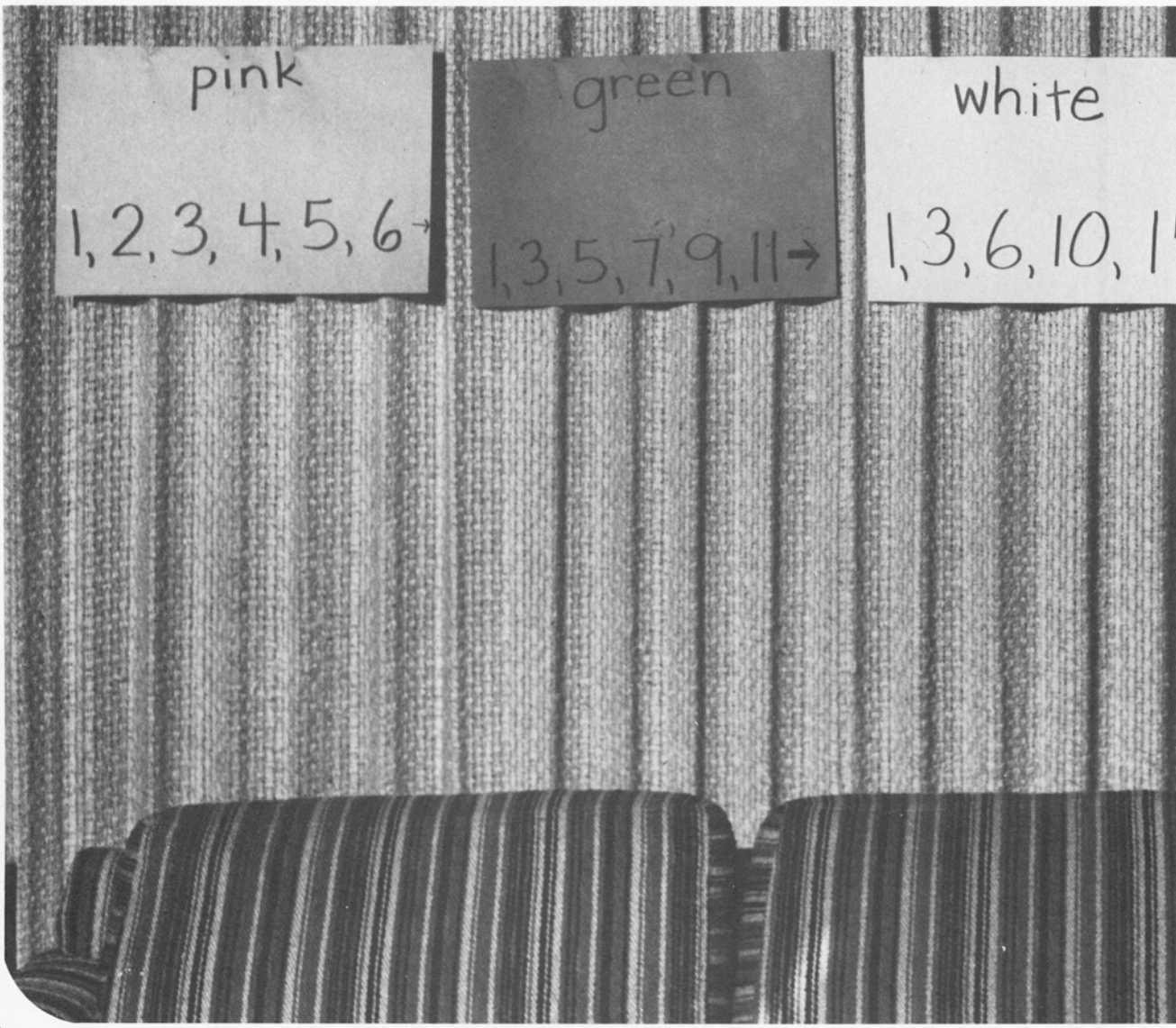
12

PATTERN BOOK EXPERIMENTS

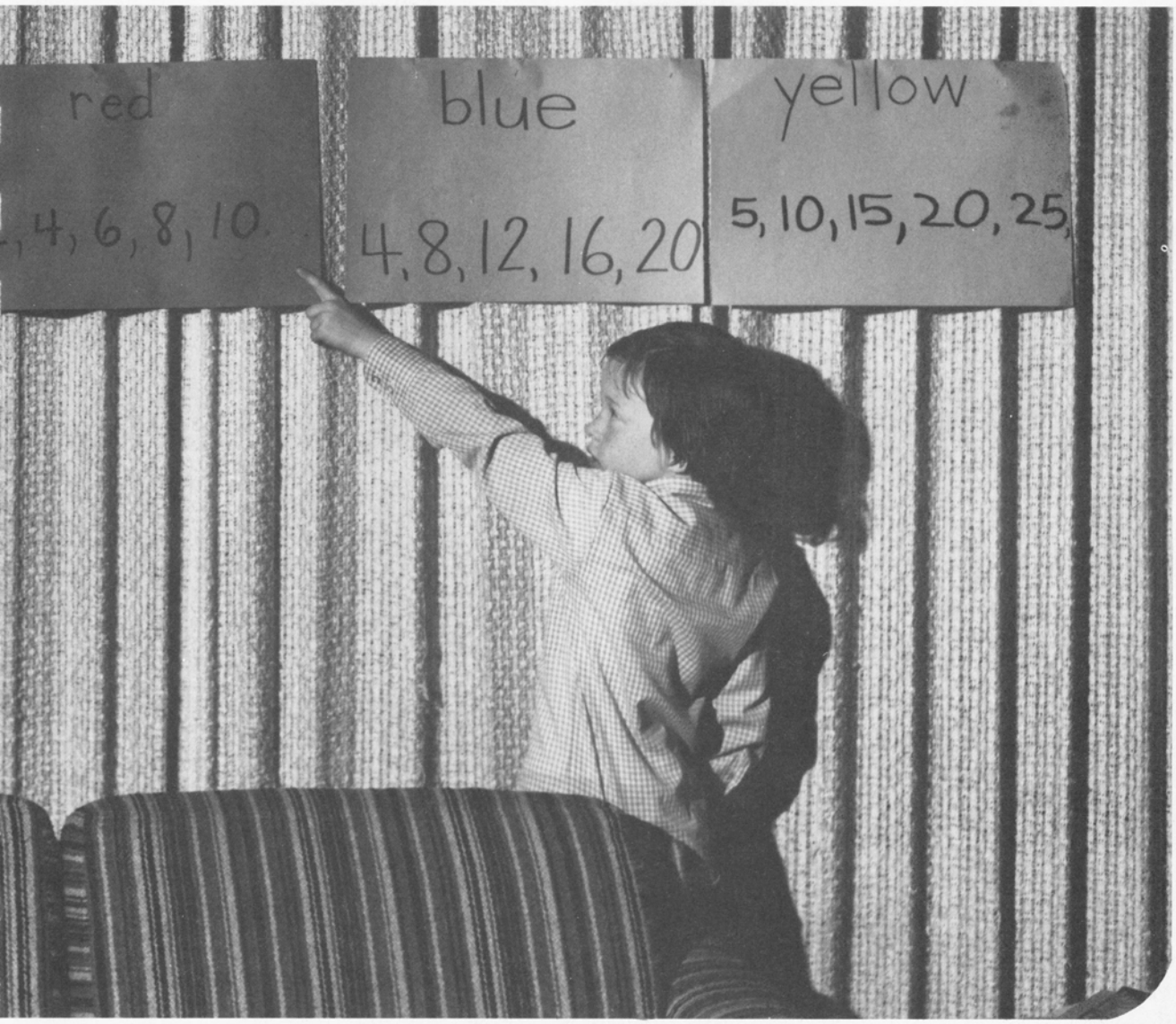


12

SKILLS AND CONCEPTS — Examining numbers for patterns
Developing mathematical functions
Adding, subtracting, multiplying, and dividing

SELF CONCEPT AND SOCIAL INTERACTION — Sensing the value of one's own and others' ideas as these are used as the core of the curriculum

FUTURE APPLICATIONS — Problem solving

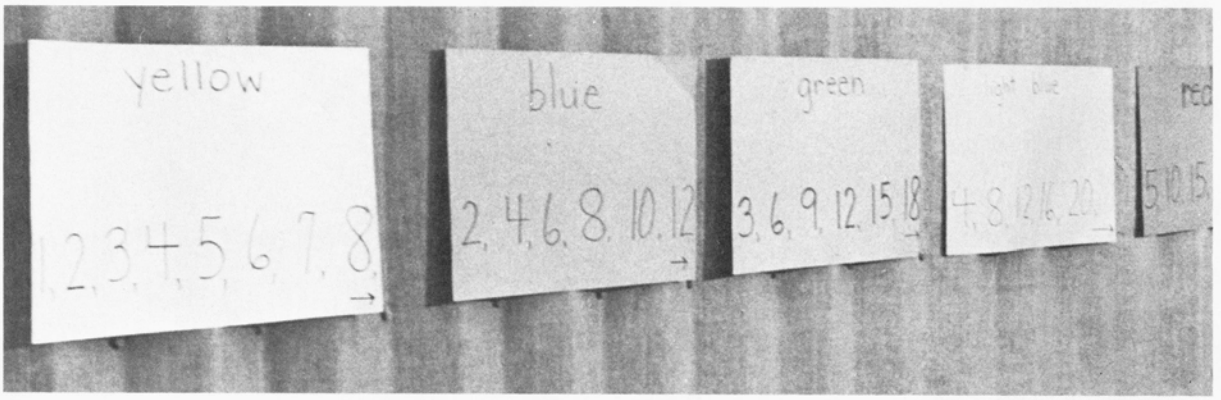


INTRODUCTION

The activities which follow are models for similar experiments which you can generate as your class searches for patterns. Any activity which results in a consistent pattern is worthwhile exploring and recording, and you should feel free to experiment with your own ideas.

Each experiment should evolve from a real experience rather than from abstract concepts. As the children record an experience systematically, a pattern will be generated naturally. Each time a new pattern is discovered, write the numbers on a new color of construction paper, and put this up where everyone can see it.

In time the children will come to recognize the different series of numbers and will refer to the patterns on the wall as they work, noting, "This is the yellow pattern," or "This could be the blue or maybe it's the brown pattern."



Eyes

SKILLS
Counting
Comparing
Pattern
Multiplication

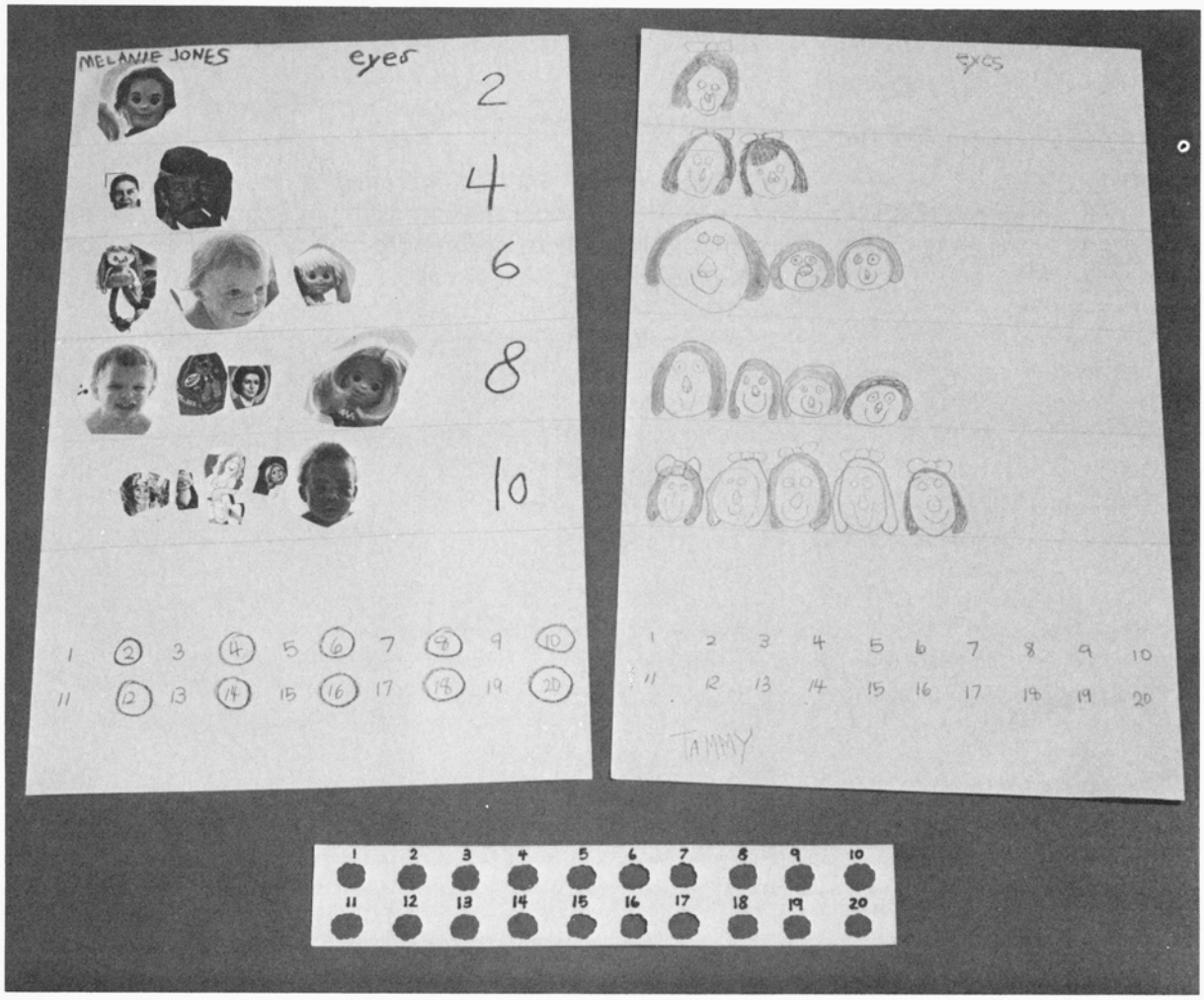
MATERIALS
Paper, number lines*

ACTIVITY
Pose the question to the children, "How many eyes do nine people have among them?" Allow the children to solve the problem in their own way. Do not intervene, just observe. Try two or three other numbers and see if the children can figure out the totals.

Then ask the children to prepare an "eyes paper" for the math lesson on the next day. The children use the edge of their number line to draw lines separating each step. Have them draw the eyes in an increasing pattern and write the numbers from 1–20 along the bottom line of the page with the number line template.

On the following day during the math period, have the children record the number of eyes in each row and circle the same numbers at the bottom of the page.

This activity is much more successful if you have your children prepare their paper a day ahead. The afternoon just before a recess or free time is a good time because this allows a flexible finishing time. Making this part of the record is a very individual thing. Because it is basically art work, some children get more involved or need more time than others to finish. By having an opportunity to spend as much time as desired, each child values the finished product personally and it becomes more meaningful. There is an additional benefit, and this is the intellectual growth that occurs because of the anticipation that results from linking one day's activities to the next.



Stars

SKILLS

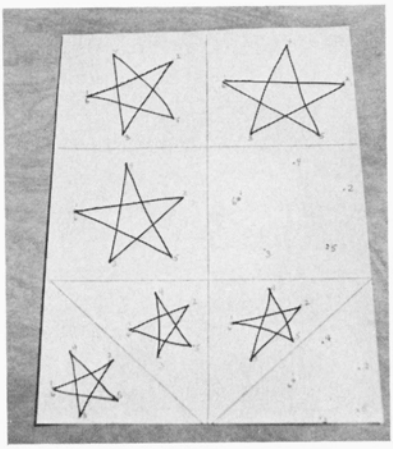
Problem solving
Counting
Pattern
Multiplication

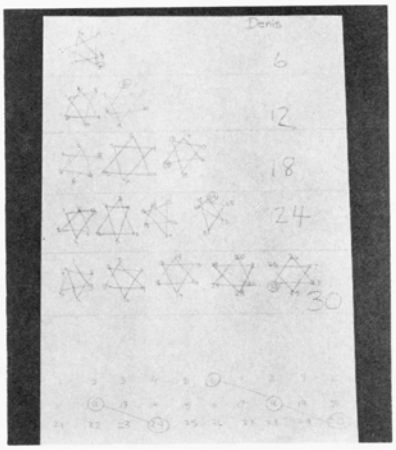
MATERIALS

Paper, number lines*

ACTIVITY

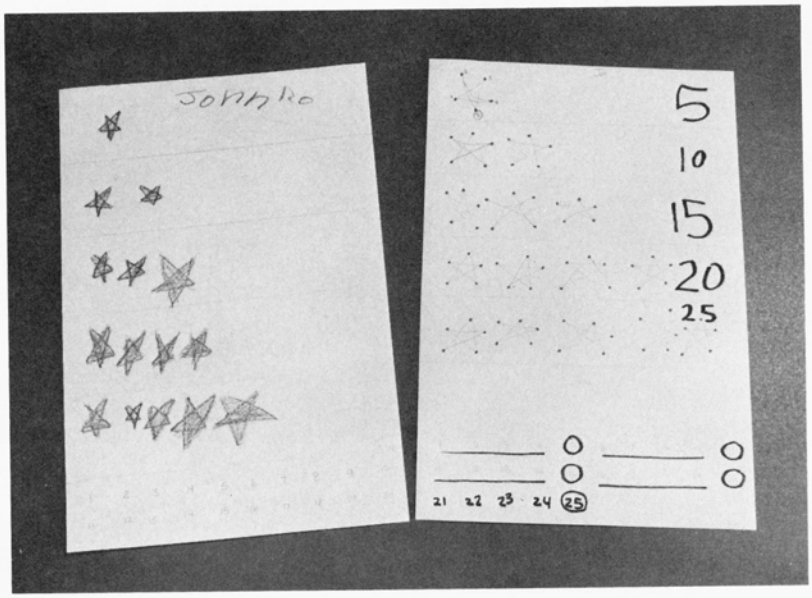
Allow the children to practice making five-pointed stars on the chalkboard. If anyone has great difficulty, make up a ditto with dot-to-dots for the children to use in practicing making stars.





In a week or two, when all the children are successful and are enjoying their star-making skill, have them make stars in an increasing pattern and record the total number of points in the design.

At another time the children can repeat this activity making Stars of David.



Popsicles

SKILLS

Problem solving
Counting
Pattern
Division

MATERIALS

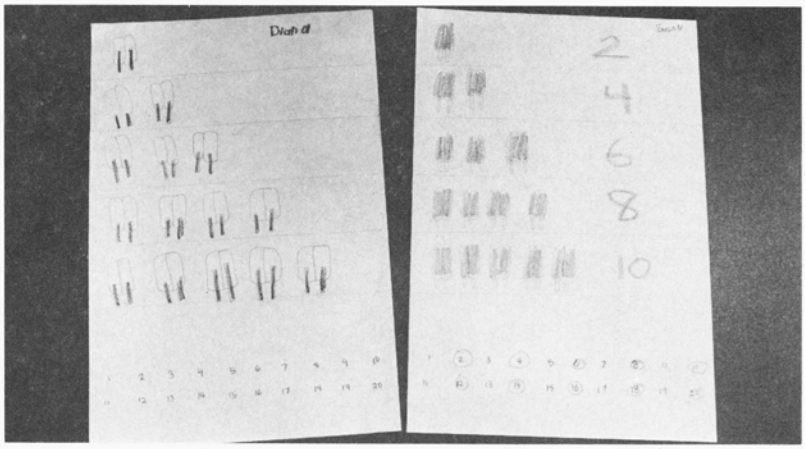
Popsicles, paper, number lines*

ACTIVITY

Bring in some popsicles and pose the question, "How many people will three popsicles serve if each person gets one stick?" Watch the children try to work this out and then break the popsicles in half and see if this generates the solution. Pose other problems until every child has half a popsicle to enjoy.

When the children finish eating, ask them to prepare a "popsicle paper" for the next day.

The following day, help the children work out the problem, determining the number of people who could share the popsicles in each row.



Hands

SKILLS

Problem solving
Pattern
Counting

MATERIALS

Paper, number lines*

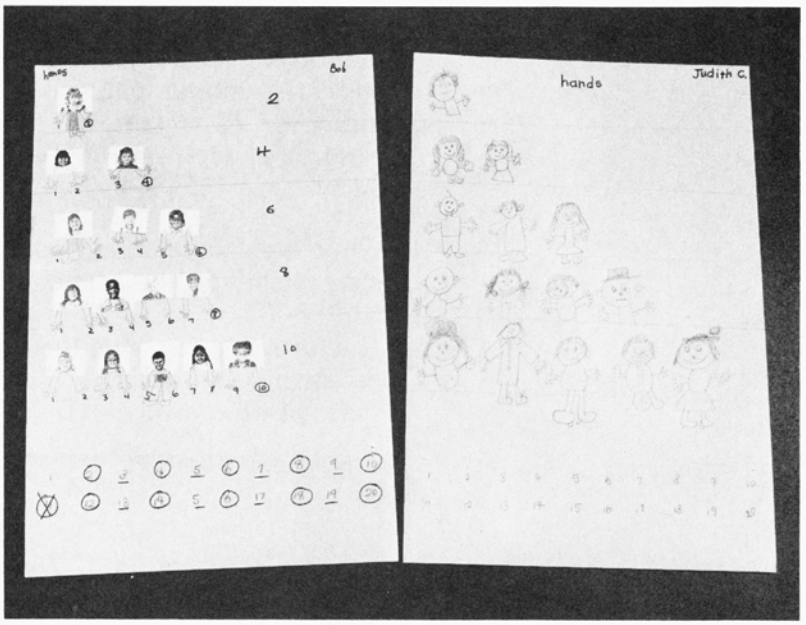
ACTIVITY

Pose the question to the children: "How many hands do six people have among them?" Puzzle together and let the children struggle with solving the problem.

Then ask the children to prepare a "hands paper" for use the following day.

Remind the children that the hands are the important element in their picture, so if they draw persons, they should remember to show the hands for each person clearly.

The next day, count the number of hands in each row and record the totals.



Money

SKILLS

Connecting an abstract idea to the real world
Problem solving
Pattern
Counting

MATERIALS

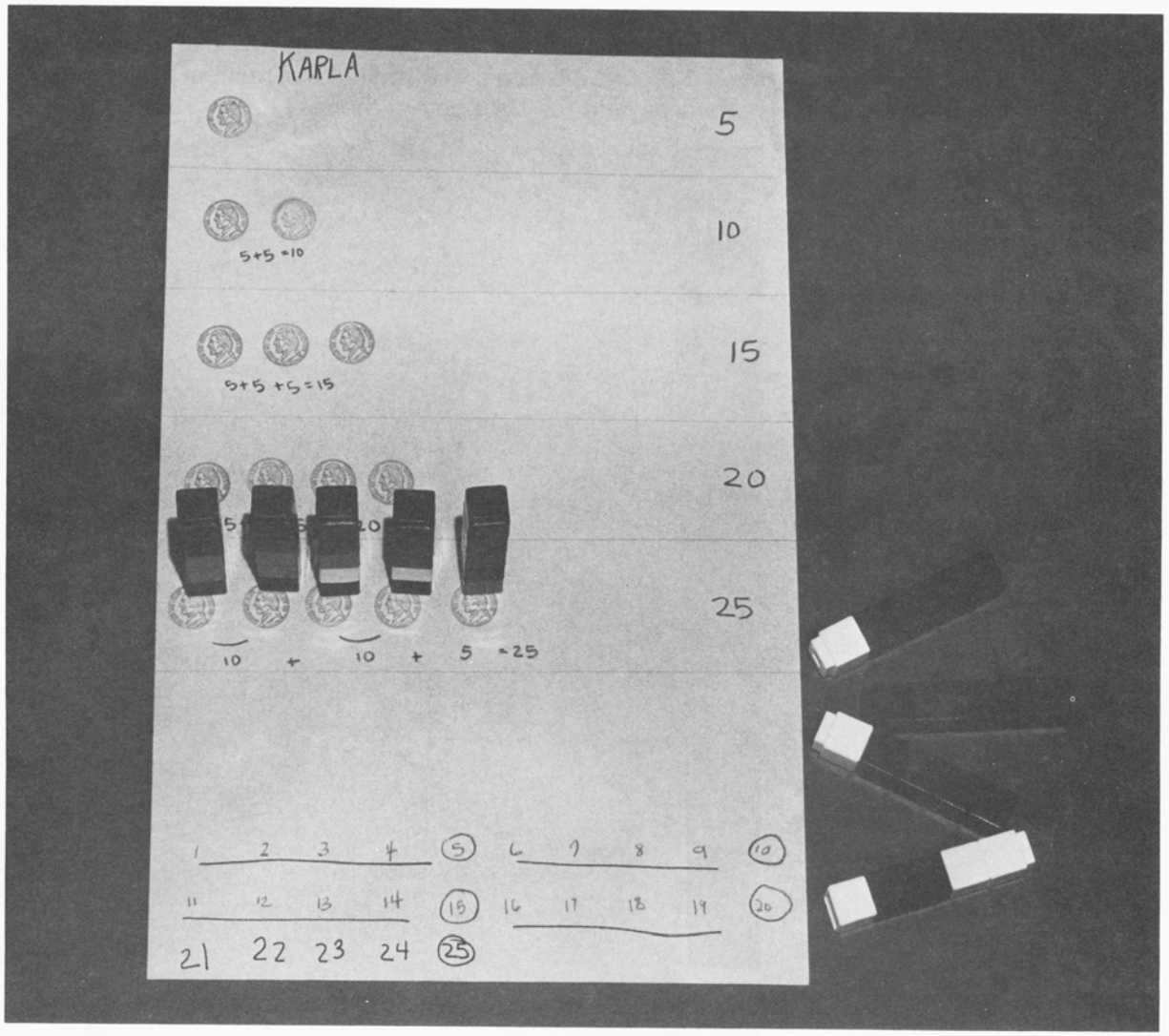
Pages of money from old workbooks, glue, paper, number lines*

ACTIVITY

The children paste pictures of nickels cut from their math book in an increasing pattern on their number lines.

The next day, have the children count how much each row is worth in cents and record the numbers.

If the children have difficulty computing the totals, have them place five Unifix cubes over each nickel and then regroup the cubes on their place value board.



This activity should be repeated at other sessions with pennies, dimes, and quarters.

Toothpick Squares

SKILLS

Problem solving
Counting
Writing mathematical symbols
Pattern

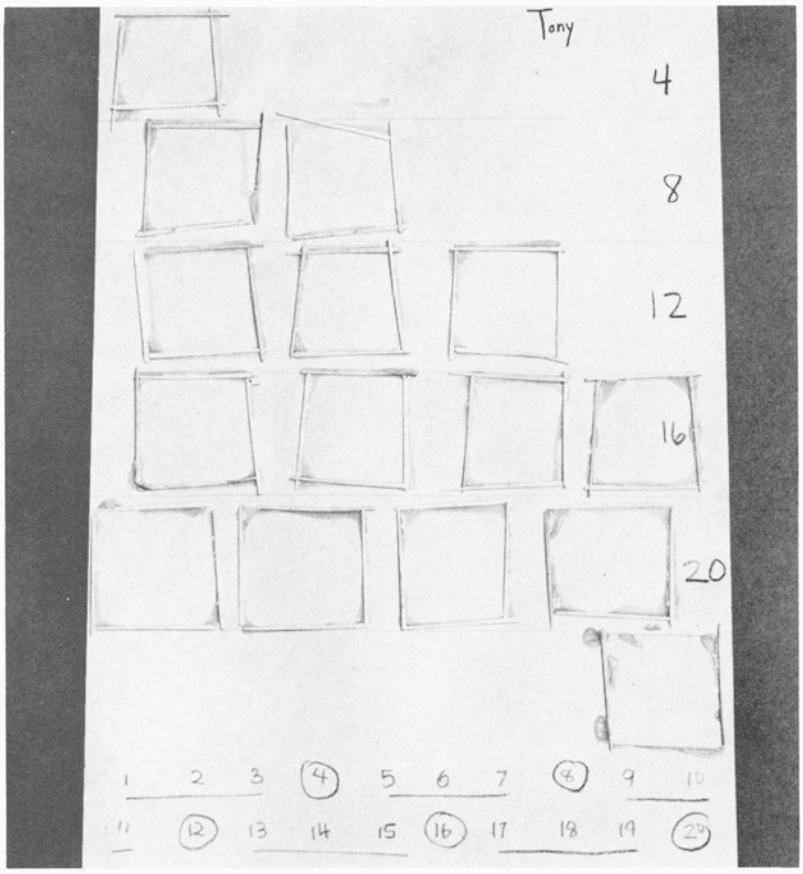
MATERIALS

Toothpicks, paper, number lines*

ACTIVITY

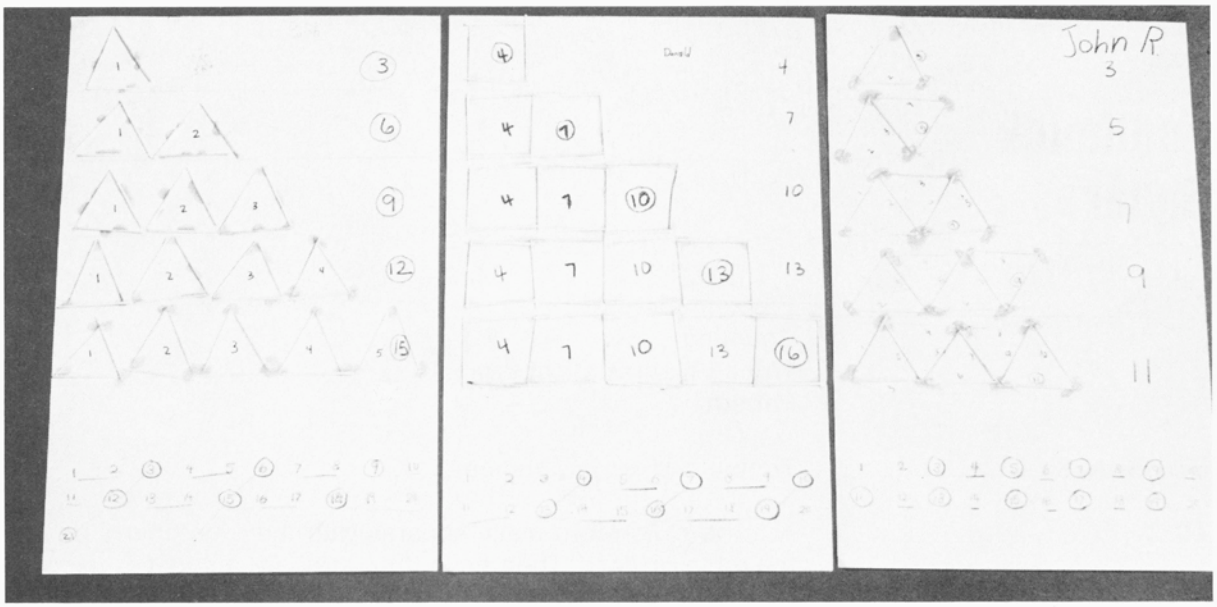
Ask the children to make squares with their toothpicks on the table or floor. Then have them prepare a squares paper for the next day.

The following day, focus the children's attention on the number of toothpicks needed to make each row of squares. They should record the totals and predict the numbers in the pattern beyond the data before them.



The children can repeat this activity at another time, making triangles.

If squares and triangles share sides, a new number pattern results.



Jumping Rope

SKILLS

Problem solving
Counting
Writing mathematical symbols
Pattern

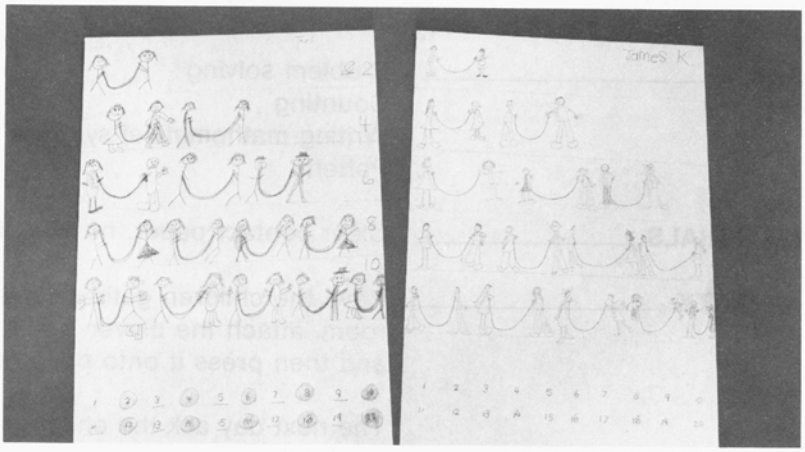
MATERIALS

Jump ropes, paper, number lines*

ACTIVITY

Pose the question during P.E., "How many people are needed to swing five jump ropes?" Puzzle together over the problem. Allow the children to solve the problem in their own way. When you come in from P.E., have the children prepare a "jump rope paper" for the next day. Discuss the problem and draw the jump ropes together. Then allow the children to draw the necessary people at their own pace.

The next day during your math period, the children should focus on the number pattern and record the number of people needed to swing the jump ropes.



Glasses

SKILLS

Problem solving
Counting
Writing mathematical symbols
Pattern

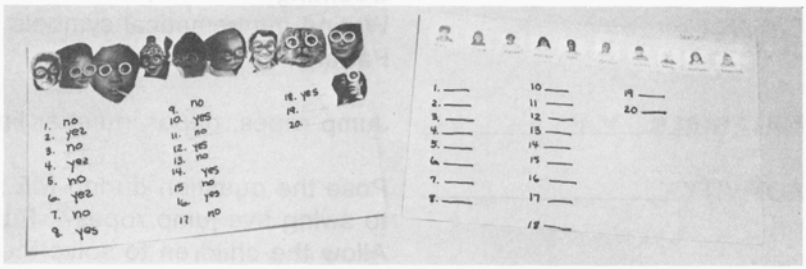
MATERIALS

Chicken rings from junk boxes,* magazines or photocopied pictures of the children,* paper, number lines*

ACTIVITY

The children glue a row of ten faces at the top of a piece of paper and number from one to twenty in a line below the faces. When the glue is dry, cover the row of faces with a strip of clear contact paper.

On the following day, the children experiment with the chicken rings, trying to find the number of rings that will make pairs of glasses for the faces on their paper. The children write "yes" beside the numbers that work and "no" beside those that do not.



Three Leaf Clovers

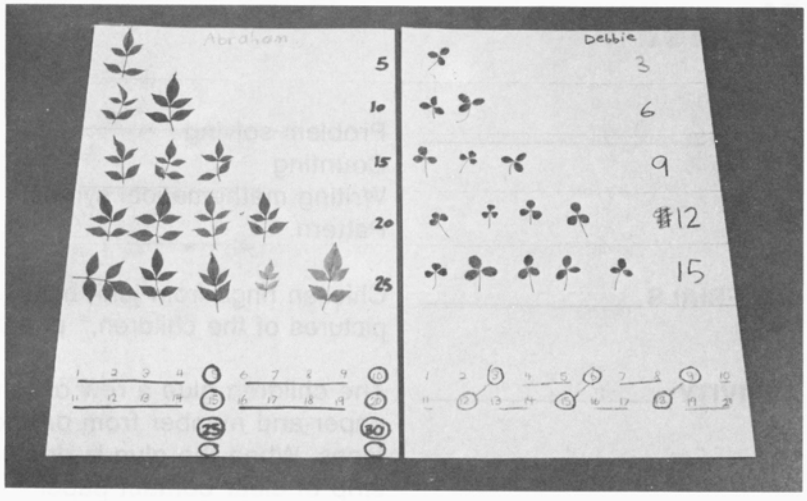
SKILLS
Problem solving
Counting
Writing mathematical symbols
Pattern

MATERIALS
Clear contact paper, number lines*

ACTIVITY
Have the children gather clover at recess. Back in the classroom, attach the clover to the sticky side of the contact paper and then press it onto paper in an increasing pattern.

The next day ask the children to count the leaves and record the totals.

Any natural material can be counted that has a consistent pattern.



Triangles

SKILLS

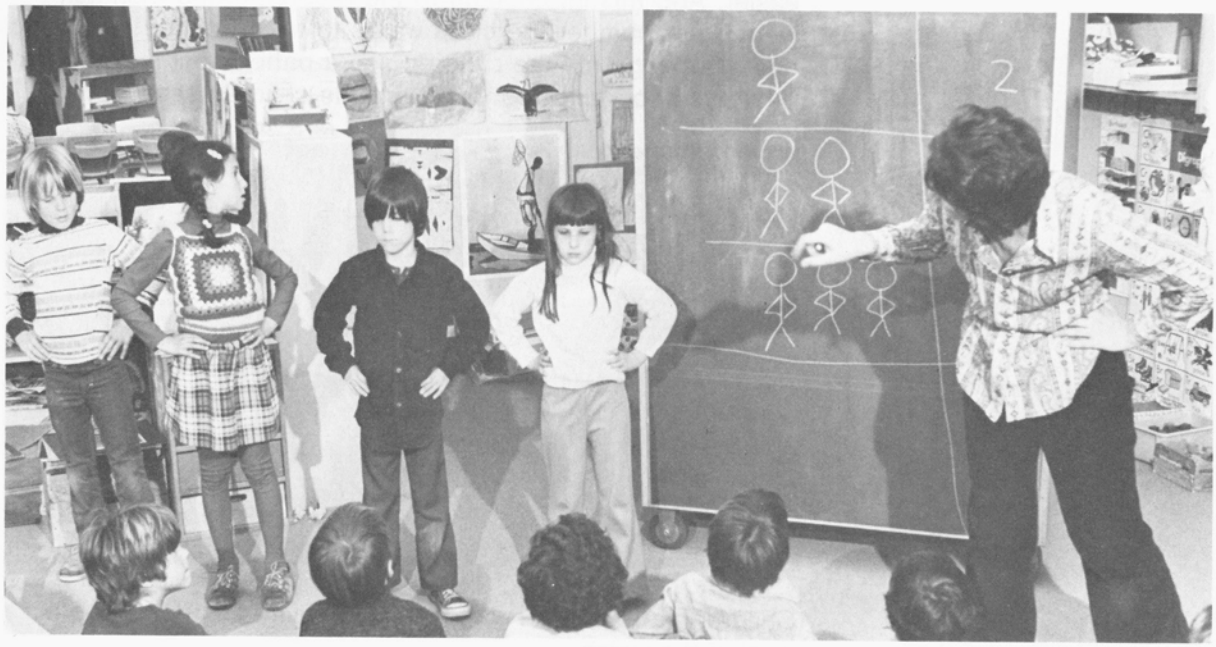
Problem solving
Counting
Writing mathematical symbols
Pattern
Comparing

MATERIALS

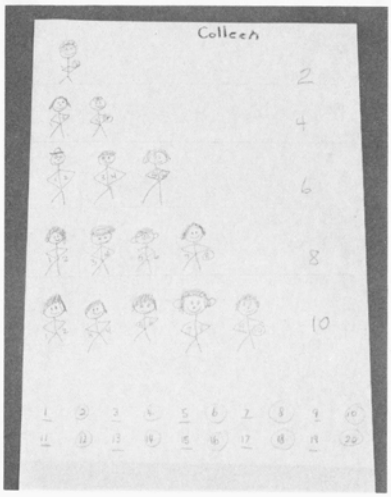
Paper, number lines*

ACTIVITY

Ask a child to stand with both hands clasped behind hisorher back and say to the class, "I see two triangles, do you?" When the children see the triangles, have them come up one at a time, count the triangles, and record the totals on the board.



Children who are interested can make an individual copy of the activity for their pattern book.



Joining Hands

SKILLS

Comparing
Pattern
Problem solving
Counting

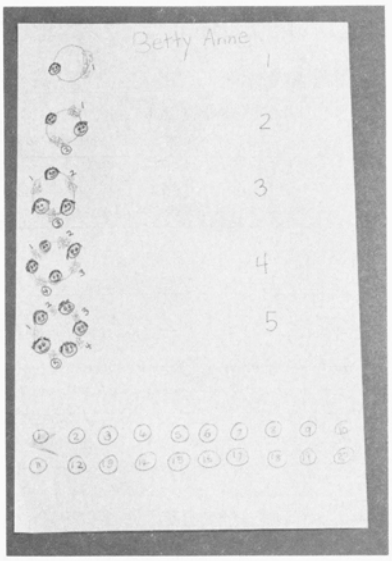
MATERIALS

Pieces of paper with one numeral written on each

ACTIVITY

Play a circle game and at the end discuss the number of joined hands. Write down the number of children and the number of joined hands. Pose the question, "How many joined hands would there be with only ten children?" Have the children predict and then role play the problem. You might have each child hold a number to make the counting easier. Add this information to the recording and then ask what other number the class wants to try. Continue predicting and checking until the children see a pattern. Fill in the other numbers according to the pattern the children see.

Children can make a record of this activity for their pattern book if they wish.



A Chain Reaction

SKILLS

Division
Pattern
Counting
Writing mathematical symbols

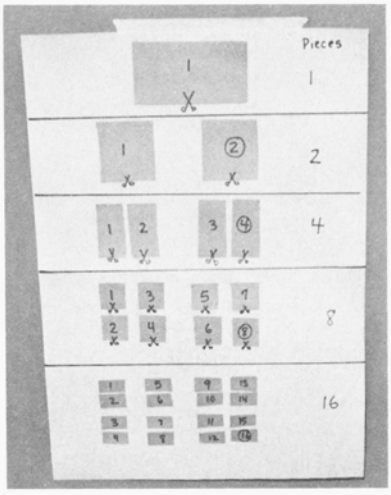
MATERIALS

Paper, number lines,* scissors

ACTIVITY

Assemble the children and give one child a large piece of paper. Ask this child to cut the paper in half and give both halves away; these two new children each cut their piece of paper in half and give both halves away. Continue this process two or three more times. On another day, repeat this activity this time keeping track of the number of children and pieces of paper at each step.

Some children will enjoy making an individual record of this activity for their pattern book.



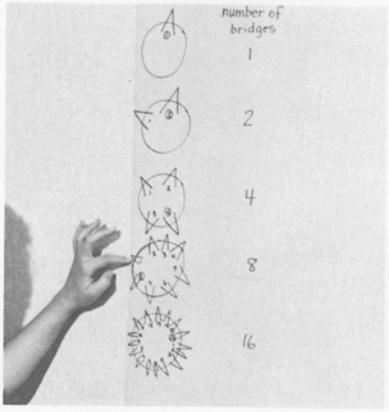
London Bridge

SKILLS Problem solving
Counting
Writing mathematical symbols
Pattern

MATERIALS Paper, number lines*

ACTIVITY Play London Bridge in a circle. Each time the song ends, the children who have been caught select a child from the circle to be part of a new bridge. Play the game this way for at least a week and then record the number of bridges at the start of each successive round.

The children can make individual records for their pattern book if they wish.



Pyramids

SKILLS

Ordering
Counting
Pattern
Comparing

MATERIALS

Paper

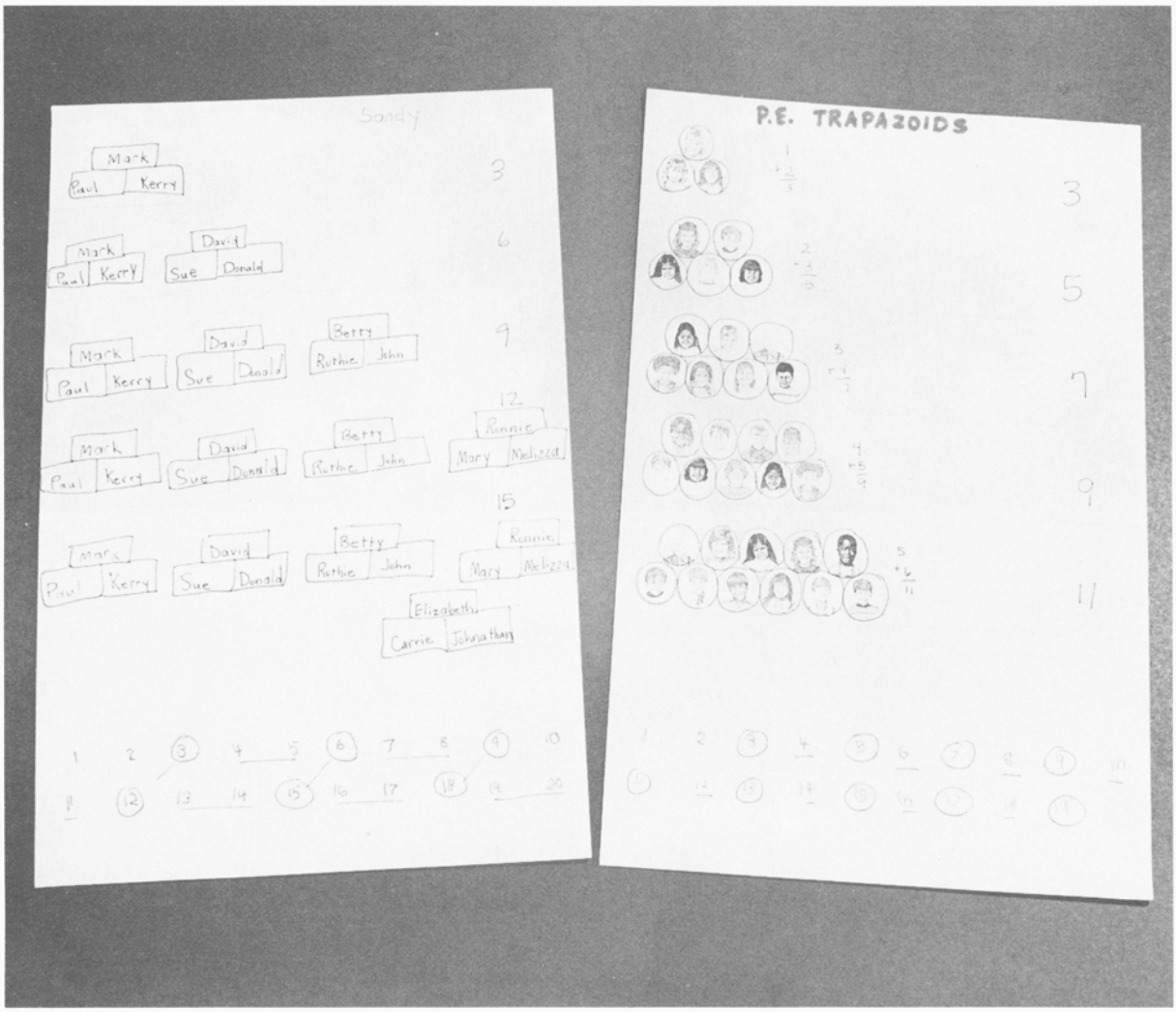
ACTIVITY

Teach your class to make pyramids during P.E. After the children perfect their skills, take pictures of the children making one pyramid, two pyramids, three pyramids, and so forth.

Then during your math period, put the pictures on a chart and work out the number pattern together.

The children may be interested in making a record of their own by drawing the pyramids or writing the children's names in the shape of a pyramid for a page in their pattern book.

Try trapezoidal pyramids at P.E. another time and make a similar record.



Apartment House Manager

SKILLS

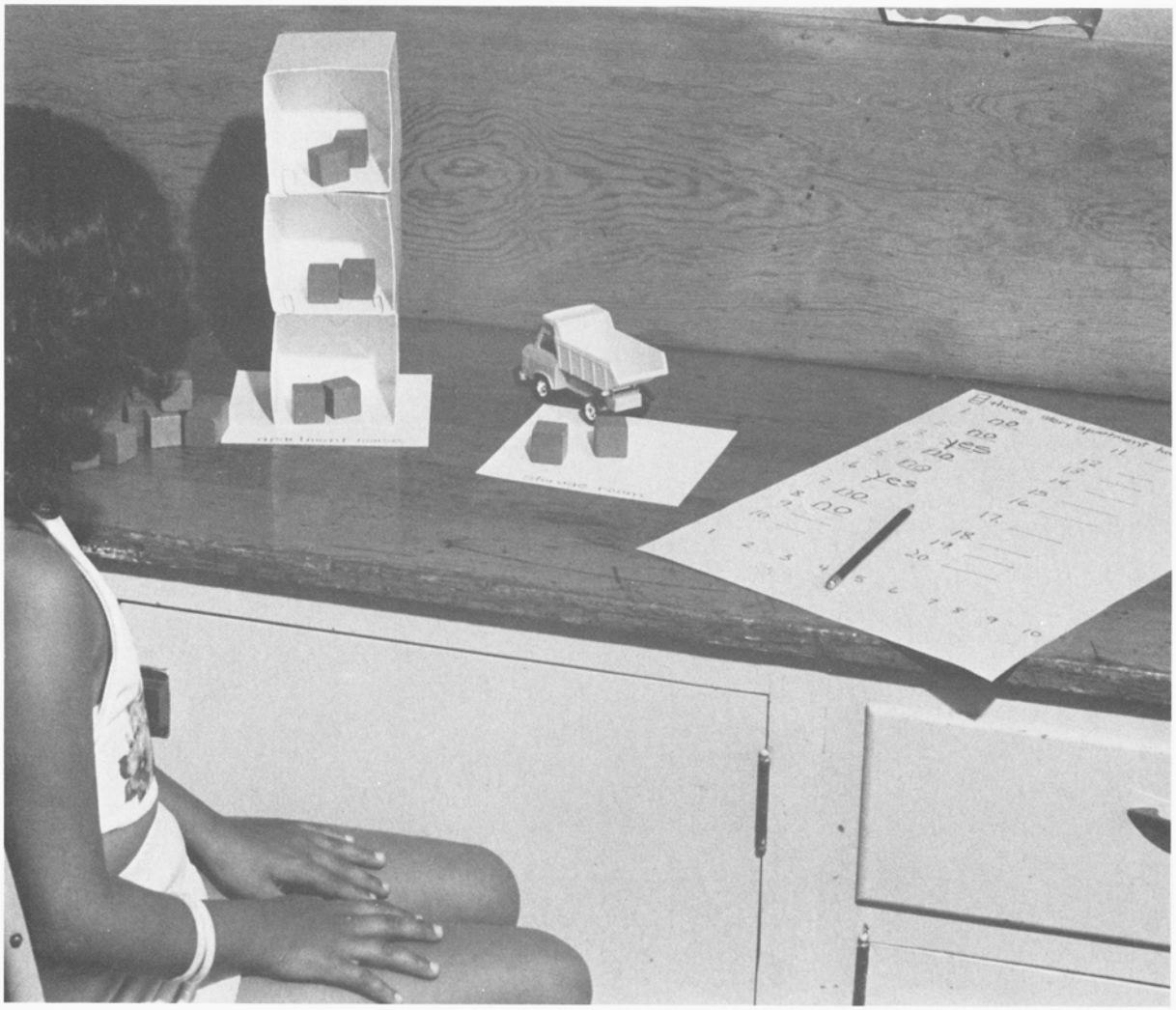
Problem solving
Counting
Writing mathematical symbols
Multiplication
Division

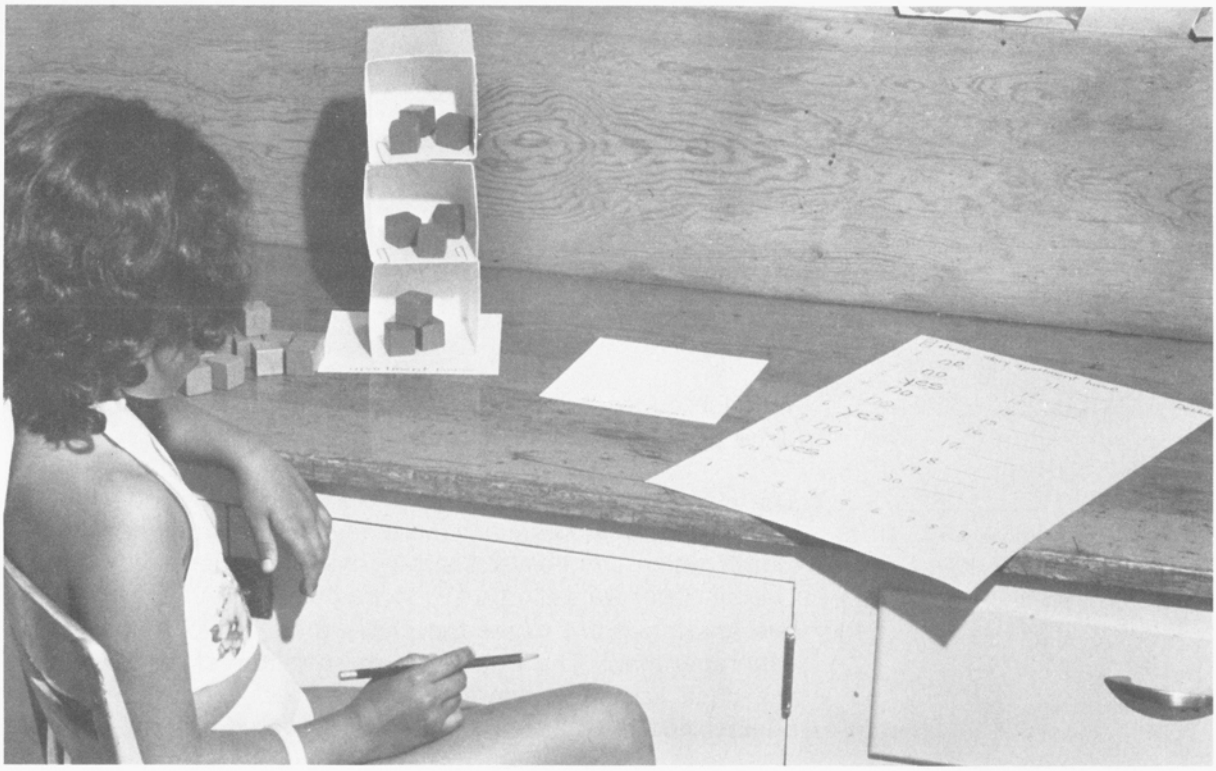
MATERIALS

Wooden cubes,* milk carton graphing boxes,* clothespins or large paper clips to connect cartons, number lines*

ACTIVITY

The children pretend to be apartment managers and work out the following situation: there is a little extra money each month which can be used to buy chairs for the apartments. The manager wants to be fair so he does not move a chair into one apartment but stores the chairs until he has a chair for *each* apartment. The truck from the furniture store delivers one chair each day, and the children keep a record on their number line of when the chairs are delivered.

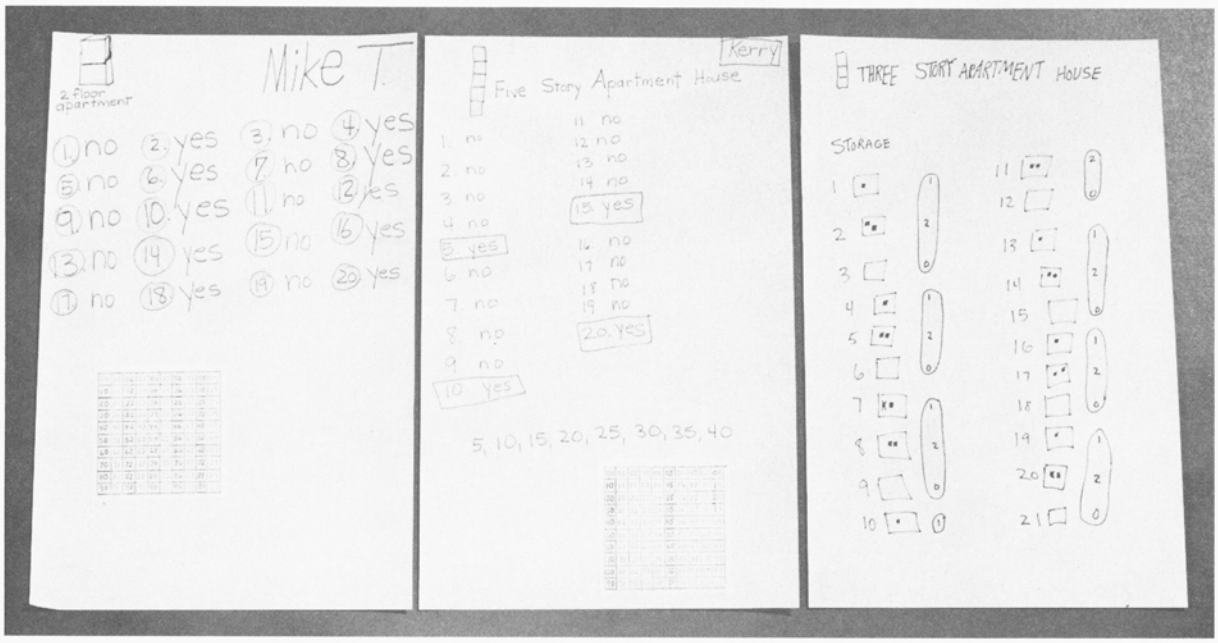




On another occasion the children keep a daily record of how many chairs are in the storage room.

This activity should be repeated, changing the numbers of apartments and recording the resulting pattern.

In another session put ten chairs in each apartment and describe the following situation: a truck will come to move one chair out of each apartment on each trip and deliver it to the used furniture mart. Keep a record of how many chairs are at the store after each trip.



Karate

SKILLS

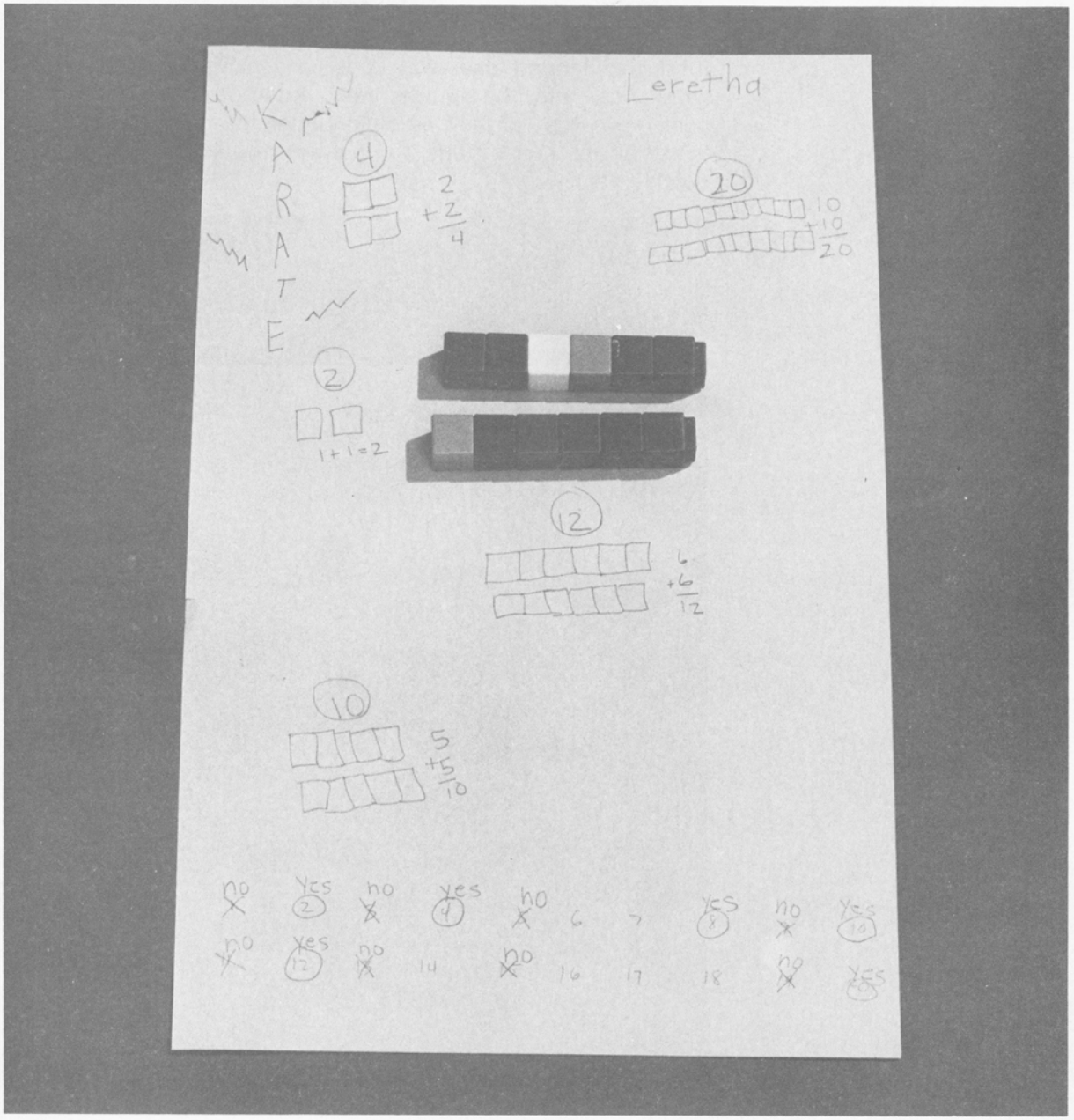
Problem solving
Division
Writing mathematical symbols
Pattern

MATERIALS

Unifix cubes,* paper, number lines*

ACTIVITY

Pose the question, "If you take nine Unifix cubes and try to break them in half, do you think the two halves will be the same?" Let the children guess and then snap nine cubes together and find out. The children should try all the numbers on their number line, recording their discovery for each one.



Two-Handed-Take-Away

SKILLS

Problem solving
Subtraction
Writing mathematical symbols
Pattern

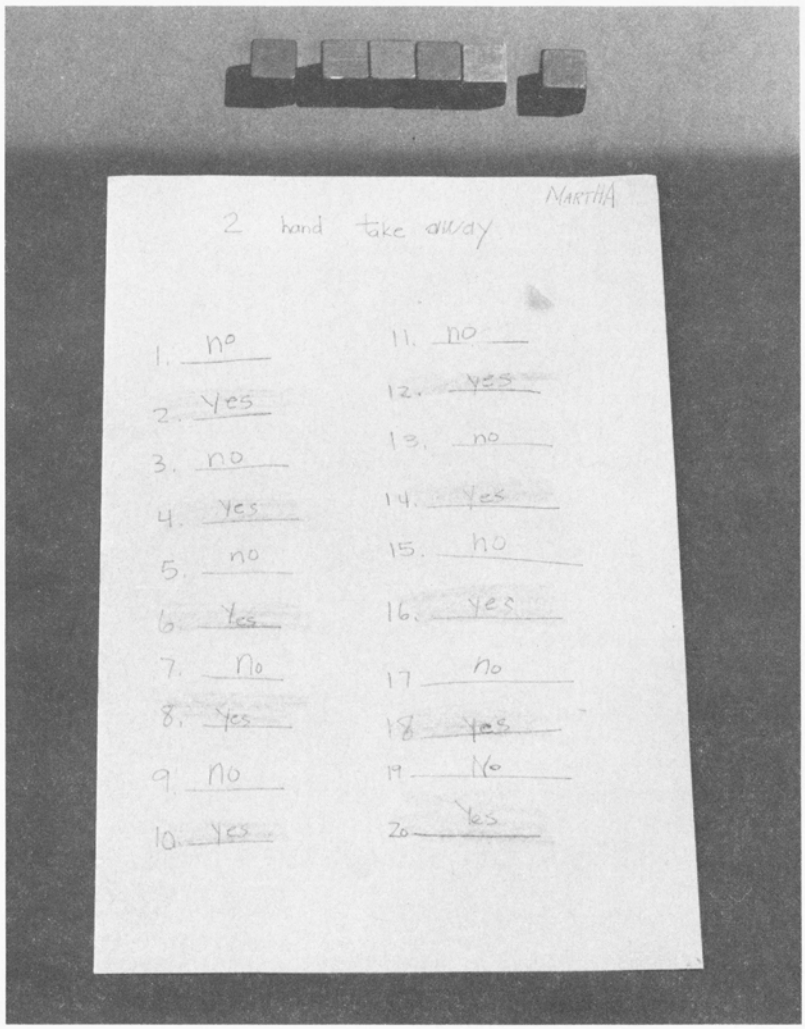
MATERIALS

Wooden cubes,* paper, number lines*

ACTIVITY

The children choose any number of cubes and line them up in a row. They remove two cubes at a time, taking one from each end of the row in order to find the numbers that come out evenly. The children do this until they have either removed all the cubes or are faced with one cube left over.

If the two-handed-take-away ends up coming out evenly, they write "yes" after the number being explored. If a block is left over they write "no." If the child circles the numbers marked "yes" on the number line, the pattern reveals itself more quickly.



Milk Carton Clothespin Game

SKILLS

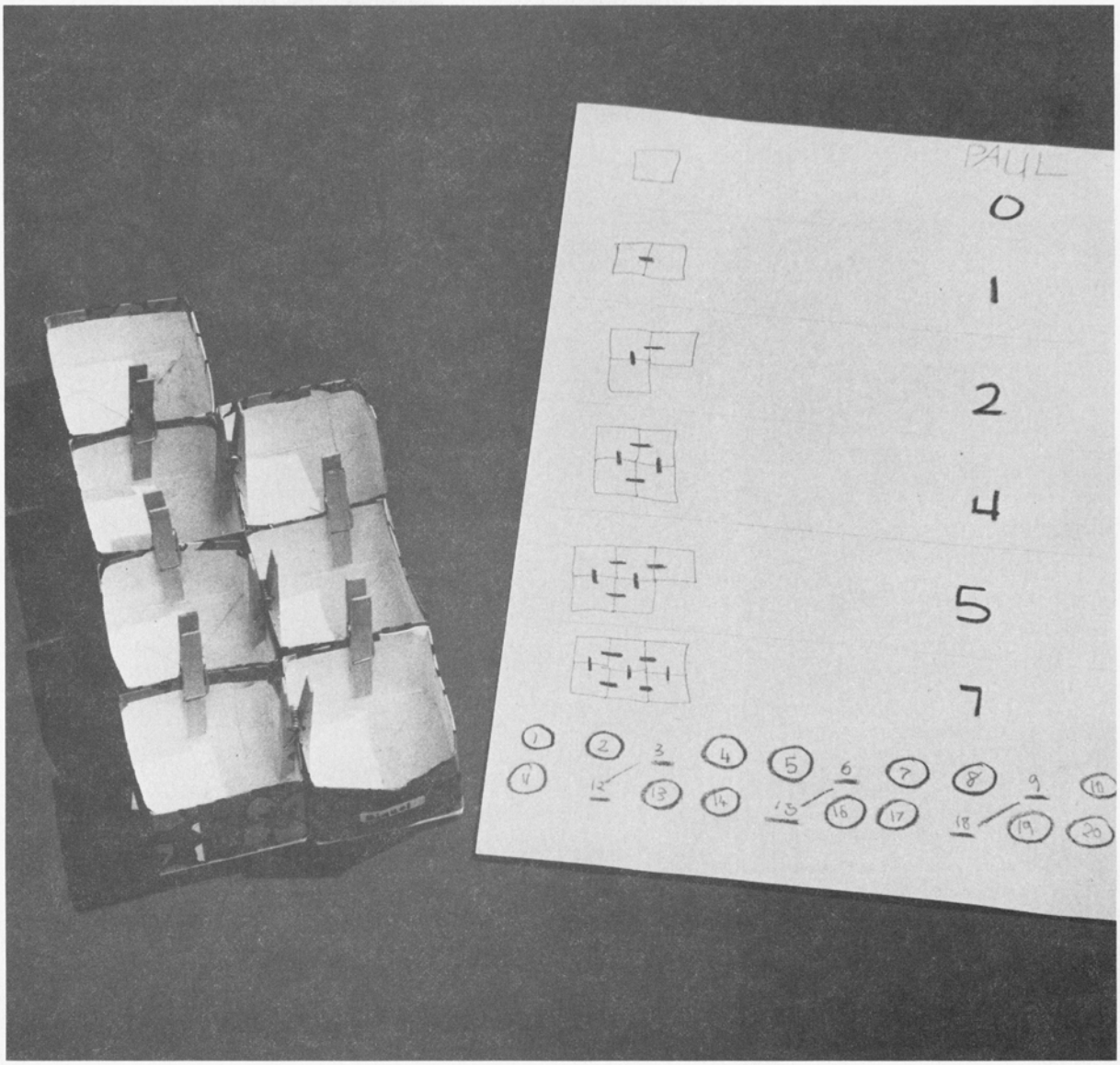
Problem solving
Counting
Writing mathematical symbols
Pattern

MATERIALS

Milk carton graphing boxes,* clothespins, construction paper cut as wide as two milk cartons, number lines*

ACTIVITY

Pose the question to the children, "How many clothespins would you need to fasten five milk cartons together?" Have the children predict and then let someone clip five milk cartons together and count. Ask the children to find out how many clothespins they would need for each number of milk cartons up to twenty.



Count the Squares

SKILLS

Problem solving
Counting
Writing mathematical symbols
Pattern

MATERIALS

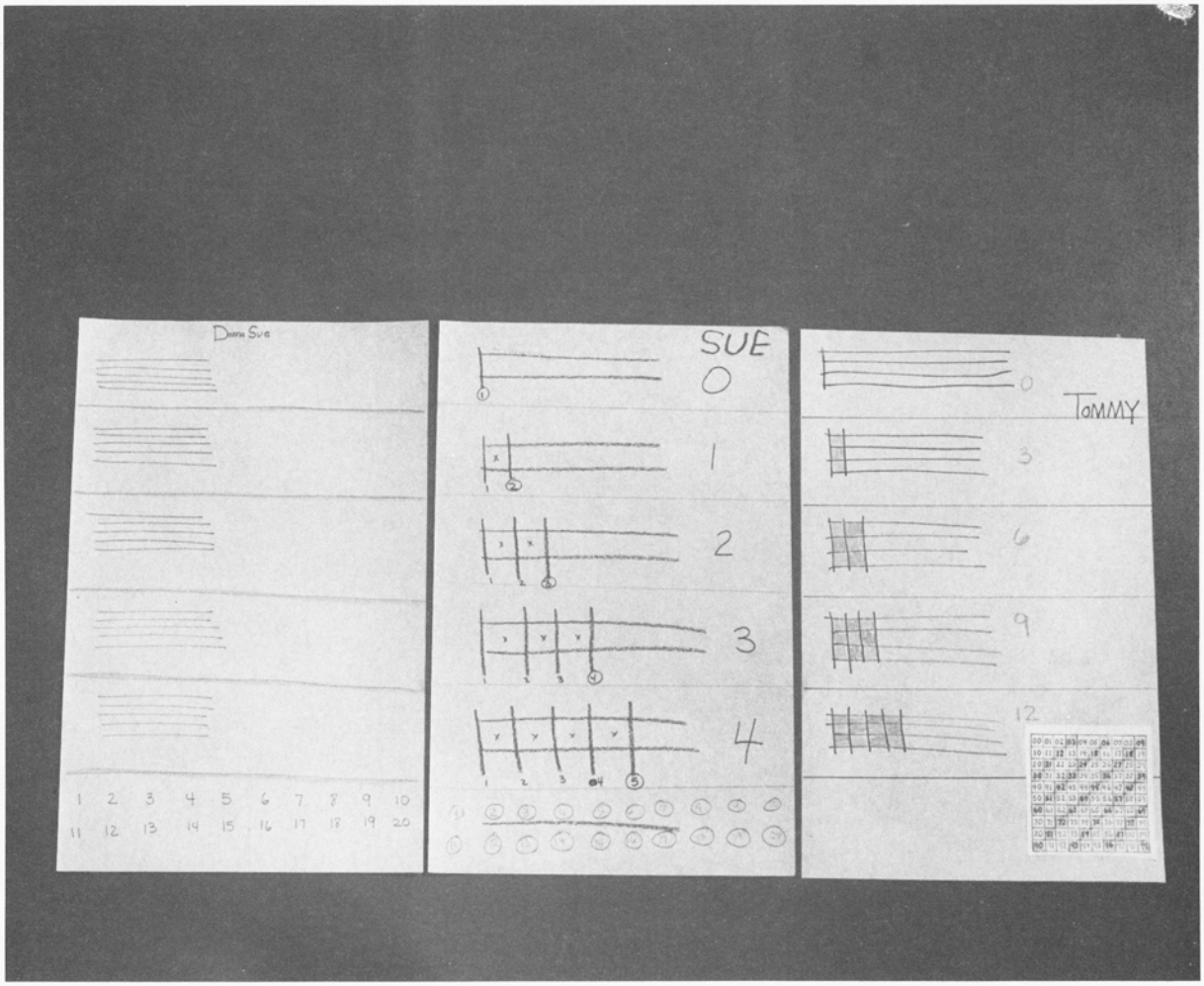
Paper, number lines*

ACTIVITY

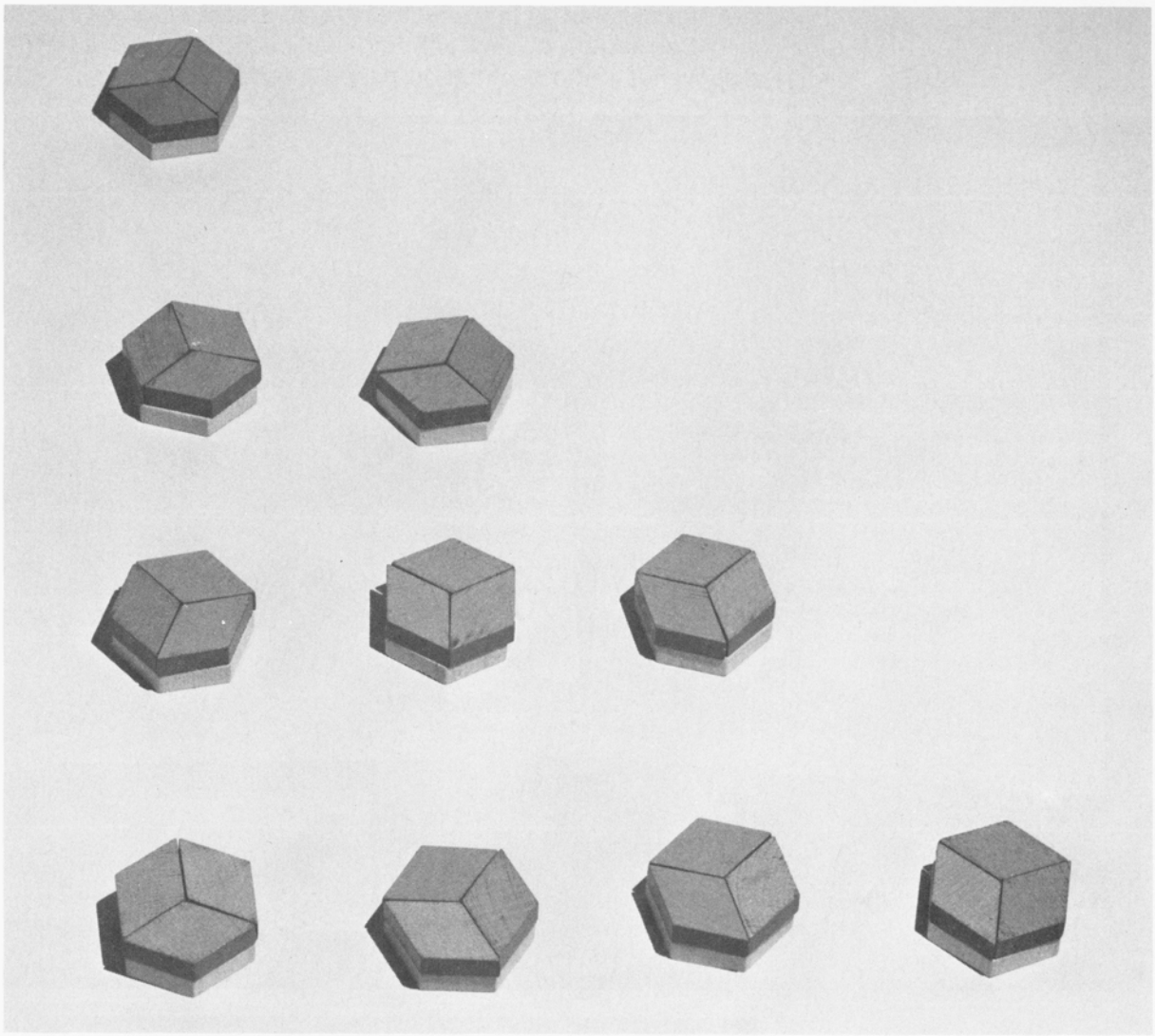
Give the children small squares of paper and ask them to draw three lines.

Ask each child to explore a different number, drawing that number of vertical lines. Have the children number each line and color in the squares that are formed.

Collect the papers and sort them by the number of lines. Encourage the children to look for a pattern and discuss what they see. Ask the children to prepare a paper with a series of three lines for the next day.



This activity should be repeated with two, four, or five lines at other sessions.



Pattern Block Puzzles

SKILLS

Fractions
Problem solving
Counting
Comparing
Pattern

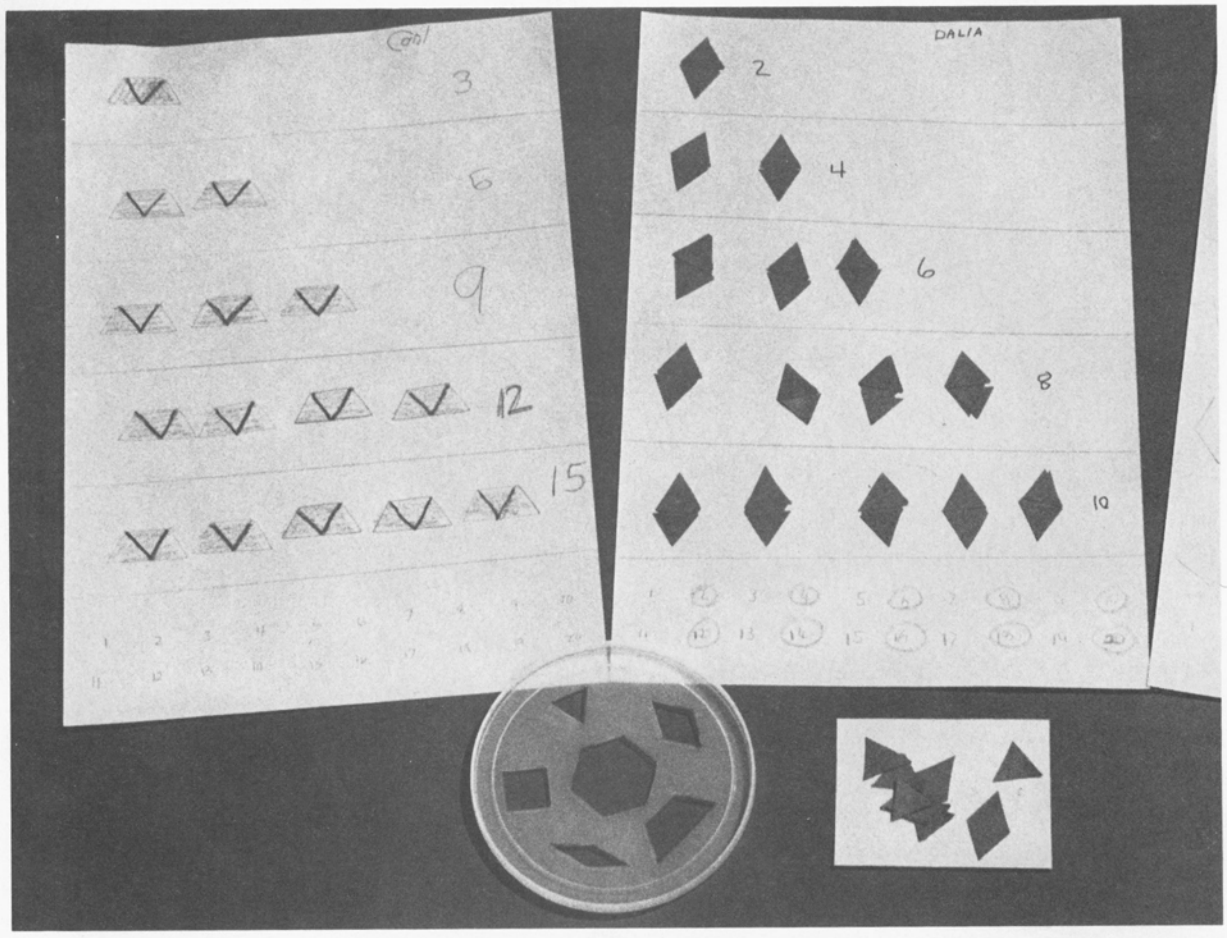
MATERIALS

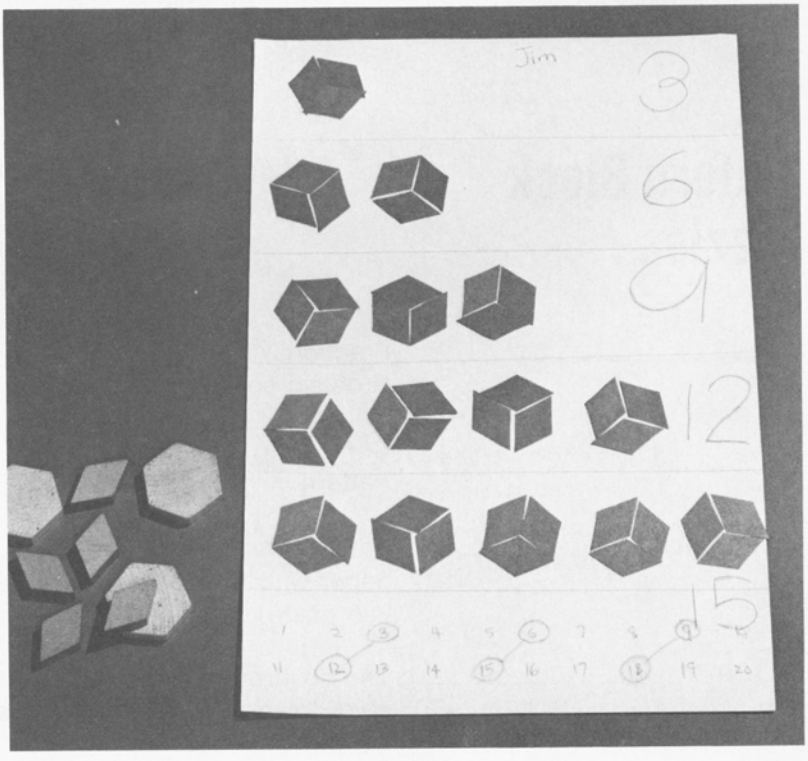
Pattern blocks,* pattern block shapes cut from construction paper with the pattern block template* or from Worksheets 2–6 paste, paper, number lines*

ACTIVITY

The children sort the pattern blocks by color and take one color to explore, arranging this color of blocks in an increasing pattern.

Ask the children to try to find blocks of a second color that will fit on top of the first pattern evenly and to record their discoveries with construction paper shapes.





Geoboard Nails

SKILLS

Problem solving
Counting
Comparing
Pattern

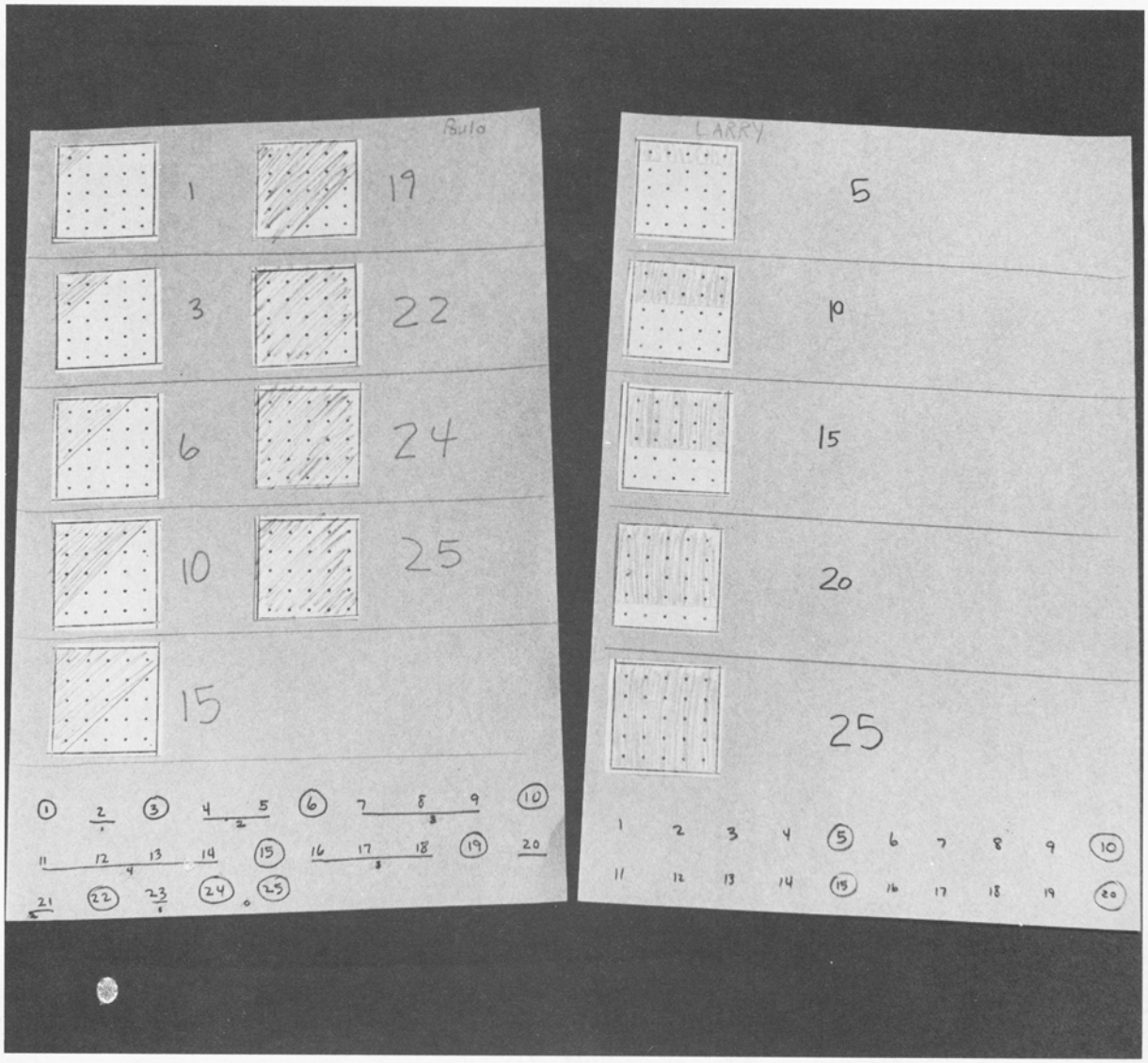
MATERIALS

Geoboards,* rulers, Unifix cubes,* paper

ACTIVITY

The children count the number of nails along successive diagonals on the geoboard, using a ruler.

The children talk first about the rows of nails and then about the total number.



"1", "2,1", "3,2,1", "4,3,2,1", "5,4,3,2,1".

This same activity should be repeated with a meterstick or yardstick and four geoboards placed in a square.

City Planner

SKILLS

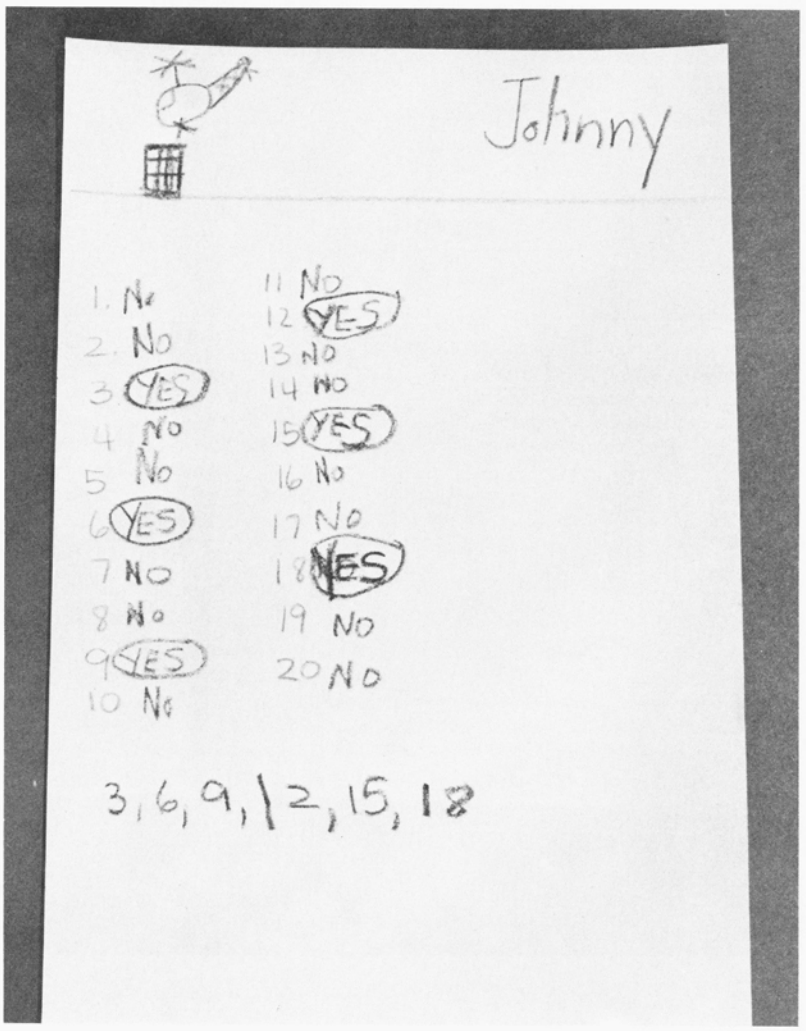
Pattern
Counting
Division
Problem solving

MATERIALS

Unifix cubes,* paper, number lines*

ACTIVITY

Set up the following situation: the city planner needs to know how many stories high some three building complexes can be and still have level roofs so that a helicopter can land on them. The children choose any number, make a stack with that number of cubes, and try to break the stack into three even buildings. If they are successful making level helicopter pads, the children write "yes." If the stack of cubes does not break evenly into three parts, they write "no." At the end a list of all the "yes" numbers is made to give to the city planner.



This activity should be repeated to explore two, four, and five on other days.

Jewels

SKILLS

Problem solving
Multiplication
Division
Writing mathematical symbols
Pattern

MATERIALS

Jewels,* paper, number lines*

ACTIVITY

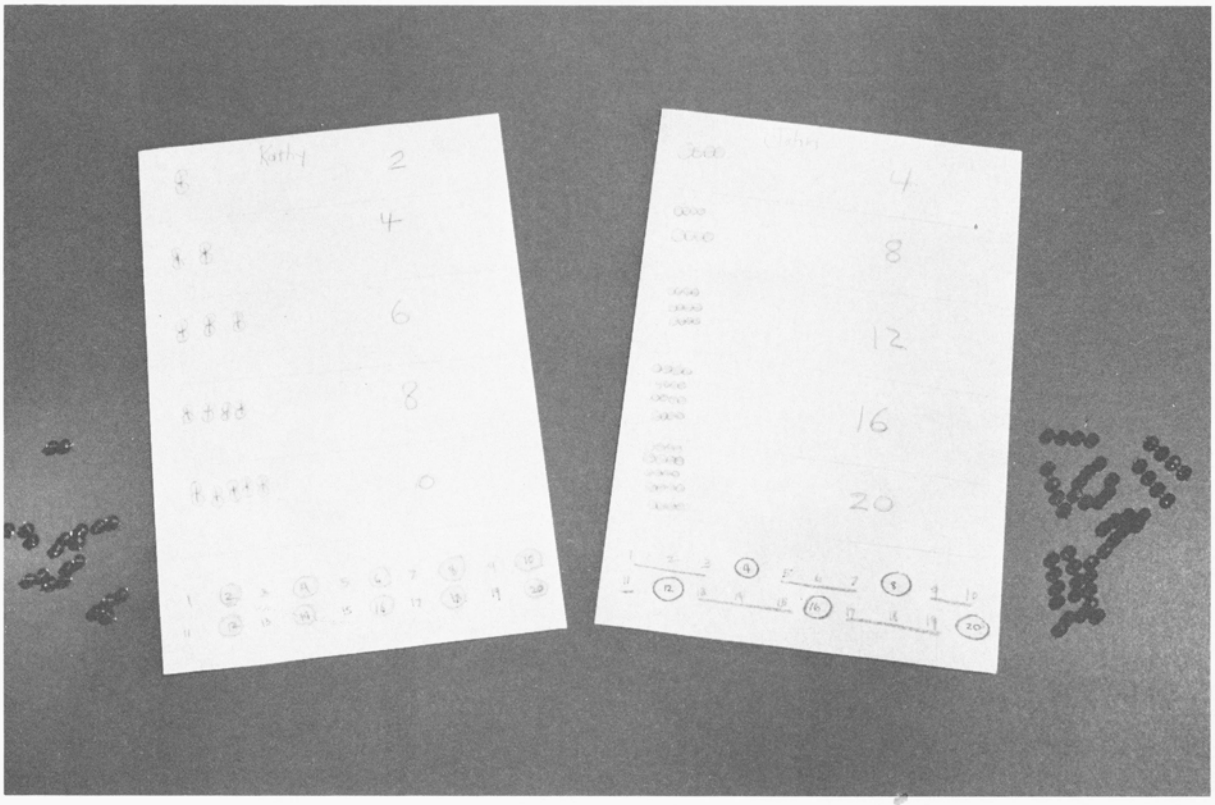
Ask the children to sort the jewels by color and take one color to explore. The goal is to try to make each number from one to . . . and to record whether or not this is possible.

Remind the children that the jewels must never be broken apart. Once a child in my class made every number and I had to buy a lot of new jewels!

During another session ask each child to get a pile of twenty beads (ten twos) and record experiments testing the possibility of subtracting each number from the pile.

The same activity should be repeated for each color. Do not neglect the ones!

Coloring all the "yes" one color and the "no's" another makes the pattern stand out more clearly.



Intersecting Roads

SKILLS

Problem solving
Counting
Comparing
Pattern

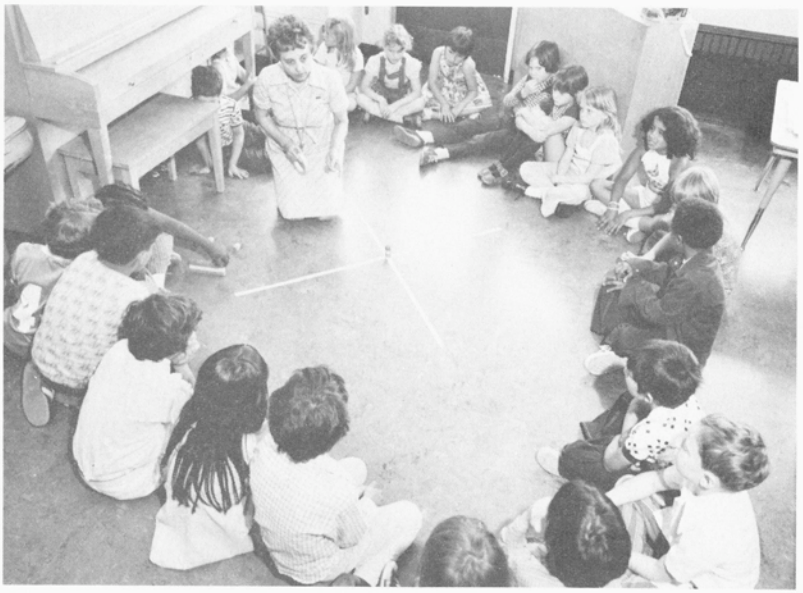
MATERIALS

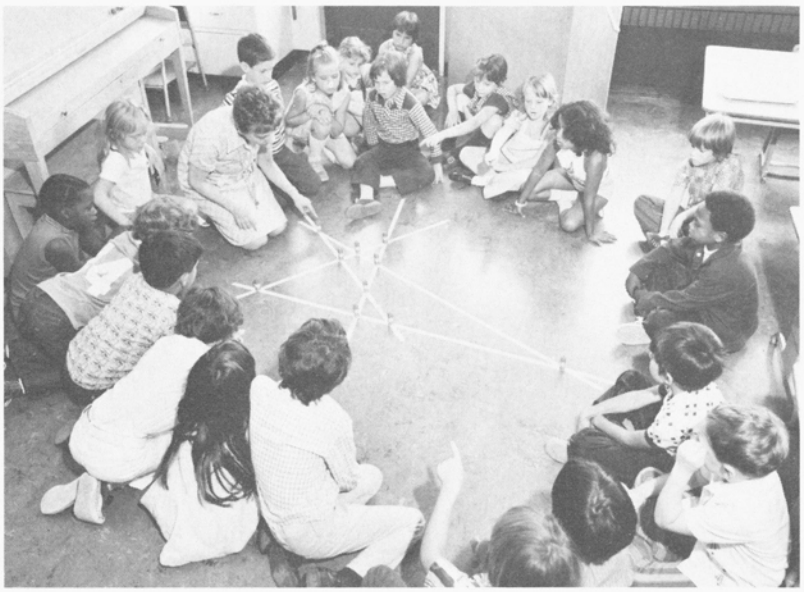
Several three foot lengths of black ribbon, stop lights made from stacks of red, yellow, and green Unifix cubes, 45 cm × 1 cm or 18″ × ½″ strips of construction paper

ACTIVITY

Ask the children to take three 1 cm or ½ inch strip construction paper roads and make them cross over one another. Point out the *different* ways the children find and ask them how many intersections they each have formed. Now, tell the children to try to make their roads intersect as *many* times as possible. Place three ribbons in the pattern that the children discover creates the most intersections and put up the Unifix stop lights at each crossroad.

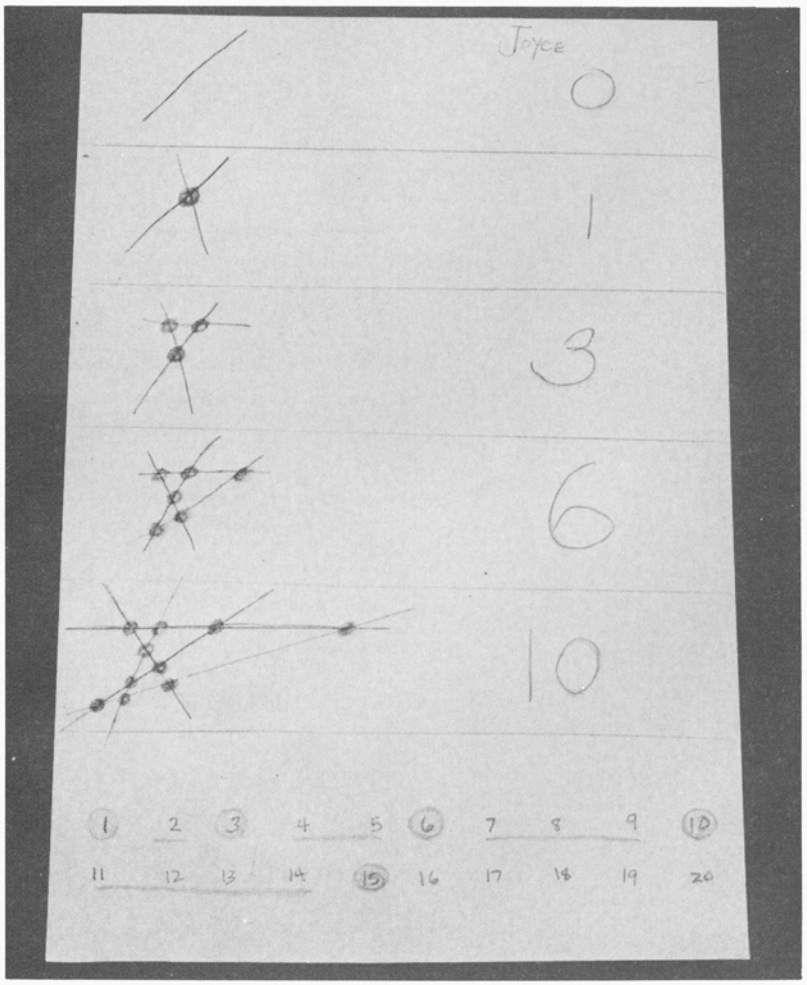
On another day, build the three road pattern discovered previously and then search for the arrangement of four roads that results in the greatest number of intersections. Repeat this for five roads and then snap on one Unifix cube for each intersection to compare the increase from step to step.





Encourage the children to look for a pattern and predict the number of intersections for six roads. Allow them to experiment to check their prediction.

Some may want to make a record of their explorations to add to their pattern book.



Partners

SKILLS

Problem solving
Comparing
Pattern

MATERIALS

4 cm or 1½ inch squares and full sheets of construction paper, photocopied pictures of the children,* paper, glue, Unifix cubes*

ACTIVITY

Pose the following question to the class: "How many different ways could Mark, David, and Cathy team up as partners?" Let the children try to solve this problem in their own way and then suggest keeping a record.

Give Mark, David, and Cathy each a different colored sheet of construction paper and have them glue their xeroxed picture on a square of the same paper. Then explore the different ways they could team up as partners by putting a square of each child's color on the work area to record the suggested possibilities.

Ask how many different ways there would be with just Mark and Cathy and with Mark alone and record that information on the chart.

The next day give Mark, David, and Cathy their same colors back and give another child a fourth color. Search for all the different ways of pairing the four children and record the results.

This is tricky. When the children get bogged down, lose track, and duplicate possiblities, do not abstract the solution for them! Allow them to struggle with the wrong information or duplications. Trust that as they begin to see a pattern, this will sort itself out. If you abstract for them and point out mistakes, they are robbed of the experience of creating order out of seeming chaos. This is the most rewarding experience in life—seeing the light dawn.

Focus the children's attention on each step by asking how many squares of each color was used at that particular step.

Encourage the children to predict the number of each color they expect to find at a certain step and see if this prediction will help them sort out the different possibilities.

On the third day, review the numbers of colors at each step and then focus on the total number of possible pairs at each step. Make a train of Unifix cubes for each total and compare them, trying to see the pattern in terms of the increasing number of cubes.

Have the children predict how many more there will be in the next step. Count out this many more Unifix cubes and determine the total. Now get the children to predict how many of each color they expect to find and begin recording the possibilities.

On the fourth day, add one more child, predict, and then explore.

Recording Tile Patterns

SKILLS

Problem solving
Counting
Writing mathematical symbols
Pattern

MATERIALS

Tiles,* square template,* paper, number lines*

ACTIVITY

The children make tile patterns (See p. 261) and record them on paper with their square template.*

The children can color the design to highlight the vertical, horizontal, or diagonal pattern. They can also count the total or add the perimeter and then record each pattern on their number line.

This activity should be repeated many times.