

Inspect

CCR Performance Tasks

**Math Grade 3: Relate Shapes, Fractions,
and Area**

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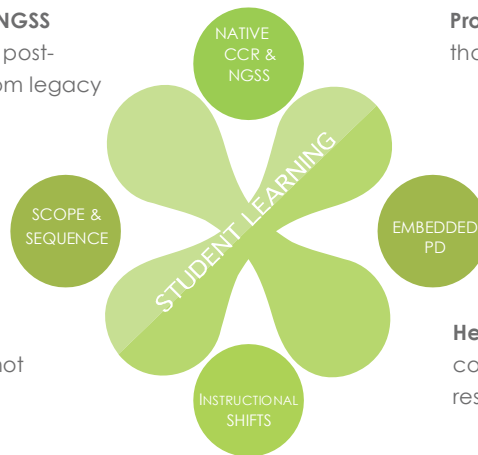
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Inspect assessment content offers these benefits:

Native college- and career-ready and NGSS content prepares students to meet their post-secondary goals. Content re-aligned from legacy standards cannot do this.

Content that addresses your scope and sequence so that your assessments do not waste valuable instruction time



Professional development embedded within content that

- shows the relationship between specific skills and higher-order thinking
- includes authentic, permissioned texts of appropriate complexity
- and documents student progress using DOK and learning progressions

Help for teachers addressing the instructional shifts with content that elicits evidence of learning from each response

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CCR Performance Tasks

Math Grade 3: Relate Shapes, Fractions, and Area

Student Test Booklet

Name:

Student Rubric

This problem tests if you can:

- Classify two-dimensional shapes based on the number of sides and angles;
- Divide shapes into parts with equal areas;
- Express the area of an equal part of a whole as a unit fraction;
- Use a model to show equivalent fractions.

Your teacher will give your answer a 4, 3, 2, 1, or 0.

This is how you get a 4:

Your answer is correct and complete.

- You correctly identify shapes and explain how you know;
- You divide a shape into equal parts and identify the new shapes;
- You write fractions that represent parts of a whole and explain how you know the fractions are correct;
- You tape together some of the new shapes and write a number sentence to show that the fractions are equivalent.

This is how you get a 3:

Your answer is mostly correct, but you make some small mistakes.

- You correctly identify shapes and explain how you know;
- You divide a shape into equal parts and identify the new shapes, but your identification is incomplete;
- You write fractions that represent parts of a whole but you make a small mistake;
- You tape together some of the new shapes correctly or write a correct number sentence to show that fractions are equivalent.

This is how you get a 2:

You do not answer one part, or you make some big mistakes.

- You correctly identify some of the shapes but make mistakes or do not explain how you know;
- You are unable to divide the shape into equal parts and identify the new shapes;
- You write some fractions that correctly represent parts of a whole but you make mistakes or do not explain how you know the fractions are correct;
- You are unable to tape the shapes together correctly or you write an incorrect number sentence.

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This is how you get a 1:

Your answers are not correct.

- You incorrectly identify shapes;
- You are unable to divide a shape into equal parts and identify the new shapes;
- You are unable to write fractions that correctly represent parts of a whole;
- You are unable to tape the shapes together correctly, and you write an incorrect number sentence.

This is how you get a 0:

You do not answer the question, or your teacher cannot understand your answer.

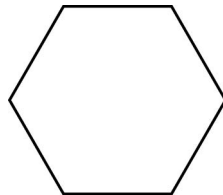
Name:_____

Math Grade 3: Relate Shapes, Fractions, and Area

Complete all the tasks in the test booklet.

- 1

Li and 5 friends are making a cake that they want to share equally. The cake has this shape.



A. Li and his friends cut the cake into equal parts (or areas) for them to share. Tear off the last two pages of this booklet. Use the shape that is divided into equal parts. Carefully cut out each part.

- **What is the shape of the whole cake? Explain how you know.**
- **What shape is each piece of cake? Explain how you know.**
- **What fraction of the whole cake does each piece represent? Explain how you know.**

Go On

Name:_____

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B. What if Li shares the entire cake equally with only 2 friends, and each child gets one big piece?

- **Use the shape that is not divided into parts. Draw lines to show what the cake looks like, with the correct number of equally sized pieces.**
- **What shape is each piece of cake? Explain how you know.**
- **What fraction of the whole cake does each piece represent? Explain how you know.**
- **Write the fraction that represents the whole area of the cake.**

Go On

Name: _____

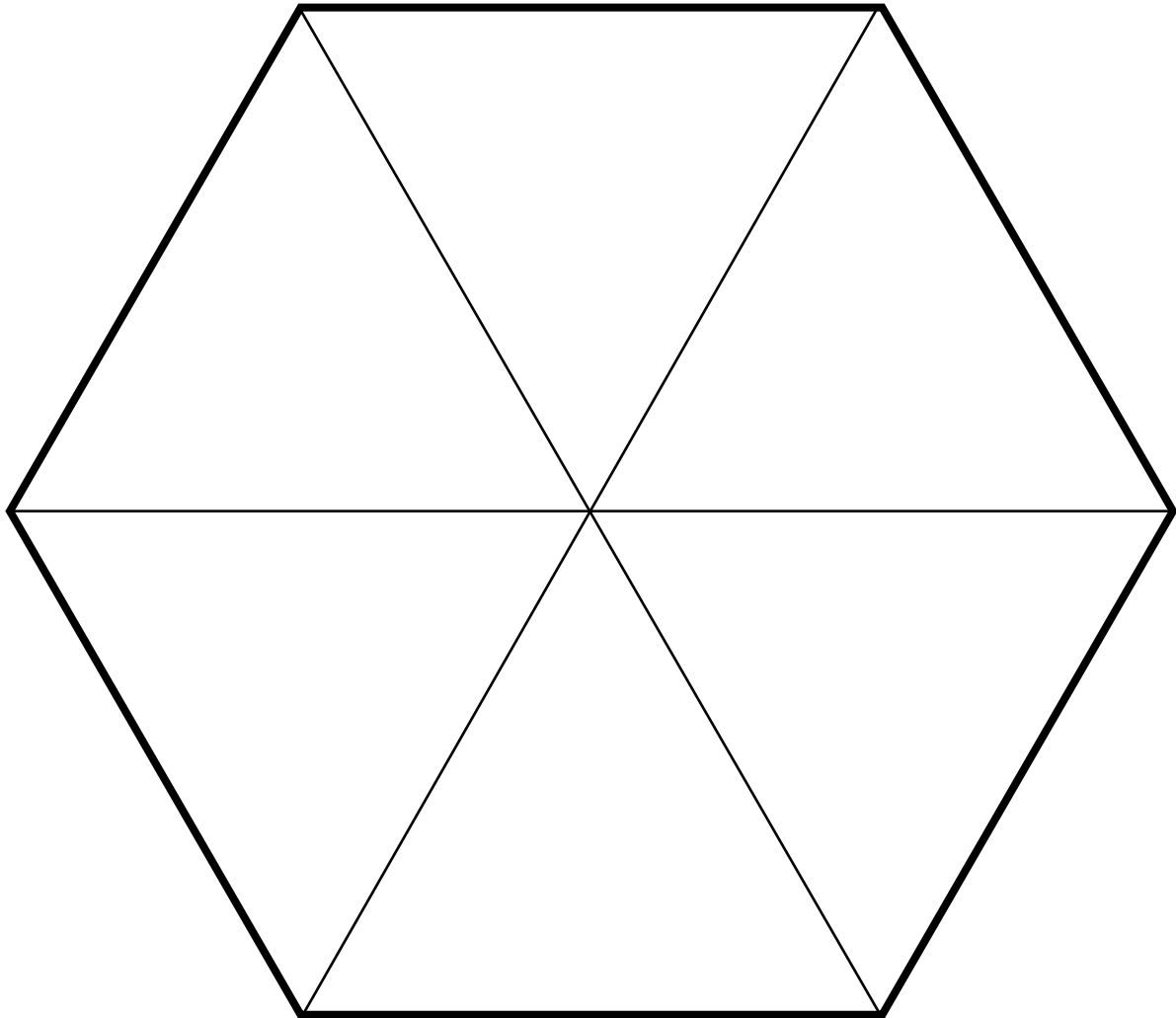
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C. Use some of the cut-out pieces from part A to make a shape that is the same size and shape as one of the pieces you drew in part B. Tape the pieces together to show how they fit. Fill in the blanks below to make a number sentence that says that the pieces from part A are equivalent to the piece from part B.

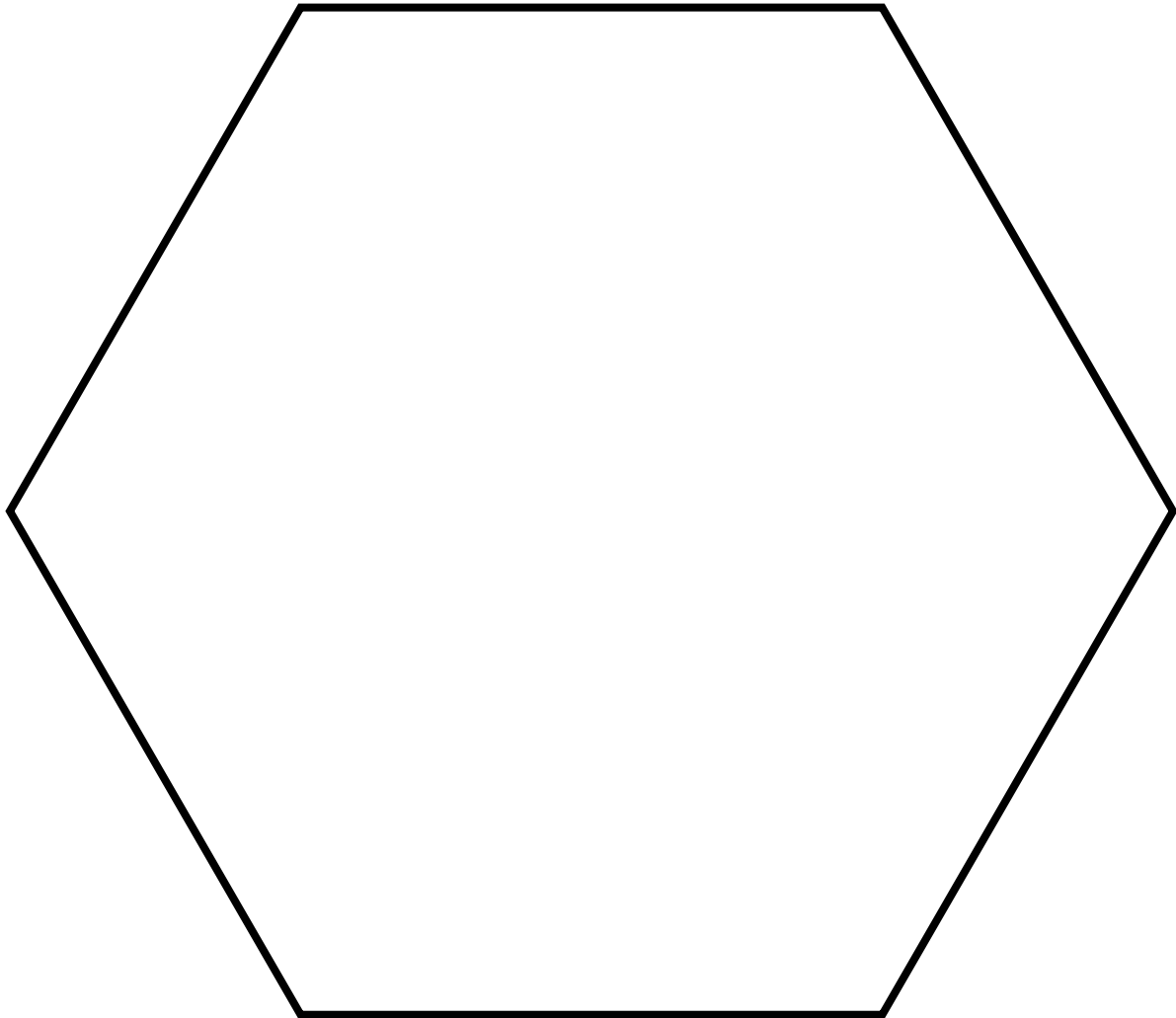
$$\frac{\square}{\square} = \frac{\square}{\square}$$



Cake Shape



Cake Shape



CCR Performance Tasks

Math Grade 3: Relate Shapes, Fractions, and Area

Teacher Guide

About the Teacher Guide

This document contains support materials for “Math Grade 3: Relate Shapes, Fractions, and Area.” This includes:

- (a) The task
- (b) The standards and depth of knowledge level of the task
- (c) The scoring rubric
- (d) Discussion questions
- (e) Extension activities

These specifications have been included to help you connect the task to the Common Core content standards and the standards for mathematical practice. The rubric is designed to help you look for the development of mathematical practices in student work. It is also here to help you look for consistencies in student content errors that can help guide intervention and reteach strategies.

Test Definition File

Item #	Correct Answer	Practice Standard	Content Standards
1	See Scoring Rubric	Mathematical Practice 7	3.NF.3.b, 3.NF.3.c, 3.G.1, 3.G.2

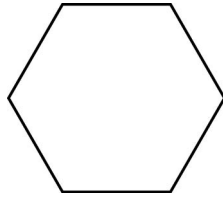
SBAC Claims	PARCC Sub-Claims
1 and 4	A, B, and D

Special Instructions

Students need scissors and tape to complete the task. Have the students remove the last two pages from their test booklets and use the shapes to solve the problems.

Performance Task

Li and 5 friends are making a cake that they want to share equally. The cake has this shape.



A. Li and his friends cut the cake into equal parts (or areas) for them to share. Tear off the last two pages of this booklet. Use the shape that is divided into equal parts. Carefully cut out each part.

- What is the shape of the whole cake? Explain how you know.
- What shape is each piece of cake? Explain how you know.
- What fraction of the whole cake does each piece represent? Explain how you know.

B. What if Li shares the entire cake equally with only 2 friends, and each child gets one big piece?

- Use the shape that is not divided into parts. Draw lines to show what the cake looks like, with the correct number of equally sized pieces.
- What shape is each piece of cake? Explain how you know.
- What fraction of the whole cake does each piece represent? Explain how you know.
- Write the fraction that represents the whole area of the cake.

C. Use some of the cut-out pieces from part A to make a shape that is the same size and shape as one of the pieces you drew in part B. Tape the pieces together to show how they fit. Fill in the blanks below to make a number sentence that says that the pieces from part A are equivalent to the piece from part B.

$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

Standards Alignment

Practice Standards

MP7 > DOK 3

Look for and make use of structure. -- Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y .

Content Standards

3.NF.A.3b

Recognize and generate simple equivalent fractions, e.g., $\frac{1}{2} = \frac{2}{4}$, $\frac{4}{6} = \frac{2}{3}$. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

3.NF.A.3c

Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

Examples: Express 3 in the form $3 = \frac{3}{1}$; recognize that $\frac{6}{1} = 6$; locate $\frac{4}{4}$ and 1 at the same point of a number line diagram.

3.G.1

Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

3.G.2

Reason with shapes and their attributes. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

SBAC Claims

Mathematics Claim #1:

Concepts and Procedures. Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.

Mathematics Claim #4:

Modeling and Data Analysis. Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

PARCC Sub-Claims

Sub-Claim A:

Major Content with Connections to Practices. The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Sub-Claim B:

Additional and Supporting Content with Connections to Practices. The student solves problems involving the Additional and Supporting Content for her grade/course with connections to the Standards for Mathematical Practice.

Sub-Claim D:

Highlighted Practice MP.4 with Connections to Content: modeling/application. The student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or, for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them (MP.1), reasoning abstractly and quantitatively (MP.2), using appropriate tools strategically (MP.5), looking for and making use of structure (MP.7), and/or looking for and expressing regularity in repeated reasoning (MP.8).

Scoring Rubric

4 Point Response:

The response demonstrates a high level of understanding. A level 4 response is characterized by:

- A strong ability to classify two-dimensional shapes based on the number of sides and angles;
- A strong ability to partition shapes into parts with equal areas;
- A strong ability to use a unit fraction to represent a part of a whole;
- A strong ability to use a model to demonstrate equivalent fractions.

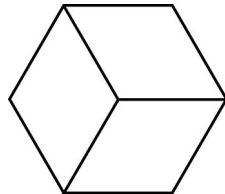
A level 4 response should include:

- A correct identification of the original shape and its attributes;
- A correct identification of the shapes created by dividing the cake into equal parts in parts A and B with a correct explanation of their attributes;
- A correct drawing in part B that shows the cake divided into the correct number of equal parts;
- A correct identification of the unit fraction that represents each part of the whole area and the fraction that represents the whole area, with a valid explanation in both parts A and B;
- Two shapes from part A taped together correctly to make the same shape as in part B and a correct number sentence that shows this equivalency in fraction form.

A sample level 4 response follows.

Part A: "The whole cake is a hexagon; the shape has 6 sides and 6 angles. Each piece is a triangle, because the shape has 3 sides and 3 angles. Each part represents $\frac{1}{6}$ of the cake because the cake is divided into 6 equal parts."

Part B:



"Each piece is a rhombus; the shape has 2 pairs of opposite sides that are parallel and 4 sides that are equal length. Each piece is $\frac{1}{3}$ of the whole area of the cake, because the cake is divided into 3 equal parts. The whole area of the cake is $\frac{3}{3}$ because it is made of 3 pieces and each piece is $\frac{1}{3}$."

Part C: Each student should have taped together 2 triangular pieces from part A so that the pieces make a rhombus the same size and shape as the rhombus in part B. The number sentence should be filled in as follows.

$$\frac{\boxed{2}}{\boxed{6}} = \frac{\boxed{1}}{\boxed{3}}$$

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3 Point Response:

The response demonstrates a strong understanding, but the work contains minor errors. A level 3 response is characterized by:

- An understanding of classifying shapes and identifying their attributes. In part A, the response correctly names the shapes created and their attributes. In part B, although the student correctly identifies the shapes created and their attributes, the identification may be incomplete. For example, the student identifies the shapes as quadrilaterals because they have 4 sides, but does not recognize that they are rhombuses;
- A strong ability to partition shapes into parts with equal areas;
- A strong ability to express the area of the equal part of a whole as a unit fraction;
- A basic ability to use a model to demonstrate equivalent fractions. For example, the student may correctly fill in the number sentence or demonstrate an ability to tape the two triangles together to be the same shape as rhombus, but does not do both correctly.

2 Point Response:

The response demonstrates a basic but incomplete understanding. The response includes one or two parts that are correct or mostly correct but includes major errors in the other parts. A level 2 response is characterized by:

- A basic understanding of classifying shapes and identifying their attributes. The student may correctly identify the number of lines and angles in the various shapes but not correctly identify the shape's name, or may correctly identify the shape's name but fail to identify its attributes;
- A weak ability to partition shapes into parts with equal areas. For example, the student partitions the cake into 3 parts, but the parts are not equal;
- A basic understanding of connecting unit fractions to area, with major errors. For example, the student may correctly identify that the triangles are $\frac{1}{6}$ of the hexagon, but might also name the three parts drawn in part B as $\frac{1}{3}$ even if the parts are not the same size;
- A weak ability to use a model to demonstrate equivalent fractions. For example, the student attempts but is unable to tape the triangles together to be the same shape as the shape from part B, and includes a partially correct number sentence.

1 Point Response:

The response demonstrates minimal understanding. A level 1 response is characterized by:

- A weak understanding of classifying shapes and identifying their attributes, with mostly incorrect identifications;
- An inability to correctly partition the hexagon into equal parts;
- A weak ability to connect unit fractions to area. The student may write the fractions for each part but includes incorrect numbers for the whole and parts of the whole;
- An inability to use a model to demonstrate equivalent fractions.

0 Point Response:

There is no response, or the response is off topic.

Discussion Questions

Use the following questions to help students struggling to access the problem:

1. Draw a simple house or other building on the board or chart. Include two-dimensional shapes in the drawing, such as rectangles, squares, triangles, trapezoids (in the roof), and so on. A sample drawing of a house is shown below.



Ask students these questions about the drawing.

- What shapes do you see?
- Describes each shape's sides and angles.

Possible response: *The front of the house is a square and the roof is a trapezoid. The windows are squares divided into smaller squares. The door is a rectangle and the door knob is a circle. The step is also a rectangle.*

2. Draw a trapezoid on the board or chart. Ask a volunteer to divide the shape into 3 parts with equal area. It may be helpful to ask students to explain how they know the three parts are equal.

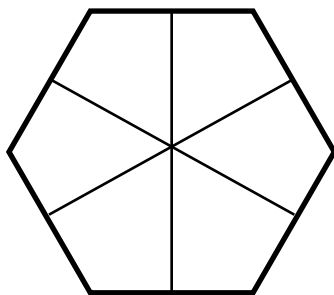
- What is the name of the original shape?
- What are the names of the new shapes?
- What fraction names the area of each part of the whole?
- What fraction names the area of the whole?

Possible response:

- trapezoid
- triangles
- $\frac{1}{3}$
- $\frac{3}{3}$

Extension Activities

1. Give students grid paper and have each student draw an 8 by 3 rectangle. Tell students to divide the rectangle into 6 equal parts. Ask questions such as, "What unit fraction names each part of the divided whole?" "How many $\frac{1}{6}$ parts make up the one whole?" "Is the area of each $\frac{1}{6}$ part the same? How do you know?"
2. Show a hexagon cut into sixths another way, as shown below.



Have the students use the pieces they cut in part A. Cut each piece to make two EQUAL parts, and have students manipulate the pieces to show that each piece of cake from part A is equivalent in area to each piece when the cake is cut this different way. Why should the two pieces be equivalent?

3. Have students make other regular shapes using the 12 pieces from #2, above, such as a rectangle. Ask students to compare the total area of the rectangle to the total area of the original shape. Should the areas be the same? Why or why not? How can you show this?
4. Provide pairs of students with geoboards and rubber bands. Have students find ways to partition their geoboards into equal parts:
 - a. Find at least 3 ways to divide the geoboard into 2 equal parts. What unit fraction represents each part?
 - b. Find at least 3 ways to divide the geoboard into 4 equal parts. What unit fraction represents each part?
 - c. Find at least 3 ways to divide the geoboard into 8 equal parts. What unit fraction represents each part?