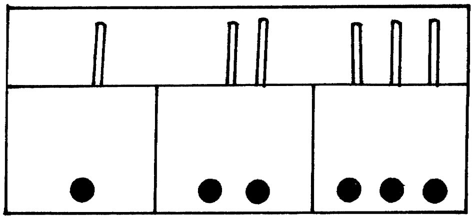
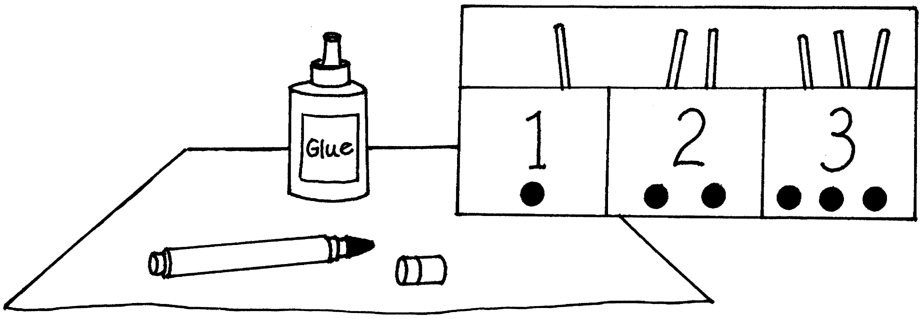
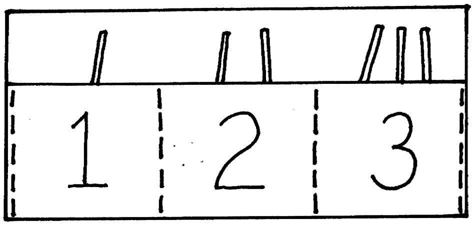
MATHEMATICS/ MANIPULATIVES

3 to 4

Popstick Pockets







Purpose: The following 3 games are designed to give children mathematical experiences with tangible objects. They encourage the association of tangible materials with symbols and numerals. Young children can often recite numbers by rote, but not necessarily understand what they stand for. Children need time, opportunity, and many experiences handling real objects before they understand abstract numerals. This activity moves in 3 steps, from simple to slightly more complex, so that children can move at their own pace and developmental stage. The steps are prerequisites for developing a strong understanding of numbers and numeration.

HOME CONNECTION

Ask parents to save sticks for this activity. They can also help make the pockets in an informal session after school or at home in the evening if they are not free during the day. The pockets can be made of fabric by a willing parent; these are more durable for the class.

Materials: popsticks, ruler or measuring tape, scissors, glue, thick paper

Preparation:

1. Cut out 12 dots and 2 sets of the numerals 1, 2, and 3.

2. Make 3 sets of 3-sectioned pockets out of thick paper.

3. On the first set of pockets, glue 1 dot on the left pocket, 2 dots on the middle pocket, and 3 dots on the right pocket. (Or, if a parent is making the pockets out of fabric, sew on buttons.)

4. On the second set of pockets, place 1 dot and the numeral 1 on the left pocket, 2 dots and the numeral 2 on the middle pocket, and 3 dots and the numeral 3 on the right pocket.

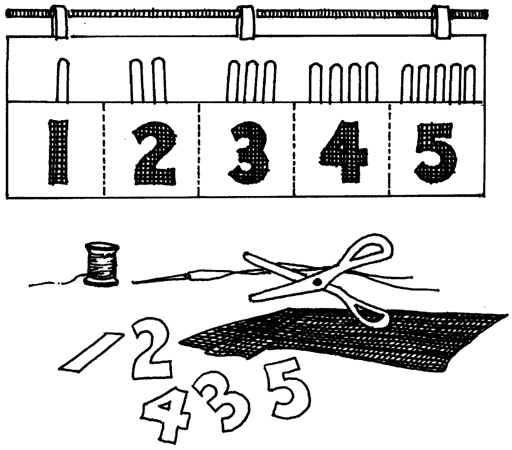
5. On the third set of pockets, place the numeral 1 on the left pocket, the numeral 2 on the middle pocket, and the numeral 3 on the right pocket.

Activity: In a group of 3 children, give each child a popstick pocket and several popsticks (or tongue depressors). At first, the children may just enjoy randomly putting the sticks in the pockets. Give them time to explore and discover. On their own, some will begin to associate one dot with one stick. Others may just need more time, and some may need a teacher's prompting: "How many dots do you see here? One - yes. Can you put one stick in the pocket. Good! How many dots are next? Two - yes! How many sticks go in there? Let's see you put the same number of popsticks in the last pocket as there are dots on the pocket." When the child masters the activity with dot-only pockets, introduce the dot/numeral, then the numeral pockets.

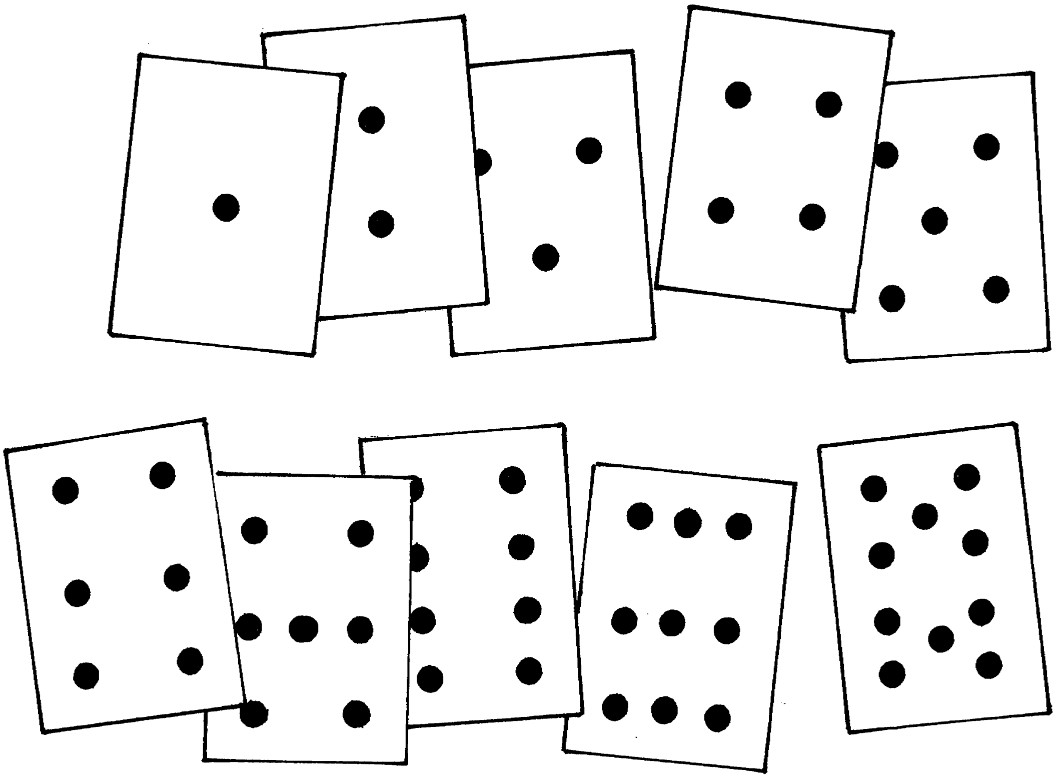
Extensions and variations:

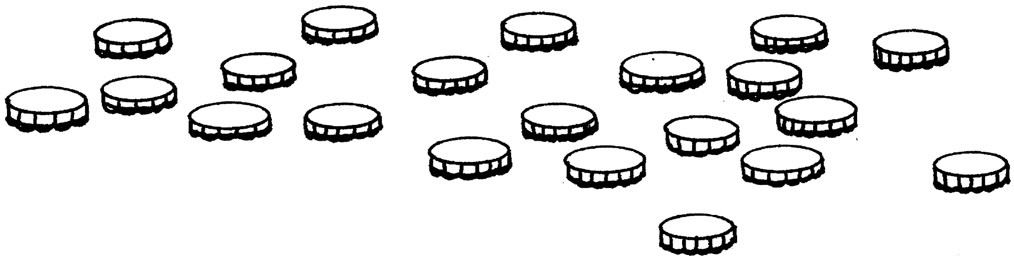
- Make popstick pockets with numerals from 4-6, 7-9, etc.

- Make collections of pebbles, buttons, or keys in a bowl. Take 1 pebble and place it in front of you. Now ask a child to take the same amount and place it in front of her. Can she match sets and count the objects? As the child's facility with numbers increases, create more complex addition and subtraction games. How many combinations of pebbles can you think of to make 5? How many do you remove to get 3?



Bottle Caps to Dots





HOME CONNECTION

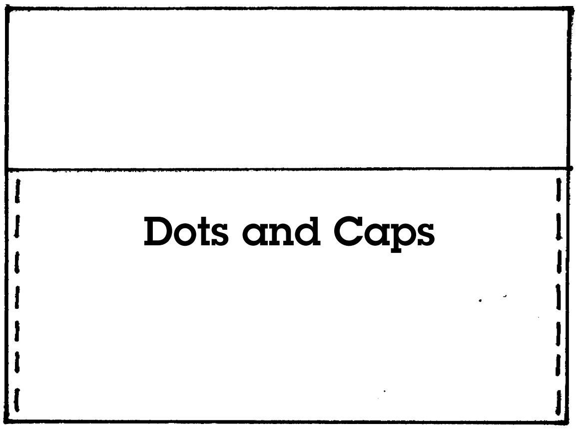
Announce that you are collecting bottle caps for a classroom game. Set a specific amount of time—for example, one week—and have the children bring in all the bottle caps their families were able to save during that time.

Purpose: In this activity, children learn to associate tangible items with numerical values.

Materials:
10 unlined cards or thick paper (cut to 12 cm. x 18 cm.)
stapler
55 bottle caps
marker

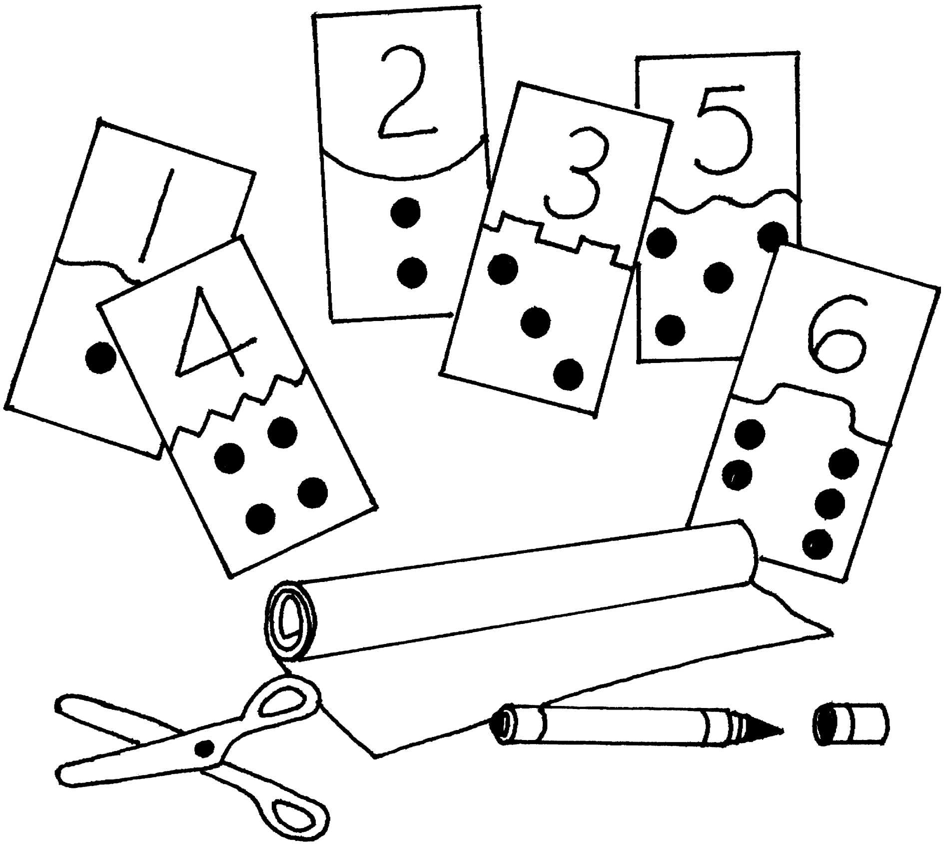
Preparation:
1. Cut 10 cards out of thick paper (or use unlined cards).
2. Mark 1 to 10 dots (not numbers) on the cards.
3. Collect 55 bottle caps.
4. Make an envelope out of thick paper (with stapled sides) to hold the cards and bottle caps.

Activity: Using a set of cards, ask a child to match the number of bottle caps to dots on the cards. Count together the number of bottle caps.



Extensions and variations:
- Show a younger child a card with 1, 2, or 3 dots and ask what number the card represents.
- Ask a child to close his eyes. Hide one of the cards. When the child opens his eyes, can he say which card is missing?

Number Puzzles



HOME CONNECTION

This activity can be made into a permanent game for the classroom if parents are willing to make the number puzzles on cardboard. In this way, parents can help at home to support classroom activities.

Purpose: The 6 puzzles described in this activity have a variety of uses in the classroom. Number puzzles give children needed opportunities to experience mathematical relationships through the manipulation of concrete objects. By observing the children, the teacher recognizes when a child is ready for the next step, that is, higher number puzzles. The puzzles are designed so that children will associate a specific quantity of dots with the corresponding numerals. As they begin to associate symbols with objects, they learn that amounts are represented by particular numerals.

Materials:

- 6 unlined cards
- marker
- scissors
- thick paper

Preparation:

1. Using a marker, write the numeral on one half of a card and make the corresponding number of dots on the other half. (Laminate the cards or cover with clear contact paper, if possible.)

2. Cut each card in half, using a different cutting pattern—saw-toothed, straight, curve, etc.—for each card.

Activity: Lay out all of the pieces face up on a table. Let the children match the dot half to the numeral half of the puzzles. Then, one or two children play "find the number." They place all of the dot cards face down in a stack and all of the numeral cards face up on the table. Children take turns selecting a dot card and placing it on the appropriate numeral card. The shape of the card also guides them to identify the correct half. The game continues until all dot cards have been matched to the numeral cards. The teacher encourages children to express their understanding of number and quantity by asking questions such as, "How did you decide to put those pieces together?" "Why did you match them?" "Are you sure?"

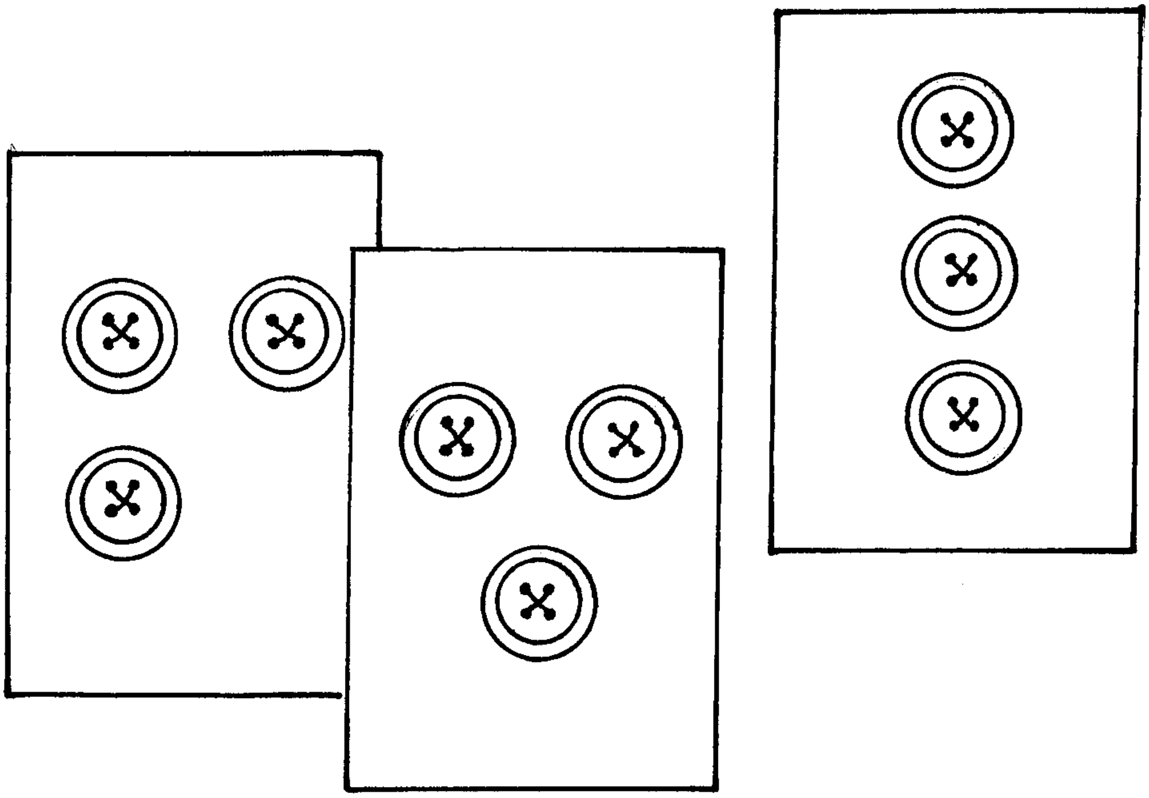
Extensions and variations:

- Have the child order the number puzzles from 1 to 6. Are the puzzles ordered from left to right? Are the numbers facing in the right direction?

- A variety of games can be "invented " by the children using the number puzzle cards. Encourage them to make up their own games.

Same or Different Quantities

3 to 4



HOME CONNECTION

A simple matching lotto game can be played at home by children and parents using a deck of cards.

Purpose: This activity helps children understand the concept of "conservation of number" (although the arrangement of a set of objects differs, the quantity remains the same). See the illustration showing 3 cards with the same quantity of objects in different locations. The activity helps with the recognition that number [is a property of a set of collection of objects.]

Materials: 8 cm. x 13 cm. cards
markers or dot stickers

Preparation:

1. Make 18 cards, 8cm. x 13 cm.

2. Place 1 to 6 dots on each card in various arrangements.

3. Have at least 3 different dot arrangements for each number.

Activity: Place all cards on the floor. A child or a pair of children can sort the cards for each number. Some children may be ready for a culminating activity of placing the stacks of cards in order from 1 to 6.

Extensions and variations:

- Make a set of cards from 1-6 by sewing the appropriate number of buttons on each card. There should be three different button arrangements for each number.

Number Lotto

3 to 4

0	1	2	3	4	5	6	7	8
0	1	2	3	4	5	6	7	8

2	5	7	1	3
4	1	6	8	9
0	9	4	2	5
8	6	3	0	7

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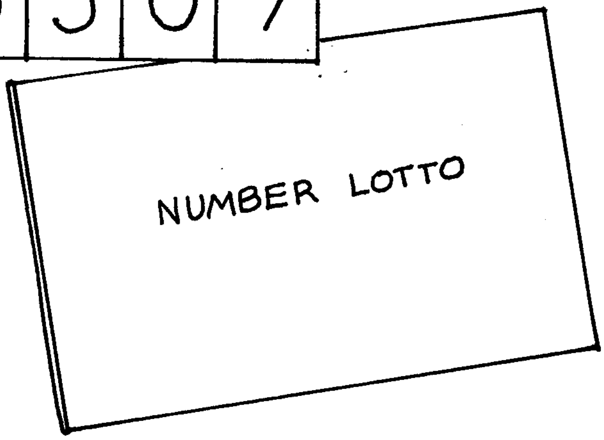


Purpose: Number lotto is a great way for a child to learn to read numerals and associate them with the amounts they represent. After a child demonstrates an understanding of the amounts from 0 to 9, she is ready to work with the number symbols. Playing number games such as lotto helps to integrate number awareness into a child's daily life. Having numbers displayed on birthday, job, and schedule charts and other classroom materials will illustrate that numbers are all around us and essential in daily life.

Materials:	cardboard	ruler
	pencil	scissors

Preparation:

1. Make 20 5 cm. x 5 cm. cardboard number cards.

2. Take a 26 cm. x 26 cm. piece of cardboard and section it off so that it can accommodate 5 number cards across and 4 cards down. This is the lotto board. Next write a numeral from 0 - 9 in each of the sections. Write the numerals out of order. Each numeral will appear twice.

3. On the 20 number cards made in Step 1, write the numerals 0 - 9. (One number to a card. Each number will appear on 2 different cards.)

Activity: One or 2 children can play number lotto. Begin by placing the number cards face down in a pile. If 2 children are playing, they can take turns selecting a card and placing it on the appropriate number space. The game continues until all cards have been placed on the number spaces. Teachers can assess whether or not a child can match numbers and name them.

Extensions and variations:

- The lotto cards can be used for a number concentration game. Two or 3 children can play this game. Cards are spread out face down on the table. Children take turns turning over 2 cards at a time. If the cards match, the child keeps them; otherwise the cards are returned to their original position. The game is over when all cards are picked up.

Number Book

3 to 6

Purpose: The number book reinforces the concept that numerals represent tangible objects. Children associate the numeral with objects that they can touch and count. This activity shows teachers how to make books. Making one's own book can be a useful and rewarding effort for teachers.

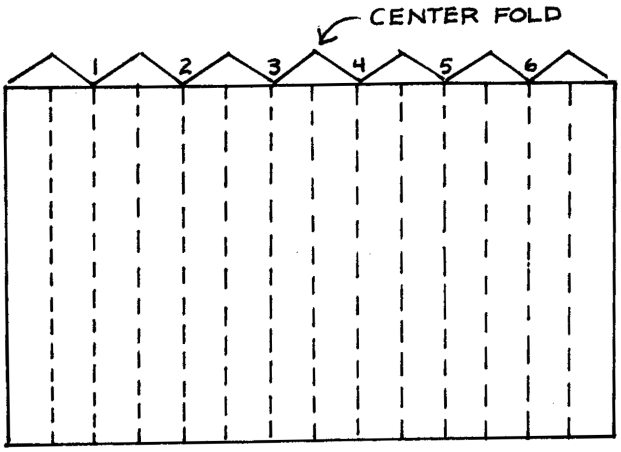
Materials:

- thick colored (or white) paper (30 cm. x 45 cm.)
- heavy paper for two covers (22 cm. x 30 cm.)
- glue
- ruler and pencil
- exacto knife

Preparation:

1. You will be folding a piece of paper (30 cm. x 45 cm.) like a fan to form the spine or back of the book. Begin by folding the sheet of paper in half and with a ruler mark off lines from the center fold at 2 cm. intervals. For a 6-page book, you will need 13 lines.

2. Start to fold on each of the lines. See the illustration for the 6-page book.

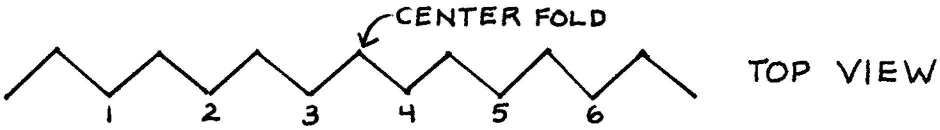


A 6-PAGE BOOK

HOME CONNECTION

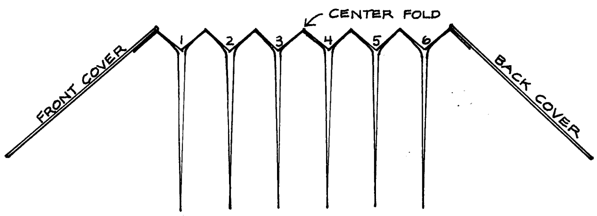
Invite an older sibling or relative to visit school and make books with the younger children. The children can choose the objects to be glued. They will then have number books that they helped make!

3. After computing the fan folds, stop and do some planning. Decide on the number sequence you want to show, 1 - 5 or 1 - 10, etc. Make some special pages by folding your pages in half and placing a piece of cardboard in between them.

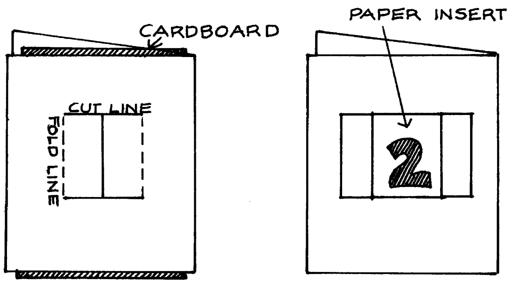


Cut out a window. Write the numeral on the paper that shows through the window. Do this for each page to show the number sequence presented in the book.

4. Glue in the double pages. Make sure to glue each long edge of the page right into the fold.



5. Glue front and back covers on the book.



6. Go back to the first window page showing number 1 and glue 1 object, such as a feather, on the page. Do the same for each window page that shows a numeral. Glue corresponding amounts of objects to the page. Use different objects for each page, such as pieces of straw, sticks, paper clips, etc.

Activity: A number book can be used to introduce or reinforce counting and one-to-one correspondence (matching number names to the objects in a set.). In small groups or individually, give children repeated opportunities to count the sets of objects on the pages in the book. These counting experiences will help children establish important number concepts beyond rote counting.

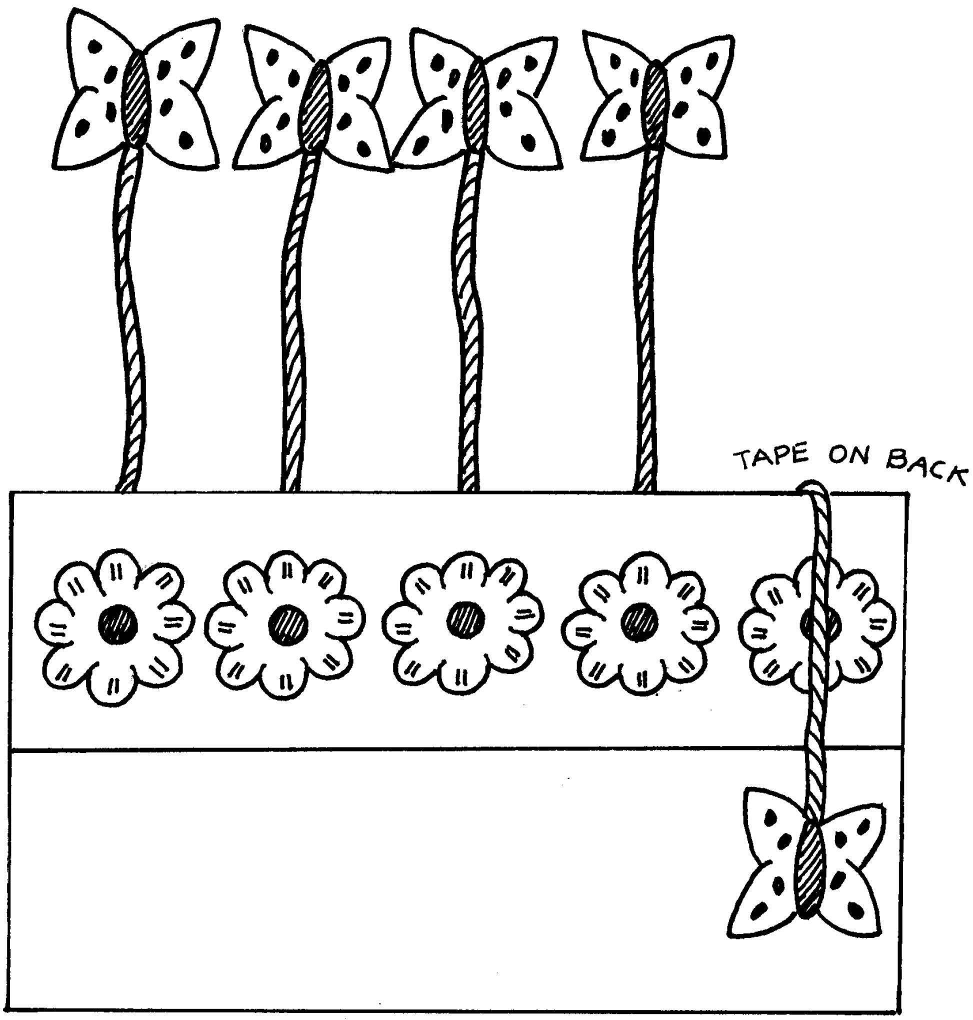
Extensions and variations:

- Have children make their own number books. Children can select from among a variety of objects to glue on the pages in their books. The teacher and volunteer parents can help bind the books.

3 to 6

Butterfly Counter

Submitted by Moldova



HOME CONNECTION

Let parents know that young children are working on mathematical concepts in their own way from a very early age. Parents should watch for times when their child seems intent on getting just the right amount of something or matching objects accurately. They should play simple counting games such as this one with their child without pressuring the child for speedy computation.

Purpose: Butterfly counter is a mathematical game. It teaches the concepts of one-to-one correspondence and equal/unequal amounts. At this point in their development, young children do not need to know numbers or be able to count. Later, when children understand counting, butterfly counter is a valuable activity that gives practice in addition and subtraction problems from 0 to 10.

Materials:

	paper	crayons or markers
	glue and tape	string or yarn
	ruler	scissors

Preparation:

1. Cut a piece of paper 22 cm. x 15 cm.

2. Hold the paper lengthwise and draw 5 flowers of similar size (approximately 3.5 cm. in diameter) and color. The flowers should be evenly spaced.

3. Draw 5 butterflies of equal size (about 3 cm.). Cut them out. Color both sides of the butterflies and glue or staple them onto a string or piece of yarn (approximately 13 cm. in length).

4. Attach yarn pieces to the back of the card so that they line up with the flowers.

Activity: When presenting this activity to young children, flip the butterflies so they appear to be flying above the flowers. Then say, "Now have each butterfly fly to its flower. Are there as many butterflies as flowers?" This experience encourages the development of one-to-one correspondence.

Butterfly counter is an activity that children can use at different levels of understanding of addition and subtraction. The teacher asks questions to show children how to use this learning tool: "How many butterflies are there? How many flowers are there? Look, one butterfly flew away [the butterfly is flipped behind the flower]. How many butterflies are left? What would happen if 2 butterflies flew away?"

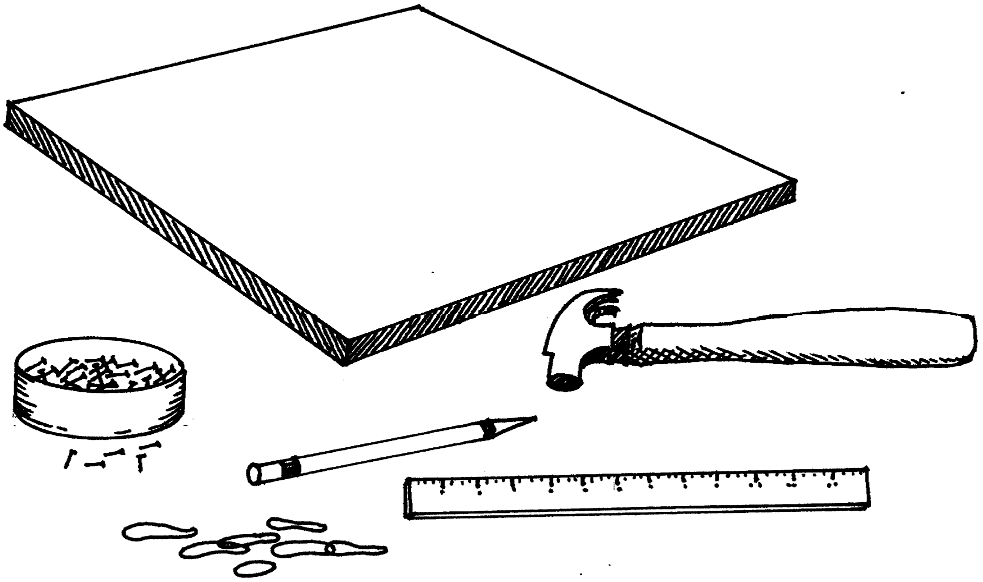
Extensions and variations:

- Plant a "butterfly" garden using plants that attract butterflies. Make a sign for the butterfly garden and display it in the garden.

- Write a class story about planting the butterfly garden or take pictures of planting and growing to help children recall and describe the process.

Geoboard

3 to 6



Purpose: The purpose of this activity is to make a classroom material called a geoboard, which is a resource for mathematical learning. Geoboards are square, wooden boards studded with small nails across which rubber bands stretch to form various shapes. Recognizing, forming, and communicating about geometric shapes are important mathematical skills for young children to attain. A multitude of learning activities are provided by the use of a geoboard and rubber bands. As children begin to develop an awareness and appreciation of geometric shapes in their environment, they will become better able to describe and classify them. Geoboards help children begin to understand the relationships among shapes. One distinct advantage of the board is that it can be rotated.

Materials:

- hammer
- pencil
- 25 nails per board
- ruler
- rubber bands (colored if possible)
- wooden boards 1.5 cm. to 2 cm. thick (to make 30 cm. squares)

HOME CONNECTION

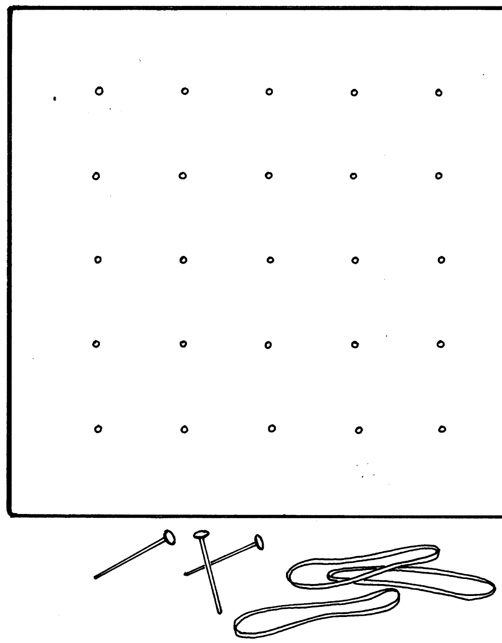
Ask parents to saw the wooden pieces for the boards. This is a good way to involve them directly in the classroom by doing the measuring and cutting with a small group of children.

Preparation:

1. Cut 1.5 cm.-2 cm. thick boards into 30 cm. squares.

2. Each board requires 25 nails, about 2 cm. long. Hammer the nails into the board in a 5 x 5 arrangement.

3. Collect rubber bands in a variety of colors and sizes.



Activity: Encourage children to experiment with the geoboards by stretching rubber bands around the nails. Without models, allow the children to independently create designs and shapes. Encourage them to talk about what they are doing. Children sometimes make up names for what they create. Some children recognize shapes and can name them. When they do, casually ask questions such as, "How many sides does your square have?" "How many corners does your square have?" "Are there more corners or more sides?" "Can you make another one that looks just like it but is bigger or smaller?" "Does your square look the same if you turn the geoboard around?" When children have created unusual designs, rotate the board. Sometimes that leads to the children giving different names to the same design.

Extensions and variations:

- Encourage further experimentation by giving children different amounts of rubber bands.

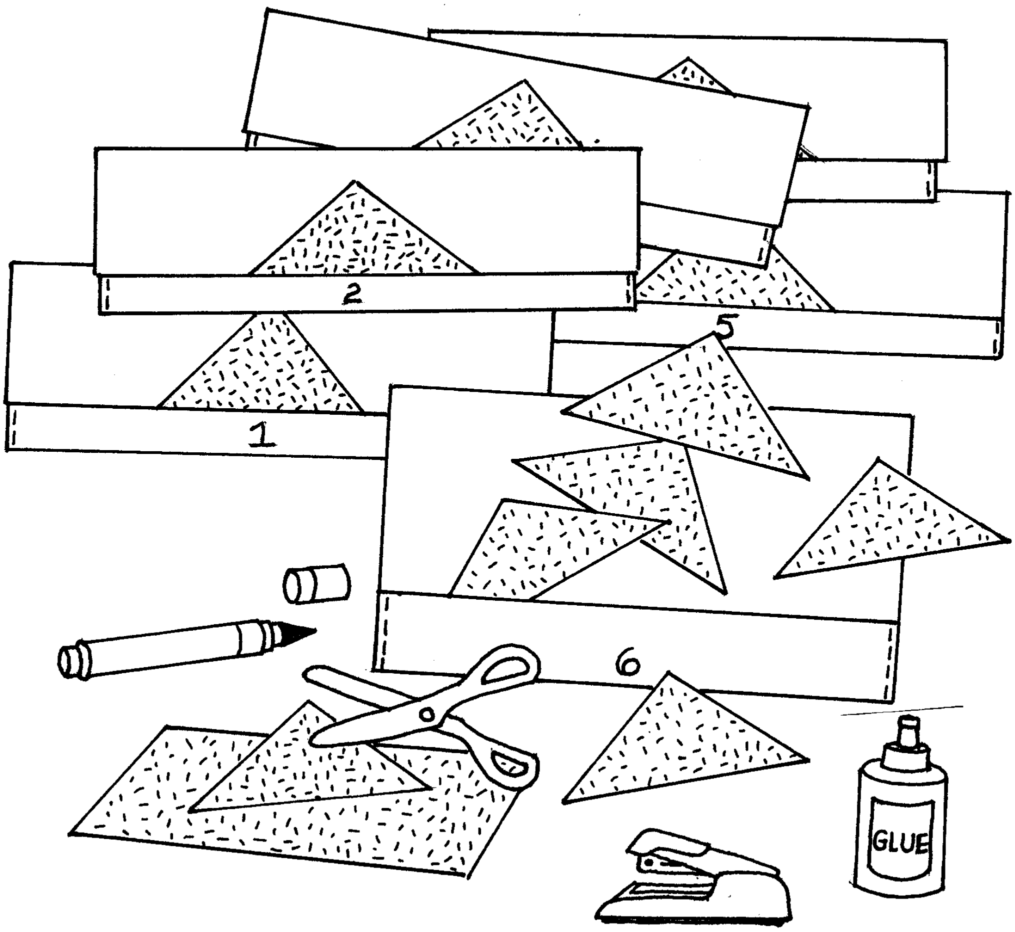
- Depending on their age and experience, children will react differently to clues such as the following: "With your rubber bands, make a geometric form with 3 sides [4 sides, 5 sides]. What shapes did you just make?" "Is it still a triangle if you turn the board around?"

- Create a shape hunt. Have the children search their classroom for shapes in the windows, doors, chairs, blocks, balls, etc.

- Using water and paint brushes on the playground, have children paint geometric shapes.

3 to 5

Shape and Number Envelopes



Purpose: Young children need many opportunities to manipulate shapes and numbers for mathematical readiness. This activity combines shape recognition, matching, number recognition, and counting. Children are asked to place the appropriate number of shapes into numbered envelopes. This activity focuses on numbers 1 through 6, but it is easily adaptable to other numbers. When children count and match amounts to the corresponding numeric symbol or numeral, they develop logical reasoning abilities.

HOME CONNECTION

Parents should be informed about the basic concepts being explored with children in class so they can also focus on similar ideas at home. For example, parents can point out various shapes around the house when they know that "shapes" are the focus of a popular game in school.

Materials: glue or stapler; pen and ruler; scissors; thick colored paper

Preparation:

1. Make an envelope by taking a piece of thick colored paper and laying the paper in a horizontal position. Fold the paper 7.5 cm. from the bottom. Then fold the remaining 6 cm. over the bottom portion. Secure the sides with staples or glue. Make 5 more envelopes.

2. Decorate the front of the envelope with a shape, such as a triangle. The shape should be a different color than the envelope.

3. Write a numeral, from 1 to 6, on the flap of the envelope.

4. To fill the 6 envelopes, cut out 21 triangles. Fill each envelope with the number of triangles that corresponds to the numeral written on the envelope. For example, 5 triangles are inserted in the "5" envelope.

Activity: This activity is a good one to use for an individual child. Give the envelopes and shapes to a child. Ask the child to fill each envelope with the number of shapes corresponding to the numeral written on the envelope. Encourage the child to fill all the envelopes. In this way the child begins to associate amount with the representational numeral and begins to practice counting.

Extensions and variations:

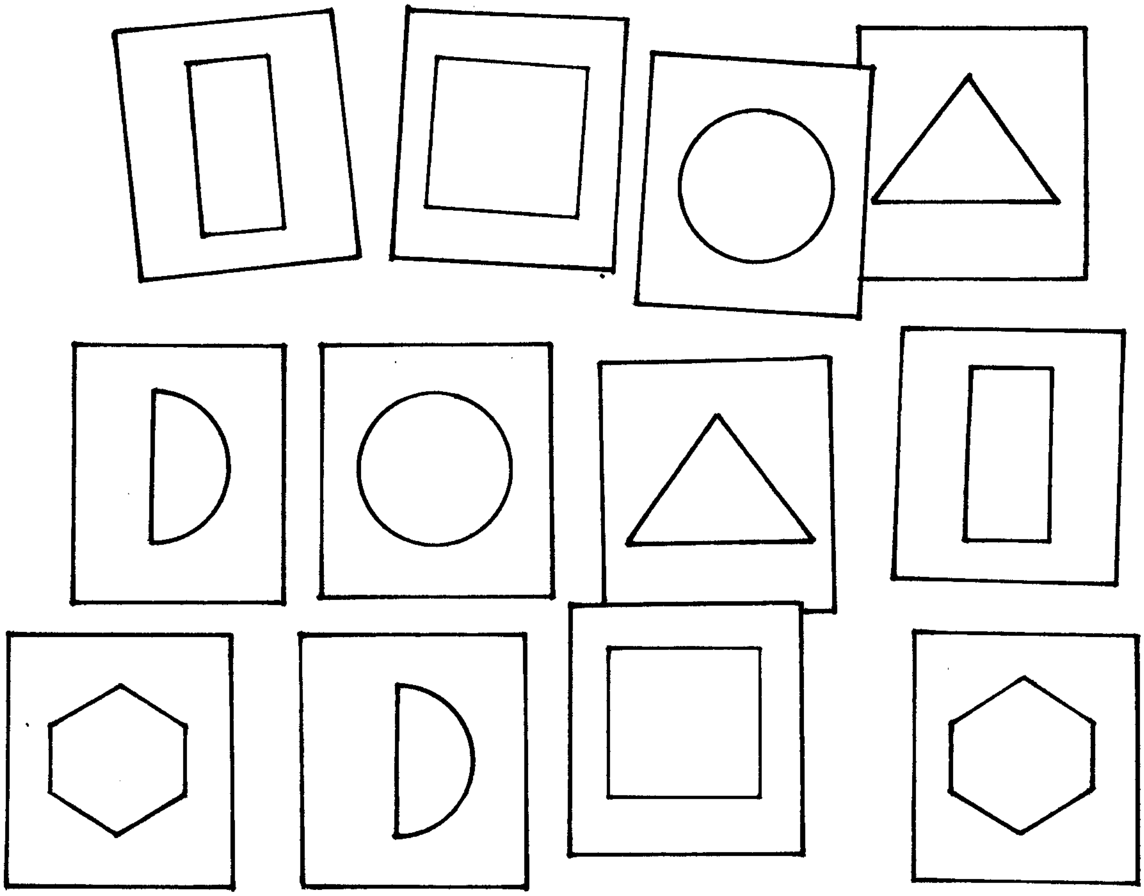
- Using the above directions, prepare a set of 6 envelopes with circles, a set of 6 with rectangles, and a set of 6 with squares. Number each set from 1 to 6 and prepare 21 cut-out shapes for each set.

- Place all of the number-shape envelopes in the center of a table. Mix the 21 circles, 21 rectangles, and 21 squares. Invite a small group of children to each take 1 or 2 envelopes, select their shapes, and fill the envelopes with the corresponding shapes. As the children work, ask them to discuss the numerals and shapes they are using.

- Number-shape envelopes can be extended to numbers above 6. Those children who have mastered this activity to 6 can use number envelopes to 10.

Shape Pair Cards

4 to 5



HOME CONNECTION

Matching objects based on characteristics is a learning game that parents can do at home with their children. Encourage parents to help children find natural pairs of things in the home, such as shoes, socks, mittens.

Purpose: Using shape pair cards is an active-thinking task that encourages children to explore geometric shapes, colors, and the concept of pairs. Young children need changes of pace and time to move around. In this activity, they walk around the room trying to find another child who has a card with the same color and shape. ("Children can learn as much on their feet as they can on their seat." —James L. Hymes)

Materials: unlined cards
markers (many different colors)

Preparation:

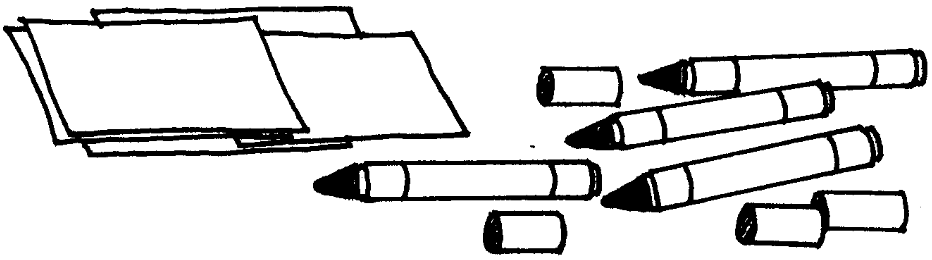
1. Make pairs of cards with identical colored shapes on them—for example, a pair of cards with yellow circles, a pair with red triangles, a pair with green rectangles, etc. Make the cards approximately 8 cm. x 13 cm.

2. Be sure that there are enough cards for each child to have one.

Activity: Give each child a card. Tell the children that they should find the person who has a card that is exactly the same as theirs. The children then come together in a group and report what shape and color they have, for example, "We have a green triangle."

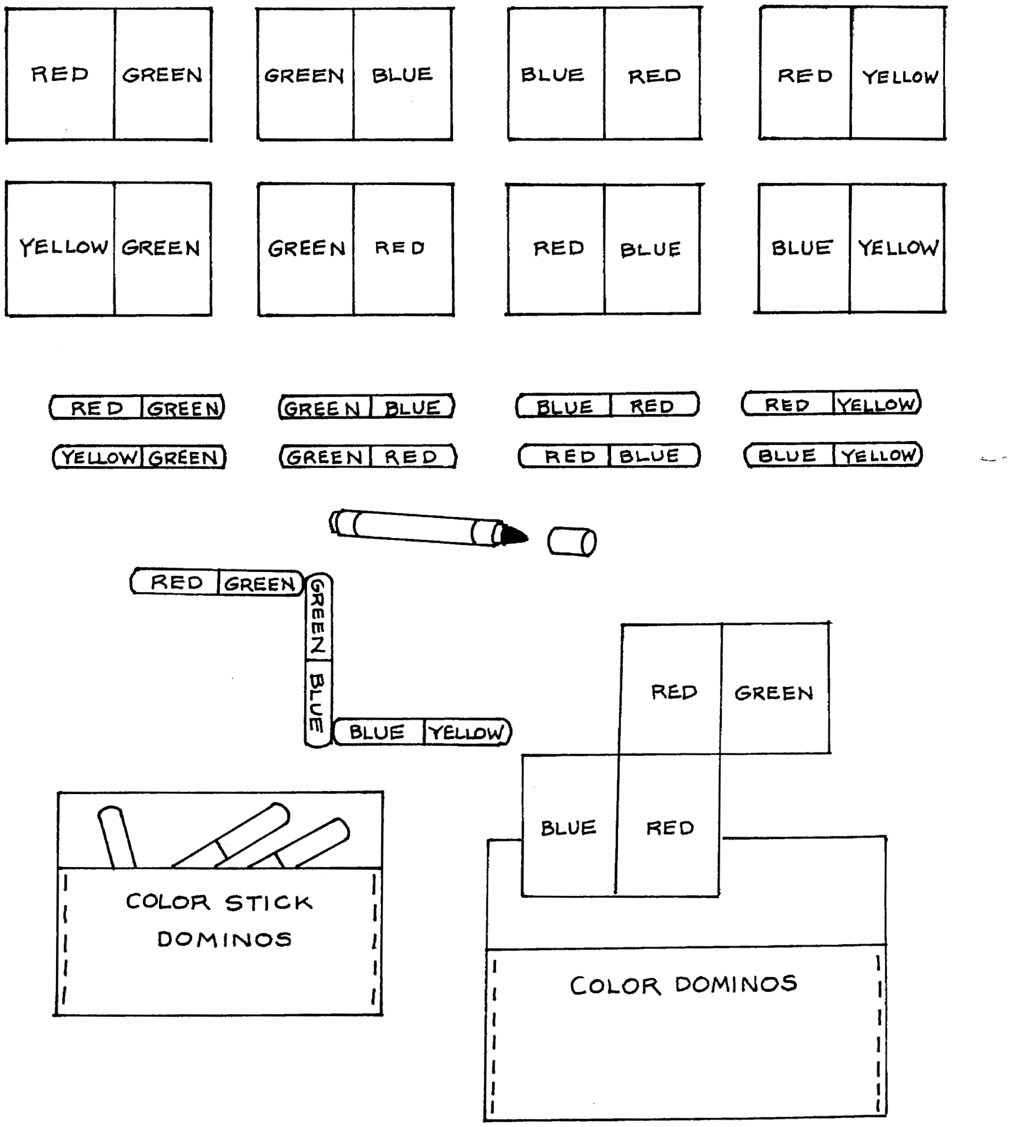
Extensions and variations:

- The teacher can easily extend this activity by asking the children to observe more details about their geometric shapes—how many sides and corners?



Color Dominoes

3 to 4



HOME CONNECTION

Children can teach this simple form of dominoes to their parents, grandparents, or siblings. This game is a simple one for children to make at home with parents, too.

Purpose: Using dominoes requires that children observe, compare, identify, and match with one-to-one correspondence. All of these skills are necessary in the study of science and mathematics and in developing early reading skills. Dominoes come in many different forms. This activity suggests several ways that dominoes can meet the age, developmental stage, needs, and interests of children in the classroom. Some sets encourage children to match the number of dots; in others, children match geometric shapes, colors, and leaves.

Materials:

- 8 unlined cards
- black marker
- pencil and ruler
- thick colored paper (red, blue, green, yellow)
- glue
- scissors
- stapler

Preparation:

1. Hold each card horizontally and draw a black line from north to south in the middle of the card. The size of the card (the domino) can be approximately 7 cm. x 15 cm.

2. Cut the colored paper into pieces one half the size of the card. Glue one piece of paper on to one half of the card and another piece of paper on to the other half. Use the colors red, blue, green, yellow, as follows:

   Red/Green, Green/Blue, Blue/Red, Red/Yellow, Yellow/Green, Green/Red, Red/Blue, Blue/Yellow

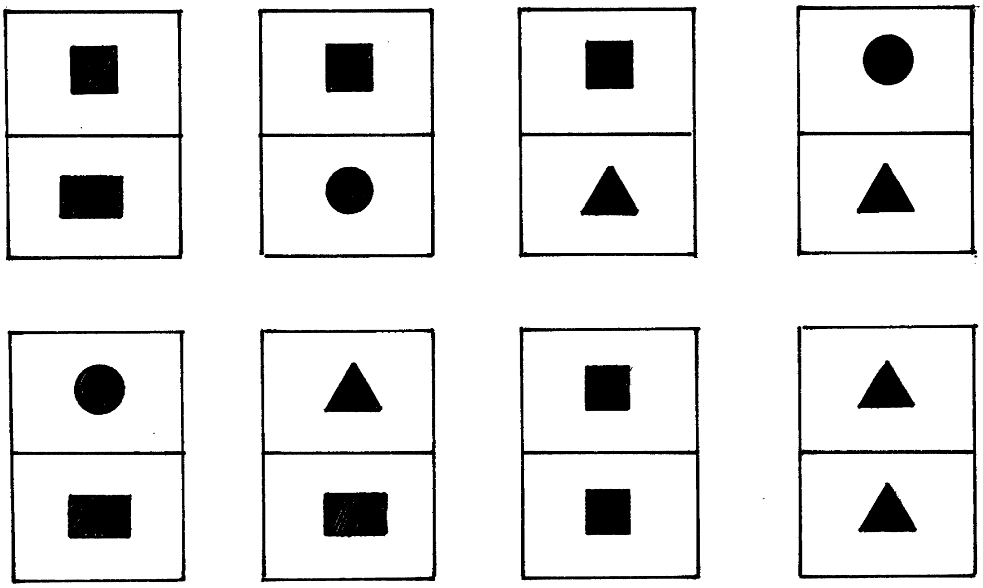
Activity: An appropriate game for 3 to 4 year olds is a color dominoes set with each card having 2 colors. Children begin to recognize that there are 2 halves to each domino. The object of the game is to match the color at each end. Have the children work in pairs or alone with the dominoes. Guidance may be given by pointing to each end and asking, "Can you find one with a color like this?" Use the colored paper to make an envelope in which to keep the dominoes.

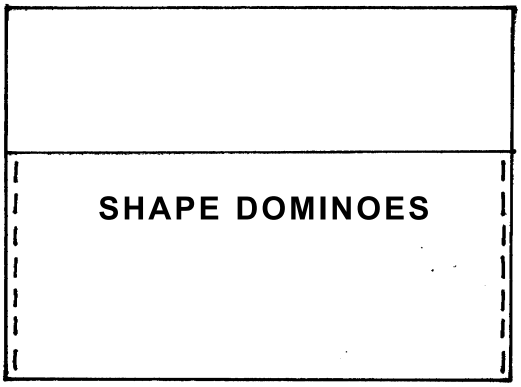
Extensions and variations:

- A special value of color dominoes is that children can make a variety of sets. Help the children make a set of color dominoes from tongue depressors. Place a black line in the center of the sticks. Give the children one stick at a time and two crayons or markers. Use the pattern listed above.

4 to 5

Shape and Dot Dominoes





HOME CONNECTION

Invite parents to help supply materials for the classroom by making sets of shape dominoes with their children at home. In this way families know that they are helping their children learn and that they are contributing to the classroom's needs.

Purpose: Repeating an action is important to reinforce learning. Help children to build on their previous experiences with color dominoes by introducing shape dominoes and then dot dominoes. The activities reinforce the concept that there are 2 halves to each domino.

Materials:

8 unlined cards	glue
black marker	scissors
pencil and ruler	stapler
thick colored paper (red, blue, green, yellow)	

Preparation: Shape Dominoes—Follow directions for making color dominoes on page 37. This time use shapes. Start with squares, rectangles, triangles, and circles. Other sets could include ovals, diamonds, stars, hexagons. Or, try sets with big and small sizes of the simpler shapes.

Preparation: Dot Dominoes—Follow the basic directions for color dominoes. Use small cards.

Activity: Use the shape domino activity first to ensure that children are recognizing that there are 2 halves to each domino. Some young 4 year olds may need help with shape vocabulary.

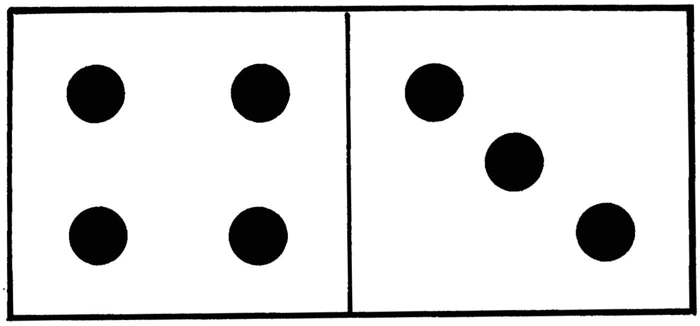
Use the dot dominoes with the older 4 and 5 year olds. If they need some help, point to one domino and ask if the child can find a domino with more dots, with fewer dots. Using mathematical vocabulary will enhance children's concept development. Make an envelope out of the colored paper to store the dominoes.

Extensions and variations:

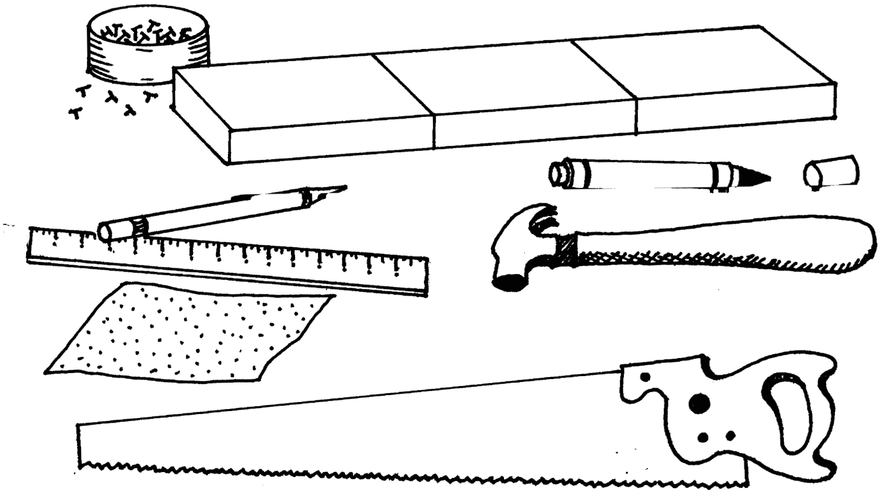
- Make nature dominoes. Find pairs of leaves of several varieties. Although no 2 leaves will be exactly the same, children aged 5 or 6 will recognize the similarities. The teacher can comment on how interesting differences are in nature and, of course, in people.

Wooden Dominoes

5 to 6



A GOOD SIZE FOR THE WOODEN DOMINO



Purpose: This activity reinforces mathematical concepts of measuring and counting as the class makes a complete set of 28 big wooden dominoes. The activity also teaches children how to organize, plan, and work together as a team. It provides physical activity and helps to develop eye-hand coordination.

HOME CONNECTION

This is a great activity for involving families in an activity outside of school. Mothers, fathers, aunts, and uncles can accompany the class on a trip to a lumberyard. If a trip is not possible, some parents may be able to bring wood to the classroom. Woodworking in class is an activity for which extra adults are always needed. Send an invitation home asking for help with the project. Give parents plenty of time to adjust their schedules so that they can participate.

Materials:

168 tacks (large heads)	2 hammers
saw	sandpaper
marker	ruler
boards of soft wood	

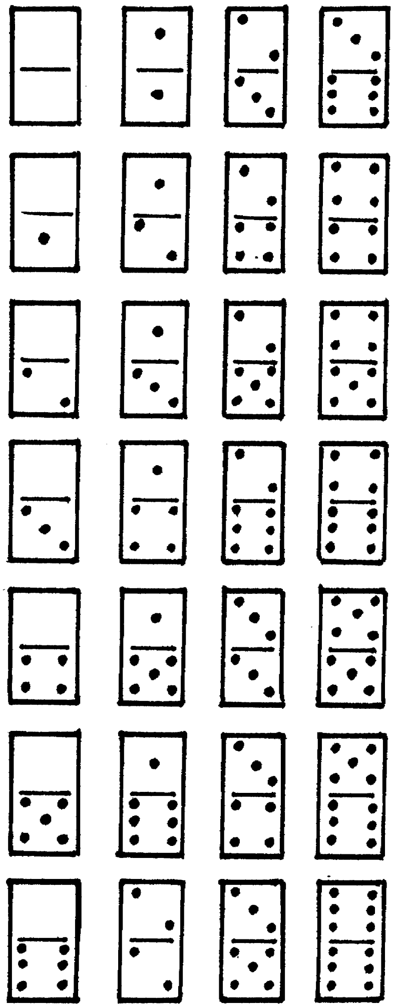
Preparation:

1. Assemble all the materials. Extra adult help should be available to help manage the woodworking activities.

2. Use a marker to designate the cuts for each domino.

Activity: Take the children to visit a lumberyard. While there, have children handle several weights of wood. Buy enough boards of a soft wood (such as pine) to saw into 28 dominoes.

Back in the classroom, one child at a time should have an opportunity to saw a tile. Other children take turns using sandpaper to smooth the cut tiles. Note the texture of the wood before and after sanding and let the children explore the sawdust.



The line between the halves of each tile can either be made with a piece of black tape or a saw. Children with limited or no vision will be able to differentiate sides better if the saw is used.

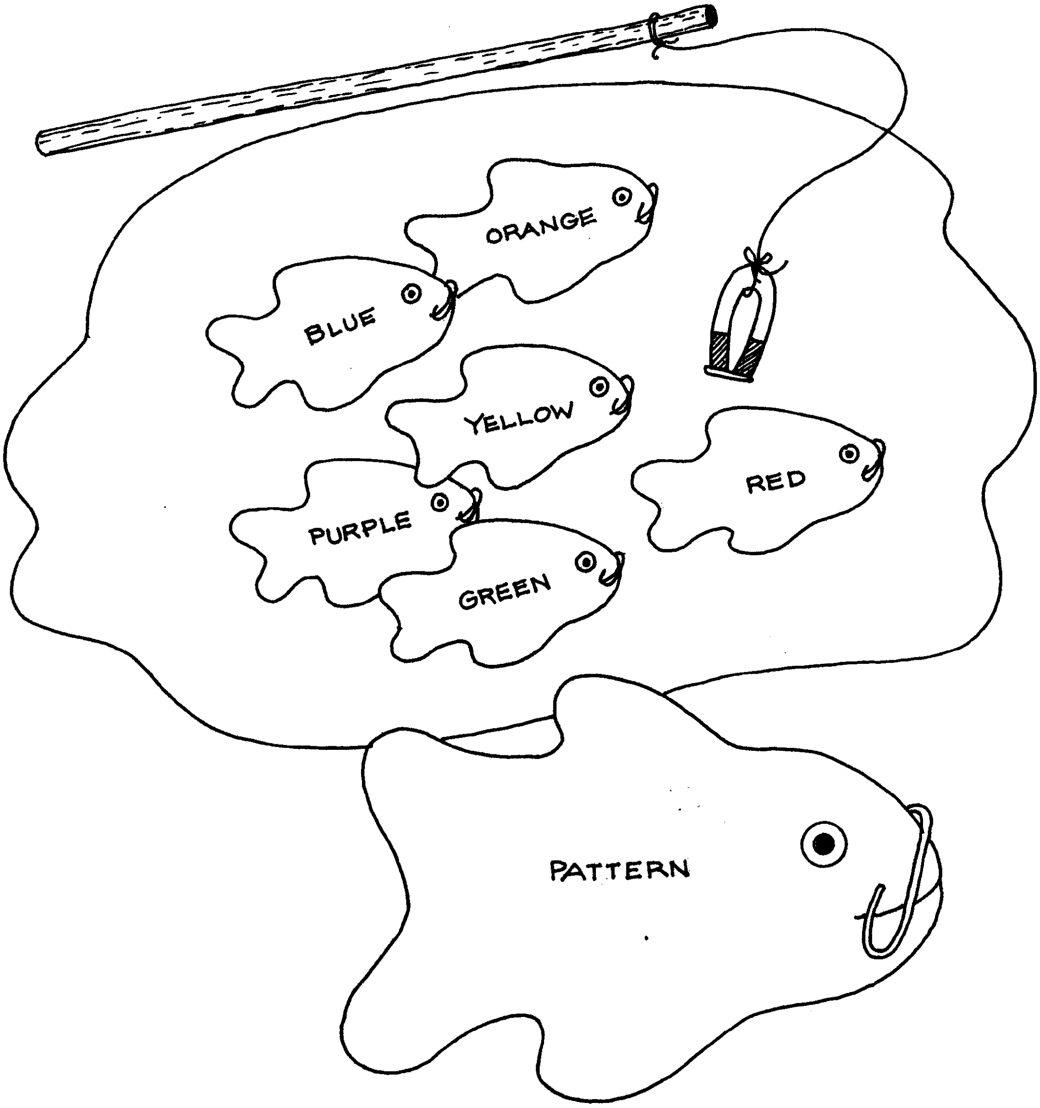
The children then take turns hammering in tacks to make each dot on the domino. The children will have a sense of accomplishment and will especially enjoy using this set of dominoes. This set (see illustration) includes blanks and doubles tiles, which the teacher must explain.

Extensions and variations:

- With 6 year olds, count the dots on a 6-dot domino. Ask them to select other dominoes that have the same number of dots but in different combinations: 6/0, 4/2, 3/3, 5/1. Demonstrate that the same value is arrived at through different combinations.

The Fishing Pond

4 to 5



HOME CONNECTION

Ask parents to save wooden dowels or sticks to be used in this activity. Emphasize to parents that learning basic information, such as color names, can be made enjoyable and challenging by using a game format.

Purpose: Learning to group or sort is an important pre-math skill that gives order to a child's world. It is a process, however, that takes time and experience. Because abstract grouping is complex, classification for the young child should be on the basis of easily observed physical properties, such as color, or size, or shape. This activity encourages classifying by color through dramatic play as children use their imaginations to catch colored fish.

Materials:

- thick colored paper: red, blue, yellow, orange, purple, green
- magnet
- blue cloth or cardboard
- scissors
- 6 metal paper clips
- string
- stick or dowel

Preparation:

1. Cut out 6 pairs of fish (12 fish altogether), using different colored paper for each pair. For the youngest children, use primary (red, blue, yellow) and secondary (orange, purple, green) colors. The fish should be approximately 15 cm. long.

2. Attach a paper clip around the "mouth" of one fish in each of the pairs.

3. Make a fishing pole by tying a string around a magnet and attaching it to a stick (or dowel) near one end of the stick.

Activity:

Put a blue cloth or piece of cardboard on the floor. Spread the 6 fish with the paper clips on the "water." Tell the children that they are going to go to a pond to catch some fish. Hold up one of the fish without a paper clip and ask the child with the fishing pole to search the pond for a matching fish. When the child catches the matching fish, ask the child what color it is. Repeat the steps by asking another child to fish for a fish of another color.

Extensions and variations:

- By preparing other pair cards, the teacher can extend this game to include vegetables, domestic animals, wild animals, shapes, numbers and corresponding dots, etc.

4 to 5 Classification by Attribute Cards

Purpose: When children learn about shapes in many different ways, they develop a foundation of knowledge about the properties and relationships of shapes. Classification with the shape cards is an activity in exploring attributes, likeness and differences, and sorting. This activity also helps children to learn to identify 3 shapes, 4 sizes, and 5 colors.

Materials: thick colored paper

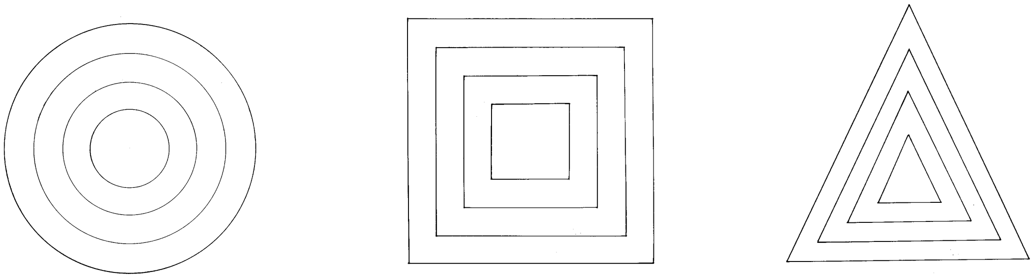
Preparation:

1. Make templates out of thick colored paper in triangles, circles, and squares. Cut 4 sizes of each.

2. Cut out each shape in 5 colors.

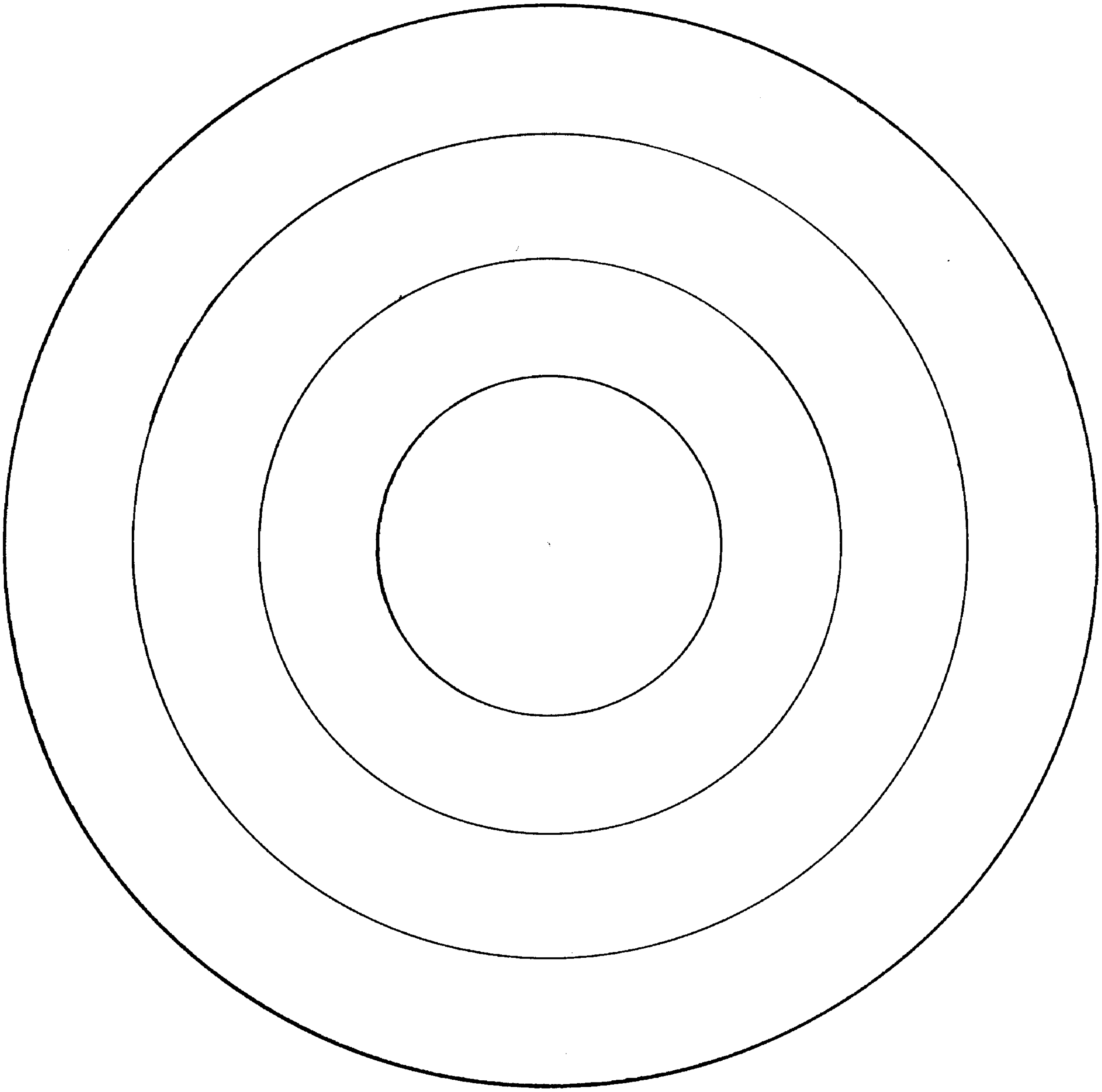
Activity: Give children sufficient time to look at and play with the shapes during their free-choice periods. In small groups, discuss the various attributes—shape, color, size—and the different ways of sorting them.

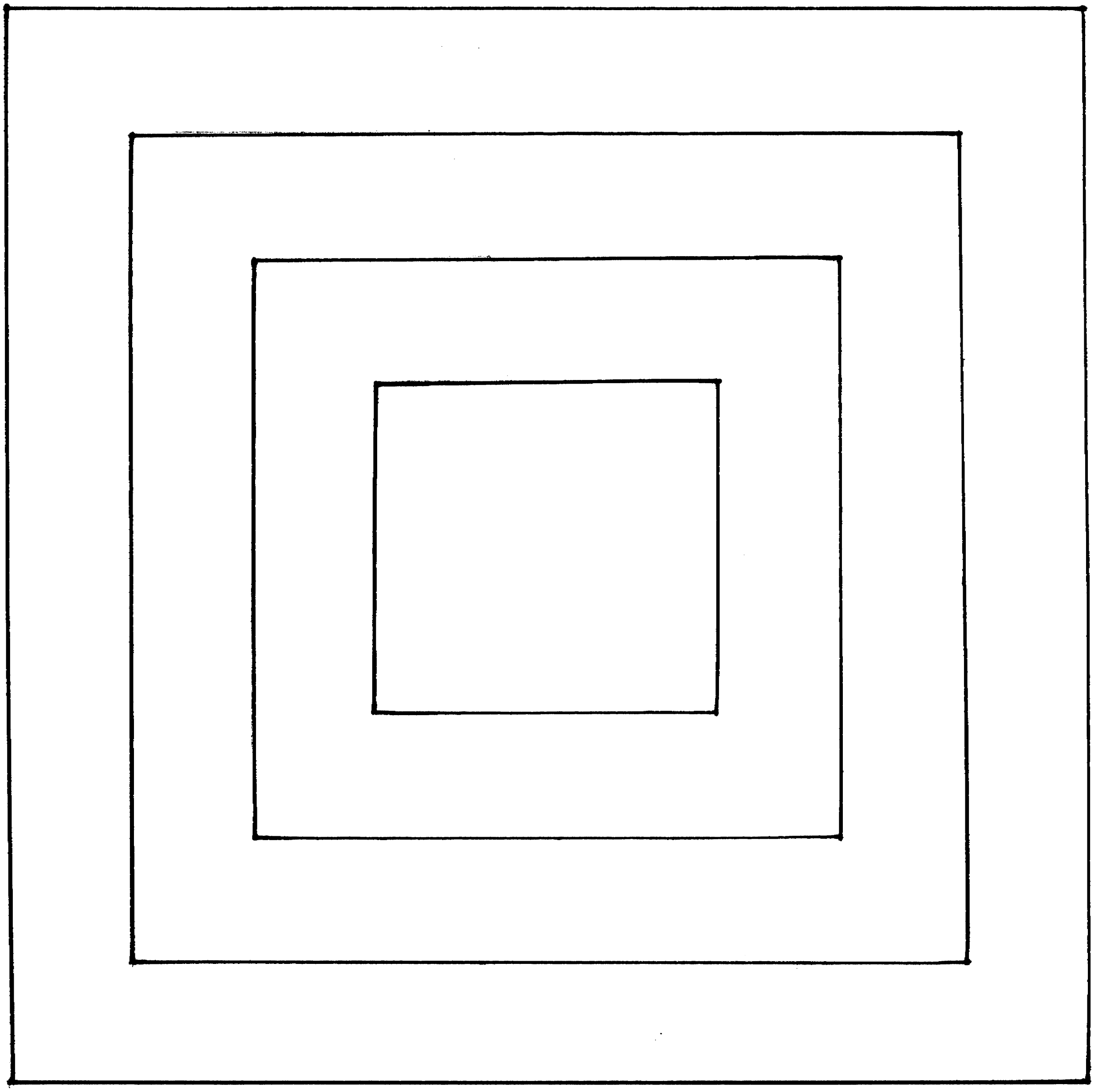
In the manipulative center after a child has sorted the cards, say, "Tell me about what you did." Depending on the child's response, you might then ask, "Why does this group of cards belong together? How are the cards alike? How are they different?"

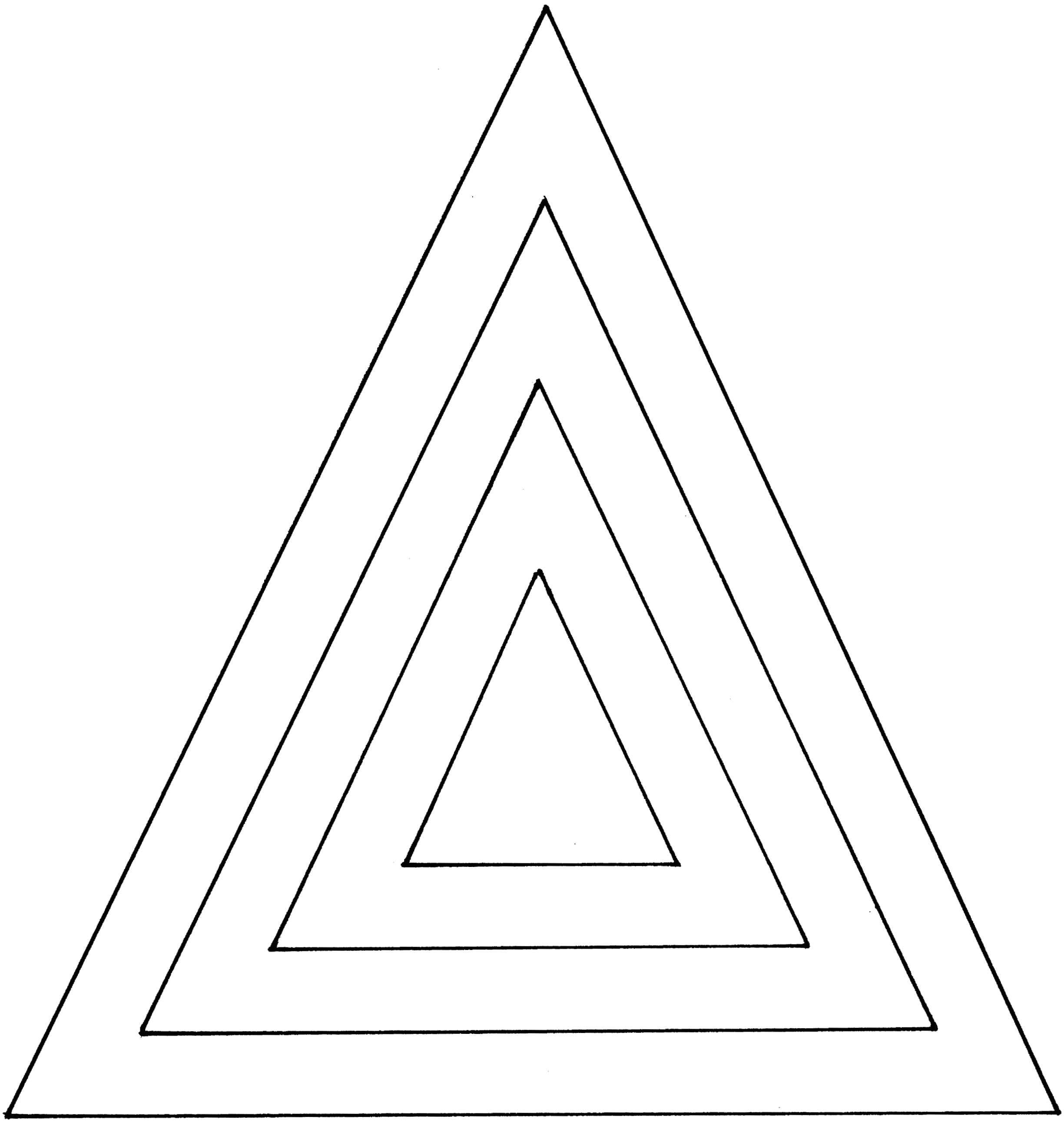


HOME CONNECTION

Playing classification games at home is a wonderful way for children to learn from older siblings and parents and to demonstrate to their family members what they know. A classification game that many children enjoy is to have the people in the game try to guess the animal that one player is thinking of by guessing various possible attributes of the animal.







4 to 6

Piaget's Pennies

Purpose: This is a simple activity to test Piaget's insight that children under age 6, and even some 7 year olds, do not actually understand concepts of numbers. Although they may recite numbers by rote, they do not comprehend the principle that underlies numeration. This activity is designed to encourage teachers and parents to recognize that young children—before they really internalize numbers—need time and opportunity to manipulate, explore, experiment, and make discoveries using tangible materials.

Materials: 10 identically sized chips, coins, discs, or playing cards

Preparation:

1. On a flat, uncluttered surface, arrange 5 chips (or coins, discs, or playing cards) in a horizontal row, but spread them apart. Then, below them, in another horizontal row, arrange the other 5 chips close to one another. See diagram below.

O O O O O

OOOOO

Activity: In a quiet spot with one child at a time, without cues, ask, "Do both of these rows have the same number of chips?" Accept whatever response the child gives. You will find that children of this age will say the top line has more. In the logic of the young child, it if looks like more, it is more. Try moving the chips closer so they match the bottom row. Ask again if the rows have the same number of chips; the child will usually say yes. Separate the chips out and repeat the questions. To use this activity with a large group, glue the chips onto a sheet of cardboard in two rows as described above. This allows more children to see the arrangement because the teacher can hold it up. Do not provide "right" answers. It takes time and experience for children to develop the concept of numerical equivalence.

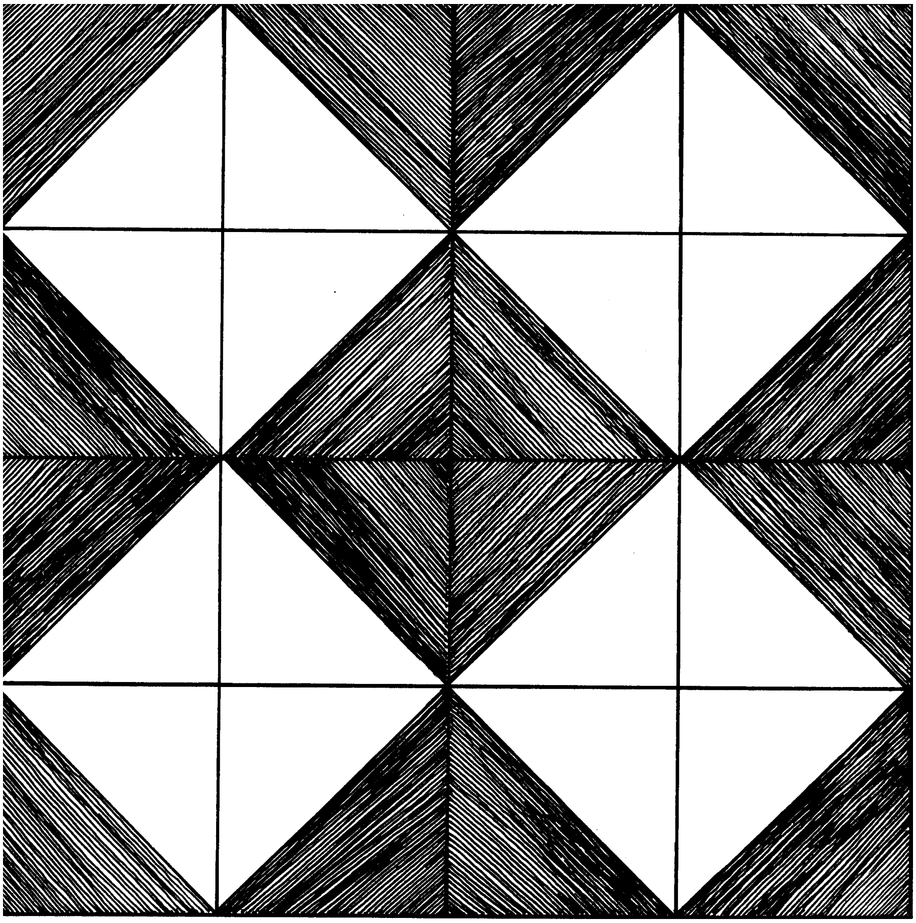
Extensions and variations:

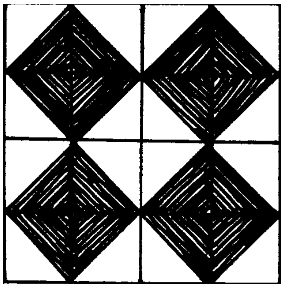
- Take a ball of clay and make it into a flat pancake. Turn it back into a ball. Ask which has more clay, the ball or the pancake. The children may think that somehow the pancake has more clay because it is wider or conversely that the pancake has less clay because it is so thin. Give a child many chances to work with the clay to experience that the re-formed ball always has the same amount as the pancake.

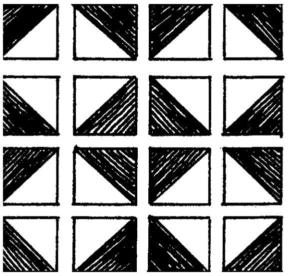
4 to 6

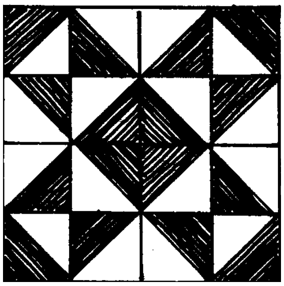
Geometric Puzzle

Submitted by Latvia and Slovenia









Purpose: The geometric puzzle is a problem-solving activity. Children develop spatial skills when they manipulate the pieces. This kind of puzzle is a valuable mathematical activity because it gives children the experience of looking for a solution in an unfamiliar situation. Children develop their perseverance and patience in seeking solutions. The activity becomes more open-ended by allowing children to create their own geometric puzzles.

Materials: heavy paper
scissors

Preparation:

1. Cut 3 20 cm. x 20 cm. squares out of heavy paper.

2. Draw a 4 x 4 grid on the three squares.

3. Leave one grid blank. On the other two grids, draw the geometric design using markers to color in the squares.

4. Cut one of the grids with the geometric design into small squares. There should be 16 square puzzle pieces.

5. Store the geometric puzzle in an envelope.

Activity: The geometric puzzle is designed to be used by one child at a time. Allow the child enough time to experiment with the puzzle pieces and to create designs on his own. Because problem solving involves trial and error, let the child try the pieces in a variety of positions. Encourage the child to place the small square puzzle pieces on top of the larger square design. If there is frustration associated with completing the puzzle, talk to the child about the many ways of manipulating the small puzzle pieces to match the identical squares in the grid. Point out that it takes time to solve puzzles and that there is no need to rush.

Those children who easily assemble the geometric puzzle by placing the small pieces on top of the larger square design may want to try a new challenge. Next to the larger square design, place the blank grid. Ask the child to replicate the design on the blank grid. This requires children to use their visual discrimination skills to examine the larger square design and to assemble the smaller puzzle pieces based on what they see.

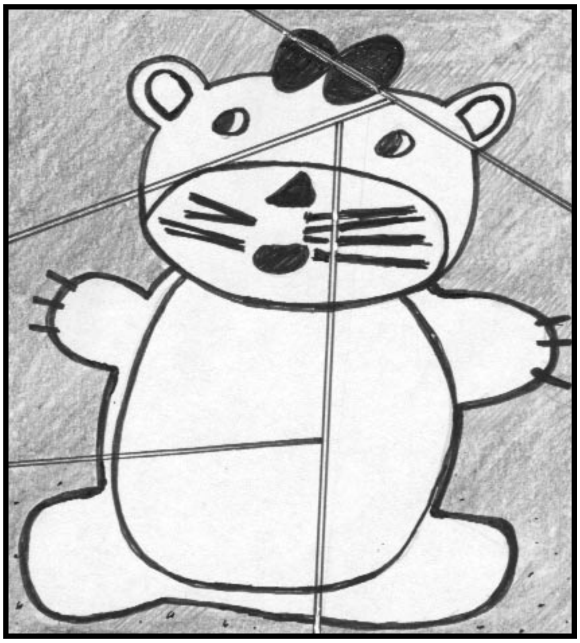
Extensions and variations:

- Make an open-ended grid by outlining the 20 cm. x 20 cm. perimeter and the 4 x 4 squares. Let the children create their own puzzles by manipulating the shapes into designs. Teachers can copy these and place them in the manipulative area or decoratively hang them around the room.

- In Slovenia, teachers laminate large paintings made by the children and cut them into simple 5-piece puzzles.

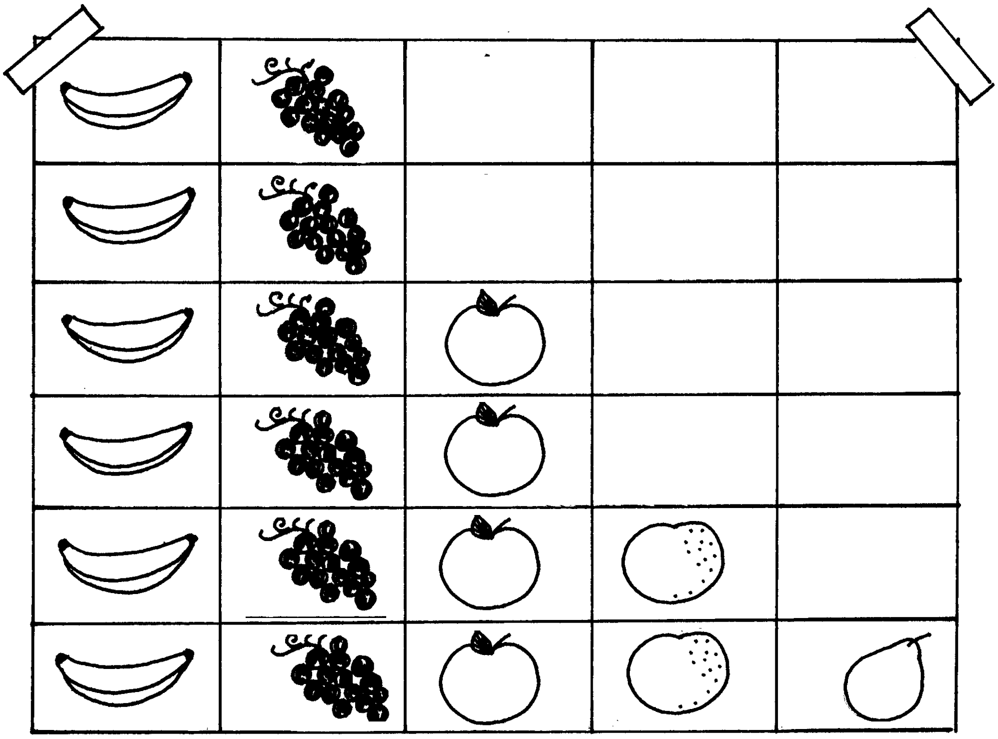
- Using attribute cards or wooden blocks, have individual children create designs for others to copy.

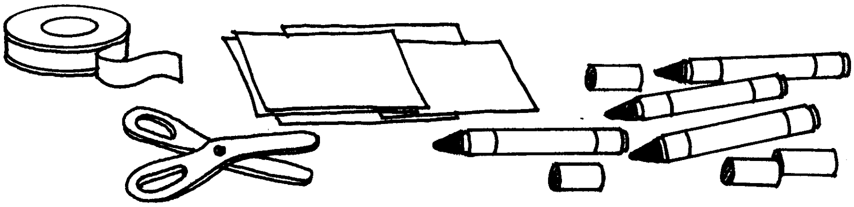
- Make simple designs on a geoboard (see page 30). Ask a child or small group of children to copy your design on their own geoboards. Working with simple shapes will help young children build their spatial sense.



Fruit Graph

4 to 6





Purpose: Graphing is a great way to organize, display, and compare information. Using pictures, lines, or bars, a graph shows the relationships among choices. Interpreting graphs requires many skills: communication, classification, one-to-one correspondence, symbolization, and measurement.

HOME CONNECTION

Children learn to develop opinions through self-knowledge. Parents who thoughtfully ask their children's preferences and opinions about daily topics are encouraging healthy development. Inform parents when you start this activity, which can extend over a week or so. Ask the children to do some data gathering at home by collecting the names of the favorite fruits of their family members. Include this information on the graph also.

Materials: small pieces of paper (same color), scissors, large sheet of paper, glue, old magazines, tape

Preparation:
1. Either draw pictures of fruit or cut out pictures from old magazines.

2. Give each child a small piece of paper (one that is large enough, however, to hold a picture of a fruit that you have drawn or cut out.)

3. Begin this activity at snack time by offering a variety of fruits to the children. Talk about their favorite fruits.

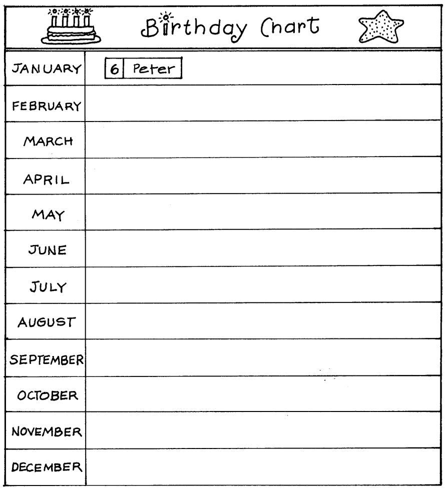
Activity: Ask children to select a picture of their favorite fruits and glue it on the paper.

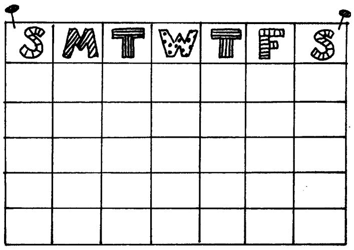
Sort the pictures by types of fruit. Count the number of papers for each type of fruit. Which fruit has the most? The least? Arrange the fruits in order, from those with the most number of papers to those with the least. Tape the pictures onto a large piece of paper and tape that paper to the wall, making a graphic illustration of the children's favorite fruit.

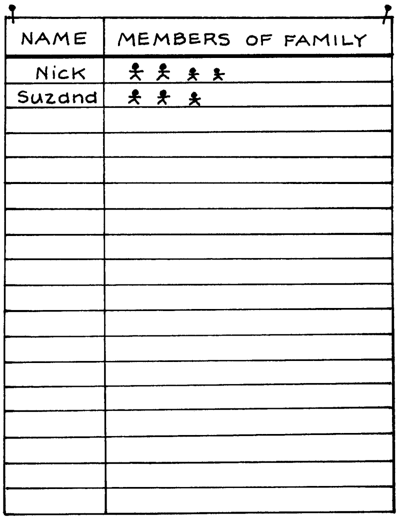
Ask the children for help in interpreting the graph. Which fruit is the class's favorite? Which is the class's least favorite?

Extensions and variations:
- Other subjects for graphs are birthdays, number of family members, number of girls and boys in the class, type of weather in the month.

- Older children may come up with their own graphing ideas. Encourage children to brainstorm possible topics for graphing.

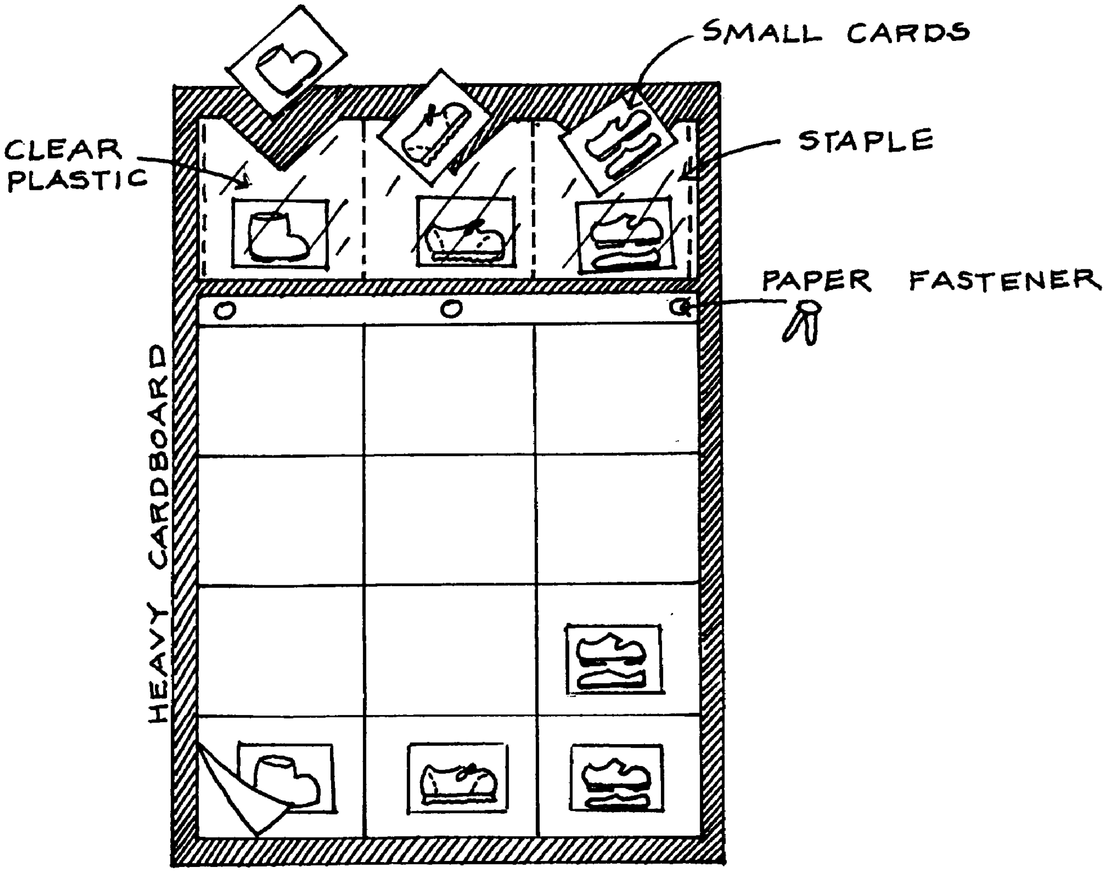






Survey Graph

5 to 6



HOME CONNECTION

Children will come to appreciate the importance of mathematics in their daily lives if parents help to point out the various ways information is presented using graphs and charts. For example, parents can show their children newspaper and magazine illustrations that depict graphs, charts, and surveys results. They can set up a simple chart to record daily activities or family preferences. It is best not to use drills or arithmetic worksheets with young children. These are overwhelming for children and often make them dislike mathematics. These drill activities contradict the natural way young children learn mathematics.

Purpose: This simple piece of equipment is a prop to encourage children to conduct surveys whose results are then graphed. It is a device children use to collect and record information from their classmates. Early experiences with comparing, classifying, and communicating develop skills that are important for mathematics and science.

Materials:

22 cm. x 28 cm. cardboard	stapler
marker or colored tape	paper
ruler	tape
heavy clear plastic	brads or fasteners

Preparation:
1. Use a piece of cardboard about 22 cm. x 28 cm. Draw 3 vertical columns each about 6 cm. wide with a wide marker or colored tape.
2. Cut a piece of heavy clear plastic and staple to make 3 pockets. Cut a V-shaped hole in each pocket.
3. Divide 3 or 4 sheets of plain paper about 20 cm. long into 3 vertical columns and 4 rows.
4. Use 3 fasteners to hold the paper to the cardboard (making a "clipboard"). Cover the other sides of the fastener with tape so the children will not be scratched.
5. Draw 3 little pictures and slip one in each of the plastic slots to show the choices in this survey (e.g., boots, sneakers, and shoes).
6. Make 5 - 8 copies of each of the 3 pictures so that the children can pick the picture that matches with what they are wearing.

Activity: Invite 2 children to work as a team to collect and record information about what children in the class are wearing on their feet. Carrying the clipboard and pictures, the polltakers feel very important. As they walk around during activity center time, they are to ask 5 - 8 children, "Are you wearing sneakers, boots, or shoes today?" Then encourage each child to select an appropriate picture. While the interviewed child watches, the interviewer tapes the picture on the clipboard in the appropriate column. A group of 5 - 8 children works well because the group is small enough to complete a graph quickly, yet it is big enough to make the graph show differences in quantities. When the survey is concluded, the top sheet can be put on a bulletin board. In other surveys, children can pick the picture that shows their answer and tape it by themselves onto the sheet.

Extensions and variations:
- Create a Graph Corner. On each graph, write the heading, the children's names, and the date of the graph. Place the graph at the children's eye level. When new graphs are put up, place the old ones in the Family Room.

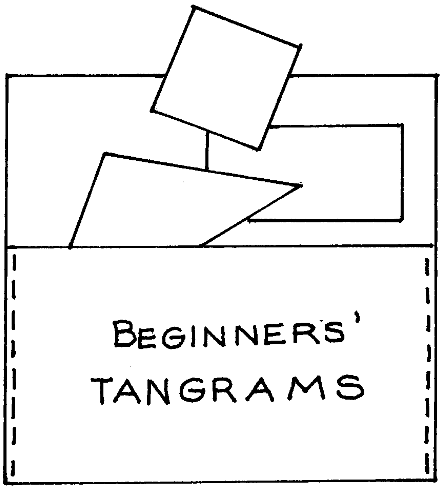
- Other topic suggestions: favorite juice, color, activity center or book.

3 to 4 Beginners' Tangrams

Purpose: Tangrams are an age-old game from China. The traditional game is composed of 7 pieces (2 large triangles, 1 middle-sized triangle, 2 small triangles, 1 square, and 1 rhomboid). The traditional tangram is too difficult for young children (and indeed for many adults!) Since playing tangrams encourages an understanding of spatial relationships, however, it is worthwhile to adapt the game for smaller children. This activity is an adaptation for 3 and 4 year olds. It includes 3 large shapes (a square, a triangle, and a rectangle) and puzzles to use with the shapes. Attached are templates of the 3-piece tangram set and 4 puzzles.

Materials:

- scissors
- pencil
- ruler
- black marker
- thick colored paper
- white paper
- templates for square, triangle, rectangle



Preparation:

1. Cut beginners' tangrams from thick colored paper, using the attached templates. The tangram pieces can be laminated or covered with clear contact paper, if available.

2. Keep each set of beginners' tangram pieces in a separate envelope.

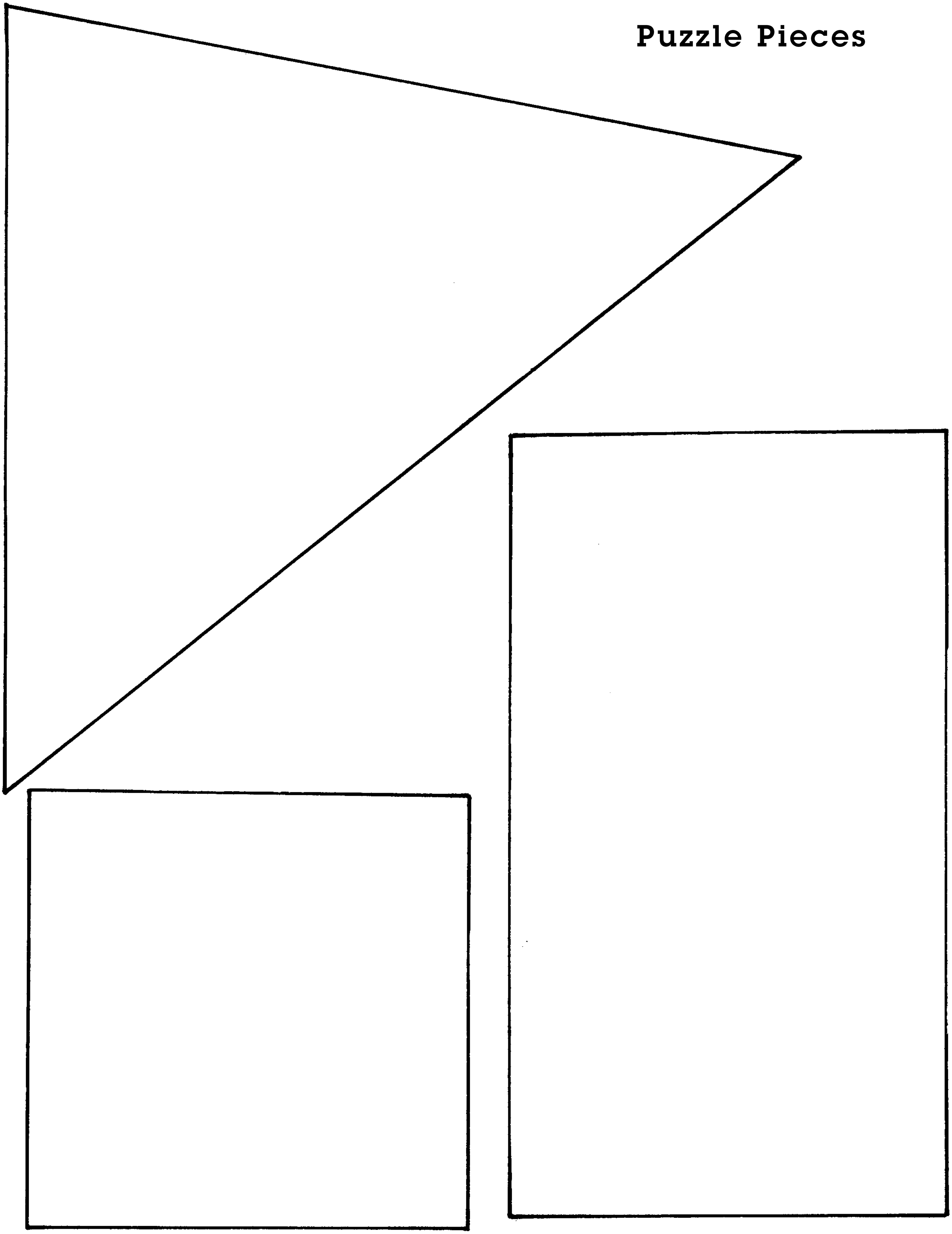
3. Copy the puzzles onto white paper. Outline the puzzles boldly with a black marker.

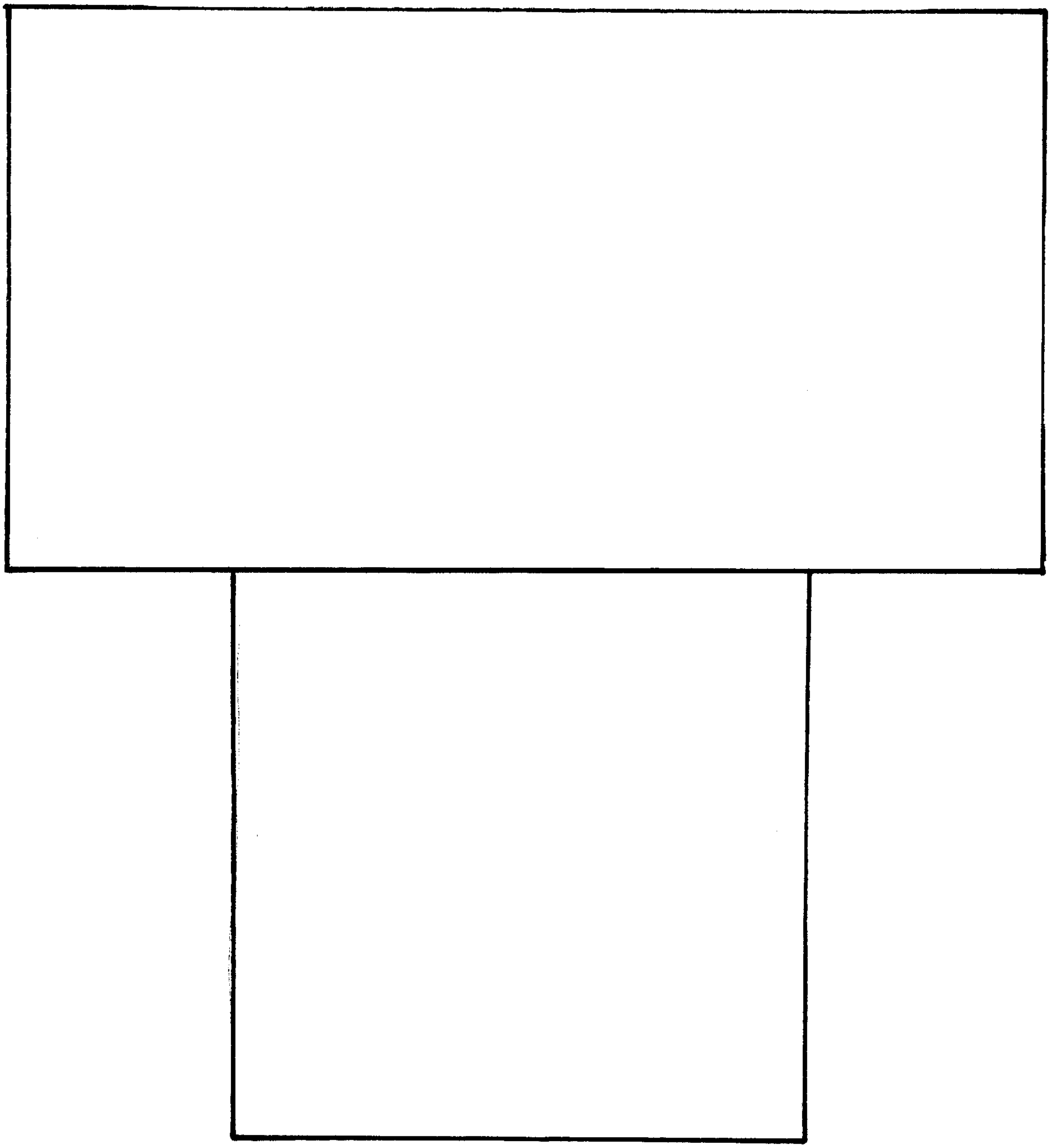
Activity: Exploring the shape, size, and the spatial relationships among these 3 pieces is a rewarding activity. Children will enjoy handling the tangram pieces. The first step in establishing geometric concepts is to give them the shapes and let them freely explore them. Using tangrams is an individual task, but you can set up a small group activity by letting 3 children work on tangram puzzles. Each child receives a puzzle and manipulates the tangram shapes to fit it. The puzzles are intended for 2 pieces; others can be 3-piece puzzles. In addition to getting children to think and problem solve, tangrams are good for further developing visual perception and fine motor skills.

HOME CONNECTION

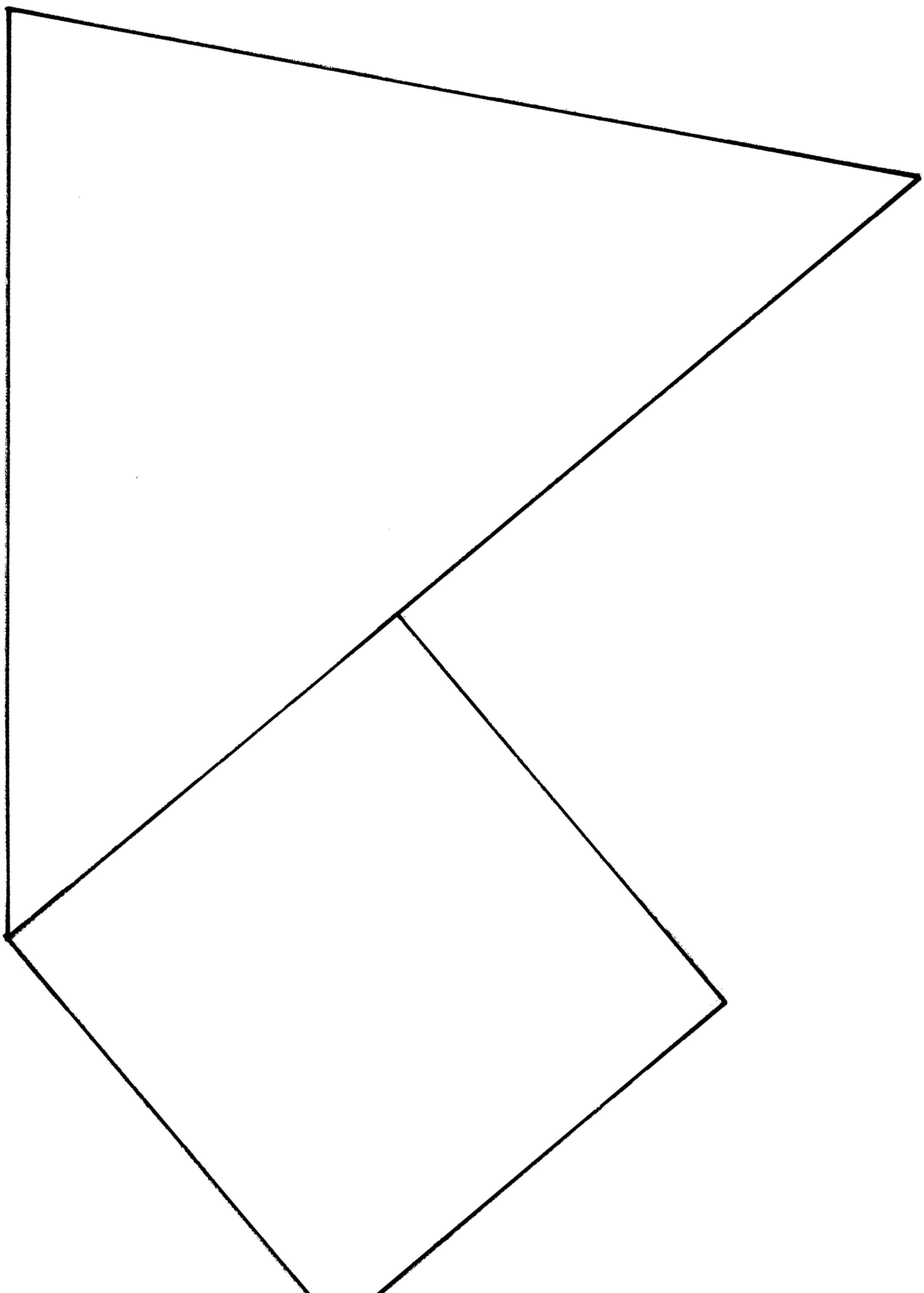
Inform families about the tangram activities before you introduce them to the children. Request volunteers to help cut out the shapes. It would be ideal to have a set for each child. Volunteers from families can help make this happen!

Puzzle Pieces

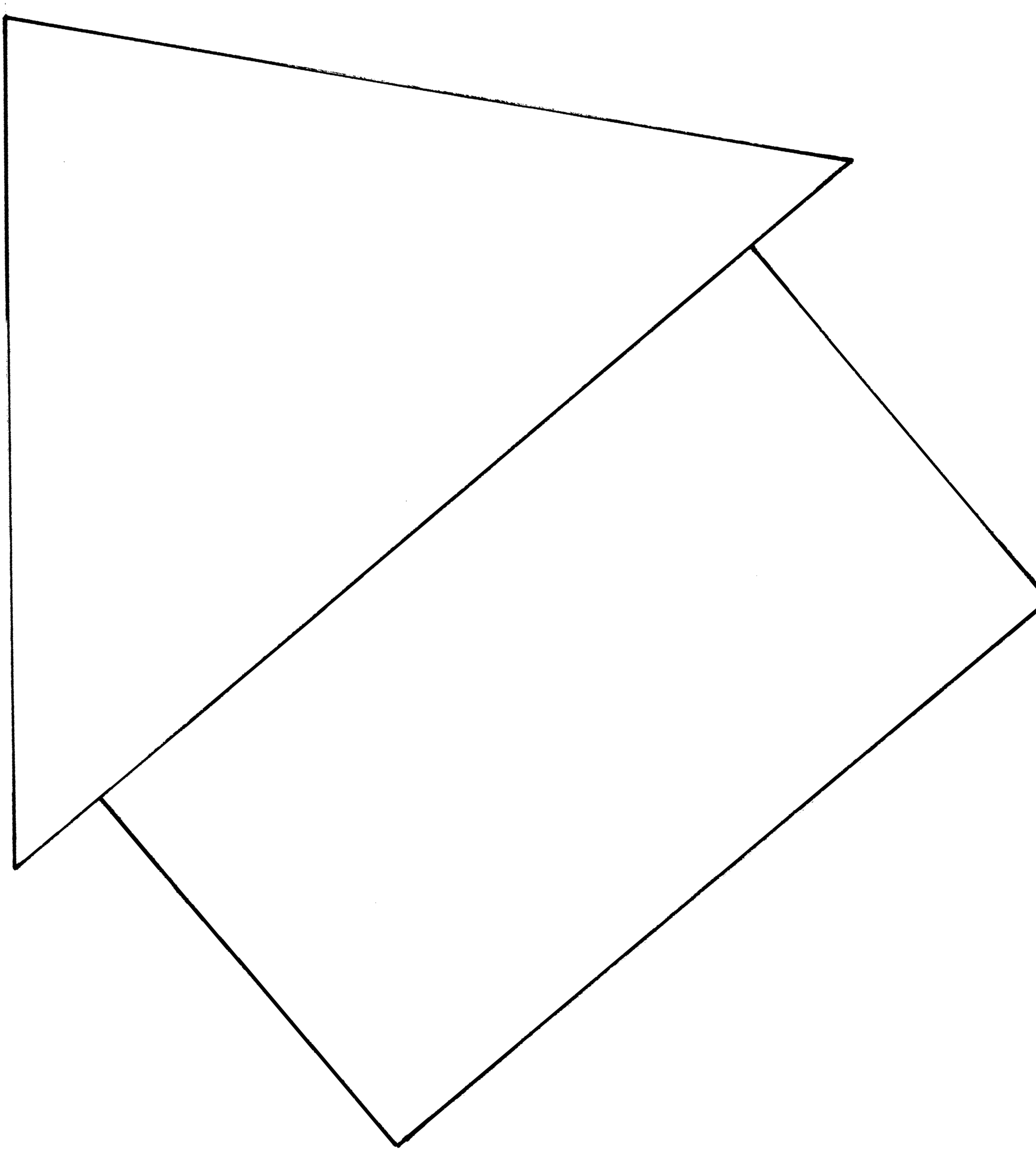




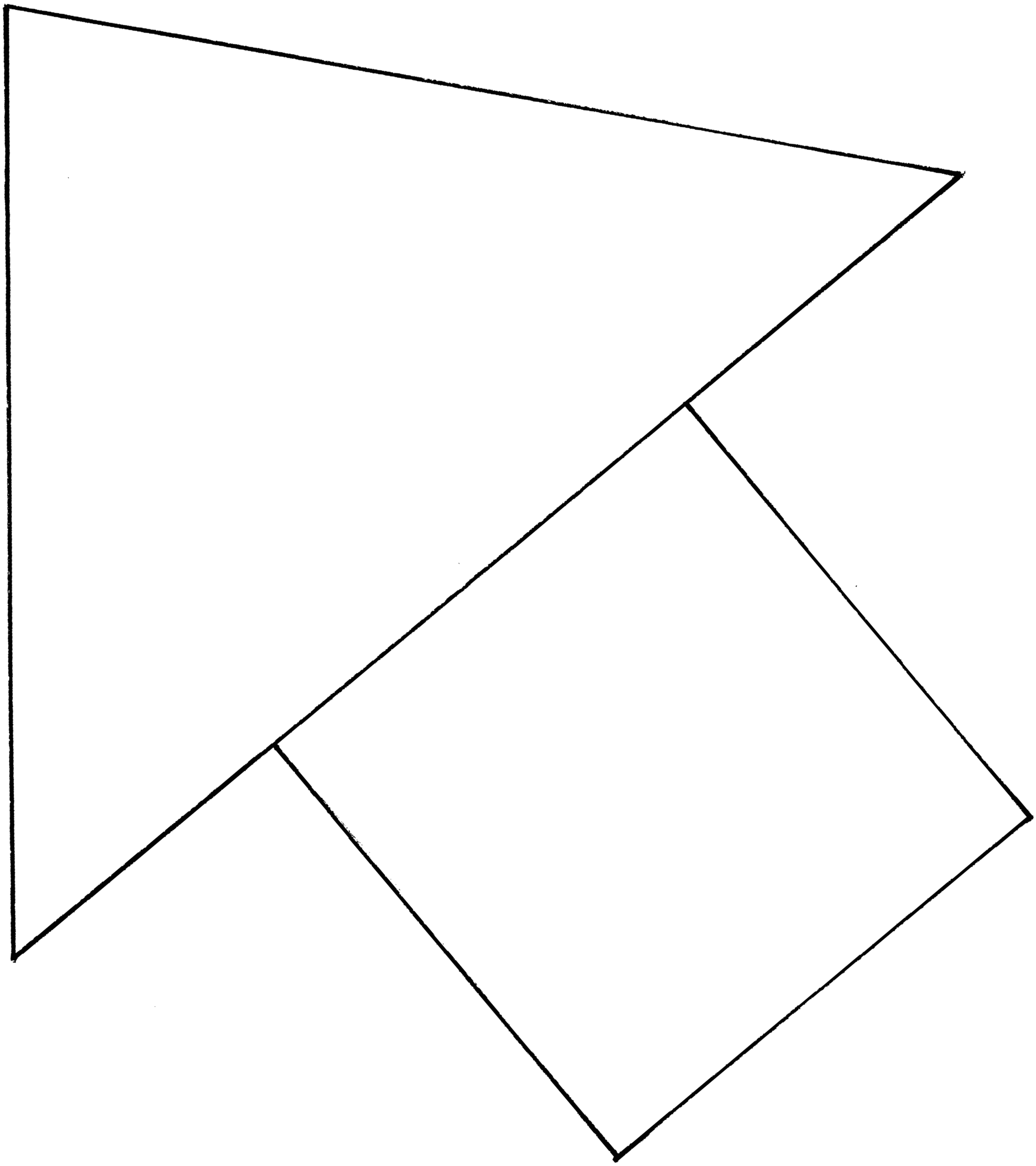
Beginners' Tangram Puzzle



Beginners' Tangram Puzzle

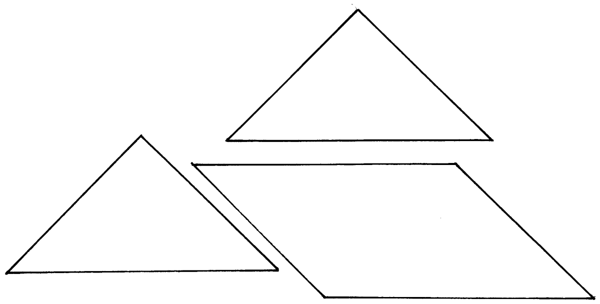


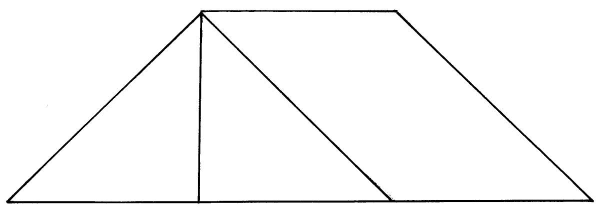
Beginners' Tangram Puzzle



Beginners' Tangram Puzzle

5 to 6 Intermediate Tangrams





Purpose: In early childhood programs, teachers provide children with varied experiences in geometry. These experiences begin with exploration of familiar objects (blocks and cans) and continue with other shapes to manipulate, such as beginners' tangrams. With the use of tangrams, children will be begin to develop concepts of size, shape, and symmetry. Tangrams aid in developing an understanding of geometric properties and relations. This activity adapts the classical tangram set. Here we use 3 pieces.

Materials:	scissors	black marker
	white paper	thick colored paper

Preparation:

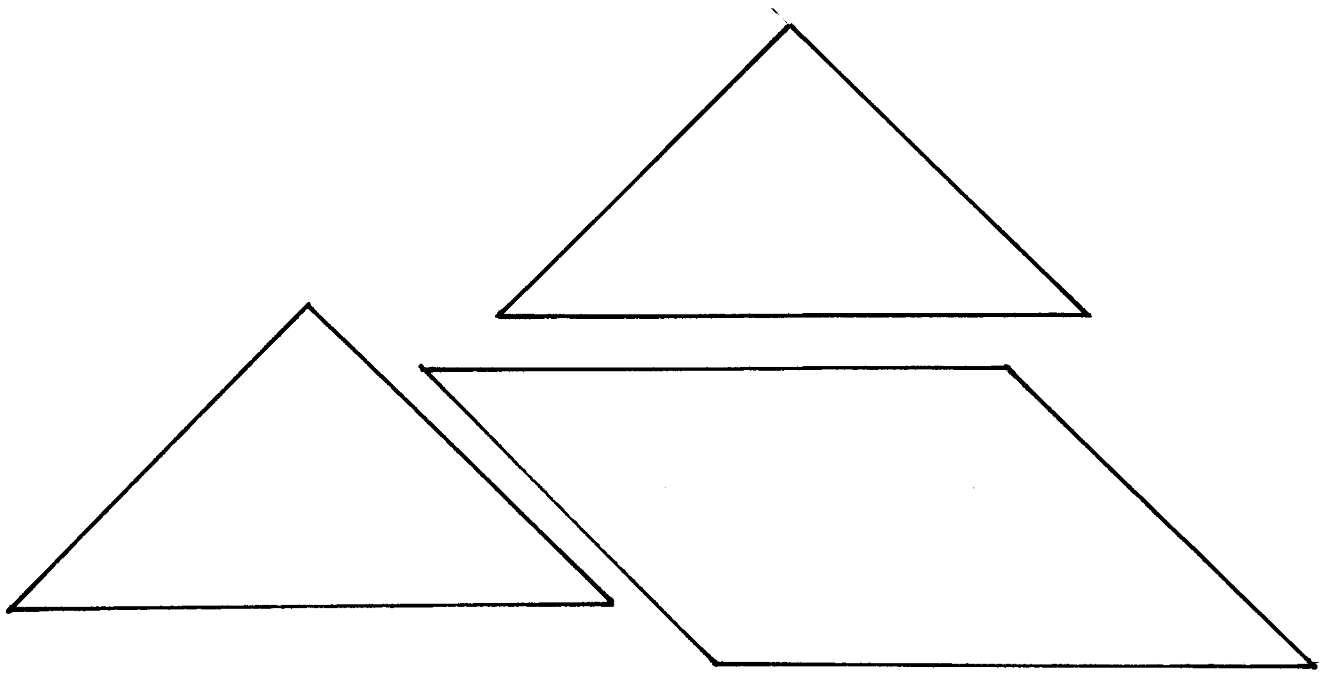
1. Intermediate tangrams include 2 small-sized triangles and 1 rhomboid.
2. Keep each set of intermediate tangram pieces in a separate envelope.
3. Using the attached templates, make the shapes out of thick colored paper. They can be laminated or covered with contact paper. Duplicate the puzzles on white paper and outline boldly with black marker.

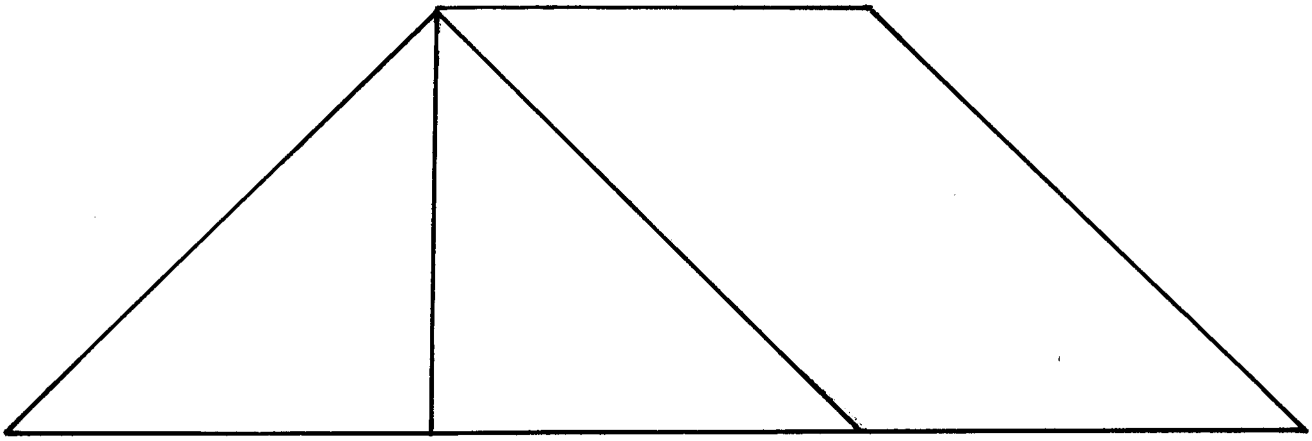
Activity : The objective for the children is to explore and experience the many possibilities involved in this spatial relationship activity. Learning the names of the shapes is incidental but will happen by using tangrams. Children can work either alone or in groups of 3. They manipulate the 3 pieces to fit the outlined puzzles. Encourage the children to play with the tangrams and make new patterns.

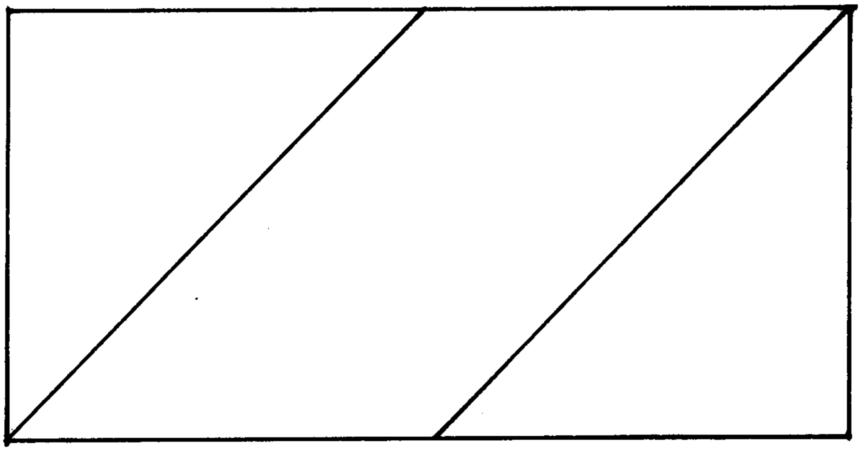
Extensions and variations:

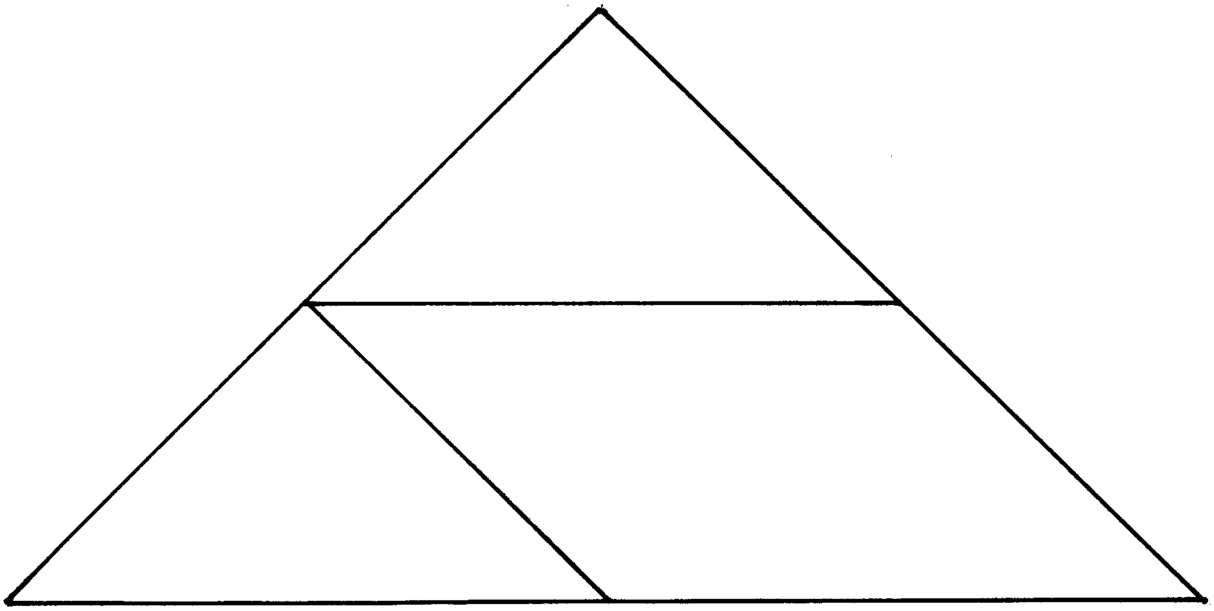
- Invite the children to make their own puzzles. As they discover new puzzle shapes, help them outline the shapes on white paper. Make the new puzzles available to all the children.

Puzzle Pieces

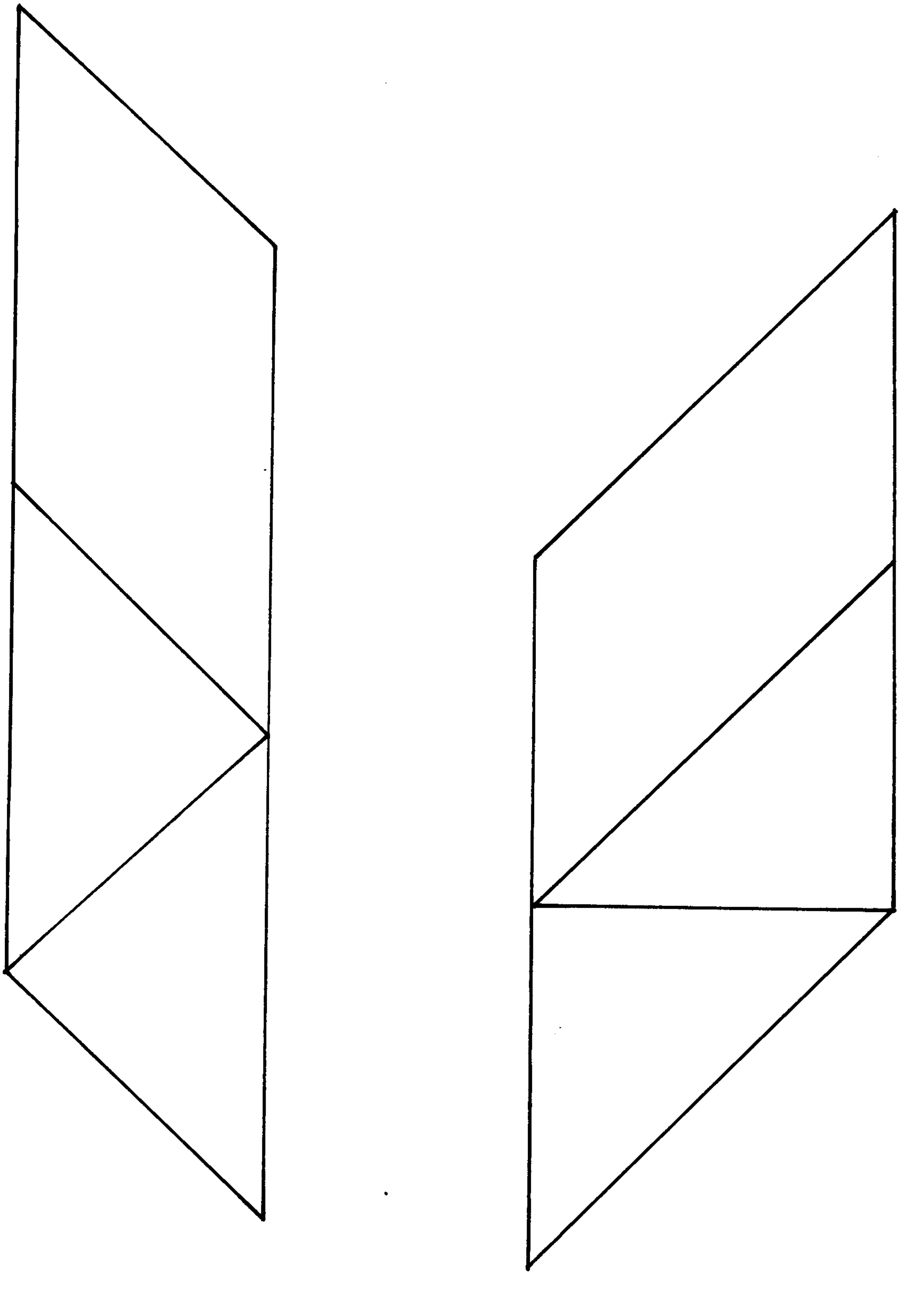








Intermediate Tangram Puzzles



Intermediate Tangram Puzzles

6 Advanced Tangrams

Purpose: Building on previous experience, some children may be ready to use all 7 tangram pieces to either explore shapes they previously formed (a square, a right-angled triangle, a rectangle, etc.) or make new designs of their own.

Materials:

scissors	white paper
black marker	thick colored paper

Preparation:
1. Cut out the 7 pieces (2 large triangles, 1 middle-sized triangle, 2 small triangles, 1 square, and 1 rhomboid). Use the attached templates. Laminate the pieces or cover with contact paper.

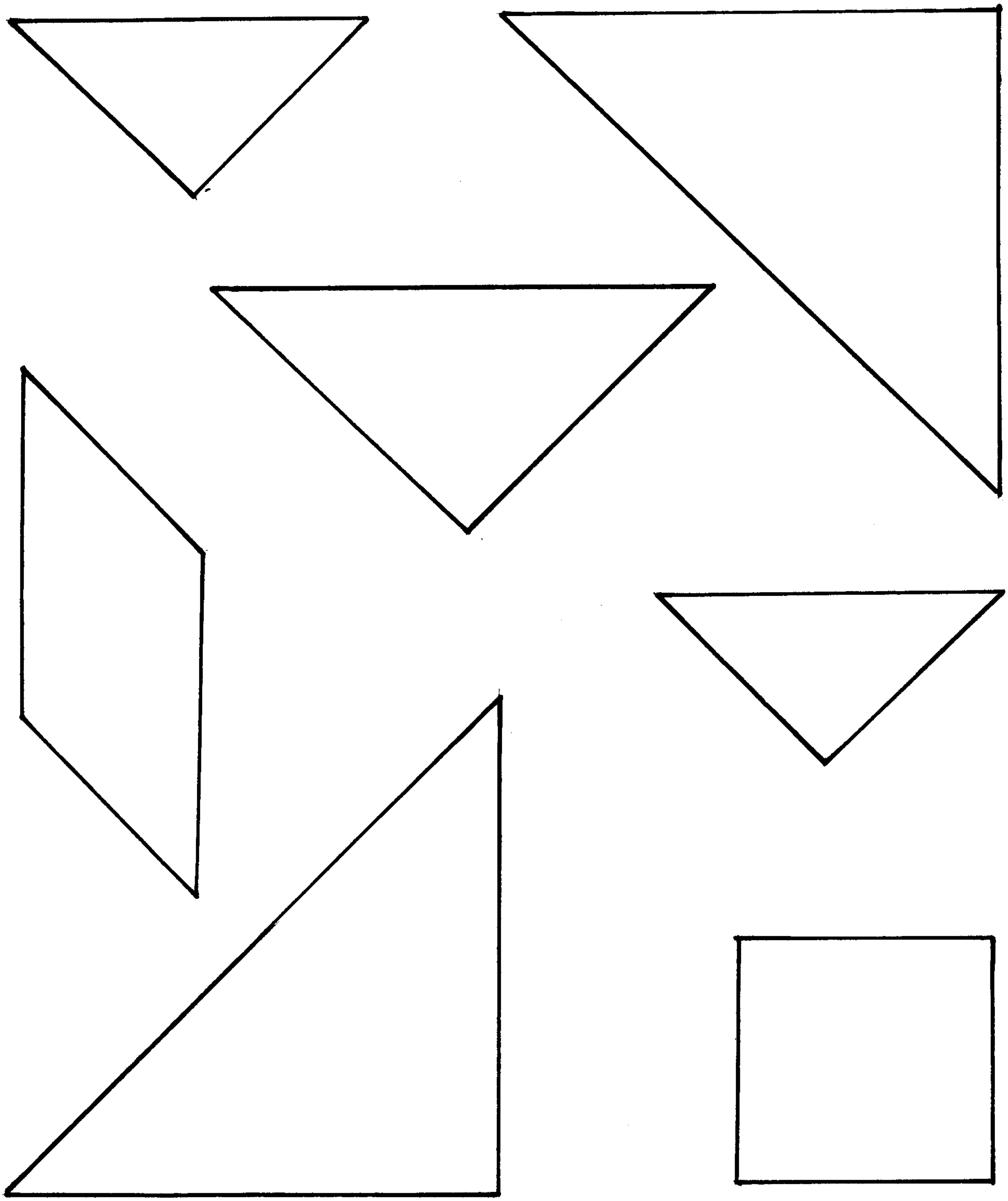
2. Duplicate the attached puzzles for each child.

3. Store the 7 advanced tangram pieces in an envelope.

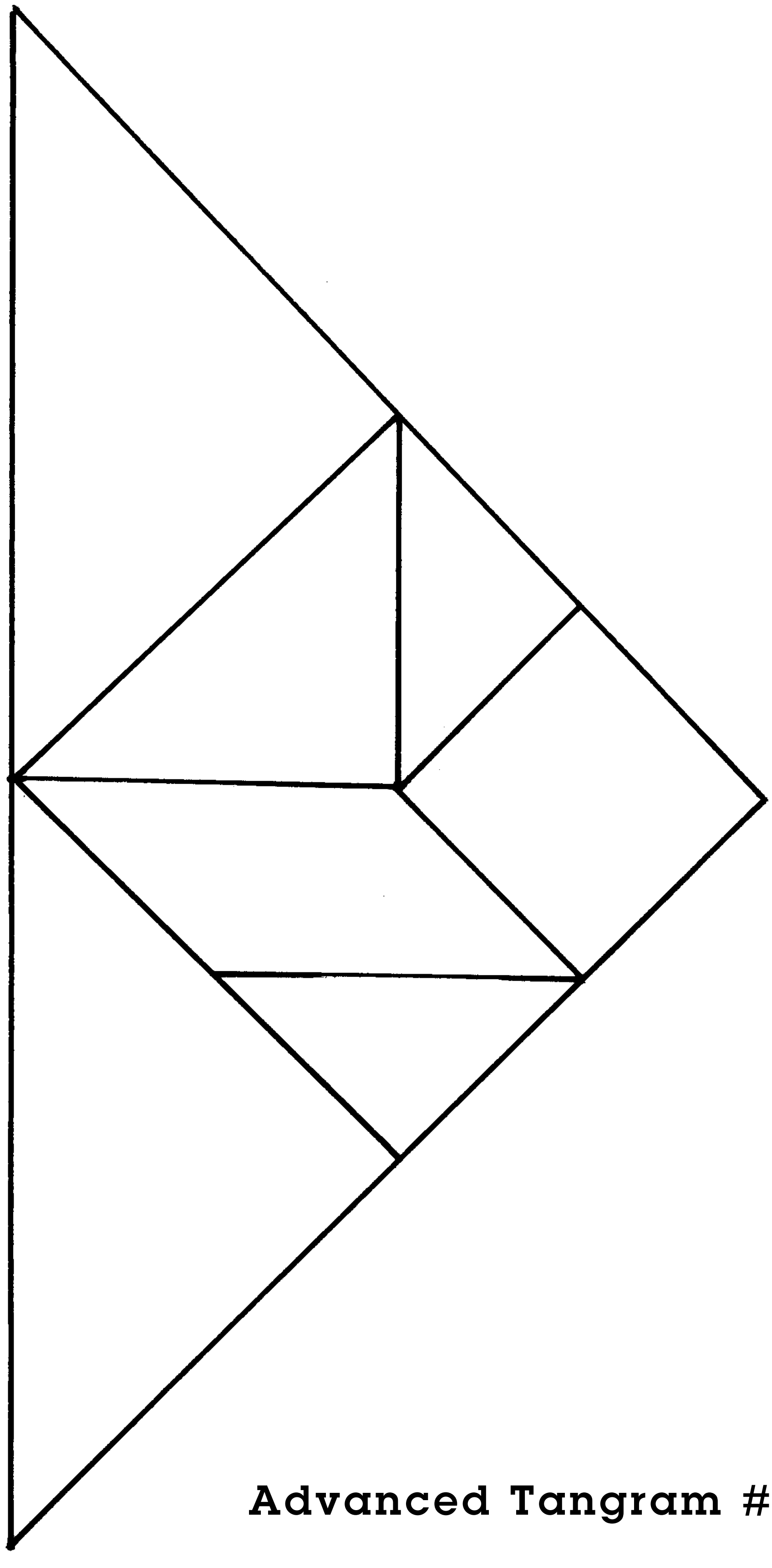
Activity : To demonstrate rearranging different combinations to make familiar shapes, ask the children to use all 7 pieces to complete puzzles 1 and 2. If the children become frustrated or bored with these, they may need more time to explore combinations of intermediate tangrams. Answers for puzzles 1 and 2 follow.

Extensions and variations:
- After free-exploration, ask children to use 3 of the smallest triangles to make a square. Children will use their problem-solving skills to manipulate the puzzle pieces into shapes. With practice they can make a trapezoid and parallelogram.

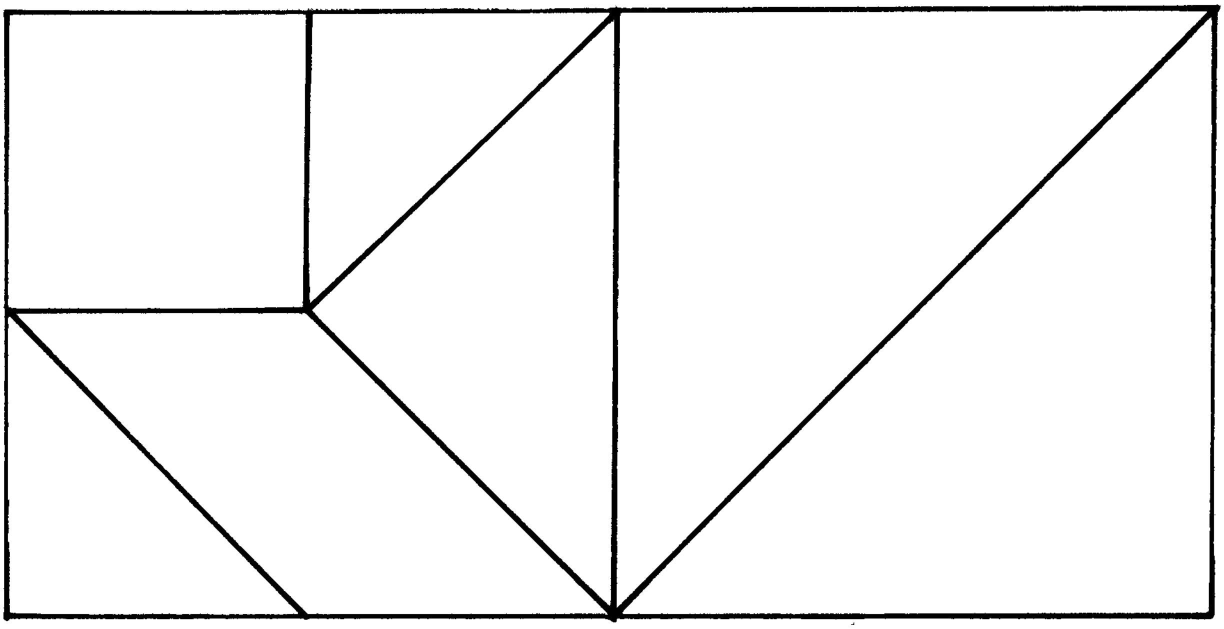
- Tell the children that they are going to have a chance to be puzzle designers. Have the children make their designs on standard size paper. When they complete a design that they like, the teacher should draw an outline around their creation on paper. (All pieces within the inside and outside of the puzzle could be outlined.) Some children may be able to sign their own names. Next write the name of the design on the front of the paper. Cover the finished product with clear contact paper and store in the manipulative center for future use.



Puzzle Pieces



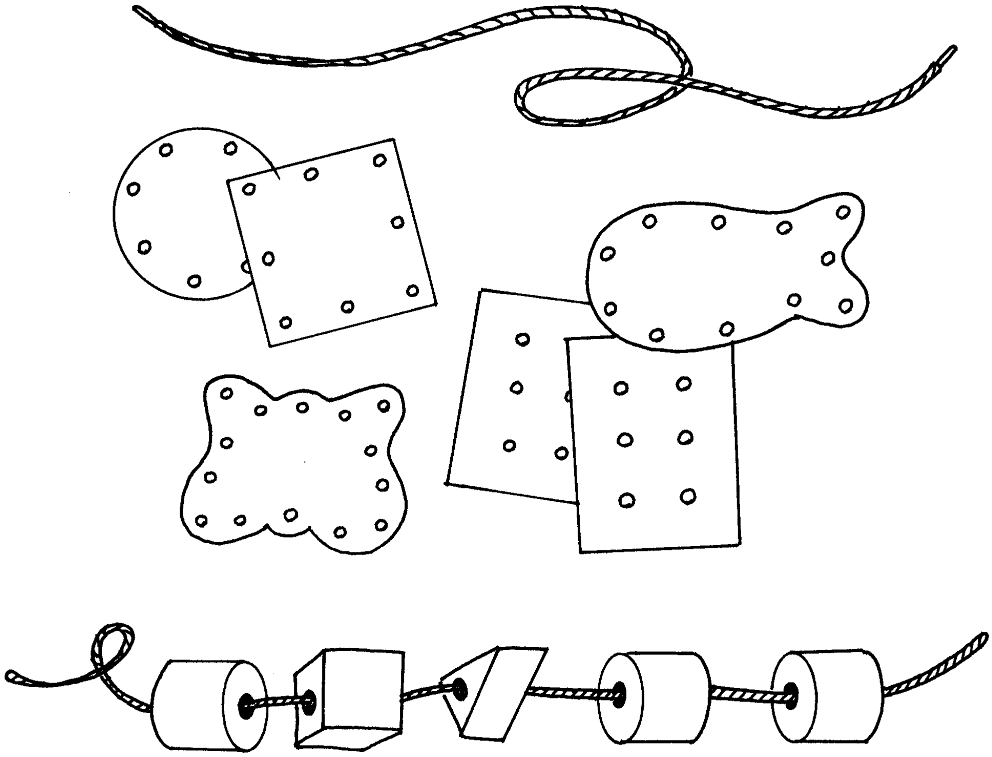
Advanced Tangram # 1



Advanced Tangram # 2

3 to 5

Sewing Cards and Dressing Boards



Purpose: This activity strengthens eye-hand coordination and provides practice with spatial relationships. It teaches essential dressing skills that contribute to a child's sense of independence and provides an awareness of how things fit together. It also provides fine motor practice as younger children learn fastening skills and older children practice tying.

Materials:

- heavy cardboard
- cord or old shoe laces
- old clothing with different types of fasteners
- scissors
- wooden beads
- wooden boards
- hammer and nails or stapler

HOME CONNECTION

Remind parents that developing skills that help the child become more independent is an important goal of early childhood. Showing children how to dress themselves and allowing them time to do so may demand extra time and patience, but the results are worth it.

Preparation:

1. Sewing cards are made by cutting heavy cardboard into 7 cm. x 12 cm. cards and punching or drilling holes in them. Sewing cards can also be made in different shapes. Collect shoe laces or cord for sewing.

2. Dressing boards are made from wooden boards. Use 6 boards about 22 cm. x 30 cm. each.

3. Find old clothing with a zipper, a button and buttonhole, a buckle, a snap, a tie, and laces. Cut out each type of fastener, leaving enough fabric around the fastener so that the fabric can be attached to the board.

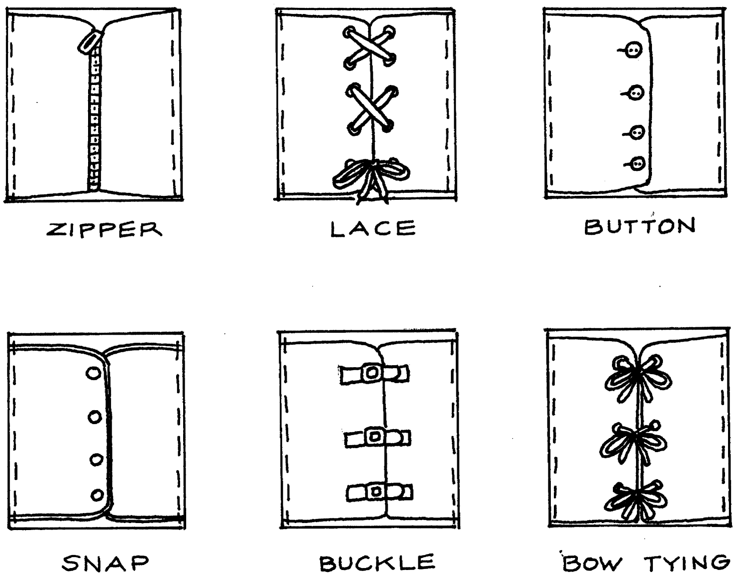
4. Staple or nail the pieces of fabric to the board.

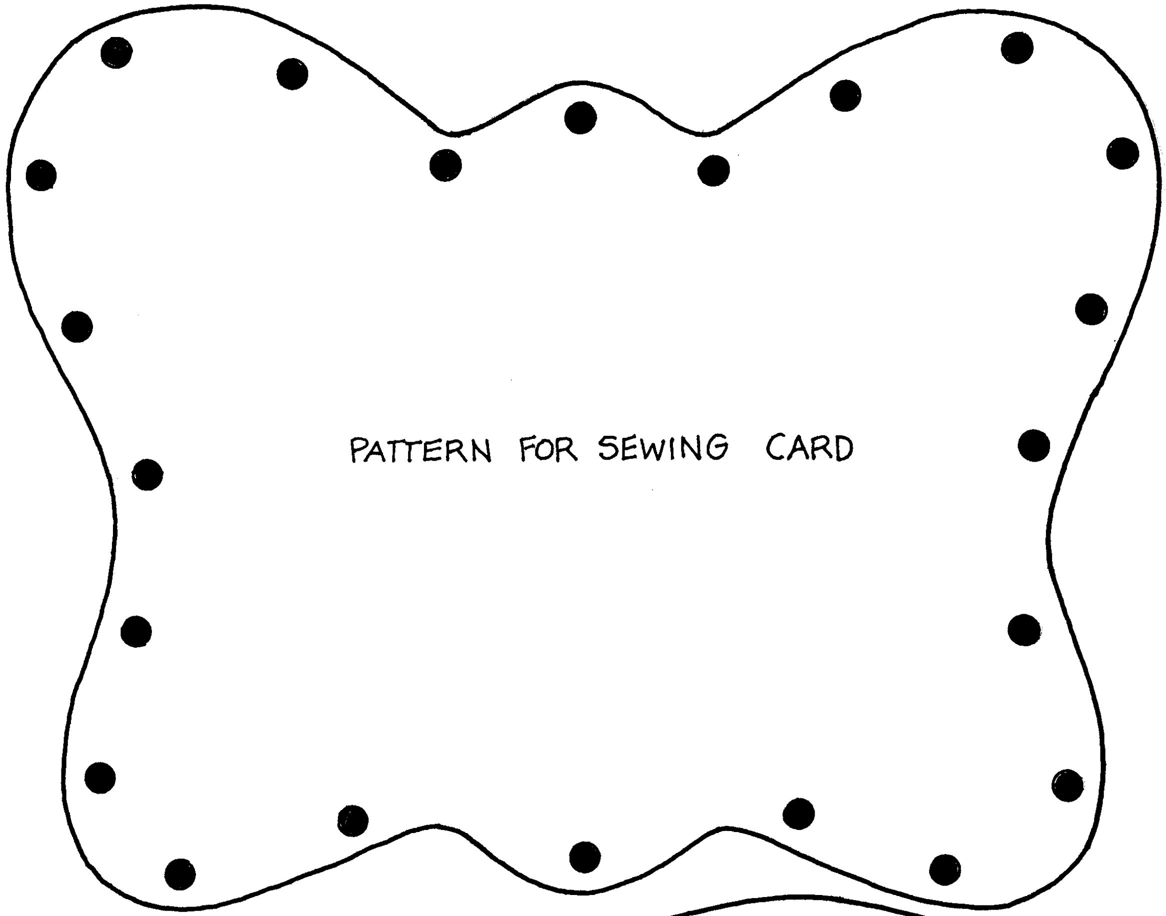
Activity: With children who are 3 years of age, begin by stringing large wooden beads together. They can make their own necklaces or just enjoy stringing colored beads in a pattern.

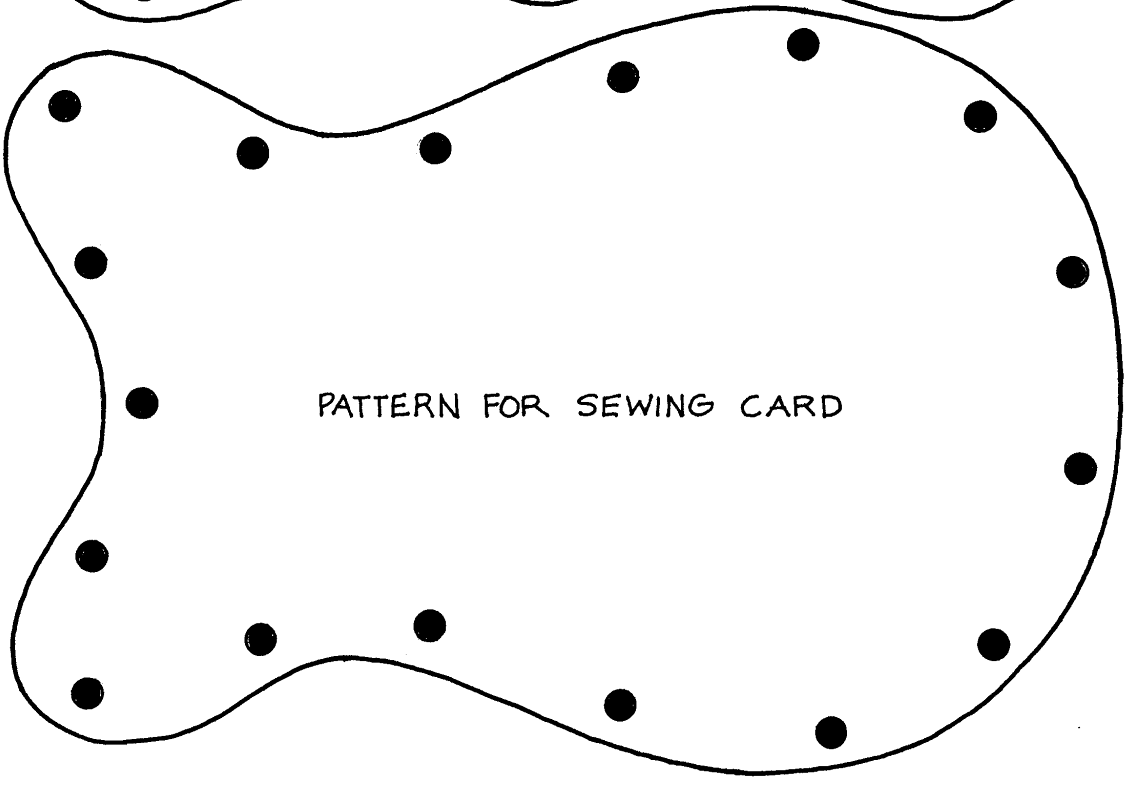
The sewing cards and dressing boards should be placed in the manipulatives center where children can experience them at their own pace. An observant teacher will provide assistance as it is needed and reinforce the skill with new vocabulary words, such as *button*: "You are able to button this. Where else do you see buttons? Can you button your sweater?"

Extensions and variations:

- Be sure to include dress-up props for both boys and girls that give practice with buckles, buttons, and zippers.




PATTERN FOR SEWING CARD


PATTERN FOR SEWING CARD