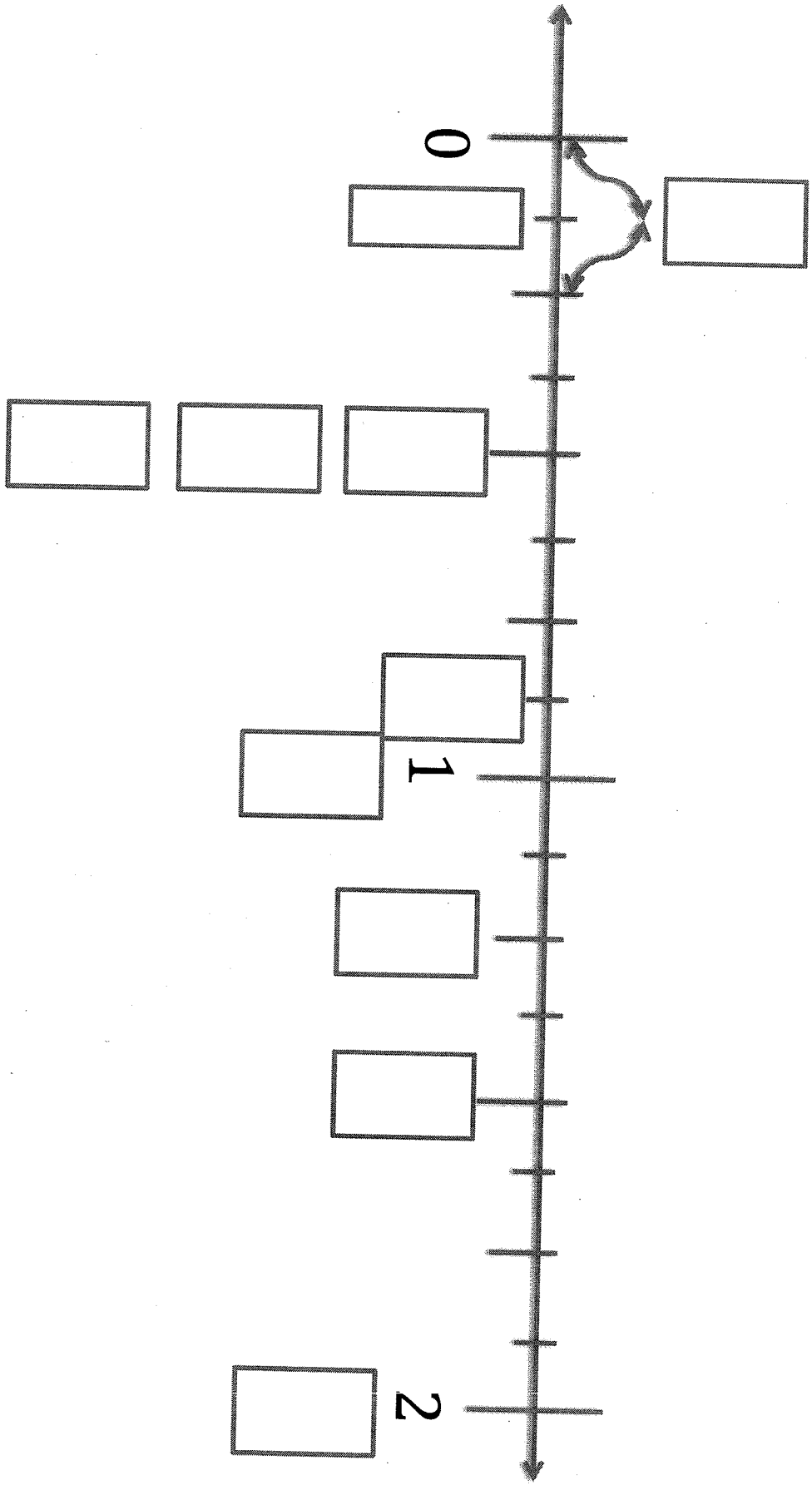
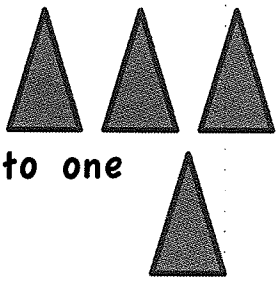

0
1
2

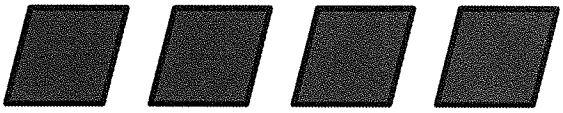
9. These are sixths. Write the fraction.



Is it more than, less than, or equal to one whole? How do you know?

10. These are halves. Write the fraction. Is it more than, less than, or equal to one whole? How do you know?

11. These are thirds. Write the fraction. Is it more than, less than, or equal to one whole? How do you know?



EP

# QUANTILE® RESOURCE

| Resource Overview | |
|---|---|
| **Quantile® Measure:** | 190Q |
| **Skill or Concept:** | Represent fractions concretely and symbolically. (QT-N-114) |
| **Excerpted from:** | **The Math Learning Center** PO Box 12929, Salem, Oregon 97309-0929 **www.mathlearningcenter.org** © Math Learning Center |

## This resource may be available in other Quantile utilities.

**For full access to these free utilities, visit www.quantiles.com/tools.aspx.**

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# Set A6 ★ Activity 1

ACTIVITY

## Sandwich Fractions

### Overview

Students fold paper squares to explore halves and fourths.

### Skills & Concepts

★ understand and represent commonly used fractions, such as ¼, ⅓, and ½

### You'll need

★ three 4" squares of white copy paper for each student plus extras

★ pastel-colored copy paper, 1 piece for each student

★ scissors

★ glue sticks

★ *Eating Fractions* by Bruce McMillan (optional)

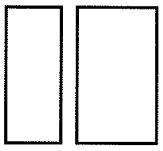
### Instructions for Sandwich Fractions

1. Gather students to your discussion circle. Tell the story below.

*Last Saturday, Kendra's mom had to go to the store. She said to Kendra, "I'll be back in about an hour. Your big sister's upstairs doing her homework, so you'll have to make your own lunch today. You know where to find everything you'll need in the kitchen, right?"*

*"Right!" said Kendra. As soon as her mom left, Kendra thought, "Hmmmm. I think I'll make a peanut butter and jelly sandwich. I just love peanut butter and jelly!" She got the bread out of the cupboard and took 2 pieces out of the bag. She spread peanut butter on one and grape jelly on the other. Then she put them together and set her sandwich on a plate. She looked at it and said, "Mom always cuts my sandwiches in half. I'm going to do the same thing!"*

*She cleaned off the knife and cut her sandwich very carefully. Here's how it looked when she was done.*



2. On your whiteboard, draw a picture similar to the one shown above. Have students pair-share some of the things they notice. Then ask:

*Did Kendra cut her sandwich in half? How do you know?*

Children's explanations will vary, and may include comments like, "When you cut something in half, it has to be fair," "Both pieces have to be just the same size," "If she shared that with her sister, one of them would only get the small part," and "One of those is smaller than the other."

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## **Activity 1** Sandwich Fractions (cont.)

3. Hold up one of the paper squares you've prepared for the lesson and ask the children to tell you how to cut it in half. Follow students' suggestions to cut the paper in half. (Use additional squares to demonstrate if they have more than one solution.) Children may suggest that you fold the paper in half before you cut. Some may advise you to fold up and down or sideways, while others may suggest that you fold it along the diagonal before you cut. As you work, pose the following questions:

- What can we do to make sure both halves are the same size?
- Why do they have to be the same size? Why can't one be bigger than the other?
- What shape are the halves if I cut the paper sideways? (rectangles)
- What shape are the halves if I fold and cut the paper on the diagonal? (triangles)

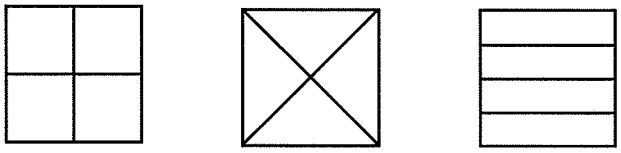
4. Then give students each a paper square and ask them to fold it in half, either sideways or on the diagonal. Write $\frac{1}{2}$ on the board. Read it with the class and explain that this is what people write to describe each of the pieces they get when they divide one object (like a piece of paper or a sandwich) into 2 equal parts. Each piece is 1 out of 2 equal parts.

5. Ask them to set their paper square in front of them and continue with the story.

*After awhile, Kendra's big sister came downstairs to make herself a sandwich. By then, Kendra was finished with her lunch, but she was still in the kitchen. As she watched, Tiffany made a grilled cheese sandwich and cut it into 4 equal pieces. "I always cut my sandwiches in fourths," she said to Kendra. Kendra thought to herself, "That looks really good. Maybe I'll try that next time, but I still like peanut butter and jelly better."*

6. Write $\frac{1}{4}$ on the board. Read it with the class and explain that this is what people write to describe each of the pieces they get when they divide one object into 4 equal parts. Each piece is 1 out of 4 equal parts. Then ask students to fold their second paper square into fourths. After they've had a minute to experiment, ask several volunteers to share their work with the class.

> ***Rosendo*** *First I folded my paper in half, like the first time. Then I opened it and folded it in half the other way.*
>
> ***Michelle*** *My mom always cuts my sandwiches in triangles. I folded my paper my paper in half like this, and then I folded it again. Here's how it looked when I opened it.*
>
> ***DJ*** *I folded mine 2 times. It came out different than the others.*



7. Give students a third paper square and ask them to fold it in fourths again. If they struggled the first time, they may have gotten a new idea by watching their classmates. If they were successful the first time, ask them to try one of the other methods that may have been shared. Encourage them to help one another as they work.

8. Now ask students to take their folded squares back to their tables. Have them recycle one of the squares they folded in fourths so they just have 2 squares in front of them, one folded in half and the other in fourths. Ask them to cut the first square along the fold line and label each of the two parts with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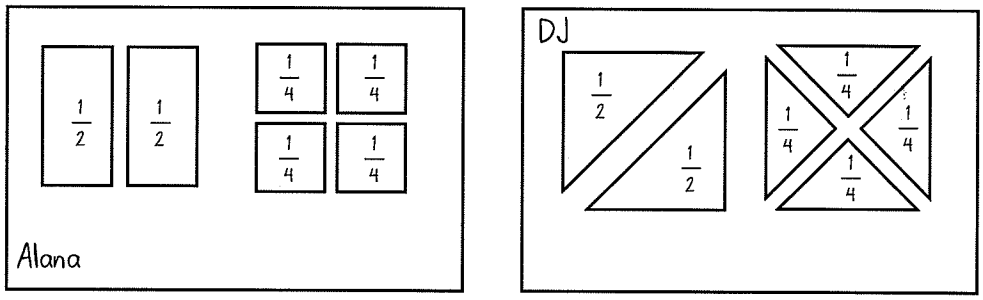
## Activity 1 Sandwich Fractions (cont.)

the fraction ½. Then have them glue the two parts to a piece of colored copy paper. Take the opportunity to reinforce the idea that two halves make a whole. Repeat with the paper squares they have folded into fourths.




### Extension

- Either before or after this activity, read and discuss *Eating Fractions* by Bruce McMillan. Here are two other fraction books your first graders might also enjoy:
  - *Apple Fractions* by Jerry Pallotta and Rob Bolster
  - *Give Me Half!* by Stuart J. Murphy

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QUANTILE® RESOURCE

## Resource Overview

| | |
|---|---|
| **Quantile® Measure:** | 190Q |
| **Skill or Concept:** | Represent fractions concretely and symbolically. (QT-N-114) |
| **Excerpted from:** | BRIDGES IN MATHEMATICS K-5 |

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# Set A6 ★ Activity 2

ACTIVITY

## Paper Pizzas

### Overview

Students explore what happens when 2, 3, and 4 children share 1 pizza, as well as what happens when 4 and 8 children share 2 pizzas. After working to solve these problems as a group, students work in pairs to share 3 pizzas between them.

### Skills & Concepts

★ understand and represent commonly used fractions, such as ¼, ⅓, and ½

### Recommended Timing

Anytime after Set A6 Activity 1

### You'll need

★ 5"-diameter paper circles (page A6.8, 3 circles for each pair of students and 7 circles for the class, see Advance Preparation)

★ tape

★ markers

★ scissors

**Advance Preparation** If you wish you can run a copy of page A6.8 to use as a template for cutting these circles. You can also cut 7 larger circles for the whole-group portion of this activity. If you think you may want to do the extension activity pages with some or all of your students, you'll need 2 more circles for every 3 students.

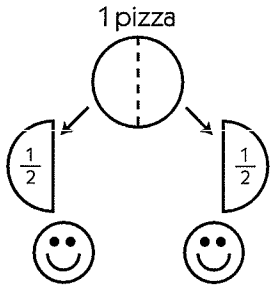
### Instructions for Paper Pizzas

1. Gather students to your discussion circle, and talk to them briefly about pizza. Do they ever have pizza for dinner? What are some of their favorite pizza toppings?

2. Explain that today, they're going to be sharing some paper pizzas. Call 2 volunteers to come stand by you where everyone in the circle can see them. Hold up a single paper circle "pizza." Ask the class how these 2 children could best share 1 pizza, and how much each child would get. Have students whisper ideas to their neighbors, and then call on volunteers to share their thinking with the class.

3. Follow students' suggestions for dividing the pizza fairly. After you do, ask 2 or 3 volunteers to explain how they know that each piece is half. If it doesn't come from the class, suggest placing one piece on top of the other to make sure they're both exactly the same size.

4. Record the problem on the board, quickly taping up the pieces you cut and labeling them with fractions.

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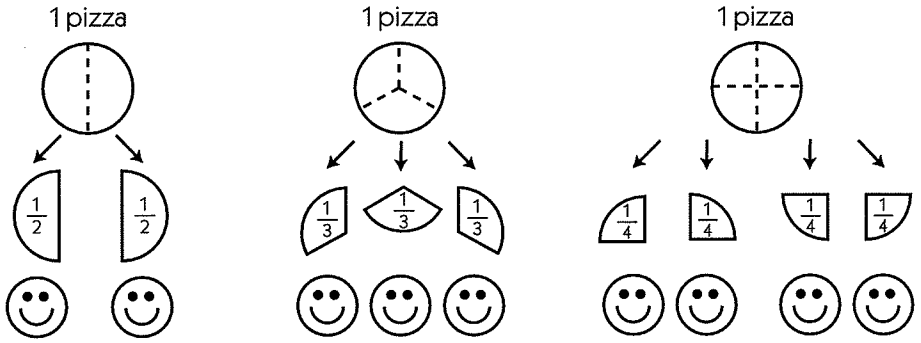
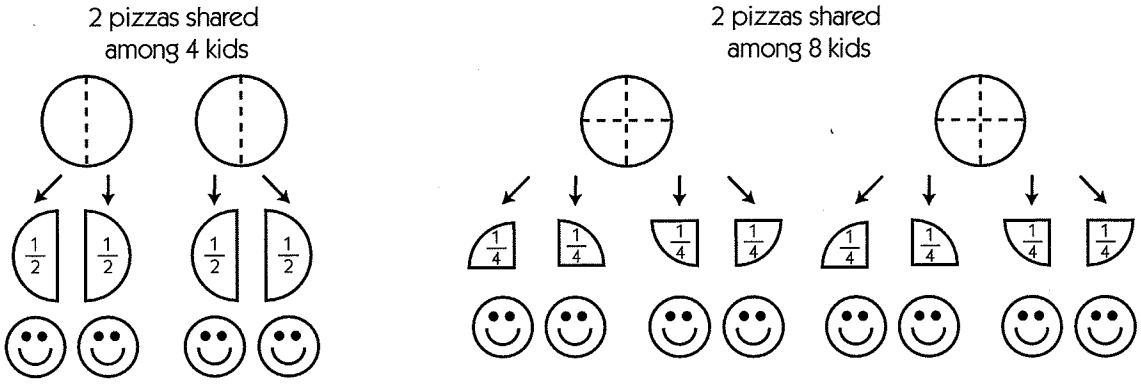
## Activity 2 Paper Pizzas (cont.)

5. Repeat steps 2–4 with 3 children and then with 4 children. Ask students to predict how much pizza the children will get each time. Record the results on the board as you go. Explain that the fractions $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ are used to show what happens when you divide 1 into 2, 3, and then 4 equal parts. $\frac{1}{2}$ means 1 divided into 2 equal parts. $\frac{1}{3}$ means 1 divided into 3 equal parts. $\frac{1}{4}$ means 1 divided into 4 equal parts.




6. Ask students to reflect on the results so far. What do they notice? What happens to the size of the piece each child gets as you add more children to the group? What would happen to the size of each piece if you divided 1 pizza among 8 or even 12 children? Why?

7. Now call 4 volunteers up to stand by you. Hold up 2 "pizzas." Ask the class how these 4 children could best share the 2 pizzas and how much each child would get. Have students whisper ideas to their neighbors, and then call on volunteers to share their thinking with the class. Record the results on the board and discuss them with the class. Then work with students to find out what happens when 8 children share 2 pizzas.




8. Partner the children and explain that you're going to give each pair 3 paper pizzas to share. Ask them to return to their tables and get out their scissors so they're ready to work, and then distribute the pizzas. Give students time to solve the problem in any way they can as you circulate to observe and converse with them. Some pairs may take 1 pizza each and cut the third one in half, while others may cut all 3 pizzas in half and share the halves equally. Some may even cut their 3 pizzas into tiny pieces (which aren't necessarily equal) and then share them out using the 1-for-you, 1-for-me method. Invite pairs to share and compare their results as they're working.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## Activity 2 Paper Pizzas (cont.)

9. After a reasonable amount of time, ask volunteers to share their solutions and strategies with the class. Understanding levels will vary from one student to the next, but all will have had some more exposure to concepts about one-half during the lesson.

### Extension

- You may want to have a few students tackle the much more challenging problem of figuring out how to share 2 pizzas among 3 children.

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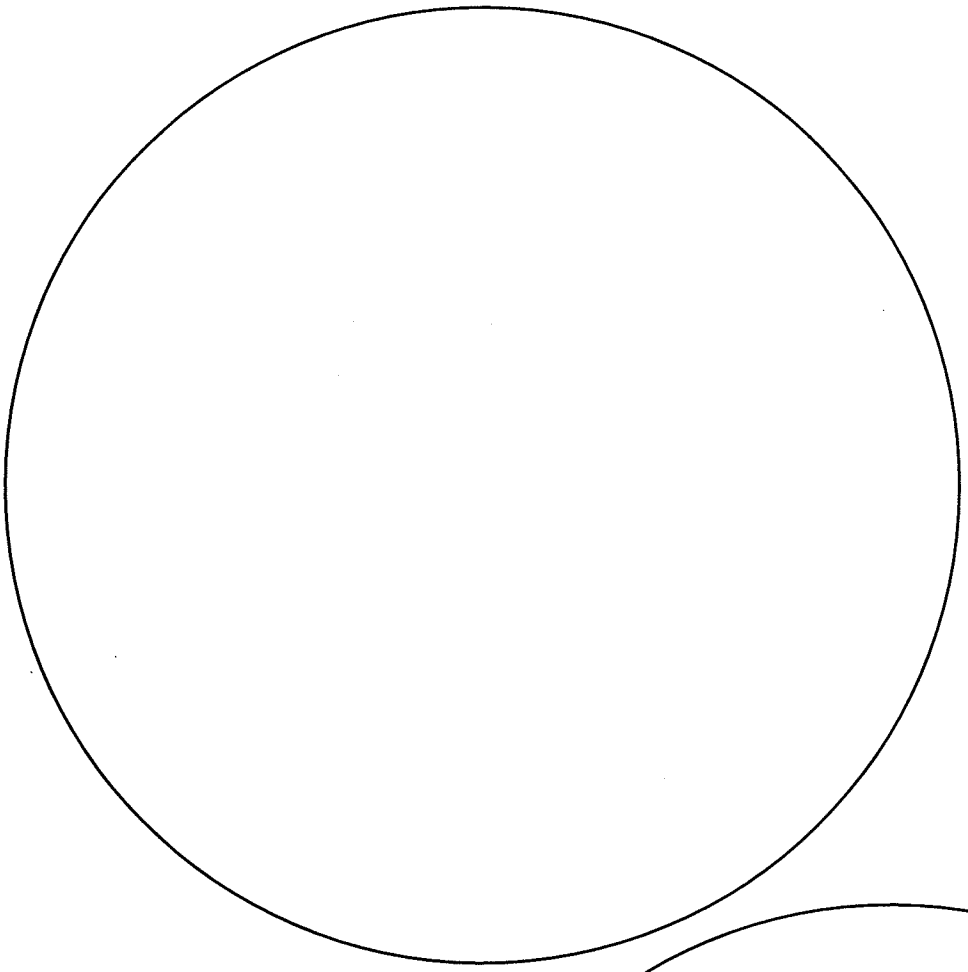

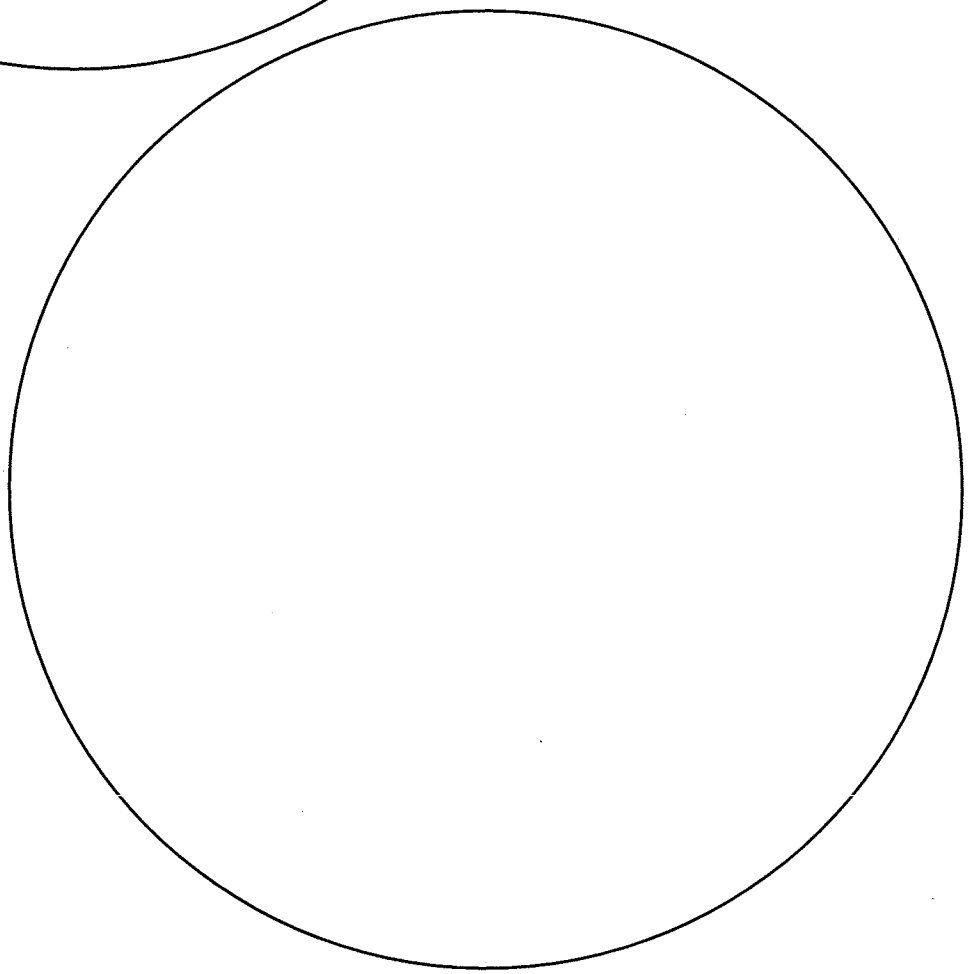

## Circle Pattern



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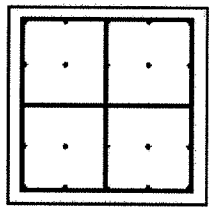
# Equal Parts on the Geoboard



***Materials:*** geoboards, rubberbands, geoboard paper, rulers

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1. Make the largest square that you can on your geoboard.

2. How many different ways can you divide your square into equal parts?

3. Using your ruler record each way you find on geoboard paper and label each part as a fraction.

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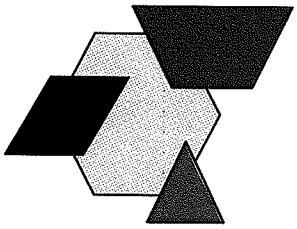


# PRACTICING TASK: MAKE A HEXAGON GAME:

*Adapted from a Learning Task from K-5 Math Teaching Resources*
*Suggested Time for Task: 1 class period*

## STANDARDS FOR MATHEMATICAL CONTENT

**MCC3.NF.1** Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

The way we write fractions with a top and a bottom number with a bar between is simply an arbitrary agreement (convention) for how to represent fractions. It falls into the category of things you simply tell/show students. However, students do need to know the meaning of the numerator and denominator. The numerator tells how many shares or parts we have, how many have been counted, how many we are talking about. It counts the parts or shares. The denominator tells what is being counted. It tells what fractional part is being counted such as fourths or sixths.
(Elementary and Middle School Mathematics: Teaching Developmentally, John A. Van de Walle, Karen S. Karp, and Jennifer M. Bay-Williams.)

## ESSENTIAL QUESTIONS

- How can I use pattern blocks to name fractions?

## MATERIALS

- Pattern Blocks: hexagon, triangles, trapezoid, blue rhombi
- Build a Hexagon Instructions and Game Board for each player
- Dice

## GROUPING

Partner Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Instruct students to work with a partner. For the game, students will take turns rolling two dice. The largest number rolled is the denominator and the smaller number is the numerator. Students build the fractional amount rolled on the game board using pattern blocks. Students may use equivalent fractions. If students roll a fraction they cannot build, they lose a turn. Play continues until one player has covered all the hexagons on his game board.

## FORMATIVE ASSESSMENT QUESTIONS

- What does the top number (numerator) tell us?
- What does the bottom number (denominator) tell us?
- What happened in the game if you rolled the same number on both dice?
- Did you have to trade triangles for other shape blocks? What equal trades did you make?

## DIFFERENTIATION

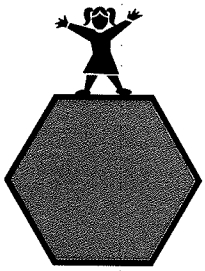
**Extension**

- Modify the game by changing the whole. Try using two hexagons for the whole or three trapezoids for the whole.

**Intervention**

- More, Less, or Equal to One Whole – Give students a collection of fractional parts (all the same type) and indicate the kind of fractional part they have. Parts can be drawn on a worksheet or physical models placed in plastic baggies with an identifying card. For example, if done with fraction strips, the collection might have seven strips with a card indicating "these are eighths." The task is to decide if the collection is less than one whole, equal to a whole, or more than a whole. Students must draw pictures and/or use numbers to explain their answer. They can also tell how close the set is to a complete whole. (Teaching Student-Centered Mathematics, Grades 3-5, John A. Van de Walle, Karen S. Karp, and Jennifer M. Bay-Williams, p. 138.)

# Build a Hexagon



**Materials:** game board for each player, dice, pattern blocks (hexagon, triangles, trapezoids, blue rhombi)

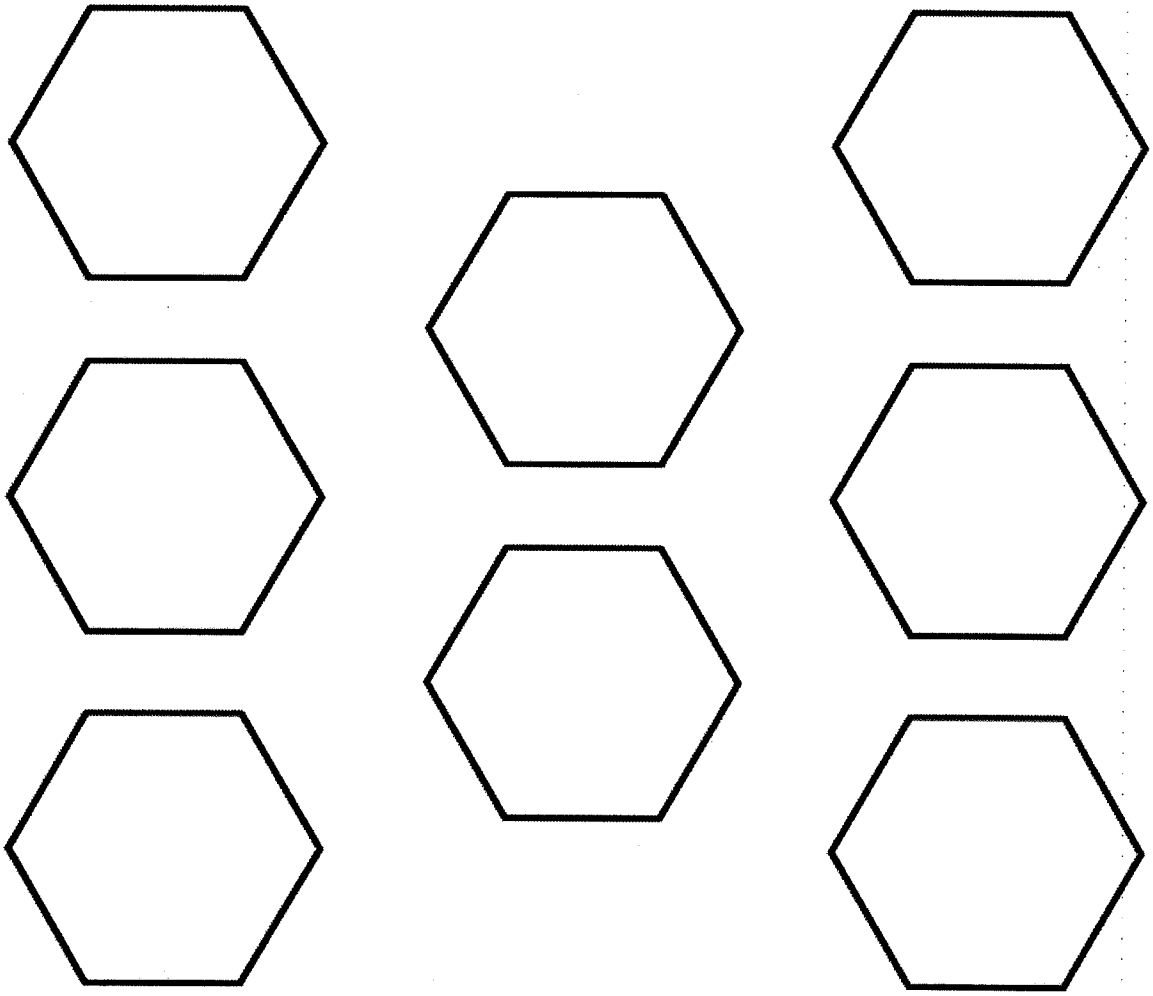
Work with a partner. Take turns to roll two dice. The largest number you roll is the denominator and the smaller number is the numerator.

1. Use pattern blocks to build the fractional amount you rolled on the game board. You may use equivalent fractions.

2. If you roll a denominator that you can't build, you lose a turn.

3. Keep going until one player has covered all the hexagons on his/her game board.

# Build a Hexagon





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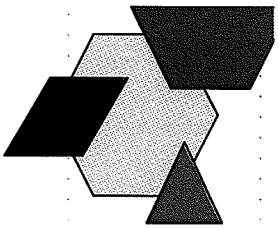
# CONSTRUCTING TASK: PATTERN BLOCK FRACTIONS Revisited: EXPLORING FRACTIONS FURTHER WITH PATTERN BLOCKS

*Adapted from a Learning Task by Debra Childs, Floyd County, GA*
*Suggested Time for Task: 1 class period*



## STANDARDS FOR MATHEMATICAL CONTENT

**MCC3.NF.1** Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into $b$ equal parts; understand a fraction $a/b$ as the quantity formed by $a$ parts of size $1/b$.

## STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

## BACKGROUND KNOWLEDGE

A big idea for students to explore is that fractional parts are equal-sized parts of a whole unit. All the parts must be the same size. The unit can be a collection of things, and the unit is counted as one. The names for fractions tell how many parts of that size are needed to make the whole. In this activity, different wholes are designated in the same model. This discourages children from identifying a fractional part with a special shape or color, challenging them to see the relationship of each part to the designated whole. (Elementary and Middle School Mathematics: Teaching Developmentally, John A. Van de Walle, Karen S. Karp, and Jennifer M. Bay-Williams.)

## ESSENTIAL QUESTIONS

- How can I use pattern blocks to name fractions?
- How does the size of the whole affect the size of the fractions?
- Is ¼ always the same size? How do you know?

## MATERIALS

- Pattern Blocks
- Exploring Fractions Further With Pattern Blocks Activity Sheet

## GROUPING

Partner/Small Group Task

## TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

**Part I**

Begin this task by presenting the students with 2 different sized pieces of construction paper. (If you wish, you can name it a pan of brownies or pizza.) Pose the question: Is ¼ always the same size? With the students fold the larger piece of paper into fourths, then do the same with the smaller piece. Verify with the students that each piece was evenly folded into fourths. Ask the question, "Which ¼ of a pizza/pan of brownies would you like to have?" This will lead to a discussion around the size of the whole.

**Part II**

Lead students in a discussion including questions such as:

- What if you use two yellow hexagon blocks to represent the whole?
- What fractional part of the whole will one yellow hexagon be?
- What block will represent ¼? What other relationships do you see?

Have students work together to complete the task sheet. Students should model each question with pattern blocks and make a sketch of the required blocks.

## QUESTIONS FOR FORMATIVE ASSESSMENT

- How did you determine ¼?
- How did the size of ½ change from the whole on page 1 to the whole on page 2?
- How does the size of the whole affect the size of the fractional piece?
- Can you find any equivalent fractions? How do you know?

## DIFFERENTIATION

**Extension**

- Challenge students to explore additional variations of the whole such as three hexagons, four trapezoids, or eight triangles.

**Intervention**

- Finding Fair Shares - Give students other objects or models and ask them to find halves or fourths. Use familiar objects such as groups of cookies or pieces of candy. Vary the number of pieces in the whole. (Teaching Student-Centered Mathematics, Grades 3-5, John A. Van de Walle, Karen S. Karp, and Jennifer M. Bay-Williams, p. 136.

# PATTERN BLOCK FRACTIONS Revisited: EXPLORING FRACTIONS FURTHER WITH PATTERN BLOCKS

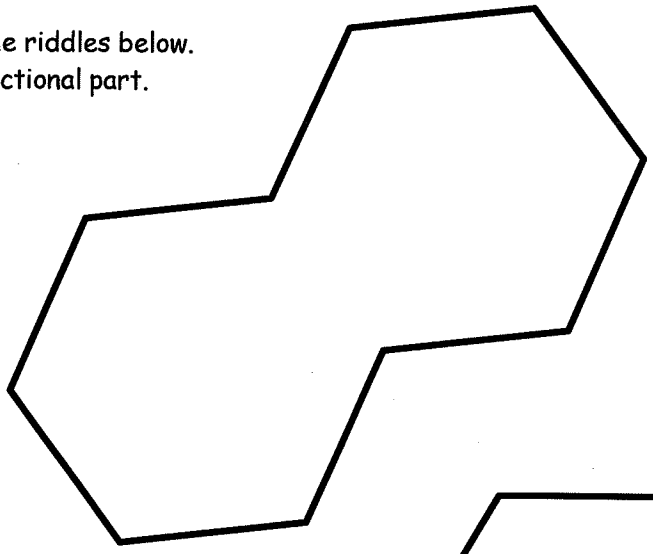
(Adapted from a Learning Task by Debra Childs, Floyd County, GA)

Name _____ Date _____

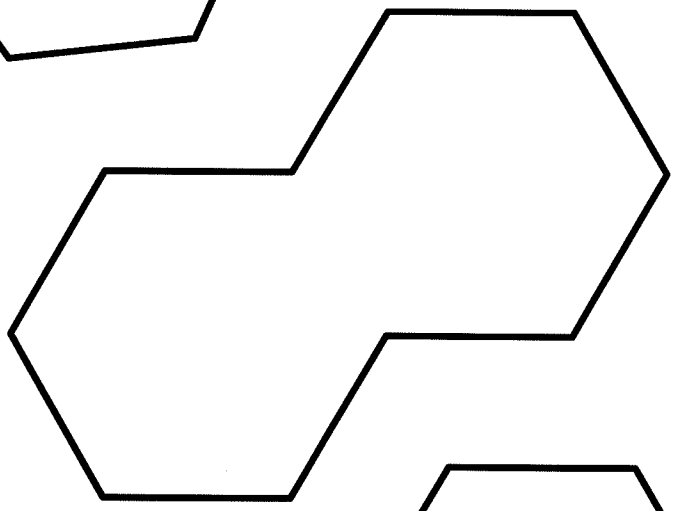
Task: Pattern Block Fractions

- Use the pattern blocks to solve the riddles below.
- Draw the shape and label each fractional part.

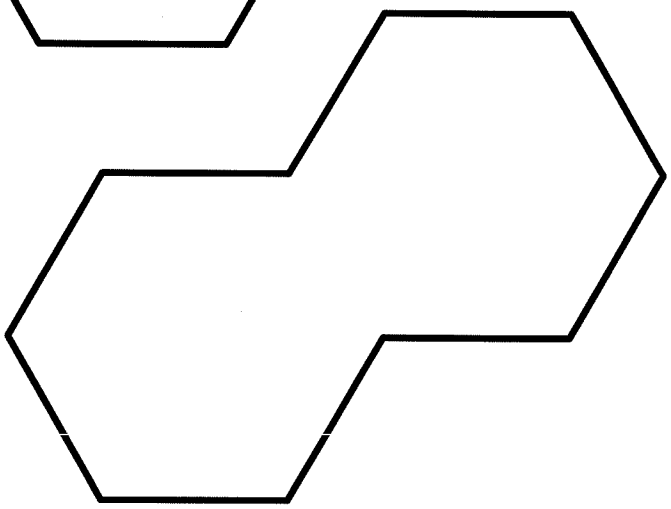
If this is one whole, what is ½?
(Draw and label)



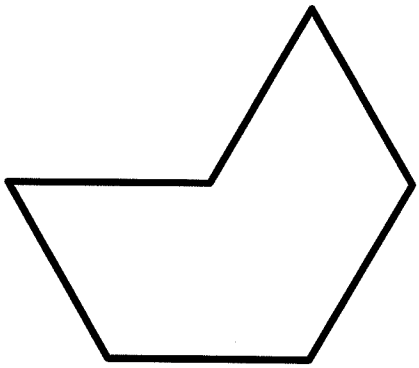
If this is one whole, what is ¼?
(Draw and label)



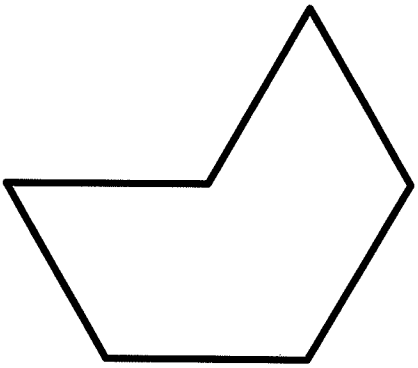
If this is one whole, what is 1/6?
(Draw and label)



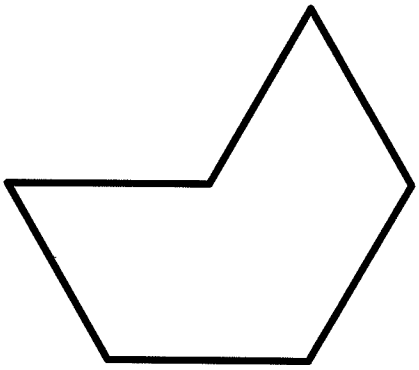
If this is one whole, what is ½?
(Draw and label)



If this is one whole, what is ¼?
(Draw and label)



If this is one whole, show 1 ½. (Draw and label)



Use pictures, words, and numbers to summarize what you have learned from this task.