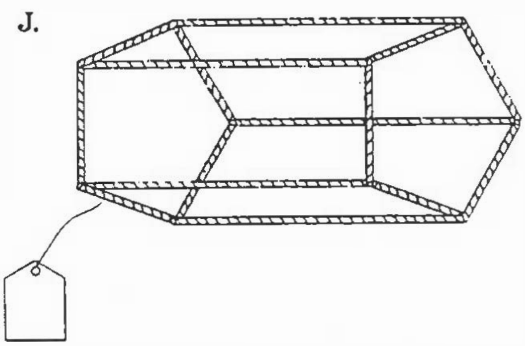
H.



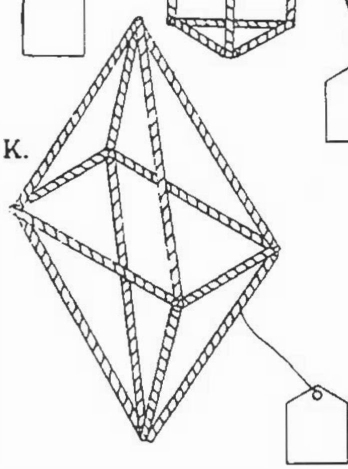
I.



J.



K.



For Teachers

Objective: Experiences with perimeter of polygons and identification of the edges of a solid

Grade Level: 3, 4, 5, 6, 7 or 8

Directions:

1. Remove the student worksheet and reproduce one copy for each student.
2. After handing out the worksheet, ask the students to fill out the price tags on each figure.
3. When the students have completed their answers, discuss the different ways the students arrived at the answers: How did you know which straws made up the sides? Did you need to measure? Which polygons have the largest perimeters? What other polygons can you make from these straws? Can you make a polygon selling for 21¢? For 13¢? For 28¢? What are possible prices for polygons made from these straws?

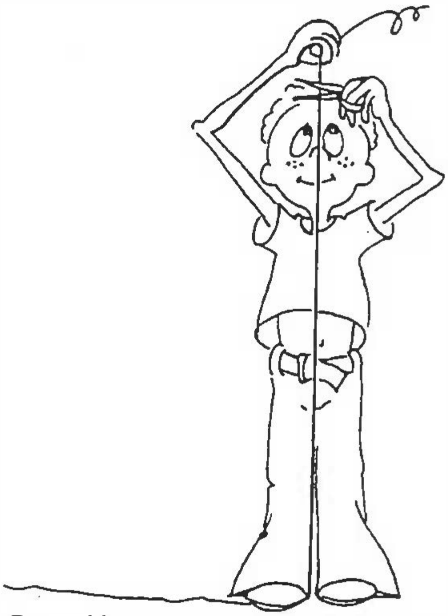
Comments: Students confuse the perimeter and area concepts because they don't have enough experience where the distinction is functional. There are few places in a student's life where he or she uses perimeter and area. An occasional contact in a classroom helps keep the distinction in mind. In many classes, it would be appropriate to discuss the classification of triangles as equilateral, isosceles or scalene. An investigation of pyramids, prisms and other solids might also result.

Grades 3 and 4 students would benefit by building some of the models, using straws and tape.

Answers: A. 9 B. 15 C. 19 D. 12 E. 16 F. 24 G. 36 H. 44 I. 33 J. 65 K. 72

Merry Measuring

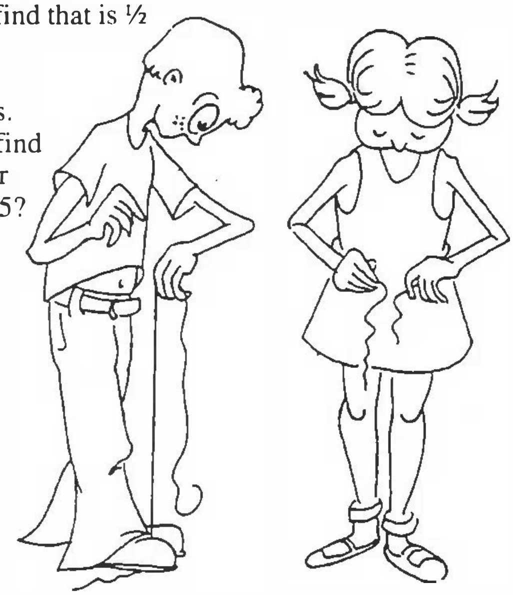
Cut a piece of string equal to your height.



Fold it in half and try it on yourself.

What can you find that is ½ your height?

Fold it in thirds. What can you find that is 1/3 your height? 1/4? 1/5? What else?



Record here

½ my height	1/3 my height	¼ my height	1/5 my height	What else?

For Teachers

Objective: Experience with body measures and body ratios

Levels: 3, 4 or 5

Directions:
1. Remove the activity sheet Merry Measuring and reproduce one copy for each student.
2. Discuss it to make sure the directions are understood.
3. Give each child a piece of string. Make sure the string doesn't have any stretch.

Follow-up: Additional problems using the piece of string can be suggested.
1. How many of your widest smile make your height? Guess first, then use your string.
2. Did your mother ever wrap a sock around your fist to see if it was your size? Why would she do a thing like that? Use your string to find out.

Jack's Bean Bag Activities

Introduction: Jack traded the family cow for a handful of "magic" beans. We cannot find magic beans at the store, but you will find many varieties available.

Objective: To provide students with experience in sorting and graphing information

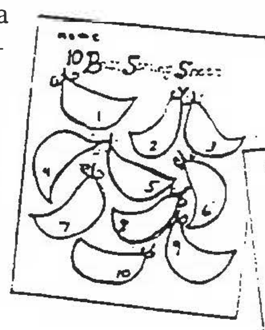
Materials:

- A bag of "Ten Bean Soup" beans
- Student copies of Sorting and Graphing sheets
- 58 g (2 oz.) of the beans in a small brown paper bag
- Pencil, crayons or marker

Suggestions: Students may work in pairs or groups of three

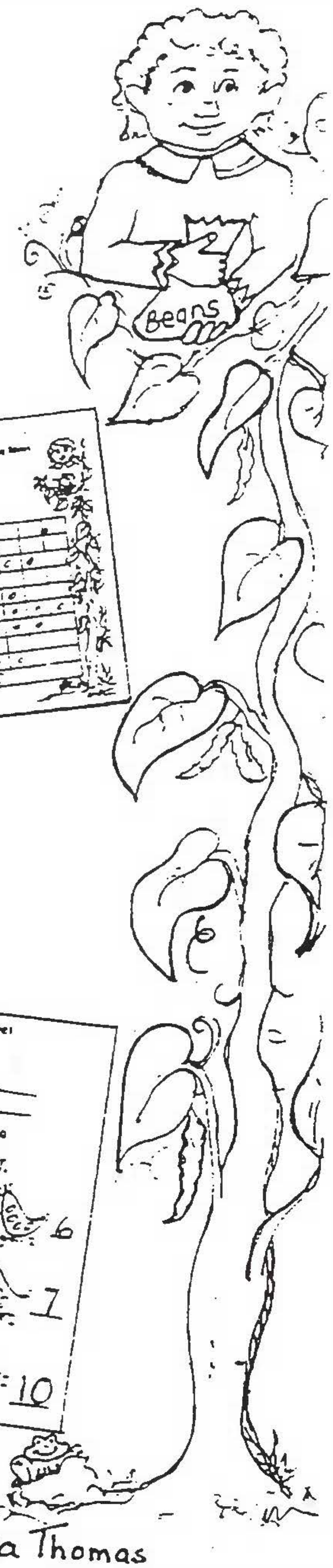
Procedure:

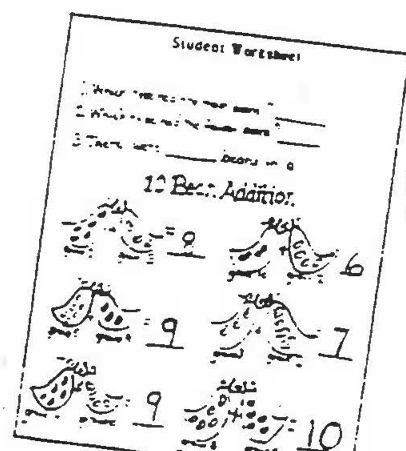
1. Give each student group a small bag of beans and the Student Sorting and Graphing Sheets.
2. Using the sorting sheets, have the students sort the beans into groups by "type" of bean.
3. Using the student graphing sheets, the students should graph the "sorted" beans by coloring spaces, drawing beans or gluing beans on the graph.
4. Groups may collect, compare and share data from each sorting and graphing sheet.

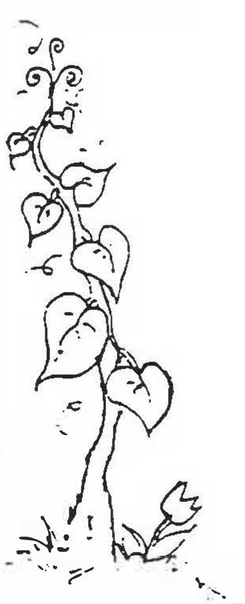


Extension: This extended lesson provides practice in problem solving, using information gained in the sorting and graphing of beans activity, and combining sets to complete addition problems.

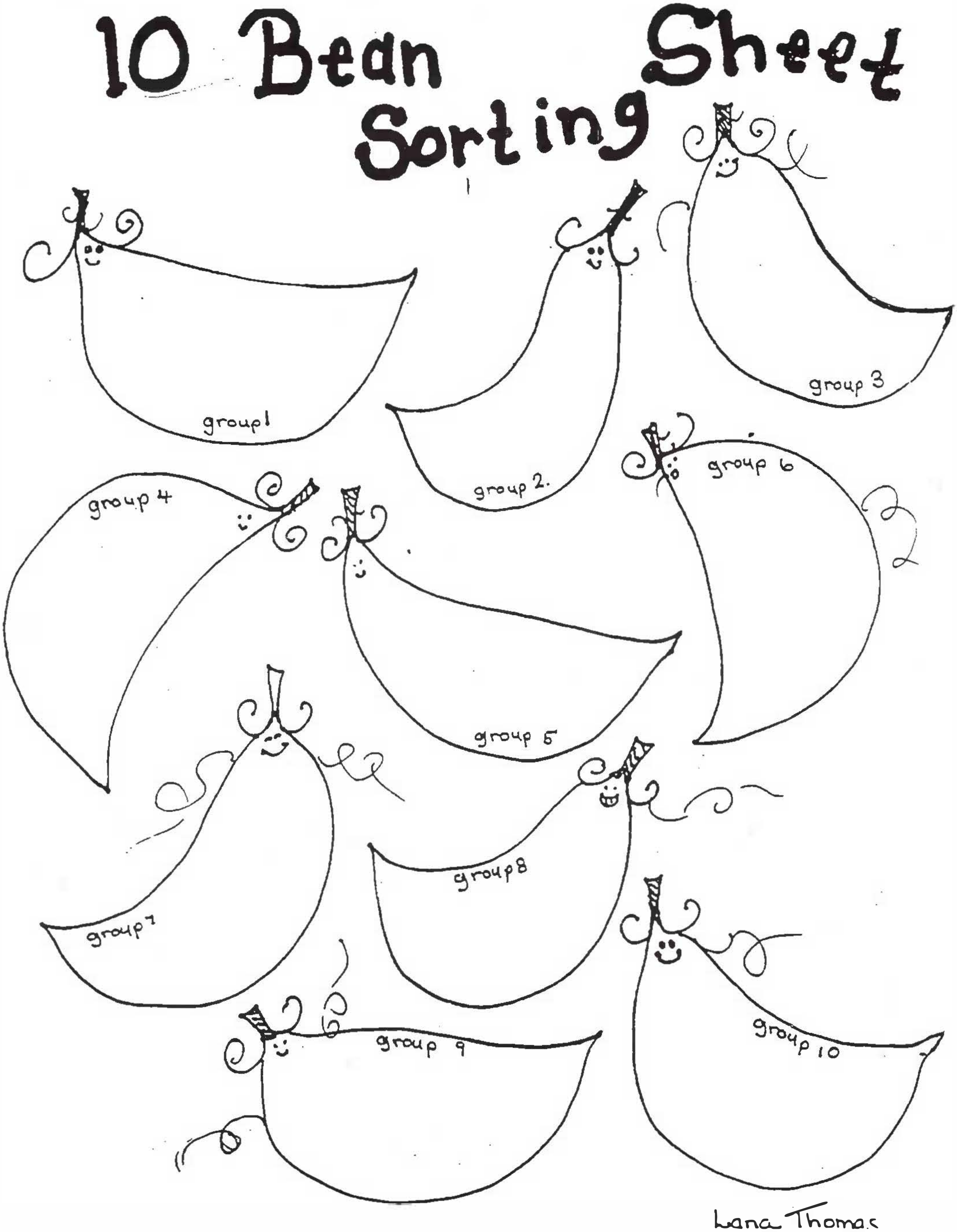
Students may use the information from the sorting and graphing activity to complete the student worksheet provided.







Student Sorting Sheet



Student Graphing Sheet

1

2

3

4

5

6

7

8

9

10

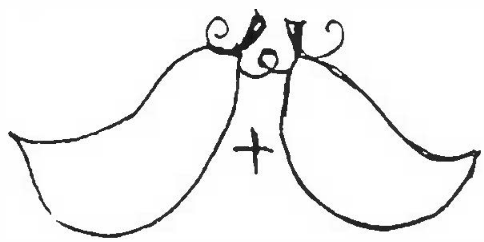
Student Worksheet

1. Which type had the most beans? ____________________

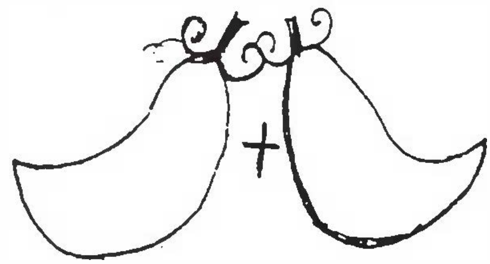
2. Which type had the fewest beans? ____________________

3. There were ____________ beans in all.

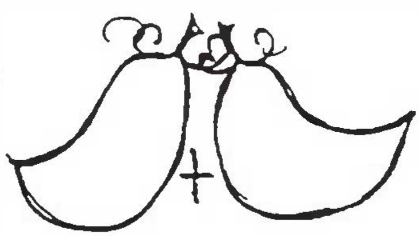
10 Bean Addition



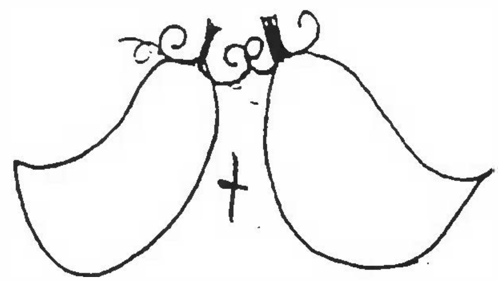
Group 1 + Group 3 = ________



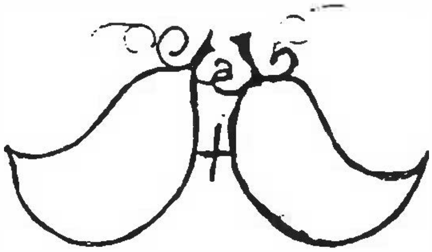
Group 10 + Group 2 = ________



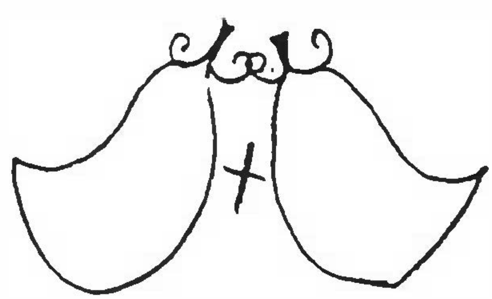
Group 5 + Group 9 = ________



Group 3 + Group 2 = ________



Group 4 + Group 6 = ________



Group 8 + Group 4 = ________

100 or Bust

Objective:	To develop relative magnitude for numbers 0–100 To apply place value concepts To explore concepts of chance To represent two-digit numbers with models To count on by tens and/or ones To develop a winning strategy
Materials:	For each group of three—1 scoresheet, 100 grid, place value pieces (ones and tens), calculator. 1 die for the whole class.
Procedure:	Place students in groups of three and assign each a role: a calculator, a recorder and a plotter. Have students take turns rolling the die. Each group decides whether the number rolled should be recorded in the tens' column or the ones' column. The recorder writes the decision on the scoresheet. When a number is written in the tens' column, "0" is written next to it in the ones' column, so 4 tens is "40." The plotter records the roll on the 100 grid using place value pieces. The calculator keeps a running total on the calculator. After 7 rolls, the group closest to 100 without going over wins.
Discuss:	What was the best total that could have been achieved with those 7 rolls? What was your group's strategy?

100 or Bust Scoresheet

Game 1

	Tens	Ones
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Game 2

	Tens	Ones
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Game 3

	Tens	Ones
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Game 4

	Tens	Ones
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Toss Up Fractions

Number of Participants:	From one person to the whole class
Materials Needed:	Two-color counters, Toss Up Fractions Record Sheets
Procedure:	Take the thirds record sheet and three two-color counters. Toss up the counters, decide what fractions part shows. (Example: Two of the three counters show yellow. Use the same color during the game.) Write 2/3 in the column of the record sheet or color in one block in that column. Continue tossing the counters and graphing the results. The game is over when one column is full. Try fourths with four two-color counters, fifths with five two-color counters or sixths with six two-color counters.

Toss Up Fractions—thirds 3/3

0/3	1/3	2/3	3/3

Toss Up Fractions—fourths 4/4

0/4	**1/4**	**2/4**	**3/4**	**4/4**

Toss Up Fractions—fifths 5/5

0/5	1/5	2/5	3/5	4/5	5/5

Toss Up Fractions—sixths 6/6

0/6	1/6	2/6	3/6	4/6	5/6	6/6