Learning About®

Pattern Blocks

A Guide to Teaching Strategies, Activities, and Ideas

ETA® Cuisenaire

INTRODUCTION

The *Learning About®… Pattern Blocks* **Activity Book** is a resource providing hands-on activities and ideas that allow you, the teacher, to lead students in an active exploration of the world of mathematics. The activities presented involve students in the process of exploring abstract concepts through the use of manipulatives. Students are encouraged to think critically, plan strategy, and share conclusions.

This *Learning About… Pattern Blocks* **Activity Book emphasizes**
- communication
- exploration
- problem solving
- analysis

Each set of Pattern Blocks consists of 250 blocks in six colors and shapes: 50 green triangles, 50 blue parallelograms (rhombi), 50 red trapezoids, 25 orange squares, 25 yellow hexagons, and 50 tan rhombi. Each side is one inch long except for the red trapezoid which has a two-inch base.

Pattern blocks can be used to—
- sort, match, and count
- identify and create patterns
- explore fractional parts
- model geometric concepts of shape, size, area, and symmetry

Exploring with Pattern Blocks
Students at all grade levels should be allowed to freely explore and experiment with the Pattern Blocks before guided activities begin.

SORTING

Objective: Sorting Pattern Blocks by color and shape.

Group Size: Small Group (3–4)

Procedure: Place a handful of blocks in front of each group of students. Ask students to sort the blocks by color: green, blue, red, orange, yellow, tan. Have students repeat the process, sorting by shape.

Ask—
- How many _____ (red, yellow, tan…) shapes do you have in all?
  [answers will vary]

- How many sides does the _____ (orange, blue, green) shape have? [answers will vary]
- Do you know the name of the orange shape? [square] Green shape? [triangle]

The detail of questions asked and the introduction of geometric terms (hexagon, trapezoid, right angle, etc.) should be matched to the developmental level of the students.

Informal Assessment: Observe students as they sort the blocks. Be mindful of children who might need additional experience with sorting and classifying by color and shape. Watch for students who group a few, but not all the blocks correctly. (Student may not understand the attribute of color or shape and may need additional sorting experiences.) Also be aware of students who sort correctly but cannot verbalize the sorting strategy. (Student may have difficulty communicating. Provide additional support in vocabulary and language development.)

PATTERNS

Objective: Exploring, identifying, creating, and continuing patterns.

Group Size: Small Group (3–4)

Warm-Up: Before beginning this activity, write the word "Pattern" on the board. Invite students to describe or define the term. (Possible student answers: "a design," "something that repeats.") Ask students to describe things or situations where patterns occur. (clothing, rhythm patterns, wallpaper…)

Procedure: Place Pattern Blocks in front of each group of students. Begin with a simple pattern using two different shaped blocks.

Red trapezoid-tan rhombus-red trapezoid-tan rhombus…

Invite students to talk about what they see. Some students may focus on the color pattern (red-tan-red-tan). Other students may see the shape pattern (trapezoid-rhombus-trapezoid-rhombus). A third group of students may grasp both attributes of color and shape working in tandem to create a pattern.

Allow students ample opportunity to express their findings. Communication is a key component of mathematical literacy. Communication also allows you to informally assess the understanding your students have of the concept.

Repeat the exercise using other block pairings. You may also wish to have each cooperative group create its own unique pattern. Allow each group to share its pattern with the remaining groups. Once your students have mastered the basic pattern identification, you may wish to create more challenging patterns. The patterns created should be developmentally appropriate for your students. Students should be allowed to freely manipulate the pattern blocks. Most students really enjoy creating patterns for their peers. Encourage students to create patterns that move in many directions. Once students feel comfortable with straight-line patterns, they will be ready to create more complex patterns.

PATTERN BLOCK RELATIONSHIPS

Objective: Exploring and identifying the relationship of the size and shape of blocks.

Group Size: Small Group (3–4) or Whole Class

Preparation: You may wish to prepare workmats for students to use. Reproductions of the student workmats for the overhead projector are helpful in guiding whole class discussions.

Procedure Activity #1: Provide Pattern Blocks and Activity Workmat #1 for each group of students. Guide students as they manipulate one kind of block to fit the shape of a different block.

This activity can be used as an introduction to fractions. For example:
- The red trapezoid covers one-half of the yellow hexagon.
- Each green triangle covers one-third of the red trapezoid.

Procedure Activity #2: Place Pattern Blocks Activity Workmat # 2 in front of each group of students. Guide students as they manipulate the blocks to cover the shape outlined at the top of Activity Workmat #2 (4 yellow hexagons joined together).

- How many _____ cover it? **[4 yellow hexagons, 8 red trapezoids, 12 blue parallelograms, 24 green triangles]**

Problem Solving: Students will first manipulate the Pattern Blocks to develop a base. Students are then free to use paper and pencil or mental arithmetic strategies to solve the problem. The yellow hexagon is used as the base, or known, of this activity. Students identify that 4 hexagons cover the displayed design.

- How many red trapezoids do you need to cover a yellow hexagon? **[2]**
- If 2 red trapezoids cover 1 yellow hexagon, how many red trapezoids do you need to cover the entire displayed design? **[8]**

As students volunteer responses, elicit explanations of how different students arrived at their solutions.

yellow hexagon

(Possible Responses: I knew 2 red trapezoids covered 1 yellow hexagon, and 4 hexagons covered the entire design; therefore, I added 2 + 2 + 2 + 2, and my solution is 8. I knew 2 red trapezoids covered 1 yellow hexagon, and 4 hexagons covered the entire design; therefore, I multiplied 2 x 4 and my solution is 8.)
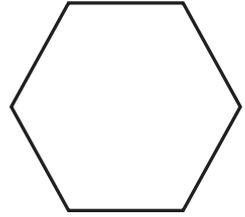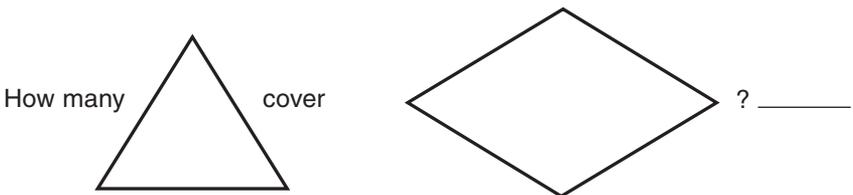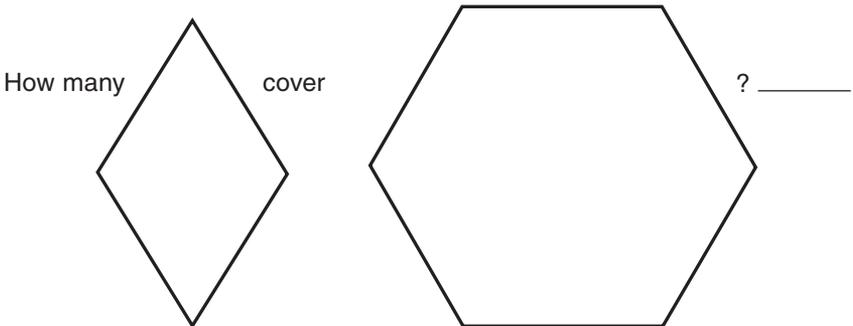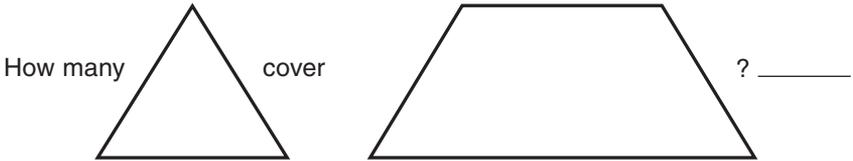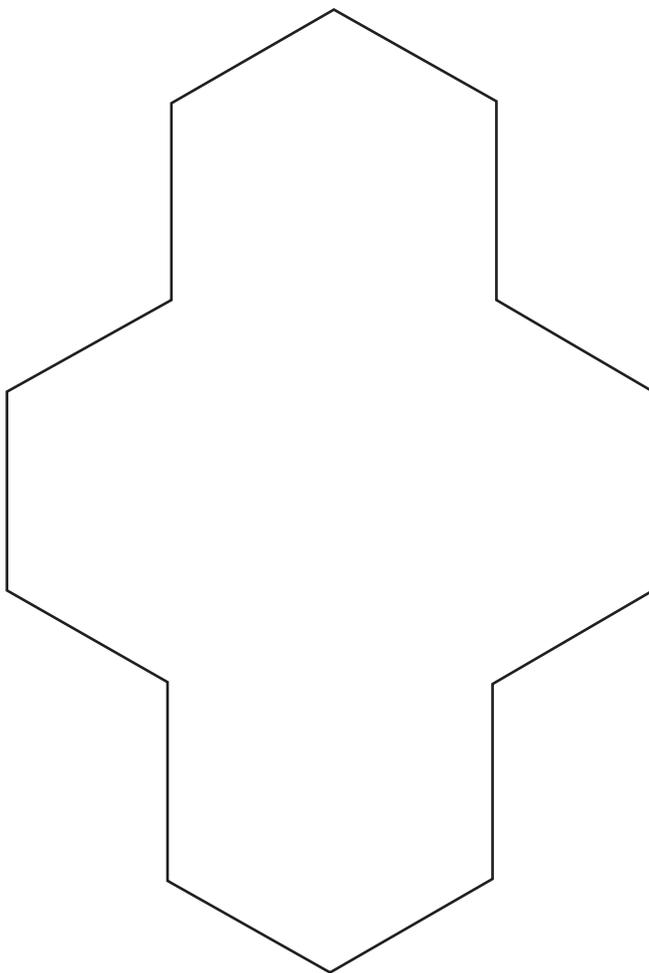
red trapezoid

Continue the activity using the blue parallelograms and green triangles. The explanations students use to account for their solutions will provide great insight into your students' reasoning skills, problem solving strategies, and mastery of basic arithmetic facts.

PATTERN BLOCK RELATIONSHIPS WORKMAT #1

How many ⬜ cover ⬜ ? _____

How many ⬜ cover ⬜ ? _____

How many ⬜ cover ⬜ ? _____

Cover the design with yellow hexagons
How many hexagons cover it? _____

Cover the design with red trapezoids
How many trapezoids cover it? _____

Cover the design with blue parallelograms
How many parallelograms cover it? _____

Cover the design with green triangles
How many triangles cover it? _____

PATTERN BLOCK FRACTIONS—HALVES

Objective: Exploring the concept of halves.

Group Size: Pairs or Whole Class

Procedure: Place blocks in front of each student or pair. Ask students to place 1 yellow hexagon on their desks or tables. Instruct students to exactly cover the yellow hexagon with red trapezoids.

■ How many red trapezoids cover a yellow hexagon? **[2]**

Display 1 red trapezoid.

■ This is one of the two blocks. This is one-half of the two blocks. Write "1/2" on the board.

Instruct students to place a blue parallelogram on their desks. Ask students to exactly cover the blue parallelogram with green triangles.

■ How many green triangles cover the blue parallelogram? [2]

Display 1 green triangle.

■ This is one of the two blocks. This is one-half of the two blocks. Ask a student to write "1/2" on the board.

Instruct your students to trace the six shapes of Pattern Blocks on a sheet of paper. If the students are working in pairs, one student may hold the block in place, as the other child traces the outline. Next, ask the students to draw a line through each traced block to show two equal parts. (Note: the red trapezoid must be divided vertically through the two parallel sides to yield two equal parts.) Draw the six shapes on the board. Invite students to come to the board to divide each shape into two equal parts. Students may also label each part as "1/2."

PATTERN BLOCK FRACTIONS—THIRDS

Objective: Exploring the concept of thirds.

Group Size: Pairs or Whole Class

Procedure: Place blocks in front of each student or pair. Ask students to place 1 yellow hexagon on their desks. Instruct students to exactly cover the yellow hexagon with blue parallelograms.

■ How many blue parallelograms cover a yellow hexagon? **[3]**

Display 1 blue parallelogram.

■ This is one of three parallelograms. This is one-third of the three blocks.

Write "1/3" on the board.

Ask students to place a red trapezoid on their desks. They should then exactly cover the red trapezoid with green triangles.

■ How many green triangles cover a red trapezoid? [3]

Display 1 green triangle.

■ This is one of the three triangles. This is one-third of the three blocks.

Repeat the exercise using 3 orange squares, 3 yellow hexagons, 3 blue parallelograms, and 3 tan rhombi. Point out that when one of the three blocks is held up, two of the three blocks, or two-thirds of the blocks, are left on the desk.

Informal Assessment: Make careful note of any students who may not hold up the correct number of blocks. These students may need additional experiences dividing objects into three equal parts.

PATTERN BLOCK FRACTIONS—FOURTHS

Objective: Exploring the concept of fourths.

Group Size: Pairs or Whole Class

Procedure: Place blocks in front of each student or pair. Ask students to place 2 yellow hexagons together on their desks. Instruct students to exactly cover the yellow hexagon with red trapezoids.

■ How many red trapezoids cover the shape? [4]

Display 1 red trapezoid.

■ This is one of four blocks. This is one-fourth. Write "1/4" on the board.

Instruct students to place 2 blue parallelograms together on their desks. Direct the students to exactly cover the blue parallelograms with green triangles.

■ How many green triangles cover the shape? [4]

Display 1 green triangle.

■ This is one of four blocks. This is one-fourth of the four blocks. Invite a student to write "1/4" on the board. Draw the following shapes on the board.

Circle   Square   Rectangle
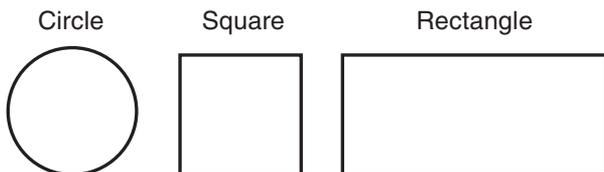
Invite a student to divide a shape into four equal parts. Ask another student to shade one-fourth of each shape. A variation is to ask a student to label one-fourth of each shape.

- Each shape is divided into how many equal parts? **[4]**
- How many of the four parts are shaded? **[1]**
- How can we identify the shaded part? **[1/4]**
- How many parts are not shaded? **[3]**
- How can we identify the three parts that are not shaded? **[3/4]**

PATTERN BLOCK RELATIONSHIPS—IDENTIFYING NUMERATOR & DENOMINATOR

Objective: Review of fraction concept. Students will uncover concept and meaning of the numerator and denominator.

Group Size: Pairs or Whole Class

Procedure: Place blocks in front of each student or pair. Draw the following shape on the board. Ask your students to model the same shape using blue parallelograms.
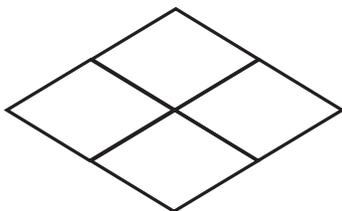
- How many blue parallelograms did you use? **[4]**
- Are they all the same size? **[yes]**

Write the word "denominator" on the board. State that a denominator identifies the number of equal parts in a fraction model. In this exercise, the denominator indicates four equal parts, or fourths. Shade one of the four parallelograms you drew on the board. Instruct your students to hold up one of the four parallelograms in their desk model.

- How many parallelograms are you holding? **[1]**
- What is the fraction name? **[1/4]**

Write "1/4" on the board.

Identify the numeral "1" as the numerator (the number of equal parts shaded or being held up for display). Identify the numeral "4" as the denominator (the number of equal parts in all).

Repeat the process by drawing a shape on the board using 6 tan rhombi (sixths), 10 orange squares (tenths), and 8 blue parallelograms (eighths).

Invite students to the board to identify fractions such as 3/6, 7/8, 5/8, etc.

Informal Assessment: Observe students as they identify fractional names. Does the student correctly identify and place the numerator and denominator? Some students may require additional experiences to grasp these concepts.

PATTERN BLOCK RELATIONSHIPS

Objective: Exploring the concept of equivalency.

Group Size: Pairs or Whole Class

Procedure: Place Pattern Blocks in front of each student or pair. Draw or display 2 hexagons together on the board.
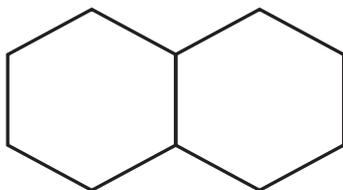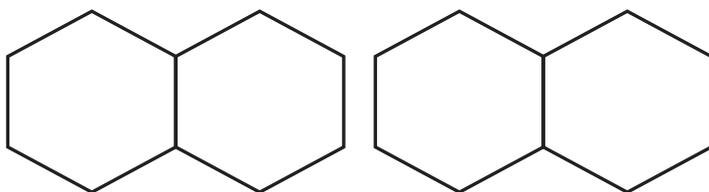
Instruct students to place 2 yellow hexagons on their desks. Direct students to exactly cover the 2 yellow hexagons with blue parallelograms.
- How many blue parallelograms did you use in all? [6]

Write the numeral 6 in the position of a denominator below the shape outlined on the board.

Divide the shape into six equal parts. Lightly shade all six parts. Draw a shape of two joined hexagons to the right of the first shape on the board.

Instruct students to build another shape using an additional 2 yellow hexagons to the right of the original shape. (Leave the original shape in place.)

Direct students to use green triangles to completely cover the second shape.
- ■ How many green triangles did you use in all? **[12]**

Write 12 in the position of a denominator below the second shape outlined on the board. Divide the shape into twelve equal parts. Lightly shade all twelve parts.
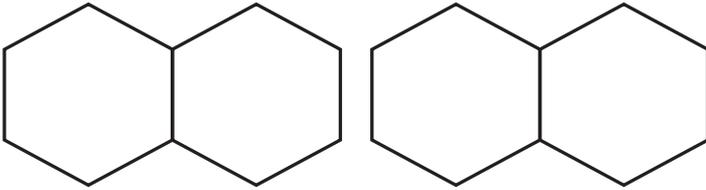
Ask students to remove two blue parallelograms from the first shape on their desks. Erase shading of two parts on the first shape on the board.
- ■ What fraction names the remaining shaded area? **[4/6]**

Invite a student to enter the numerator 4 under the first shape on the board.

Instruct students to remove 4 green triangles from the second shape on their desks. Erase shading for four parts on the second shape on the board.
- ■ What fraction names the remaining shaded area? **[8/12]**

Invite a student to enter the numerator 8 under the second shape on the board.

Point out that the shaded areas are equivalent and the fractions that name the shaded areas are called equivalent fractions.

Repeat the exercise using red trapezoids and green triangles. Continue to use 2 yellow hexagons as bases.