



It's a Perfect Fit—Part 1

Getting Into Shapes

A Class Over Time (Geometry)

Objective

Students will be able to identify, describe, and classify two-dimensional shapes.

Overview of the Lesson

Using square tiles, students are challenged to duplicate shapes shown on a card displayed by the teacher. Students then identify and describe two-dimensional shapes in the classroom environment. They sort a collection of shapes according to their attributes. After sorting the shapes in different ways, students color the shapes and arrange them to form a picture or pattern. Stories are written to accompany the pictures.

Materials

Teacher:

- Resource Sheet: Quick Image Rectangles
- Poster Board
- Shape Cards

Each Student:

- Square Tiles (about 20)
- Activity Sheet: Shape Cards

Each Student Pair:

- Glue or paste
- Crayons
- Construction paper
- Lined paper
- Envelope with cut-out "Shape Cards"

Procedure

Enlarge, cut apart, and mount shapes on "Quick Image Rectangles." Give each student approximately 20 square tiles. Show the class one of the Quick Image Rectangles. Only display the shape for about three seconds. Using the square tiles at their seats, have the students duplicate the shape. Give the students about one minute to work and then flash the shape once again for three seconds. Have students describe the shapes they made. Show the shape once again so that students may check their answers. Use the same procedure to complete several more examples.

Challenge students to survey the room to locate objects and describe their shapes, i.e., clock-circle-desk-rectangle. After several examples have been given, have student find shapes within larger shapes. For example, there are square tiles on the ceiling or floor but the tiles can be grouped together to form a variety of larger rectangles and squares.

Have the students sit on the floor in a circular arrangement. Reproduce Activity Sheet: Shape Cards and cut out the rectangle containing each shape. Give one shape to each student. Call on one student to describe his/her shape and then place it in the circle. Encourage the other students to carefully examine their shapes and if their shapes have the same attributes, have them place their shapes next to the shape in the circle. Leave the shapes on the floor and continue the same procedure with other examples until all of the shapes have been classified. Students may find one shape forms a group by itself.

Divide the class into pairs. Prepare enough cut-out shapes using Activity Sheet: Shape Cards for each pair of students. Give each pair of students a set of shapes to classify according to their attributes. After all of the students have grouped all of the shapes, have students explain and describe their reasons for the groupings.

Students should color the shapes in each category the same color. Using glue and construction paper, have them make a picture with their shapes and write an accompanying story.

For homework, give the students copies of Activity Sheet: Shape Cards. These are copies of the same shapes they worked with in the lesson. Tell the students to color and cut-out the shapes and then group them in a variety of ways. Encourage them to look for other shapes around their home, cut out these shapes, and add them to

their set of geometric shapes. Make sure to tell them to bring the shapes to school to use in the next lesson. Students will use the shapes to decorate a paper bag vest in the next lesson.

Mathematically Speaking . . .

Giving young learners opportunities to identify two-dimensional shapes in their environment helps to improve their spatial sense and visual discrimination skills. Visual discrimination is the ability to cite differences and similarities among a group of objects. Activities that promote sorting, matching, and classifying strengthens these visual discrimination skills.

During the lesson, the teacher flashed a shape card for three seconds and then asked the students to recall the shape on the card and duplicate it with square tiles. The ability to repeat or recall a pattern or shape that is no longer in view is called visual memory. When parents hide a ball beneath their toddler's blanket and the toddler lifts the blanket with delight as he finds the ball again, the toddler is exhibiting visual memory skills. The ball no longer disappears forever for the young child when it is out of sight because of his visual memory skills. Giving elementary students exercises and providing explorations to improve their visual memory will help them to conceptualize more complicated patterns later.

Extensions & Connections

Have the students use their shape cards to make repeating patterns.

Using magazines and catalogs, students can search for examples of shapes found within larger shapes. Have the students cut-out the pictures and mount them on a poster. Students should label the shapes that they find.

Use a geoboard to have students make shapes.

Have the students make "shape books" that resemble the various shapes including circle, square, rectangle, and triangle. They could fill the pages of their books with pictures cut from magazines that match the shape of their book.

Resources

Shapes, Halves and Symmetry: Investigations in Number, Data and Space. (1997). Dale Seymour Publications. Palo Alto, California

The Greedy Triangle (1994) by Marilyn Burns. Scholastic.

Geometry and Spatial Sense: Addenda Series, Grades K-6. (1993) National Council of Teachers of Mathematics. Reston, Virginia.

Ideas for Online Discussion

(Some ideas may apply to more than one standard of the *NCTM Professional Standards for Teaching Mathematics*.)

Standard 1: Worthwhile Mathematical Tasks

- What significant mathematical concepts are taught in this lesson?
- When students identify shapes in the classroom, what skills are they demonstrating, and what does this tell you about their background?

Standard 2: Teacher's Role in Discourse

- The teacher consistently asks students to clarify and justify their ideas orally. Cite instances where this is done and tell how you encourage students to speak precisely.
- The teacher noted at the end of the lesson that some students did not participate in the presentation of their creative work. What do you attribute to this drop in participation? What do you do when this happens?
- When working on the carpet, the easiest shapes are grouped first. The remaining shapes are unusual and the class struggles as they try to categorize them. The teacher does very little intervening, unless she asks additional questions. Is this strategy effective?

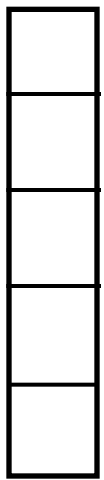
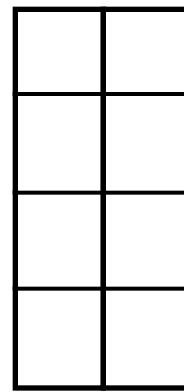
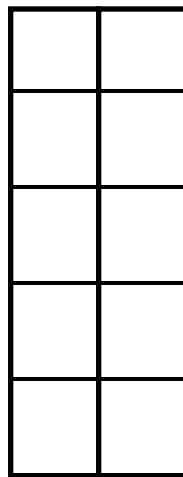
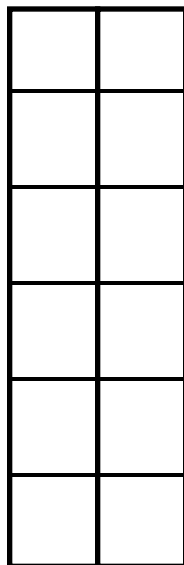
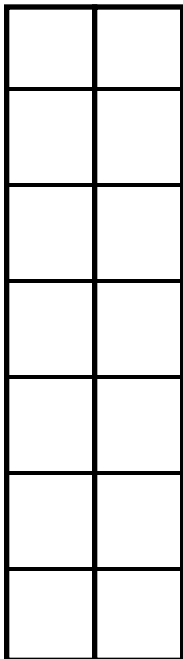
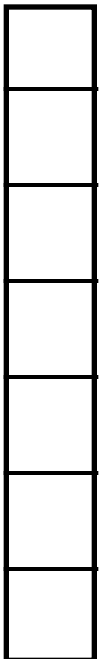
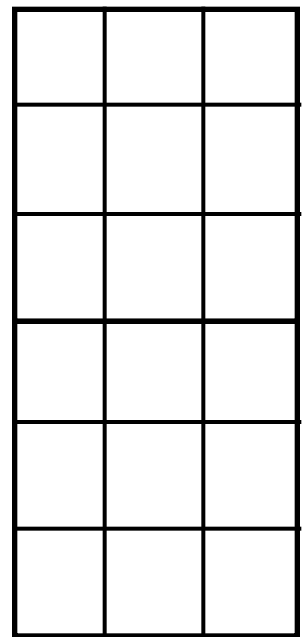
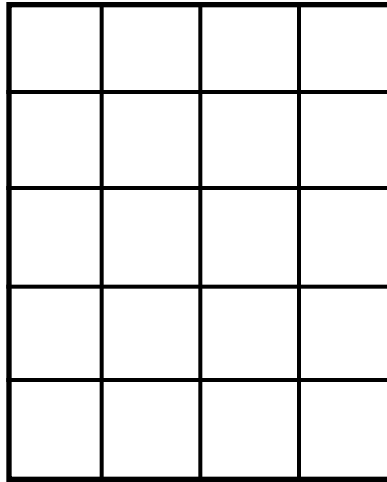
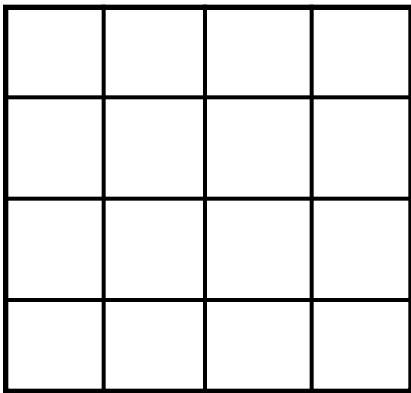
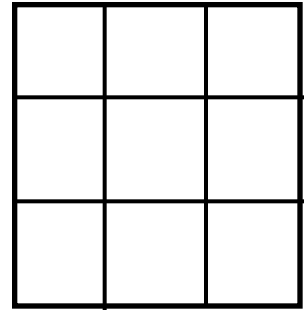
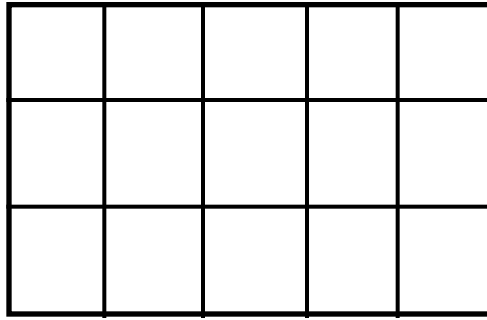
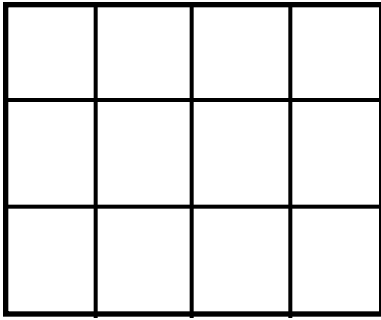
Standard 4: Tools for Enhancing Discourse

- The creative picture becomes a tool for assessment and a tool for enhancing discourse. What unusual things have you done to generatediscussion?
- The teacher used a variety of materials and techniques to make connections and help students to reason mathematically. Give a few techniques she used that you thought were interesting.
- At your present grade level, which materials would you use from this lesson? Which could be adapted?

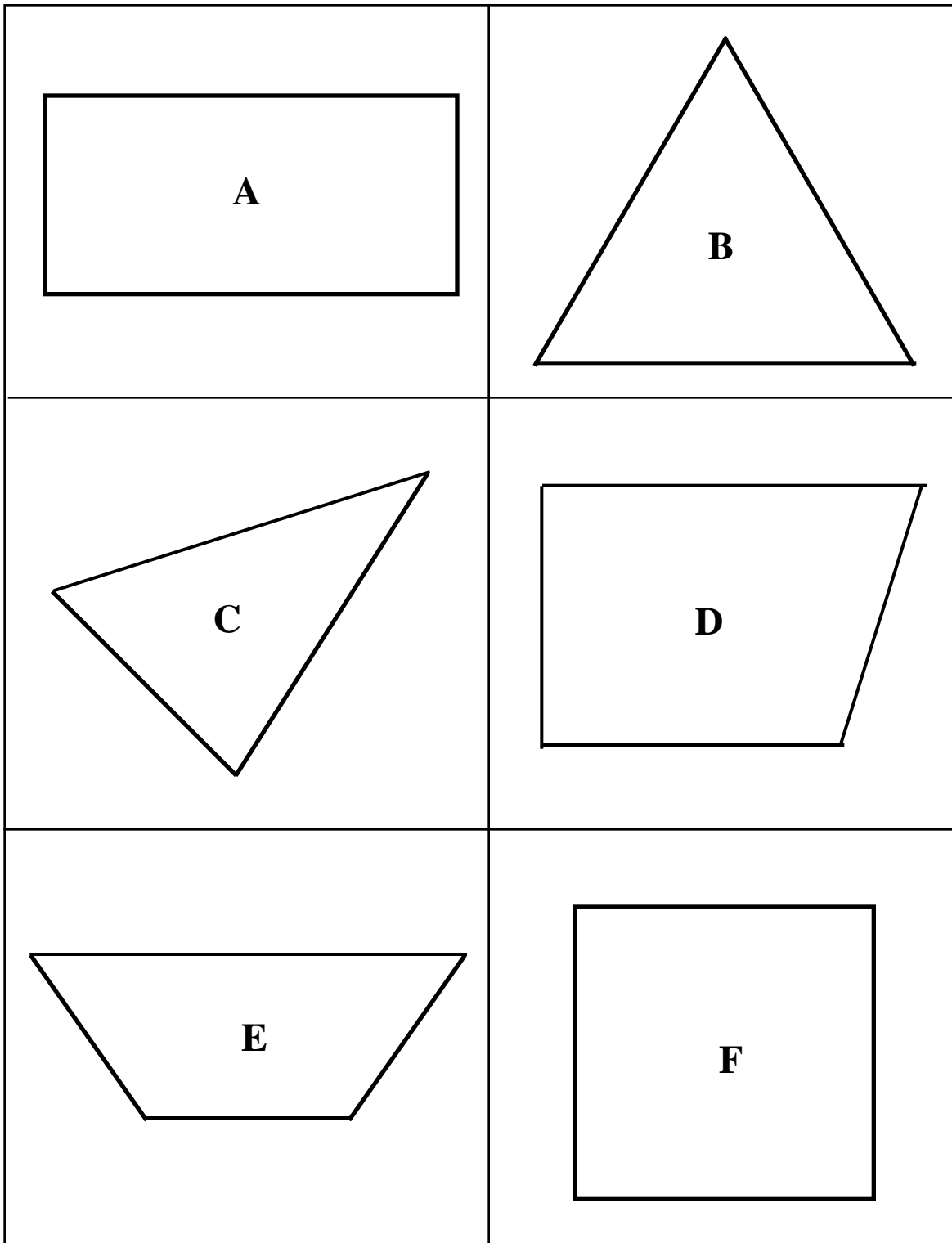
Standard 6: Analysis of Teaching and Learning

- Often the allocated math time is not enough as some tasks take students a good deal of time to accomplish. How do you deal with this problem of time? Are there any conditions that enable you to be more flexible with time?
- How does the teacher interact with the teaching intern? How did this interchange benefit students? Do you feel the intern was receiving the background necessary to become a teacher?

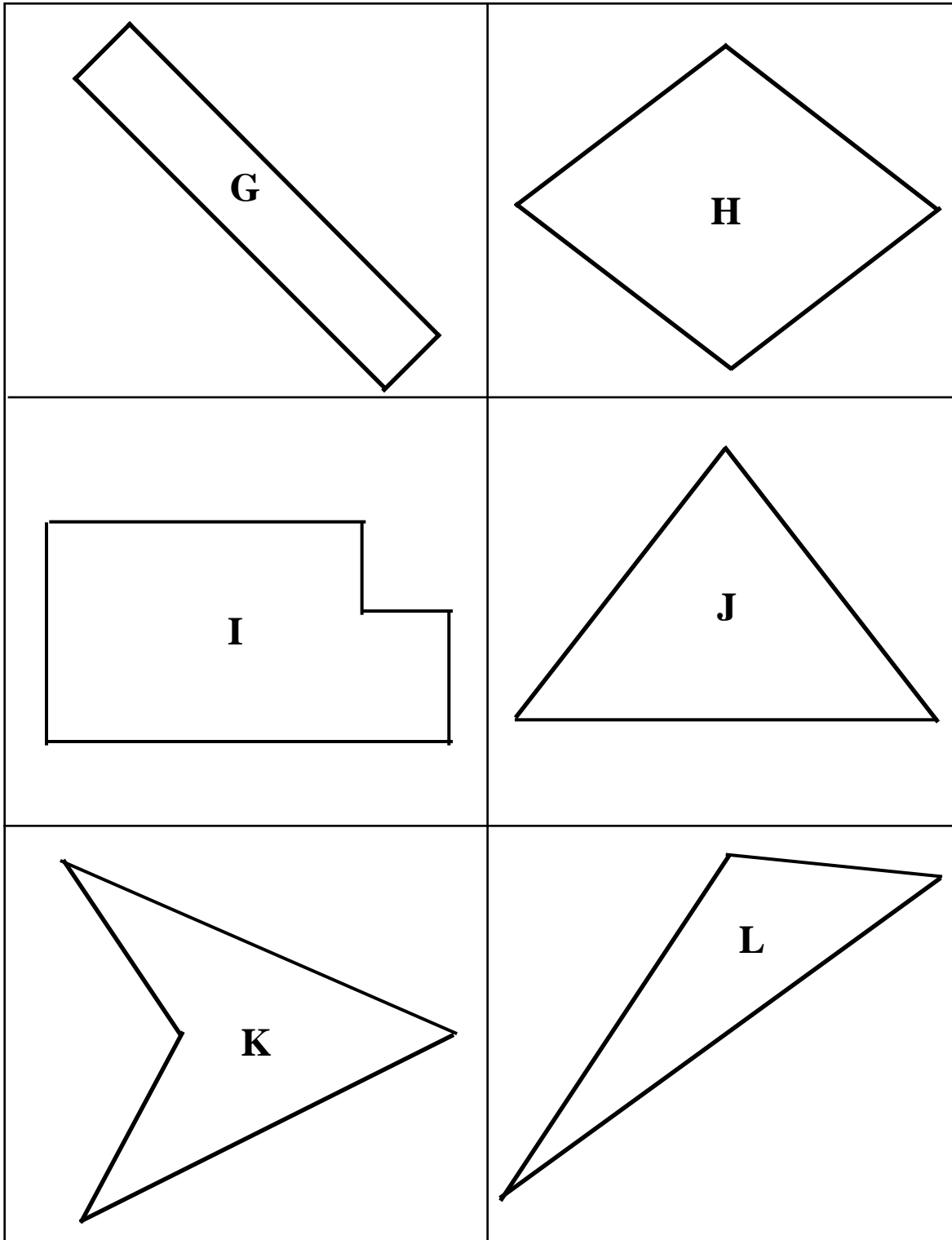
Quick Image Rectangles



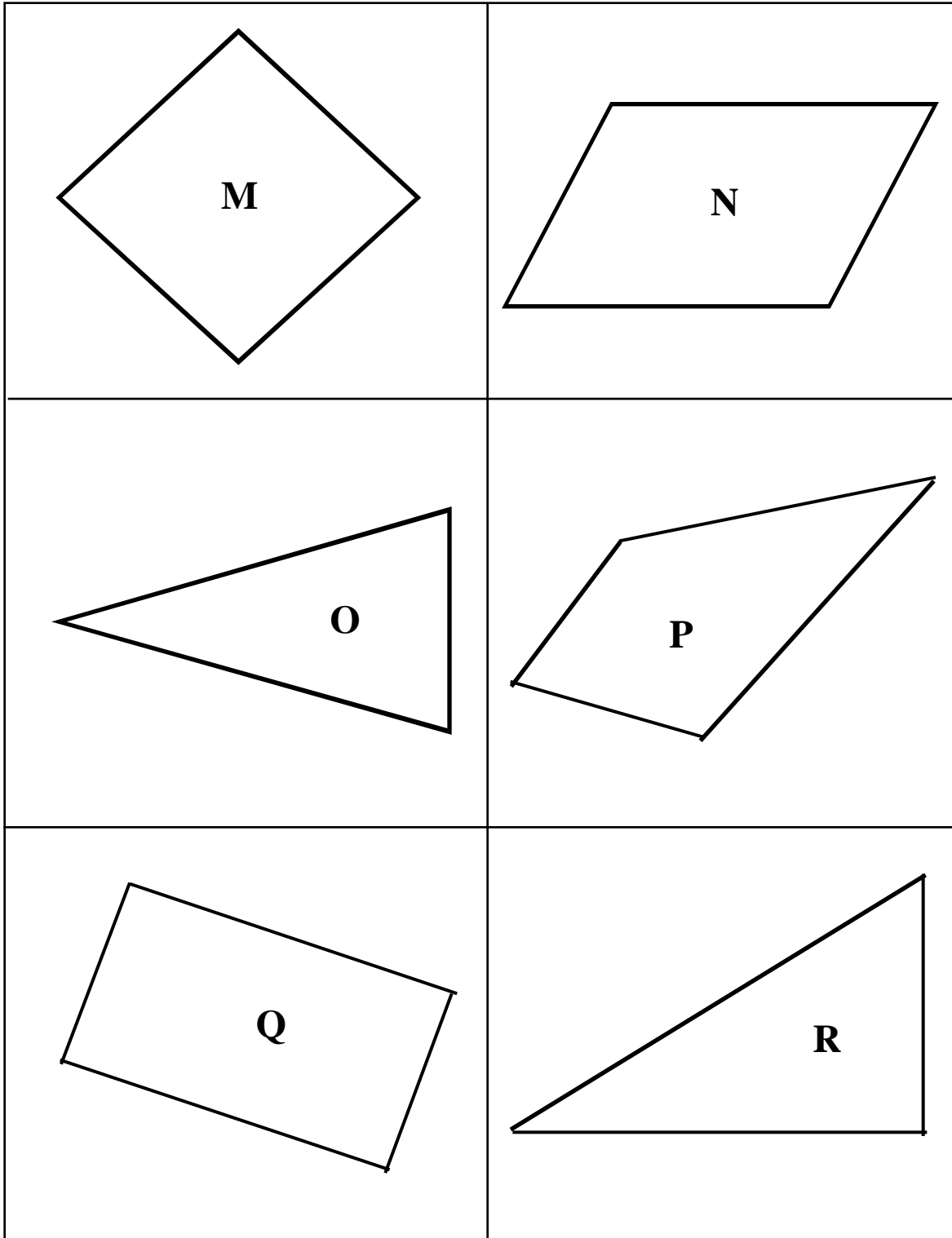
Shape Cards



Shape Cards



Shape Cards





It's a Perfect Fit—Part 2

Shaping Up

A Class Over Time (Geometry)

Objective

Students will be able to join pattern block pieces together to cover a region and to identify and describe numerical relationships found among pattern block shapes.

Overview of the Lesson

Using square tiles students begin the lesson by finding all of the different rectangles that could be made from 12 squares. Students experiment with pattern blocks to find ways to use smaller pattern blocks to cover larger ones. Using shapes from the previous lesson, students decorate colorful paper bag vests with shapes and patterns.

Materials

Each Student:

- Pattern blocks
- Activity Sheet: Pattern Block Patterns
- Unlined paper
- Glue
- Large paper grocery bag
- Square tiles (about 25)
- Activity Sheet: Predict and Cover
- Crayons or colored pencils

Procedure

Begin the lesson with a warm-up activity. Distribute a set of square tiles to each student. Ask the students to describe different ways that a rectangle could be made using 12 squares. As students use the square tiles and respond, draw a picture on the board to illustrate each rectangle.

Give each student a set of pattern blocks and a cut-out set of Activity Sheet: Pattern Block Patterns. Circulate through the classroom and give each student a square, rhombus, trapezoid, or hexagon. Note the cut-outs pieces are the same size as the pattern blocks. Challenge students to find different ways to cover each pattern block shape that they were given with smaller pattern blocks. As they find a way, have them paste or trace the pattern block pieces onto a sheet of unlined paper to record their answers. When they finish exploring the pattern blocks they were given, have the students experiment with other shapes. Circulate throughout the classroom to assess student understanding and to assist those students experiencing difficulty in accomplishing the task.

After students are finished, have them describe all of the ways to cover a blue rhombus. (There are two ways: 2 triangles; 1 rhombus). Record student answers on a chart or on the board. Use a similar procedure for the red trapezoid and the yellow hexagon:

<u>Trapezoid</u>	<u>Hexagon</u>
1 trapezoid	1 hexagon
1 rhombus, 1 triangle	2 trapezoids
3 triangles	1 trapezoid; 1 rhombus; 1 triangle
	1 trapezoid; 3 triangles
	2 rhombi; 2 triangles
	1 rhombus; 4 triangles

Distribute a copy of Activity Sheet: Predict and Cover to each student. Given an outline of a shape, students predict the number of a particular pattern block that will cover the entire shape and then check their predictions. They then predict and check to see how many of a different pattern block it will take to cover the same outline of the shape. For example, students will predict and count the number of blue rhombi it would take to cover the outline. Next, they would predict and count the number of green triangles it would take. Each sheet has a space for students to record their predictions and the actual amount. Collect all of the Activity Sheets to assess individual students understanding.

Students use the shapes they colored and classified for homework the previous night to decorate a large paper grocery bag vest. The bottom of the grocery bag will be the neck. Fold the bag so that the bottom of the bag is exactly in half horizontally. Use scissors to cut an armhole on each side of the bag. At the bottom of the bag cut a hole for the neck. Cut a straight line from the center of the neck to the end of the bag to form the vest. Students will glue the shapes onto the vest. The directions are shown on the video.

Have students celebrate by sharing and describing their vests with other students.

Mathematically Speaking. . .

Using manipulatives to develop geometry concepts is crucial with elementary students. Pattern blocks help students to connect the idea of numerical relationships to geometric relationships. Some students experience great difficulty in visualizing the relationships of one shape to another. For example, they may be unable to use the relationships between a triangle and a rhombus to predict how many triangles will cover the rhombus. These students need more hands-on experiences to visualize the relationships between the shapes. Other students instinctively "see" two triangles in a rhombus and can analyze the numerical relationship between the two. They know that if there are three rhombus shapes and two triangles are in each rhombus, then there are 6 triangles in three rhombus shapes.

Extensions & Connections

Have the students write a description of the patterns and pictures on their vests. Have a fashion show where students could walk down the runway while their descriptions are read by the teacher or another student.

Have students examine shapes for symmetry. Students may identify the lines of symmetry in different shapes. A geoboard would be helpful for this activity.

Resources

Shapes, Halves and Symmetry: Investigations in Number, Data and Space. (1997). Dale Seymour Publications. Palo Alto, California

Geometry and Spatial Sense: Addenda Series, K-6. (1973) National Council of Teachers of Mathematics. Reston, Virginia.

The Super Source — Geoboards. (1966) Cuisenaire Company of American, Inc. White Plains, New York.

Ideas for Online Discussion

(Some ideas may apply to more than one standard of the NCTM Professional Standards for Teaching Mathematics.)

Standard 2: Teacher's Role in Discourse

- As the teacher elicits responses from the students and records them on chart paper, what objectives are being met beyond the scope of geometry content?
- When the teacher supplies pattern tiles to students, and students try to cover the tile in as many ways as possible, what is being accomplished?

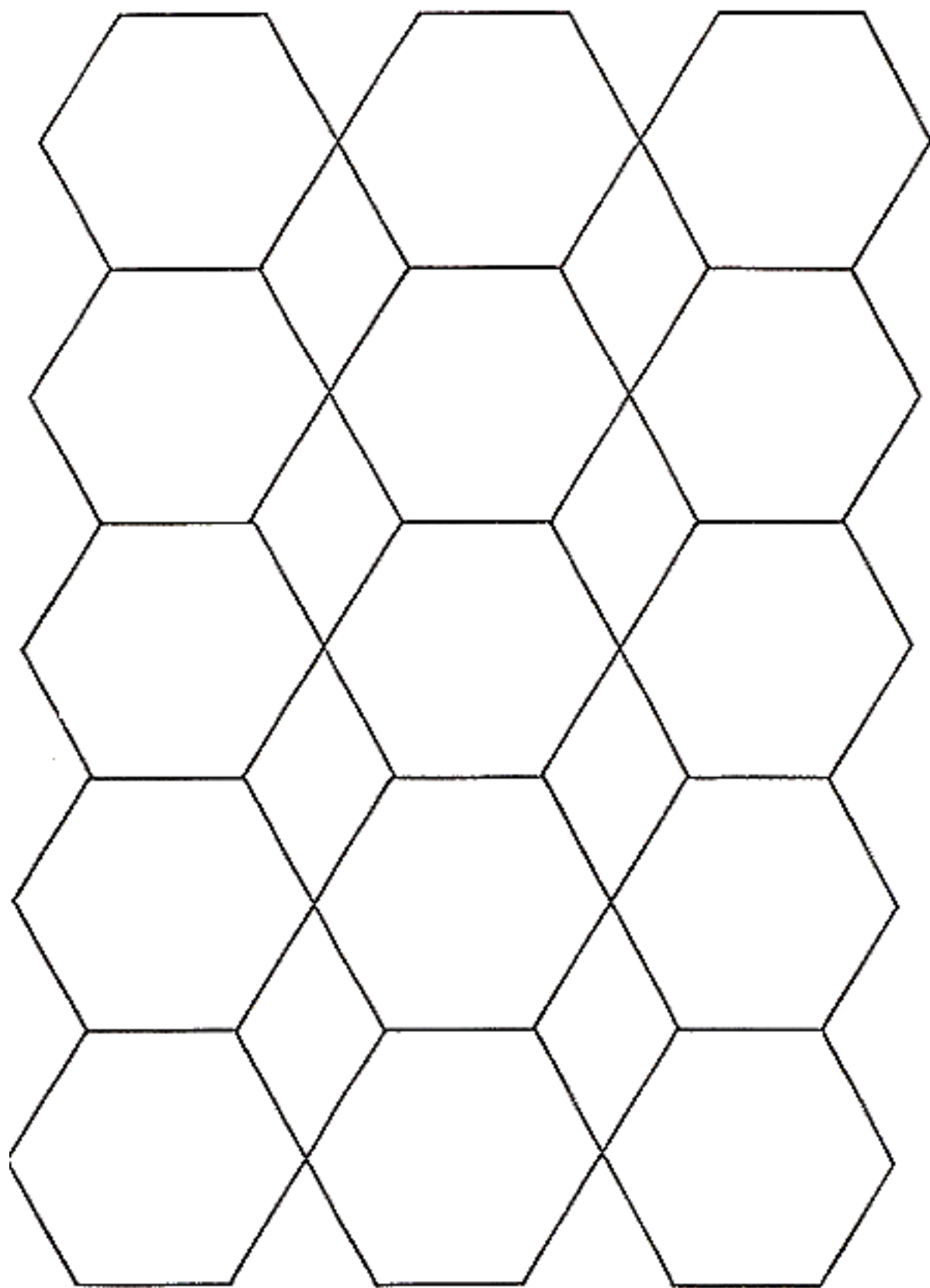
Standard 3: Students' Role in Discourse

- When students use the Activity Sheets, the first part requires them to make a prediction. Why is this important?
- How does the use of manipulatives promote student discourse?
- In the second activity of this lesson, a table is being built. As the lesson progresses, specific mathematical terminology is being introduced. Is this terminology appropriate?

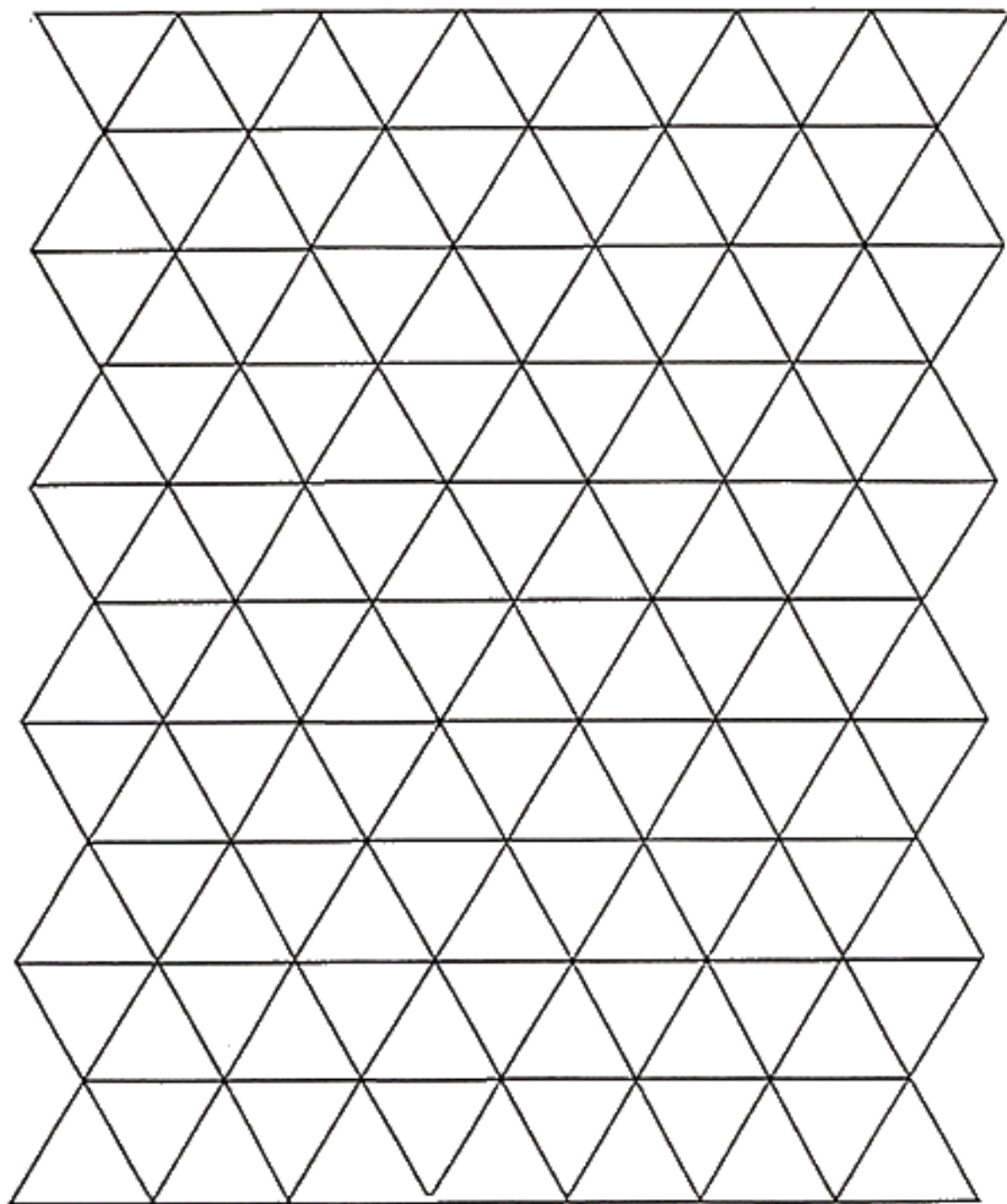
Standard 6: Analysis of Teaching and Learning

- The video teacher discusses assessment with her intern. How do you assess students understanding of a concept?
- At the end of this lesson, what concrete assessment pieces do the teacher and intern refer to in order to shape the next day's lesson?
- How important is analyzing what actually happened in class when planning the next day's lesson?

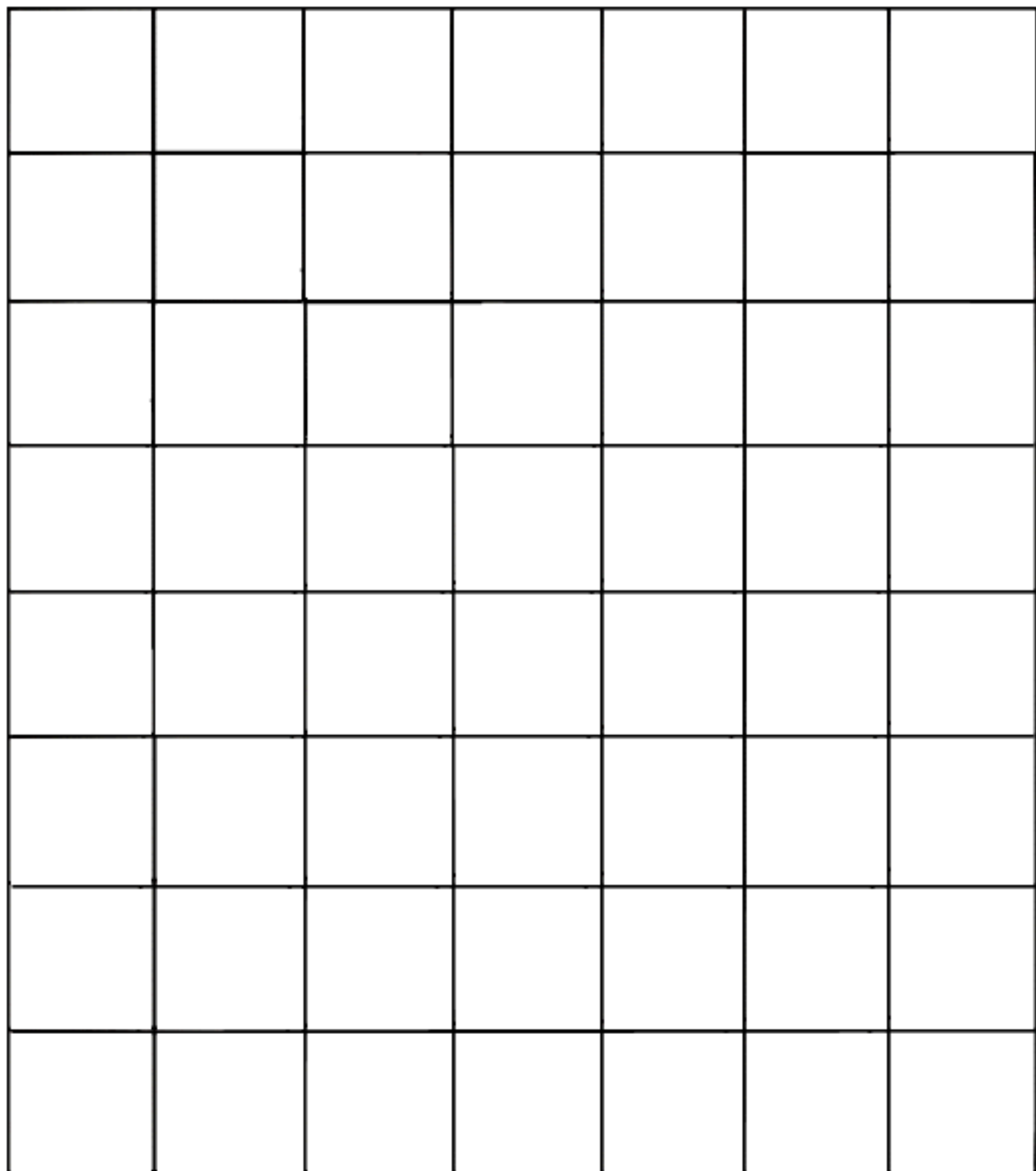
PATTERN BLOCK PATTERNS



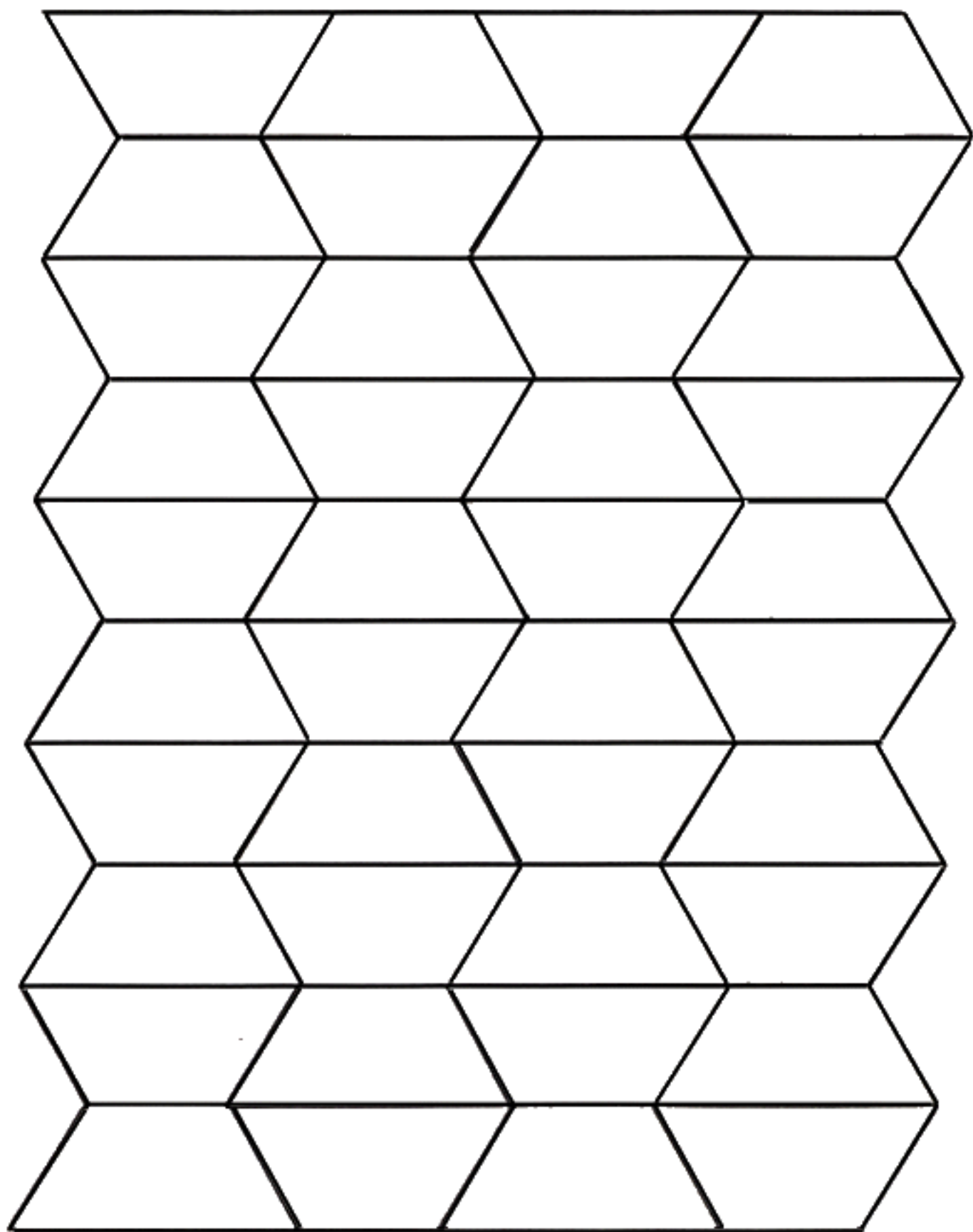
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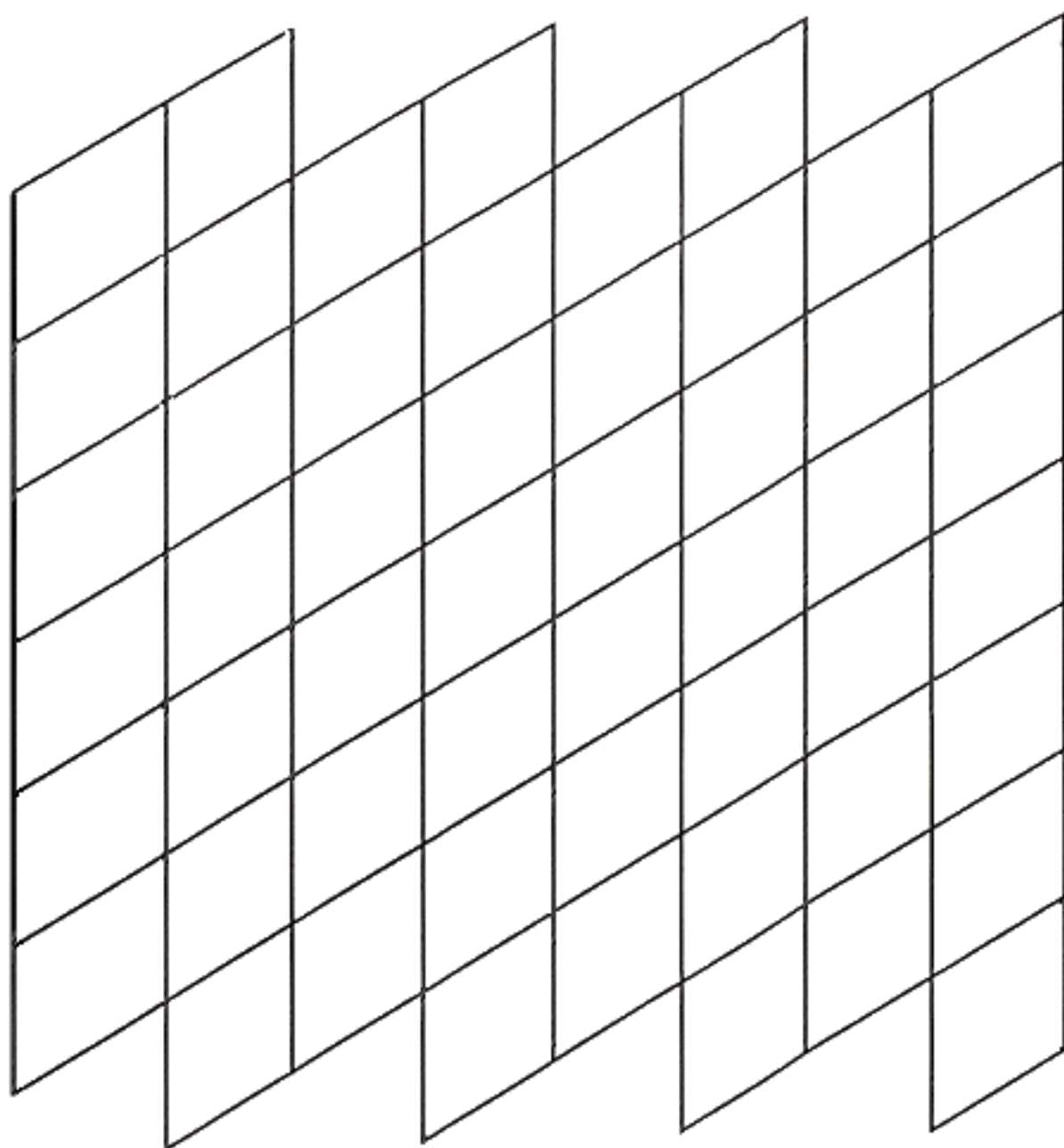
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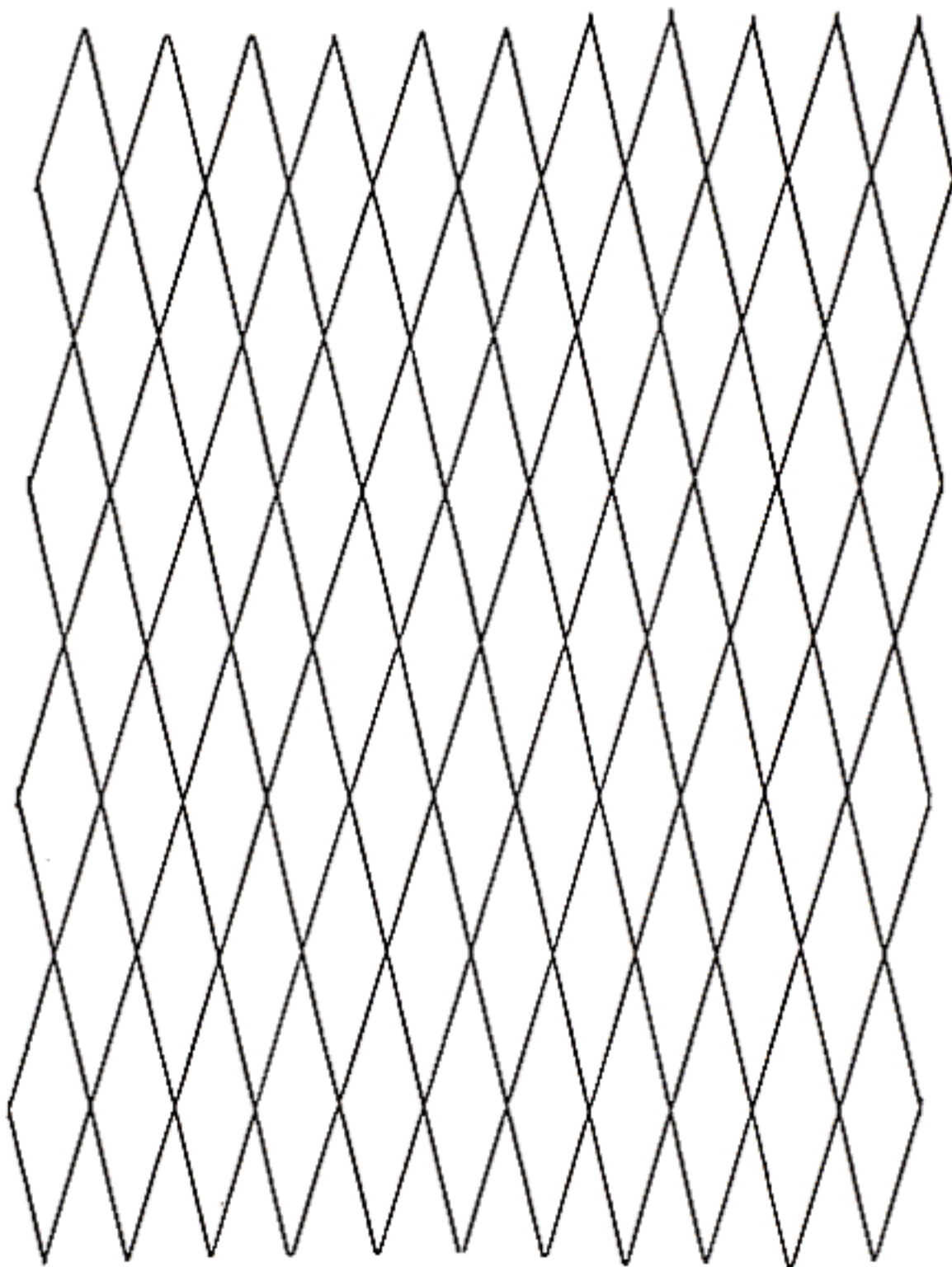
PATTERN BLOCK PATTERNS



PATTERN BLOCK PATTERNS



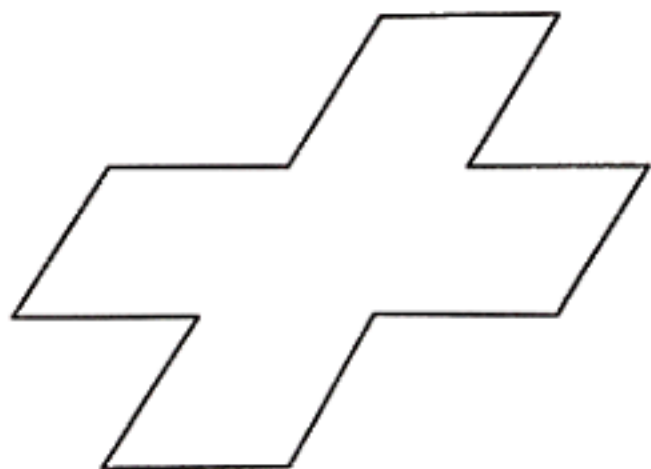
PATTERN BLOCK PATTERNS



Predict and Cover

Name _____

Shape A



Block:  rhombus

Prediction: _____

Count: _____

Block:  triangle

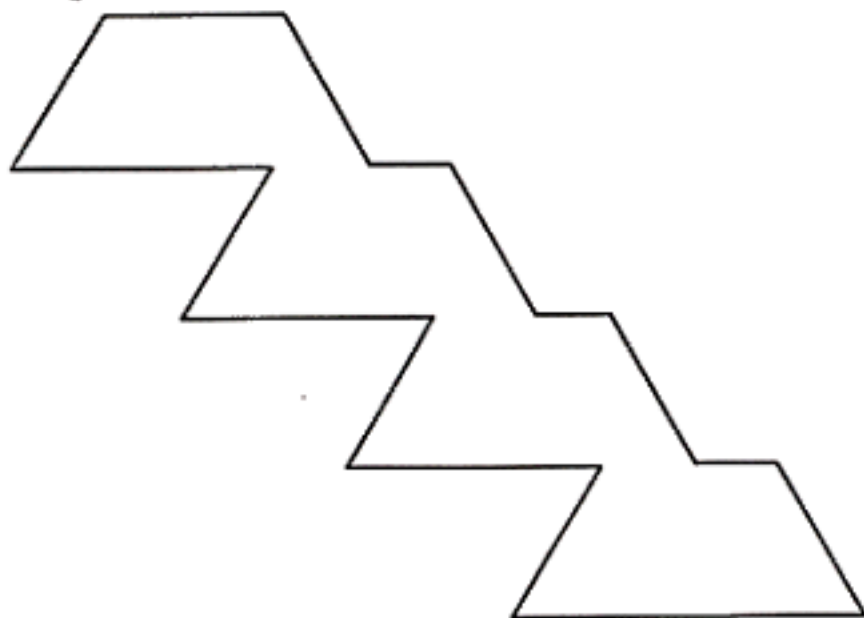
Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape B



Block:  trapezoid

Prediction: _____

Count: _____

Block:  triangle

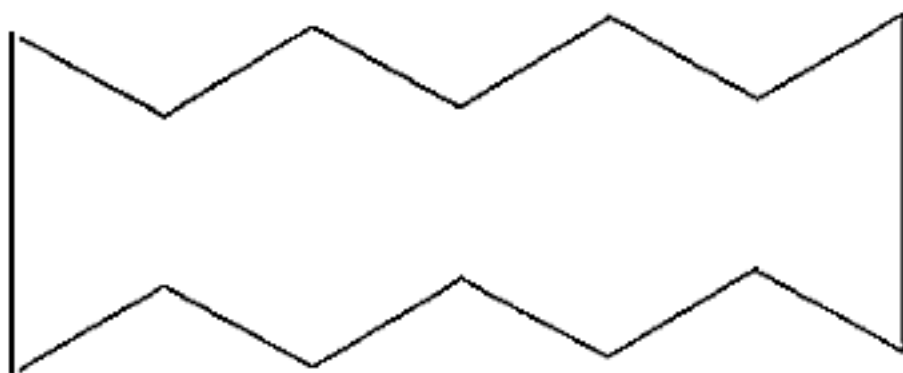
Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape C



Block:  trapezoid

Prediction: _____

Count: _____

Block:  triangle

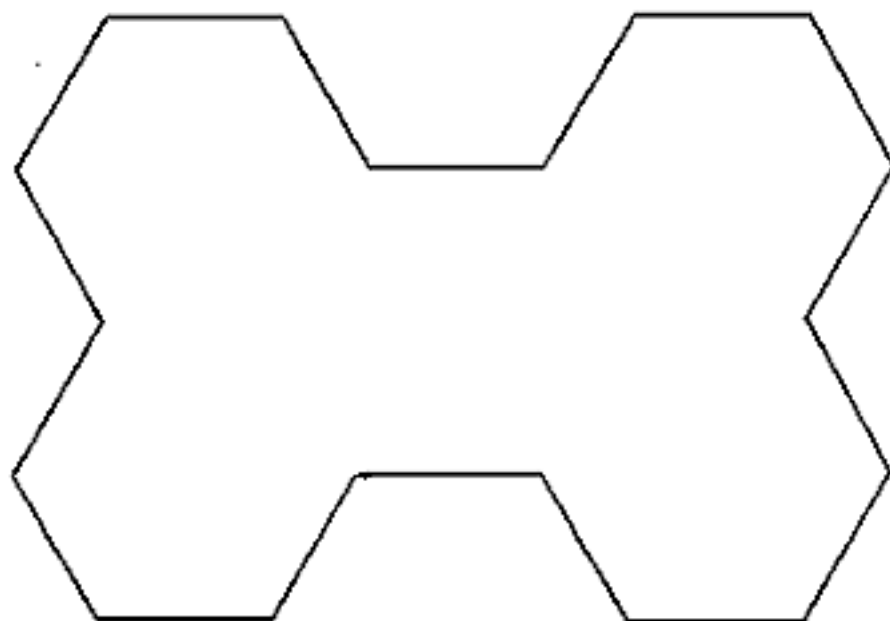
Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape D



Block:  hexagon

Prediction: _____

Count: _____

Block:  trapezoid

Prediction: _____

Count: _____

Block:  triangle

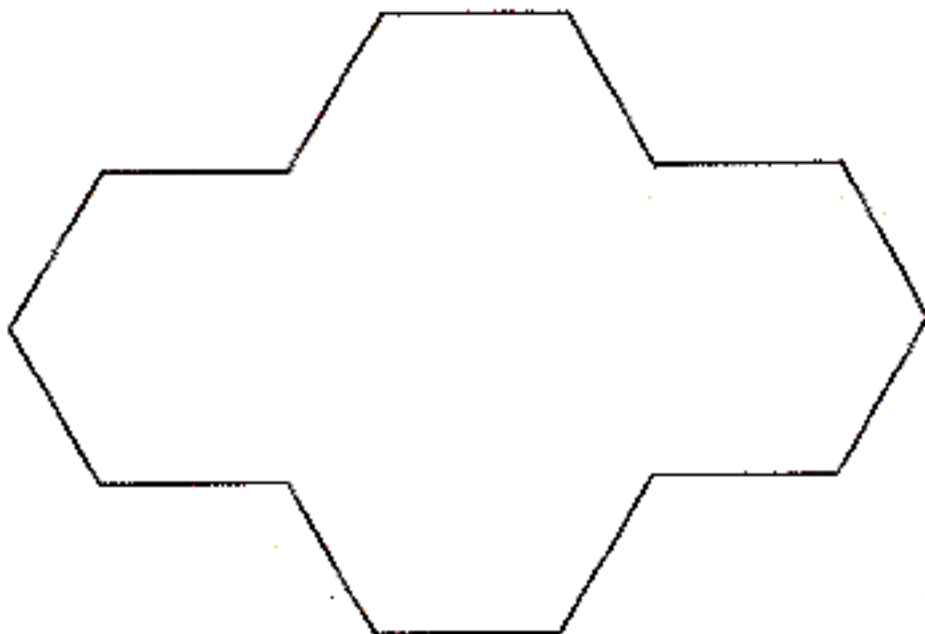
Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape E



Block:  hexagon

Prediction: _____

Count: _____

Block:  rhombus

Prediction: _____

Count: _____

Block:  triangle

Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape F



Block:  rhombus

Prediction: _____

Count: _____

Block:  triangle

Prediction: _____

Count: _____

Block:  trapezoid

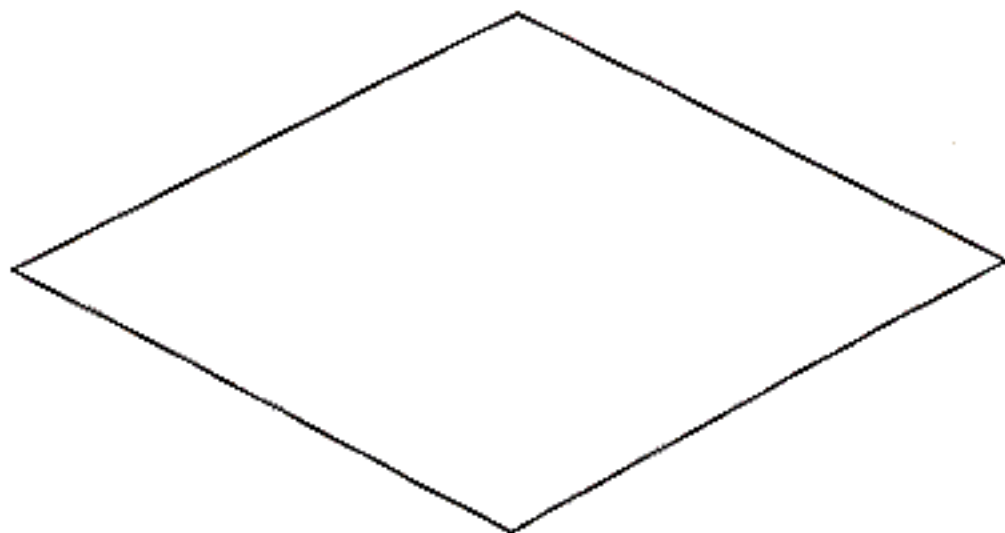
Prediction: _____

Count: _____

Predict and Cover

Name _____

Shape G



Block: _____

Block: _____

Block: _____

Prediction: _____

Prediction: _____

Prediction: _____

Count: _____

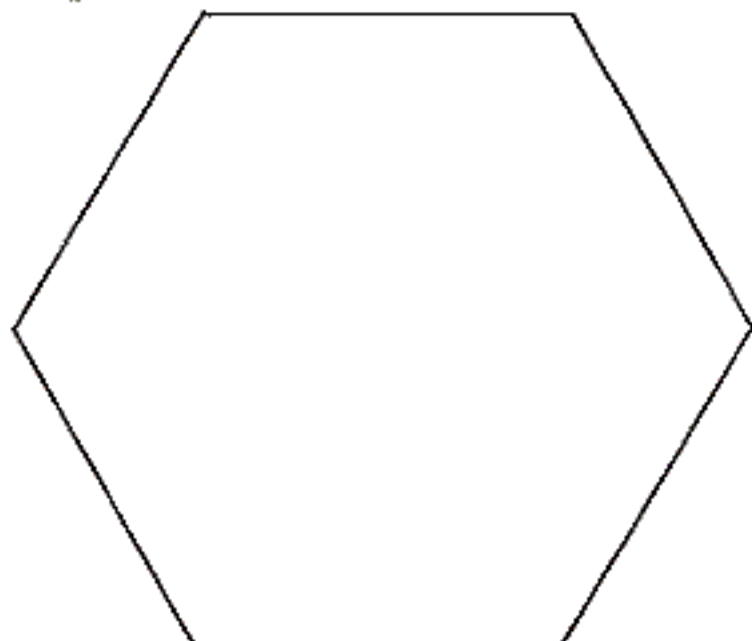
Count: _____

Count: _____

Predict and Cover

Name _____

Shape H



Block: _____

Prediction: _____

Count: _____

Block: _____

Prediction: _____

Count: _____

Block: _____

Prediction: _____

Count: _____



It's a Perfect Fit—Part 3

Ship Shape

A Class Over Time (Geometry)

Objective

Students will be able to combine three-dimensional shapes to make a three-dimensional whole using Geoblocks.

Overview of the Lesson

Students are introduced to three-dimensional shapes as they use Geoblocks to explore geometric concepts. Students use smaller Geoblocks to build congruent three-dimensional figures. They continue geometric investigations using interlocking cubes as they build cube buildings and make connections between numerical and geometric relationships.

Materials

Each Student:

- Activity Sheet: Build a Building
- Interlocking cubes (about 50)

Each Group of 3-4 Students:

- Geoblocks (1-3 sets, divided into half sets)
- Activity Sheet: Building a Geoblock

Procedure

Show the class a block (rectangular prism) from the Geoblocks. Ask the students to describe how it is different from a pattern block. Focus student attention on the idea that pattern blocks are flat (two-dimensional) and the Geoblock is three-dimensional.

Draw a picture of a rectangular prism and compare it to the actual piece. Ask the class to identify smaller Geoblocks that could be used or "glued together" to make the larger rectangular prism. Show the class two smaller blocks that when joined together are the same size and shape as the original block.

Divide the class into groups of three to four students. Distribute a set of Geoblocks and cut-out shapes from Activity Sheet: Building a Geoblock, to each group. Show the class three drawings of Geoblocks. Tell the students to give one picture to each person in their group. If there is a group of four students, two students may work with the same block. Each student will find the block represented in the drawing. They are challenged to find smaller blocks in their set that could be "glued together" to form the same size and shape (congruent) as the block in their drawing. Have students find multiple ways of using a variety of blocks to form their large block. When students have finished, encourage them to take a "gallery walk" around the room to see the work of other students.

Give each student a set of 50 interlocking cubes and a copy of Activity Sheet: Build a Building. Students will use the interlocking cubes to build five different styles of buildings. Have students pretend that each cube is a room in a building. They can make a building that is one story, two stories, or more tall. There is one rule that they must follow. Each story must have the same number of rooms and fit exactly over the one below it. Students will use the interlocking cubes to experiment with patterns of blocks in one story, two story, three story, four story, five story, ten story, and fifty story buildings. They record their answers in the table shown on the Activity Sheet. Ask students to share their results and the methods they used in determining the total number of cubes in each building. Record their answers on a chart on the board. Focus student attention on the numerical patterns and have them explain the patterns they observe.

Mathematically Speaking . . .

When introducing and exploring three-dimensional shapes with young students, it is essential to use manipulatives as tools to enhance student understanding of basic geometric concepts. As students combine smaller blocks to build other blocks, they improve their perception in spatial relationships. Geoblocks allow students a medium in which to experiment with joining edges and faces of solids to make a three-dimensional whole. When this lesson is complete, add similar activities that they can investigate during free time.

Extensions & Connections

Have students design their own "dream room". Give each student a box and have them first estimate and then determine the area of the room (box). Students use grid paper to make a floor plan of their room, noting the location of all furniture. Using scraps of a variety of materials, students will construct and place furniture in their dream rooms according to their floor plan. Discuss all the geometric shapes in their "dream room."

Have students build three-dimensional shapes using toothpicks and gumdrops or miniature marshmallows.

Resources

Geometry and Spatial Sense: Addenda Series Grades K-6. (1993) National Council of Teachers of Mathematics. Reston, Virginia.

Ideas for Online Discussion

(Some ideas may apply to more than one standard of the **NCTM Professional Standards for Teaching Mathematics**.)

Standard 1: Worthwhile Mathematical Tasks

- What makes the mathematics of this third day's lesson significantly different from the prior lessons? Do the lessons seem to have a planned scope and sequence, and is it logical?
- To ensure that students grasp the concepts of 3-dimensional figures, what explorations does the teacher present in this lesson to build this experience?
- Do you feel fitting smaller pieces together to form a large 3-dimensional figure is mathematically worthwhile?

Standard 4: Tools for Enhancing Discourse

- This lesson includes concrete 3-dimensional figures and drawings of 3-dimensional figures. Why is it important to provide both the figure and the drawing?

Standard 5: Learning Environment

- What are the key elements in the learning environment that need to be provided for young children to explore geometric concepts?
- In the video, the teacher stated that she learned to let go of some of the control of the class with respect to giving answers. She does not want students to see her role as the keeper of answers. How do you empower your students to be the "keeper of the answers?"
- How would you use elements of this lesson in a different way to accommodate the age or learning styles of your students?

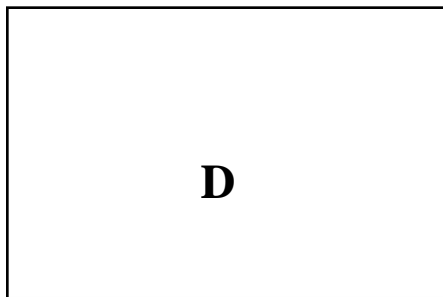
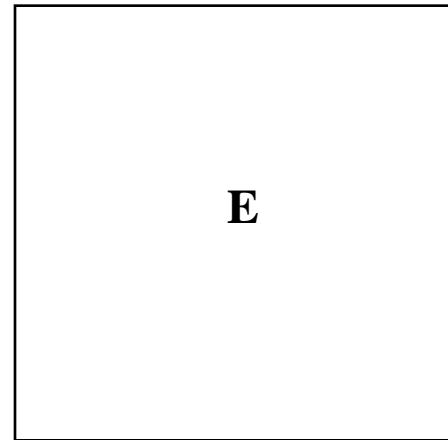
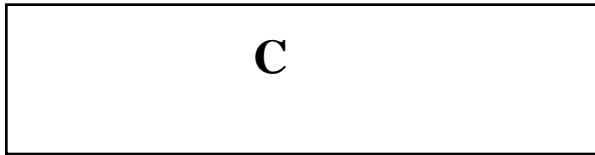
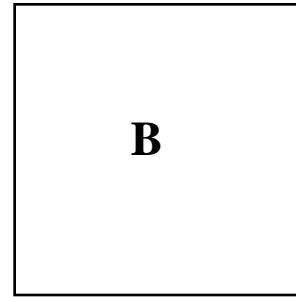
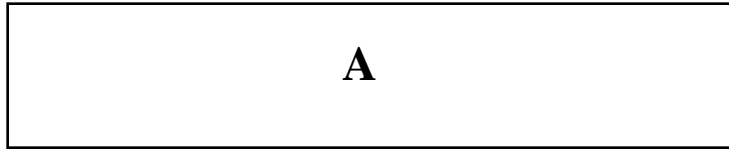
Standard 6: Analysis of Teaching and Learning

- As the teacher and intern analyze the teaching and learning that took place in this lesson, what changes would they make for future lessons, and why? Do you agree?
- What evidence is given that students are developing good number and geometry sense?
- What skills are evident in the extension activity of building the dream room? What is your feeling about projects and their educational worth?

Build a Building

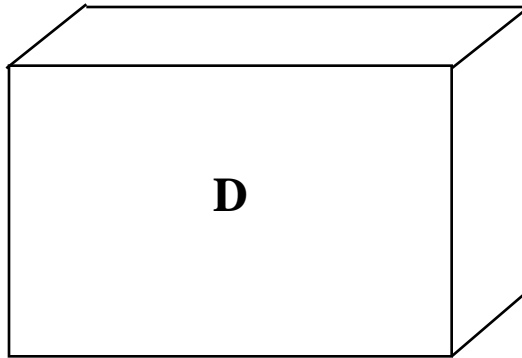
Name _____

Use interlocking cubes to build buildings.

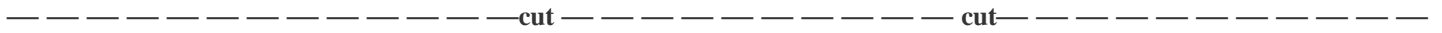


Building	Number of Rooms					
	1 story	2 stories	3 stories	4 stories	5 stories	10 stories
A						
B						
C						
D						
E						
My Building						

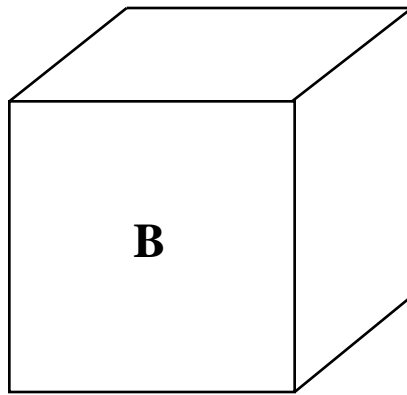
Building a Geoblock



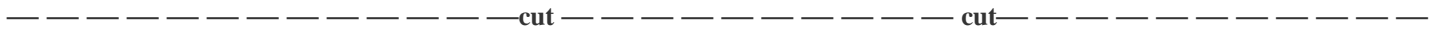
Put Geoblocks together to build this block



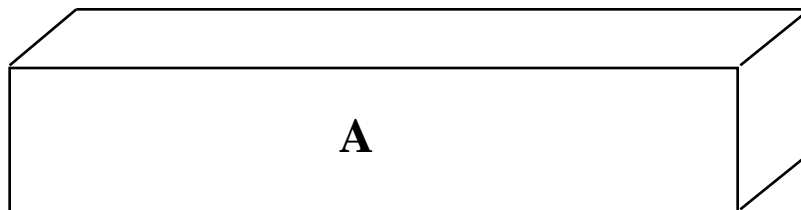
Building a Geoblock



Put Geoblocks together to build this block



Building a Geoblock



Put Geoblocks together to build this block