CCGPS Frameworks 1st Unit 3

Mathematics

First Grade Unit Three
Understanding Shapes and Fractions

Dr. John D. Barge, State School Superintendent
"Making Education Work for All Georgians"

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Unit 3: Understanding Shapes and Fractions

TABLE OF CONTENTS (* indicates new task)

OVERVIEW

In this unit, students will:

- study and compose two- and three-dimensional figures
- identify basic figures within two- and three-dimensional figures
- compare, contrast, and/or classify geometric shapes using position, shape, size, number of sides, and number of angles
- solve simple problems, including those involving spatial relationships
- investigate and predict the results of putting together and taking apart two- and three-dimensional shapes
- create mental images of geometric shapes using spatial memory and spatial visualization
- relate, identify, partition, and label fractions (halves, fourths) as equal parts of whole objects
- apply terms such as half of, quarter of, to describe equal shares.

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as counting, time, money, positional words, patterns, and tallying should be addressed on an ongoing basis through the use of calendar centers and games.

STANDARDS FOR MATHEMATICAL CONTENT

Reason with shapes and their attributes.

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

STANDARDS FOR MATHEMATICAL PRACTICE

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Students are expected to:
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.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson*****

ENDURING UNDERSTANDINGS

- The properties of shapes make them alike or different.
- Some shapes have sides, angles, and faces which can be counted.
- Patterns can be created, extended, and transferred through the use of geometric shapes.
- Location of shapes can be described using positional words.
- Equal means being of the same size, quantity, or value.

ESSENTIAL QUESTIONS

- What are attributes?
- How can shapes be sorted?
- How are shapes used in our world?
- What makes shapes different from each other?
- How can we group certain shapes together? Why do they belong together?
- How can I create a shape?
- How do shapes fit together and come apart?
- How can a shape be described?
- What can I do with shapes?
- How do I organize shapes?
- Where can we find shapes in the real world?
- What is a 2-dimensional shape?
- What is a 3-dimensional shape?
- How are shapes alike and different?
- How can we divide shapes into equal parts?
- How can we be sure that we have equal parts?
- Why is it important to divide into equal parts?
- How can you show half of something?
- How do we know when parts are equal?
- How can we divide shapes into equal parts?
- What is half of a whole?
- What is a fourth of a whole?
- How can you divide shapes into halves and fourths?
- How can a quantity be shared?
- How can things be divided into equal parts?

CONCEPTS/SKILLS TO MAINTAIN

- Sorting shapes into groups
- Positional terms
- Find and name shapes in the environment
- Compose and decompose shapes
- Identify two and three dimensional geometric shapes

SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The terms below are for **teacher reference only** and are not to be memorized by the students. Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

- **attribute**
- **circle**
- **cone**
- **cube**
- **cylinder**
- **fourths**
- **fractions**
- **halves**
- **partition**
- **quadrilateral**
- **quarters**
- **rectangular prism**
- **sphere**
- **triangle**
- **whole**

STRATEGIES FOR TEACHING AND LEARNING

Students should be actively engaged by developing their own understanding. Mathematics should be represented in as many ways as possible by using graphs, tables, pictures, symbols, and words. Appropriate manipulatives and technology should be used to enhance student learning. Students should be given opportunities to revise their work based on teacher feedback, peer feedback, and metacognition which includes self-assessment and reflection.

Math journals are an excellent way for students to show what they are learning about a concept. These could be spiral bound notebooks in which students could draw or write to describe the day's math lesson. First graders love to go back and look at things they have done in the past. Journals could also serve as a tool for a nine-week review and for parent conferencing.

Reason with shapes and their attributes.
MCC1.G.1 Distinguish between defining attributes (e.g., triangles are **closed** and **three-sided**) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

Instructional Strategies
Students will determine which attributes of shapes are defining compared to those that are non-defining. Defining attributes are attributes that must always be present. Non-defining attributes are attributes that do not always have to be present. The shapes can include triangles, circles, squares, rectangles, hexagons, cubes, cones, cylinders, spheres and trapezoids. Students will determine which attributes of shapes are defining compared to those that are non-defining. Defining attributes are attributes that help to define a particular shape (number of angles, number of sides, length of sides, etc.). Non-defining attributes are attributes that do not define a particular shape (color, position, location, etc.). The shapes can include triangles, squares, rectangles, and trapezoids. **MCC1.G.2** includes half-circles and quarter-circles.

Students can easily form shapes on geoboards using colored rubber bands to represent the sides of a shape. Ask students to create a shape with four sides on their geoboard, then copy the shape on dot paper. Students can share and describe their shapes as a class while the teacher records the different defining attributes mentioned by the students.

Pattern block pieces can be used to model defining attributes for shapes. Ask students to create their own rule for sorting pattern blocks. Students take turns sharing their sorting rules with their classmates and showing examples that support their rule. Then classmates draw a new shape that fits the same rule.

Students can use a variety of manipulatives and real-world objects to build larger shapes. The manipulatives can include paper shapes, pattern blocks, color tiles, triangles cut from squares (isosceles right triangles), tangrams, canned food (right circular cylinders) and gift boxes (cubes or right rectangular prisms).

Folding shapes made from paper enables students to physically feel the shape and form the equal shares. Ask students to fold circles and rectangles first into halves and then into fourths. They should observe and then discuss the change in the size of the parts.

Reason with shapes and their attributes.
MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

Instructional Strategies
Students will compose (build) a two-dimensional or three-dimensional shape from two shapes. This standard includes shape puzzles in which students use objects (e.g., pattern blocks) to fill a larger region. Students do not need to use the formal names such as ―right rectangular prism.

Develop spatial sense by connecting geometric shapes to students' everyday lives. Initiate natural conversations about shapes in the environment. Have students identify and name two- and three-dimensional shapes in and outside of the classroom and describe their relative position.

Ask students to find rectangles in the classroom and describe the relative positions of the rectangles they see, e.g. *This rectangle (a poster) is over the sphere (globe)*. Teachers can use a digital camera to record these relationships.

Have students create drawings involving shapes and positional words: *Draw a window ON the door* or *Draw an apple UNDER a tree*. Some students may be able to follow two- or three-step instructions to create their drawings.

Use a shape in different orientations and sizes along with non-examples of the shape so students can learn to focus on defining attributes of the shape.

Manipulatives used for shape identification actually have three dimensions. However, First Graders need to think of these shapes as two-dimensional or "flat" and typical three-dimensional shapes as "solid." Students will identify two-dimensional shapes that form surfaces on three-dimensional objects. Students need to focus on noticing two and three dimensions, not on the words *two-dimensional* and *three-dimensional.*

Reason with shapes and their attributes.
MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Instructional Strategies
Students will begin partitioning regions into equal shares using a context such as cookies, pies, pizza, blocks of wood, brownies, construction paper, etc. This is a foundational building block of fractions, which will be extended in future grades. Students should have ample experiences using the words, halves, fourths, and quarters, and the phrases half of, fourth of, and quarter of. Students should also work with the idea of the whole, which is composed of two halves, or four fourths or four quarters.

COMMON MISCONCEPTIONS

Students may think that a square that has been rotated so that the sides form 45-degree angles with the vertical diagonal is no longer a square. They need to have experiences with shapes in different orientations. For example, in the building-shapes strategy above, ask students to orient the smaller shapes in different ways.
Some students may think that the size of the equal shares is directly related to the number of equal shares. For example, they think that fourths are larger than halves because there are four fourths in one whole and only two halves in one whole. Students need to focus on the change in the size of the fractional parts as recommended in the folding shapes strategy. The first activity in the unit *Introduction to Fractions for Primary Students:* http://mathforum.org/varnelle/knum.html includes a link, *Parts of a Whole*, to an interactive manipulative. It allows students to divide a circle into the number of equal parts that they choose.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:
- Sort shapes into groups made up of members sharing the same attributes.
- Compare shapes based on attributes.
- Find and name shapes in the environment.
- Use shapes to create representations of items in the environment.
- Compose and decompose shapes.
- Create shapes, both 2 and 3 dimensional.
- Divide a collection of objects into equal parts (halves, fourths).
- Divide wholes into equal parts (halves, fourths).
- Locate where a number lives on a number line and tell who its neighbors are.
- Locate where a fraction (halves, fourths) lives on a number line.

FALS
At this time, there are no Formative Assessment Lessons are available for this unit.

SAMPLE UNIT ASSESSMENTS

Math Unit Summative Assessments were written by the First Grade Mathematics Assessment and Curriculum Team, Jackson County, Georgia. The team is comprised of first grade teachers and administrators whose focus is to provide assessments that address depth of knowledge and higher order thinking skills. These assessments are provided as a courtesy from the Jackson County School System as samples that may be used as is or as a guide to create common assessments.

NUMBER TALKS

In order to be mathematically proficient, today's students must be able to compute accurately, efficiently, and flexibly. Daily classroom number talks provide a powerful avenue for developing "efficient, flexible, and accurate computation strategies that build upon the key foundational ideas of mathematics." (Parrish, 2010) Number talks involve classroom conversations and discussions centered upon purposefully planned computation problems.

In Sherry Parrish's book, Number Talks: Helping Children Build Mental Math and Computation Strategies, teachers will find a wealth of information about Number Talks, including:

- Key components of Number Talks
- Establishing procedures
- Setting expectations
- Designing purposeful Number Talks
- Developing specific strategies through Number Talks

There are four overarching goals upon which K-2 teachers should focus during Number Talks. These goals are:

1. Developing number sense
2. Developing fluency with small numbers
3. Subitizing
4. Making Tens

Although there are no Number Talks specific to this unit, the teacher should continue with those suggested in Unit 2. Suggested Number Talks for Unit 2 are fluency with 6, 7, 8, 9, and 10; and counting all and counting on using dot images, ten-frames, Rekenreks, double ten-frames, and number sentences. Specifics on these Number Talks can be found on pages 74-106 of Number Talks: Helping Children Build Mental Math and Computation Strategies.

WRITING IN MATH

The Standards for Mathematical Practice, which are integrated throughout effective mathematics content instruction, require students to explain their thinking when making sense of a problem

(SMP 1). Additionally, students are required to construct viable arguments and critique the reasoning of others (SMP 2). Therefore, the ability to express their thinking and record their strategies in written form is critical for today's learners. According to Marilyn Burns, "Writing in math class supports learning because it requires students to organize, clarify, and reflect on their ideas--all useful processes for making sense of mathematics. In addition, when students write, their papers provide a window into their understandings, their misconceptions, and their feelings about the content." (Writing in Math. Educational Leadership. Oct. 2004 (30).) The use of math journals is an effective means for integrating writing into the math curriculum.
Math journals can be used for a variety of purposes. Recording problem solving strategies and solutions, reflecting upon learning, and explaining and justifying thinking are all uses for math journals. Additionally, math journals can provide a chronological record of student math thinking throughout the year, as well as a means for assessment than can inform future instruction.
The following website provides a wealth of information and grade specific activities for math journaling: http://www.k-5mathteachingresources.com/math-journals.html. Though this is not a free site, there are some free resources that are accessible.

PAGE CITATIONS

Page citations from the text Teaching Student-Centered Mathematics written by Van de Walle, Lovin, Karp, and Bay-Williams, has been recently revised due to reprinting. Page numbers may vary due to this change.

TASK DESCRIPTIONS

Scaffolding Task	Tasks that build up to the learning task.
Constructing Task	Constructing understanding through deep/rich contextualized problem solving tasks.
Practice Task	Tasks that provide students opportunities to practice skills and concepts.
Culminating Task	Designed to require students to use several concepts learned during the unit to answer a new or unique situation. Allows students to give evidence of their own understanding toward the mastery of the standard and requires them to extend their chain of mathematical reasoning.
Formative Assessment Lesson (FAL)	Lessons that support teachers in formative assessment which both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards.
***3-Act Task**	A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 CCGPS Mathematics Wiki.

UNIT TASKS

Task Name	Task Type/ Grouping Strategy	Content Standard	Content Addressed
Task 1: Circus Trip	Performance Task *Individual*	MCC1.G.1	Problem solving: sorting shapes by their attributes
Task 2: What Are Attributes?	Constructing Task *Large Group, Individual*	MCC1.G.1 MCC1.MD.4	Classify shapes by attributes Create graphs
Task 3: Which Doesn't Belong?	Practice Task *Large Group*	MCC1.G.1	Classify, compare, contrast, and describe shapes
Task 4: Build A Shape	Constructing/Performance Task *Large Group, Individual*	MCC1.G.1 MCC1.G.2	Constructing shapes Classify, compare, contrast, and describe shapes
Task 5: Partitioning All Around My Shapes	Constructing Task *Large Group, Partners*	MCC1.G.1 MCC1.G.2 MCC1.MD.4	Classifying shapes and dividing shapes
Task 6: Pattern Block Pictures	Practice Task *Large Group, Individual*	MCC1.G.1 MCC1.G.2 MCC1.MD.4	Combining shapes to make new shapes
Task 7: Day at the Museum	Performance Task *Small Group*	MCC1.G.1 MCC1.G.2	Study and locate 2D and 3D shapes
Task 8: Shape Detective	Constructing Task *Large Group, Individual*	MCC1.G.1 MCC1.MD.4	Compare and contrast shapes
Task 9: Fractions Are Easy As Pie!	Constructing Task	MCC1.G.3	Identifying Fractional Parts
Task 10: I Want Half!	Constructing Task *Large Group, Individual*	MCC1.G.3	Share objects between people, Identifying fractional parts
Task 11: Half and Not Half	Practice Task *Large Group, Individual*	MCC1.G.3	Building rectangles, exploring equal parts of set
Task 12: Hands On Fractions	Performance Task *Large Group*	MCC1.G.3	Explore equal parts, Dividing shapes in to fourths and halves
Task 13: Sweets for the Sweet!	Performance Task *Large Group, Individual*	MCC1.G.3	Problem solving: dividing shapes in to fourths and halves
Task 14: *Let's Eat!	3 Act Task Large Group, Individual	MCC1.G.3	Problem solving: dividing shapes in to fourths and halves

Task 15: Geo-board Fractions	Constructing Task *Large Group, Individual*	MCC1.G.3	Dividing whole shapes into halves and fourths
Task 16: Lily's Birthday	Performance Task *Large Group, Small Group*	MCC1.G.3	Share objects between people, Identify, describe, label, create, fractions Understand whole
Task 17: Culminating Task: Connecting Shapes and Fractions	Culminating Task *Independent*	MCC1.G.1 MCC1.G.2 MCC1.G.3	Build shapes and divide into equal parts

Task 1

PERFORMANCE TASK: Circus Trip

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are **closed** and **three-sided**) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

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. Students explain and discuss how shapes are alike, different, and grouped.**
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/COMMON MISCONCEPTIONS

The problem solving steps should be modeled or established in the classroom prior to this task. Students should be familiar with shapes and their attributes. This task is designed to serve as a pre-assessment of student knowledge of shapes and their attributes.

ESSENTIAL QUESTIONS

- What can I do with shapes?
- How do organize shapes?

MATERIALS

- Circus Trip task sheet
- Crayons, markers, etc.

GROUPING

- Individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Gather students in a common area. Tell them you were cleaning out your room and you found five different boxes in the corner. You wanted to put them on the shelf but could not figure out what order. Draw five different shapes on the board to represent the boxes. Ask students how you could put them in order to go on the shelf. Work through the problem together, using pictures and words.

Part II
Explain to students that the last time you visited the circus you noticed many shapes. Discuss the shapes that you saw. For example, "I saw a circle with the seals. The circle was a ring around the stage. I saw a rectangle in the lion's cage. The rectangle was a bed they were lying on." Show the students the activity page. Tell them these are the shapes you saw. Tell them to look at the shapes and think about them. Ask, "How are they alike?" "How are they different?" "How could I put these shapes in some order?" Have the students go back to their seats and independently figure out how to put the shapes in order. Tell the students they can use pictures and/or words to explain how they answer.

FORMATIVE ASSESSMENT QUESTIONS

- How are the shapes alike and different?
- How are you going to organize your shapes? Tell me more.
- Could you order them a different way?

DIFFERENTIATION

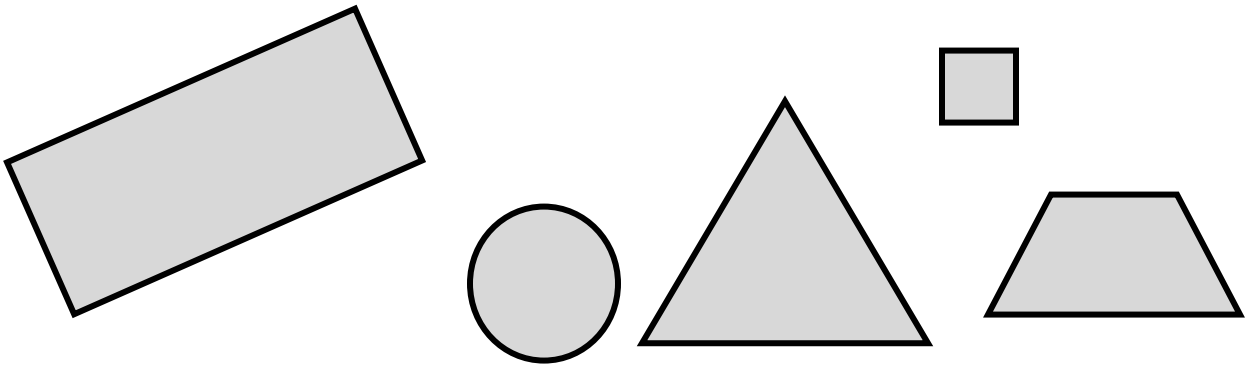
Extension
- "Shape Sorts Expanded Lesson" (Van de Walle, page 331) Students will work in pairs or groups with a set of 2-D shapes. They will take a few shapes from the set and compare and sort them. Each person or team has to describe the rule they used to sort the shapes.

Intervention
- Allow students to use pattern block shapes as they complete the activity. Encourage them to use the shapes to discuss questions on the recording sheet.

Name:_____ **Date:_____**

Circus Trip

On a trip to the Circus, I spotted the items below. How are the items alike? How are these items different? How could I put them in order?



Show your mathematical thinking.

Task 2

CONSTRUCTING TASK: What are Attributes?

Approximately 1-2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

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. Students explain, discuss, and question the reasons for sorting shapes in a particular way.**
4. **Model with mathematics. Student sort shapes by attributes.**
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/COMMON MISCONCEPTIONS

Students should come to first grade with multiple experiences with shapes such as squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres. A foundation in sorting objects by a single attribute will be beneficial before beginning this task. It is important for students to be able to pick out an attribute and know what an attribute is. Some students may be familiar with Venn diagrams and others may not. Students need to be familiar with Venn diagrams to complete this task.

ESSENTIAL QUESTIONS

- What are attributes?
- How can shapes be sorted?

MATERIALS

- Student shape page
- Large drawing paper or construction paper
- Scissors
- Glue
- Chart paper

GROUPING

Large, Individual, Partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Display a variety of the shapes from the task sheet. Have the students brainstorm ways to describe the shapes. Record their responses on chart paper. (Save this for further shape studies.) Guide students to look for ways other than color and size when describing the shapes such as by number of sides, number of corners, or no corners. Students should explore discussions about defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size).

The teacher will ask the questions, *"Why are attributes important? How do they help up organize a group of shapes? What are the different types of attributes?* Have students give examples of things they have seen in their environment that have some of these same shapes. Some examples may be badges, buttons, awards, stickers, signs, etc.

Part II-Sorting by non-defining attributes
Students will cut the shapes on the student sheet provided. Students will practice sorting the shapes into groups. Refer students to the chart created in Part I to label their groups. Encourage students to choose two attributes at a time to practice sorting. Allow students time to practice sorting with multiple attributes. The teacher will partner the students to play a game. One student will sort the shapes and the other will determine how the shapes were sorted. Remind students to refer to the chart created in part one to define the labels for the groups.

Students will sort and glue the shapes on the provided construction paper. Students may glue the pictures in various ways to display their information. (Venn diagram, charts, etc.) Students do not need to label the type of representation (ex: a Venn diagram) they used, but it is important that they label the groups with the attribute they used to sort the shapes.

Students should be able to explain why they sorted and glued the picture in this manner. At the bottom of their page have the students use tally marks to count the shapes in each group. They should create these representations on their own and then write what they know about their representation.
As students sort shapes and make their graph, make sure to ask open-ended questions so the students can verbalize how they are thinking.

Part III-Sorting by Defining Attributes
Review the previous activity with students and discuss the various ways that students chose to sort the shapes (color, pattern, shape, size, etc.). Then, present students with the second two sheets of shapes and tell them that they will repeat the same activity using these shapes. First, have students cut out each shape and examine them. What do they notice about these shapes that are different from the previous set of shapes? How will they choose to sort these shapes? Explain to students that even though, in the previous task, students were able to sort by non-defining attributes, what really makes a shape a shape, are it's defining attributes (closed, three sided, four sides, four corners, five sided, etc.). With that in mind, have students sort the next set of shapes according to the shape's defining attributes.
As students sort shapes and make their graph, make sure to ask open-ended questions so the students can verbalize how they are thinking.

Part IV
Have students examine both of their graphs with a partner and compare them. They should create a list that lists three ways the information in the graphs are the same and three ways the information is different.

FORMATIVE ASSESSMENT QUESTIONS

- What can you tell me about the way you sorted your shapes?
- Can you think of another way to sort them?
- Why do you think there is more than one way to sort the shapes?
- Where do you see these kind of shapes (listen for and encourage examples from in your classroom, outside, at home, etc.)
- What helped you decide how you were going to make your graph?
- How will you describe your representation to the class?
- What question can you write for the rest of the class to answer using your representation?

DIFFERENTIATION

Extension

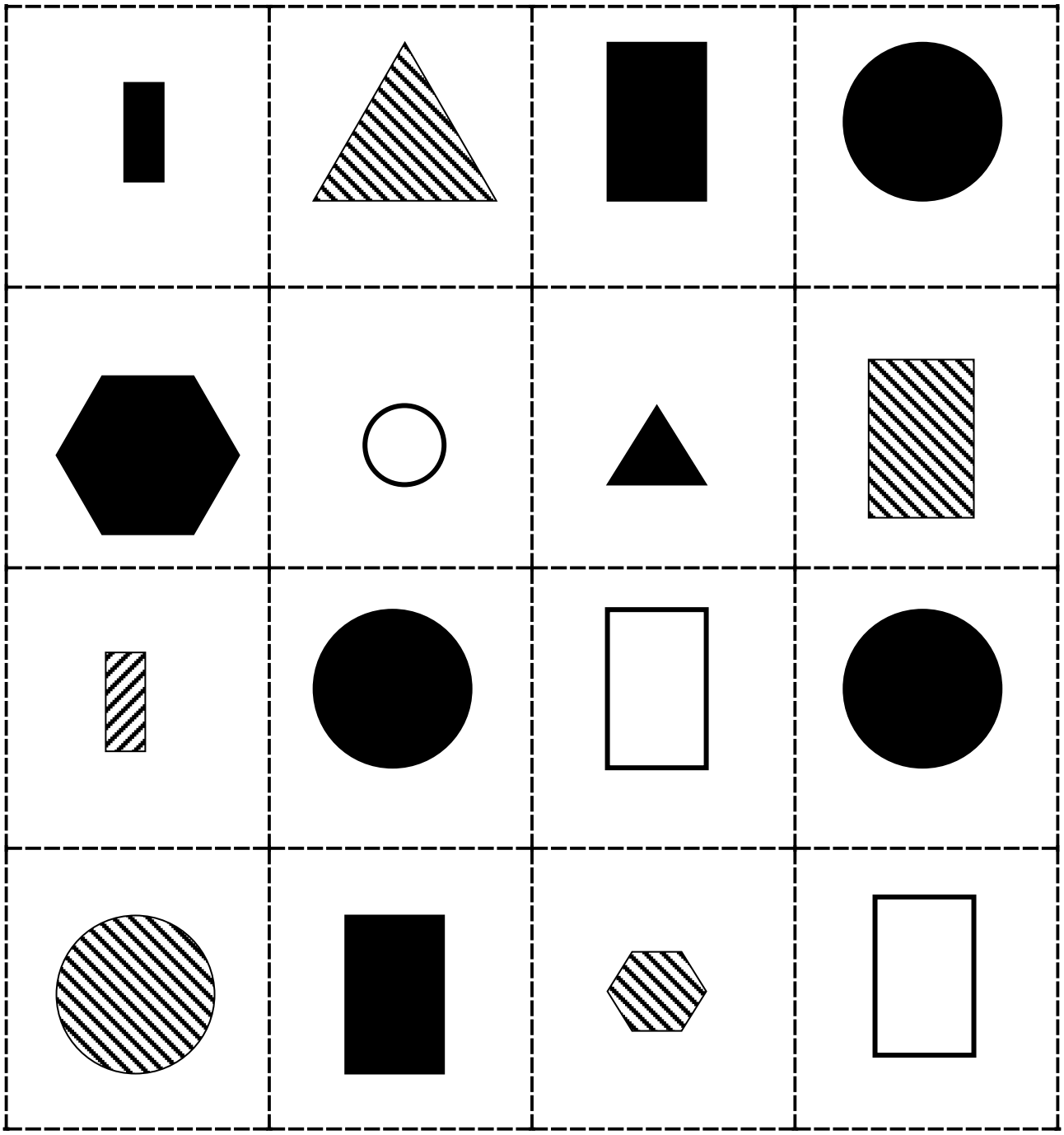
- For students who are easily sorting the shapes into two groups, have them sort the shapes again and determine how many different groups they can make.
- "Shape Sorts Expanded Lesson" (Van de Walle, page 331): The group selects one shape at random and places it in the center of the workspace. Their task is to find all other shapes that are like the target shape, but all according to the same rule. For example, if they say, "This one is like our shape because it has curved side and a straight side," then all other shapes that they put in the collection must have these properties. Challenge them to do a second sort with the same target shape but using a different property. Have students share their sorting rules with the class and show examples.

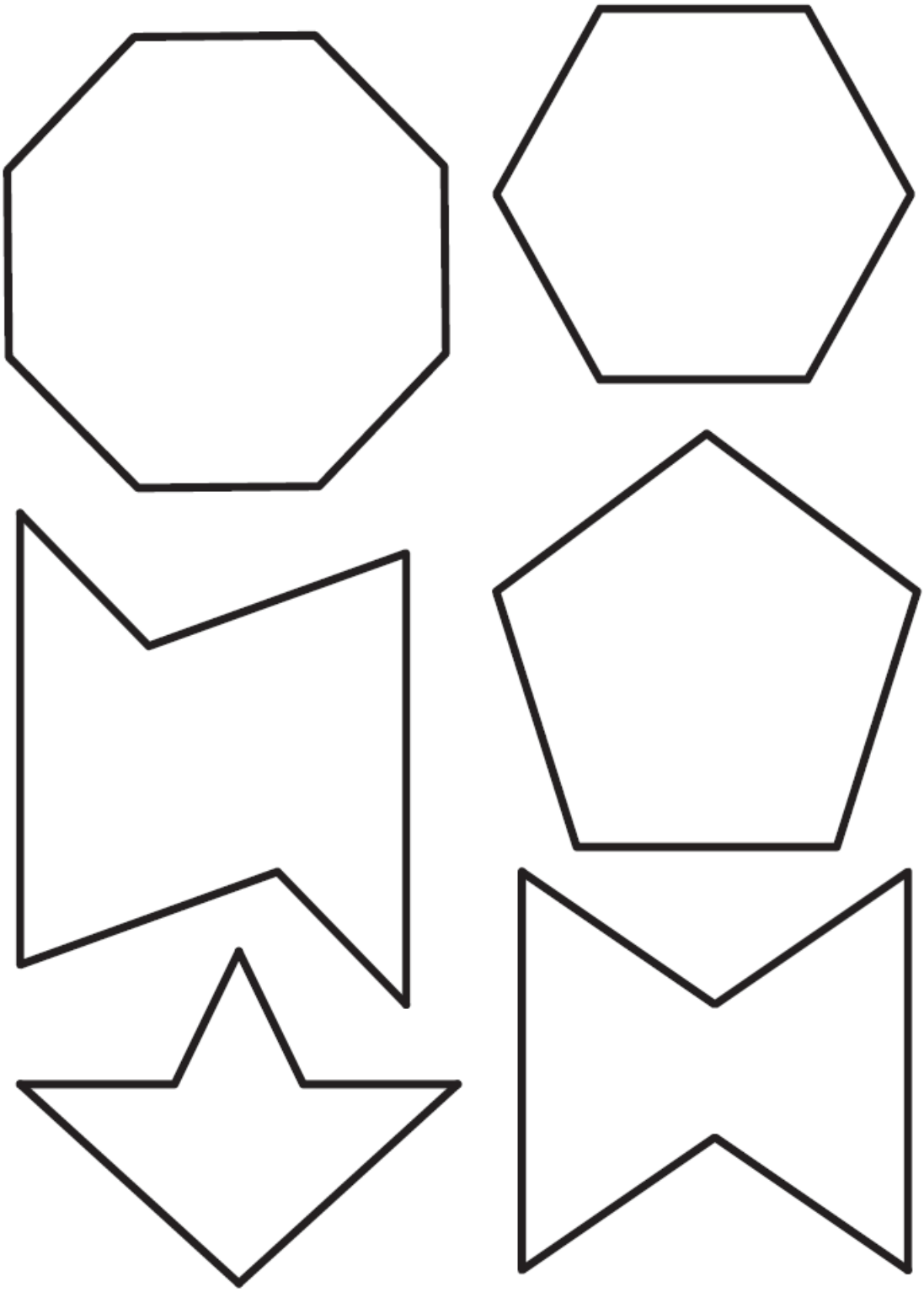
Intervention

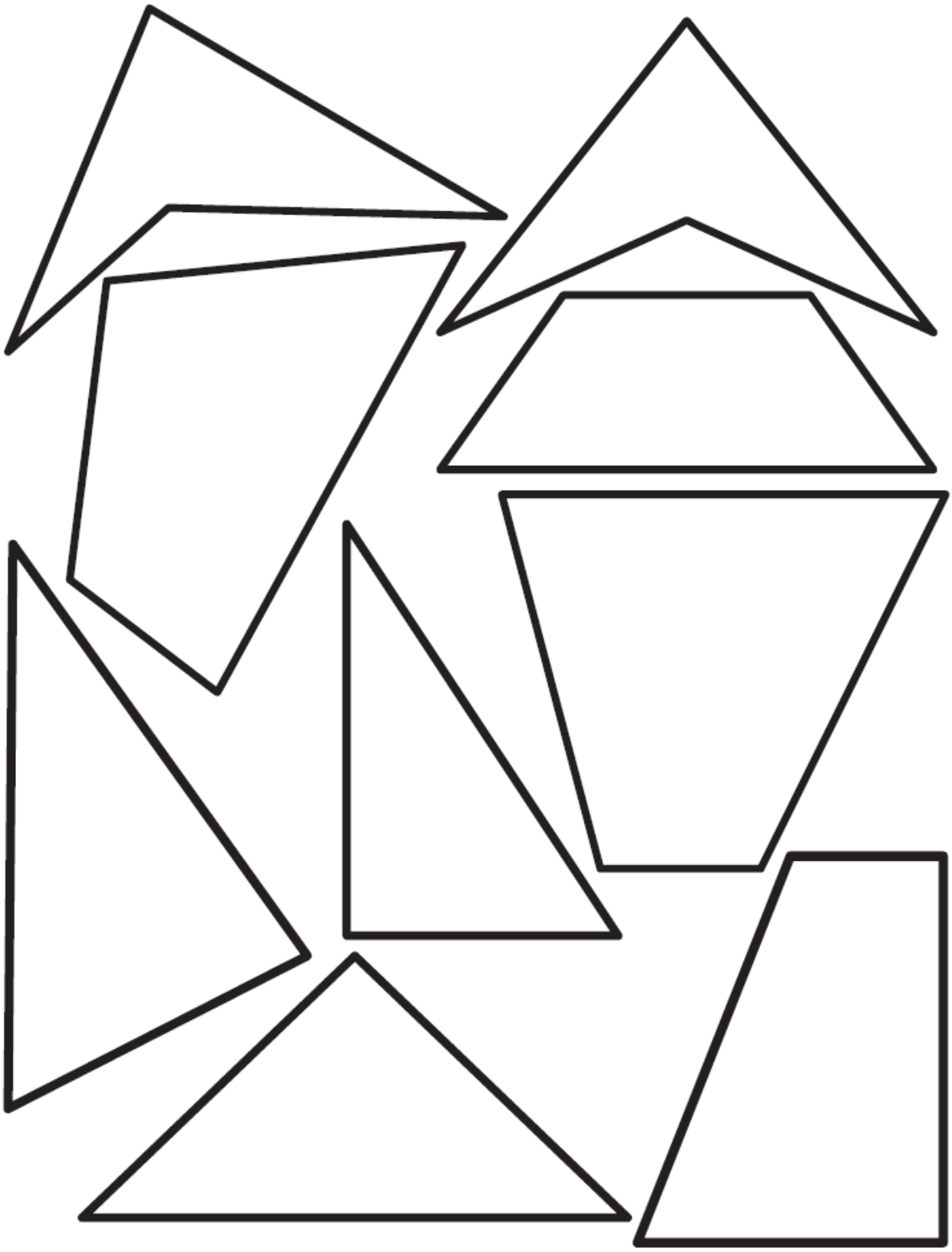
- For students who are having difficulty sorting the shapes, give them a set of attribute blocks they can pick up and feel.
- "Shape Sorts Expanded Lesson" (Van de Walle, page 331): Have students work in groups of four with a set of 2-D shapes. Each child randomly selects a shape. In turn, the students tell one or two things they find interesting about their shape. There are no right or wrong responses.

TECHNOLOGY LINK

Students can access interactive attribute blocks at *The National Library of Virtual Manipulatives* website: http://nlvm.usu.edu/en/nav/topic_t_3.html







Task 3

PRACTICE TASK: Which One Doesn't Belong?

Approximately 1-2 days
Adapted from Math Connections: Linking Manipulatives and Critical Thinking by David J. Glatzer and Joyce Glatzer (1997) by Dale Seymour Publications.

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

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. Students will explain why their blocks don't belong and discuss the reasoning for their decision.**
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/COMMON MISCONCEPTIONS

In first grade, children should be able to distinguish between a shape's defining attributes (e.g., number of sides, closed) and irrelevant attributes (e.g., color, size, orientation). They also work on composing shapes to create new shapes and begin to decompose shapes into smaller shapes (Van de Walle, p. 300). Students should understand that there is not always only one answer.

ESSENTIAL QUESTIONS

- What makes a shape different from other shapes?
- How can we group certain shapes together? Why do they belong together?

MATERIALS

- Pattern blocks
- "Which One Doesn't Belong?" task sheet
- Brown bag

GROUPING

Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
The students will be shown four pattern blocks, three of which have some similar properties or characteristics (based upon, shape, size, color, thickness.) Discuss which three belong together and why. Have students justify their reasoning. The teacher can decide how the students share their choices and their reasoning. Provide several examples. Next allow the students to work with a partner and create some examples. Allow students time to share their examples and have other students identify which one doesn't belong and why.

Having students explain WHY they respond to the answer that they give is extremely important. Encouraging student discussions about how or why other answers could also be correct will enrich student understanding. Once students are familiar with the language, they are able to make-up their own questions. Please note there are some examples that could have multiple correct answers. Answers are correct as long as students are able to justify them.

Part II
The Teacher will place pattern blocks in a brown paper bag. One student will come to the front of the room and grab a handful of blocks from the bag. The student will show the blocks to the class, describe the blocks and decide which one(s) does not belong. The teacher will want to model this prior to the students completing in front of the class. The student will place the blocks back in the bag and another student will repeat. Complete this activity several times until the students have grasped the concept of which one does not belong.

Part III
Show students the "Which One Doesn't Belong" task sheet. Students will look at the shapes in each box and think about how the shapes are alike. One of the shapes does not belong. Students will choose the shape and describe how the shape is different. The first puzzle could be done together. Please note that there could be multiple correct answers as long as the students can justify their response.

FORMATIVE ASSESSMENT QUESTIONS

- Can all pieces be the same?
- What makes your one shape different from the other shapes?
- Is there more than one difference?
- Could you have grouped your shapes any other way?
- Can you think of another shape that would fit into the group with the other three shapes?

DIFFERENTIATION

Extension

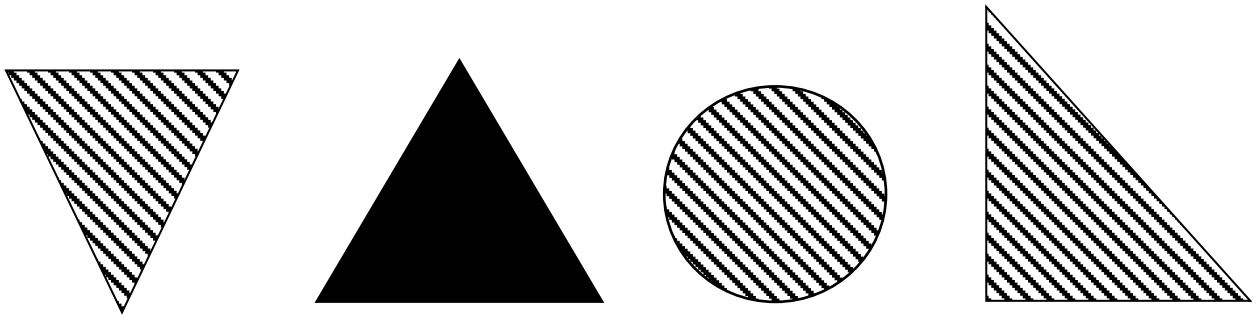
- Have students look through a magazine and cut out several shapes from the real world. They can use these shapes to make their own task cards. They could trade with a partner to find the shape that doesn't belong.

Intervention

- Use a smaller simpler set of shapes, such as a set of three where two of the shapes are obviously alike (square and rectangle) and one that is obviously different (circle). You could also start with animals, everyday objects, etc that they would be familiar with from kindergarten.
- Provide a list of attributes the students can use to compare the shapes.

Name Date

Which One Doesn't Belong?



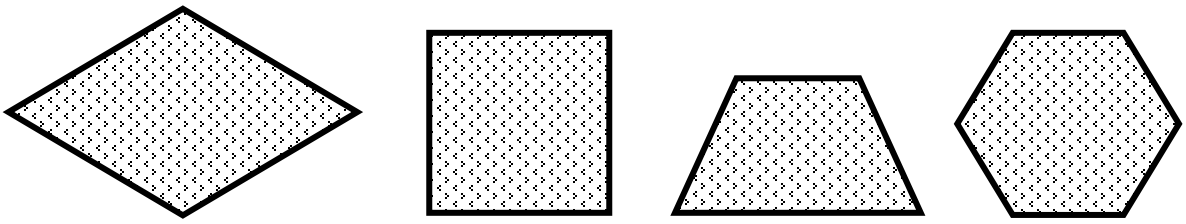
A B C D

Shape _____ doesn't belong because _____

_____

_____.

Which One Doesn't Belong?



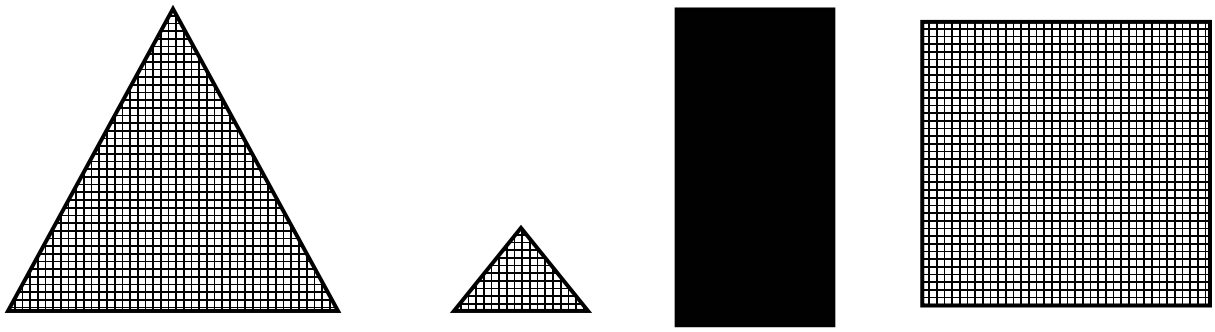
A B C D

Shape _____ doesn't belong because _____

_____

_____

Which One Doesn't Belong?



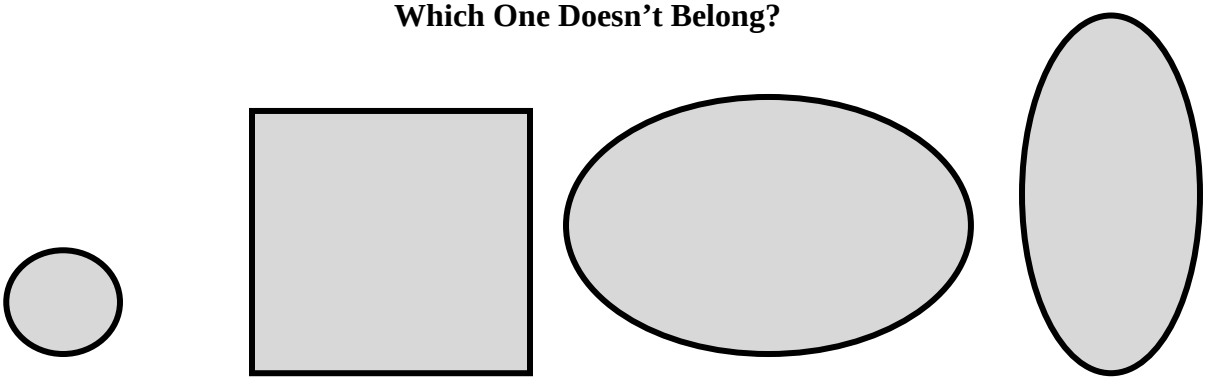
A B C D

Shape _____ doesn't belong because _____

_____

_____

Which One Doesn't Belong?



A B C D

Shape _____ doesn't belong because _____

_____

_____

Task 4

CONSTRUCTING TASK: Build a Shape

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

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. Student create models of different shapes in many ways.**
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/COMMON MISCONCEPTIONS

Students should be familiar with each shape before being asked to construct. According to Van de Walle (2014), “In this content area, children are finding out what make shapes alike and different, and in the process they will begin to discover properties of the shapes, including the conventional names for these properties.” (p. 306)

ESSENTIAL QUESTIONS

- How can I create a shape?
- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How can a shape be described?

MATERIALS

- *The Greedy Triangle* by Marilyn Burns or other similar book
- Drinking straws
- pipe cleaners
- Prior to the start of this task, cut drinking straws and pipe cleaners into fourths and place into plastic bags
- plastic sandwich bags
- Straw Shapes Recording Sheet
- Chart paper
- Long pieces of yarn (or other similar material such as ribbon, elastic string, etc.), one per student

GROUPING

Large Group

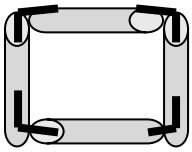
TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Read *The Greedy Triangle*, a book about a shape that wanted to be something else (or other similar book about various shapes). Discuss the shapes in the story, what the shape-shifter does to create a new shape (adds one side and one angle) and the real world connections in the pictures. As you are reading, record any new information from the story on chart paper.

Part II
Ask students if they think they could build shapes using their bodies. Give each child a long piece of yarn (or other similar material), to use to create a shape. Call out a shape and have students create a way to use their bodies and the yarn to make the shape (For example, name a triangle for students to make. Students could spread their feet apart while standing on the yarn, lift up the two ends of the yarn and bring the two ends together with raised hands to create a triangle). Repeat this activity by naming several other shapes for students to create independently or with a partner.

Part III
Students will use straws, pipe cleaners, or other manipulatives to recreate a triangle, rectangle, square and trapezoid. Tell the students that the straws are the sides and the pipe cleaners are the corners. Model how you connect the straws and pipe cleaners to create a shape (sample below). The teacher will read *The Greedy Triangle* aloud to the students again. The students will create the shapes with the straws and pipe cleaners as the teacher comes to each shape. This will allow students to practice constructing shapes with the materials provided.

The teacher will hand out the Straw Shape Recording Sheet and the students will work independently to complete. Allow students to look through the book or around the room to help with the real world connections.



FORMATIVE ASSESSMENT QUESTIONS

- How many sides does a triangle, rectangle, pentagon, etc. have? Can you show me?
- How are these shapes different from one another?
- How are the shapes alike?
- How do shapes fit together and come apart?

DIFFERENTIATION

Extension

- Challenge students to make other shapes with the straws and pipe cleaners. Ask students questions similar to: "Would you still have a triangle if two sides were longer than the third side? Why or why not?"
- Allow students to explore creating a cube with the straws and pipe cleaners.

Intervention

- Supply students with model shapes to follow as they create each shape. Assist with the first shape.
- Create a workmat to model to scale shapes for students to build on.

Name_____

Straw Shapes Recording Sheet

Directions: Create the following shapes using straws as the sides and pipe cleaners as the corners. Fill in the chart below.

Name	Number of Sides (straws)	Number of Corners (pipe cleaners)	Draw the Shape	Write an object that is similar to this shape
Triangle				
Rectangle				
Square				
Trapezoid				
Hexagon				

Task 5

CONSTRUCTING TASK: Partitioning All Around My Shapes

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are **closed** and **three-sided**) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

MCC1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

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. Students compose and decompose shapes.**
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/COMMON MISCONCEPTIONS

Students should understand how to construct plane shapes. Students should be familiar with composing and decomposing shapes.

ESSENTIAL QUESTIONS

- How can a shape be described?
- How do shapes fit together and come apart?
- What makes shapes different from each other?

MATERIALS

- Large construction paper square for demonstration
- *Shapes, Shapes, Shapes* by Tanya Hoban, or a similar book about shapes
- construction paper
- scissors
- glue
- Student shape page

GROUPING

Large Group, Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

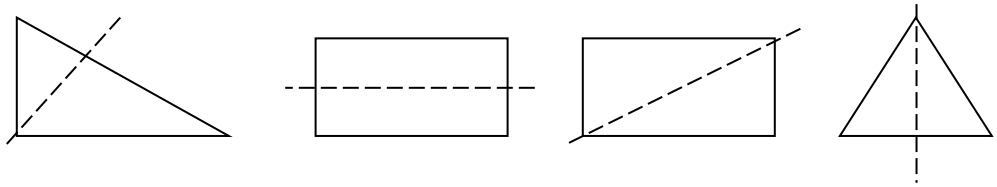
Part I
Read *Shapes, Shapes, Shapes* by Tanya Hoban (or another book about shapes). Review shapes by having the students find shapes in the classroom. Tell students, "Today, we want to see how many different shapes we can create using a square." Display a large square to the students and ask, "What will happen if I cut this shape straight down the middle? What shapes will be created?" During the conversation, student responses may be "Another square, two squares, or a rectangle and a square." After the teacher makes the cut and the students discuss the result, present the conversation about squares and rectangles.

Good questions to ask: "Why do we call these two shapes rectangles, not squares? How do you know a shape is a rectangle, but not a square? How are rectangles and squares alike? Are all rectangles squares? DO NOT ASK WHAT MAKES A SQUARE DIFFERENT FROM A RECTANGLE BECAUSE ALL SQUARES ARE RECTANGLES, BUT NOT ALL RECTANGLES ARE SQUARES. Instead, ask something like this: What makes a square special? A square is a rectangle, but what makes it a square? Ask students, "What characteristics does a rectangle have? To be a rectangle, what characteristics do I have to have? Are those the same characteristics needed to be a square?"

You are leading the students to an understanding that all squares are rectangles, but not all rectangles are squares. Discussion should continue with idea that squares are special kinds of rectangles. Horizontal, vertical and diagonal vocabulary could be used. Emphasize the lines that students cut have to be ***straight*** **horizontal, vertical, or diagonal and then demonstrate these to the students.** Example cuts should include ones that are **not** just straight through the middle; instead the teacher should snip off one corner demonstrating a small cut. This will show students their cuts can be of various lengths. Take turns having one student demonstrate a cut and then other students model the same cut.
As one piece is cut off, teacher will lead students in a discussion of vocabulary terms of possible shapes such as: trapezoids, triangle, rectangles, and quadrilaterals. Be sure to save pieces that are snipped off in the individual zippered plastic bags for students, so that they can use them later

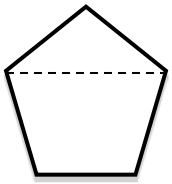
in a center to compose and decompose shapes. As students create various shapes, they can label for future investigations.

Examples of cuts that can be made:



Part II
Give each student a set of shapes (attached.) Tell them to cut out each shape and see what shapes can be made by making one cut. Have the students glue their pieces down puzzle style. Have each student share how they cut one of their shapes and identify the new shapes they made.

Ex. Triangle and trapezoid



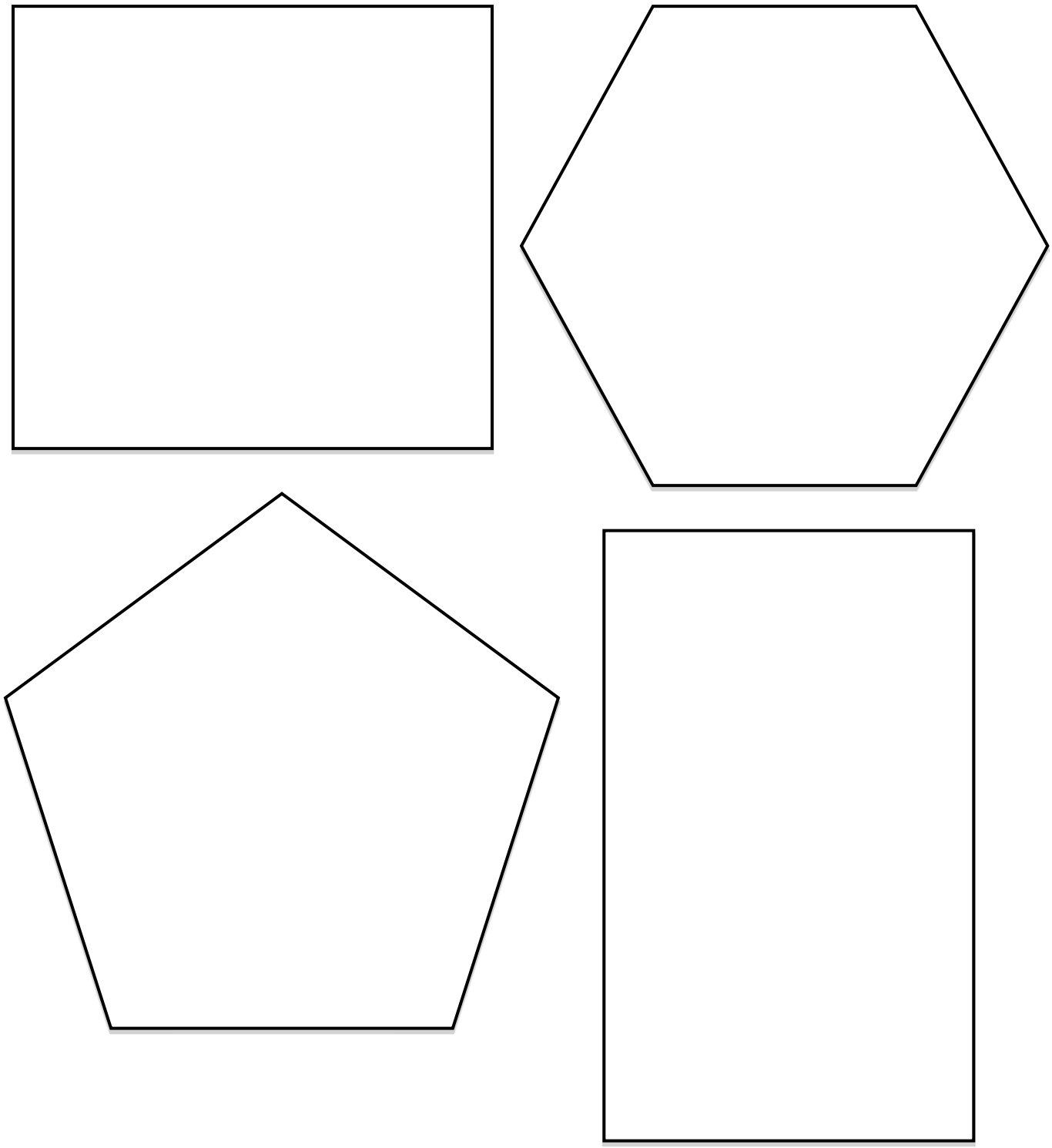
FORMATIVE ASSESSMENT QUESTIONS

- How many sides do a triangle, rectangle, pentagon, etc… have? Can you show me?
- How are these shapes different from one another?
- How are the shapes alike?
- How do shapes fit together and come apart?

DIFFERENTIATION

Extension
- Ask students, "What kind of shapes would be created by making two cuts?" Allow students to explore with combining three shapes to create a new shape.

Intervention
- Allow students who may be having a difficult time describing or making the shapes extra time with pattern blocks as a model. Students could also use tangram pieces if they are having difficulty with the cuts.



Task 6

PRACTICE TASK: Pattern Block Pictures

Approximately 2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

MCC1.MD.4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

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. Students discuss why they matched each clue with a specific shape.
4. Model with mathematics. Student compose shapes.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure. Students combine the structure of shapes to create new shapes.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

Students should be familiar with combining shapes to create new shapes from the previous task, *Partitioning All Around My Shapes*. Students should also be familiar with recording information using tally marks.

ESSENTIAL QUESTIONS

- How can a shape be described?
- How do shapes fit together and come apart?
- What makes shapes different from each other?

MATERIALS

- Pattern blocks (in bags for each student)
- Pattern Block Tally Chart/Story recording sheet
- Plain paper (one per child)
- Crayons/markers
- Precut shapes for demonstration (triangle, rectangle, trapezoid and square rectangle)

GROUPING

Large Group, Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Gather students in a common area. Display a precut construction paper triangle, rectangle (that is not a square), trapezoid and a square rectangle. Tell the students you have clues and you would like for them to match the clue to the shape. Give each pair of student's one clue. Have them read the clue and place under the correct shape. Read and discuss answers. Many statements that fit under square will also fit under rectangle because ***all squares are rectangles.*** Additional statements could be added about where we find these shapes in the real world.

Ex. This clue could go under square, trapezoid or rectangle.

has four sides and four corners

Part II
On the board, model combining shapes to create new shapes. Next give each student a zippered plastic bag of pattern blocks. Have students practice putting shapes together to create a new shape. Have students trace the pattern blocks on paper and discuss attributes of each shape. Be sure to name the number of sides, number of corners, as well as shapes that can be combined to create other shapes. For example "I combined two squares to make a rectangle." *If a white board is available, you could do this on the white board using the link below.*
http://illuminations.nctm.org/activitydetail.aspx?id=27

Allow students a few minutes to practice tracing shapes. Have students create a picture using at least a dozen of the pattern block shapes. Encourage students to combine multiple pieces together so that the picture is made up of pattern block shapes touching. You may want to provide an example for students to see how pattern blocks can be combined. Once students have created their pictures, have them trace one shape at a time before removing it from the design.

Part III

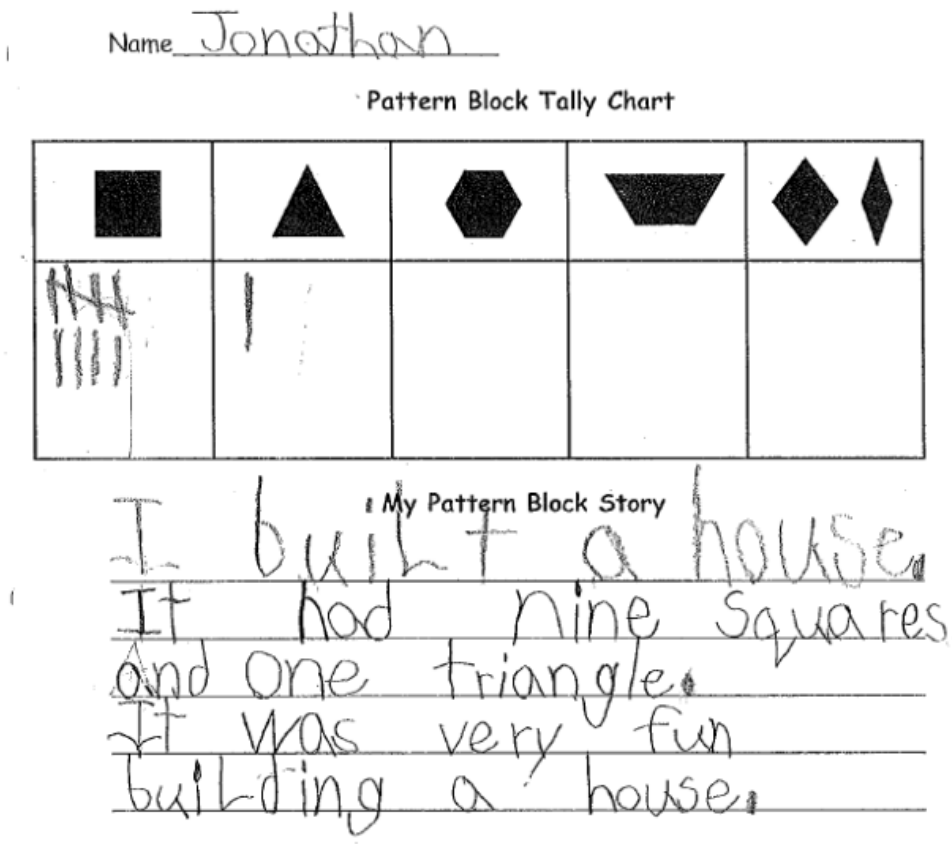
Close lesson with discussion of modeling an understanding of the fact that you used several shapes to create a picture that is not a regular polygon. That it is composed of several shapes. Display your picture and have students name the shapes used and discuss the attributes of each.

Part IV

Using the Pattern Block Recording Sheet, have students place a tally mark to record the number of each shape used to create their picture. Then students should write a story about their picture.

As a class, students share their individual shape totals in order to create a class tally chart. Students could then generate questions that could be answered using this information.

<u>Sample Student Work - Pattern Block Recording</u>



FORMATIVE ASSESSMENT QUESTIONS

- Which shape did you use the most of? Least of?
- What are you noticing about these shapes? What do they have in common? How are they different?
- Did any of your shapes combine to form other shapes?
- Which shapes are easy to combine? Why do you think this? Are any hard to combine? Why?
- What else did you discover?

DIFFERENTIATION

Extension

- Have students create questions about their own shape tally chart and create a graph about their picture. "Which shape did you have more/fewer of? How many more/fewer?"
- Students could glue shapes down and create shape again on top. This would help them as they count tallies for the chart.

Intervention

- If tracing is too time consuming for some students, skip this part and give them the precut shapes. Ask the student to identify the name of the shape and the number of sides it has verbally.
- Students may also make their pattern block picture and tally the number of shapes before gluing them down. This will allow the student to sort them into like groups first.

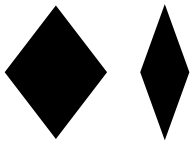
Technology Link

http://illuminations.nctm.org/activitydetail.aspx?id=27
Illuminations pattern blocks website

has four sides	has 2+1 corners
has more than 3 sides	has four corners
has two straight sides	can be made by putting two triangles together
has fewer sides than a trapezoid	has three sides
is the shape of a window	has three corners

Name_____

Pattern Block Tally Chart

My Pattern Block Story

_____

_____

_____

_____

_____

_____

_____

_____

_____

Task 7

CONSTRUCTING/PERFORMANCE TASK: Day At The Museum

Approximately 2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

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. Students discuss and explain their reasoning about 2D and 3D shapes.**
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. **Look for and make use of structure. Students use structures to locate specific items for the shapes museum.**
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

As children explore their geometric world, they should have experiences with a rich variety of both two- and three-dimensional shapes (Van de Walle, p. 306). Students will have some background knowledge on what defines two dimensional or three dimensional shapes, but they may need additional assistance and guidance as you work through the task.

ESSENTIAL QUESTIONS

- Where can we find shapes in the real world?

- How can a shape be described?
- What is a 2-dimensional shape?
- What is a 3-dimensional shape?

MATERIALS

- Geometric solid models for: cylinder, cone, and rectangular prism
- Modeling clay or play dough
- Connecting cubes
- *Captain Invincible and the Space Shapes* by Stuart J. Murphy
- Before reading, prepare a chart/organizer to record characteristics of the three dimensional figures while you read the story.
- File folders cut in half or half sheets of contruction paper (See Part IV)
- Pictures of 2-D shapes (see Part IV)

GROUPING

Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Read *Captain Invincible and the Space Shapes* by Stuart J. Murphy or other book about 3D shapes. Prepare a chart/graphic organizer to record the characteristics of the three-dimensional figures as you read the story. Pass around solid 3D shapes (cube, right rectangular prism, right circular cone, right circular cylinder) and ask students to describe how each one looks and feels and record these characteristics in the graphic organizer. Ask the students, "How are these different from the shapes we have been using?" Allow students to engage in the conversation that defines the difference between 2D and 3D. More than likely students will identify the obvious characteristics. The teacher may guide the conversation if needed. Add any additional information to the chart created above if needed.

One way to describe a 2D shape is to explain that it only has 2 dimensions such as, width and height, but no thickness. Then, show students examples of 2D shapes such as a triangle, a circle, a rectangle, etc. Then, compare the 2D shape to a 3D shape and guide students to an understanding that a 3D shape has height, width, *and* depth. Describe the components of a 3D shape by pointing out the faces, vertices, and sides.

It is natural for students to initially talk about the faces as "sides" but as you talk about them make sure to use the word faces not sides.
Gradually the students will pick up on this and will start calling the "sides" faces. This is important because "side" actually refers to a two dimensional shape. When you are talking about

a three-dimensional shape, for instance a cube, it has 6 faces but 12 edges. Each face has four sides.

Part II
Have students work at their seats for the next activity. Give students connecting cubes and ask, *What shape does each connecting cube remind you of? What shapes can be made using these connecting cubes?* Allow students to work with the cubes to create other 3D shapes, share their creations, and have a class discussion of each.

Part III
After a class discussion on the differences between three dimensional and two dimensional shapes, explain to students that they will go on a shapes hunt in the school to identify 2D and 3D shapes found within their environment. Tell them that they will work with members of a group to locate specific items on a list and bring them back or take a picture of the items to include in a "Shapes Museum".

Divide students in to groups and assign them each a specific list of items to locate, such as:

- Two or more shapes that make another shape
- Solids that are like a box, a cylinder, a pyramid, a cone
- Five shapes that are alike in some way

Give students the option to take a picture with a digital camera, draw a picture, collect the items, or make the shapes using clay, to display in a "Shapes Museum" in the classroom.

Part IV
Students will work with a partner to play, "What's My Shape" (Van de Walle, Activity 7.2, page 195). Make a set of 2-D shapes on paper. Cut out a third of the shapes and paste each inside a folded half-sheet of construction paper to make "secret shape" folders. One student will be the leader and the other will hold the secret shape folder. The leader will ask yes or no questions about the shape to lead to a correct guess.

FORMATIVE ASSESSMENT QUESTIONS

- Is this object exactly like our model? How is it the same? How is it different?
- Which solid is the hardest to find in the classroom? Why?
- What do you notice about the faces of objects?
- Where would you find _____ at your house?
- How are the students describing the shapes they are finding?
- Tell me about the shape you are looking for? The shape you found? (What attributes are the students using to describe the shape?)

DIFFERENTIATION

Extension

- Students could determine attributes and then use that information to graph objects from the "Shape Museum".
- A home connection could be made by sending a parent letter asking for students to search for solids they could bring back to school to add to the "Shape Museum" or to share during show and tell.

Intervention

- Give students who struggle cards with examples of 3-D solids that can be used when they are looking for objects for the "Shape Museum."

Task 8

CONSTRUCTING TASK: Shape Detective

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are **closed** and **three-sided**) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

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. Students compare and contrast shapes.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure by comparing and contrasting based on attributes of shapes.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

As children explore their geometric world, they should have experiences with a rich variety of both two- and three-dimensional shapes (Van de Walle, p. 306). Students should be familiar with two and three dimensional shapes. The students will investigate the similarities and differences in this lesson.

ESSENTIAL QUESTIONS

- How are shapes alike and different?
- How can a shape be described?

MATERIALS

- Geometric solid models (for tracing)
- 2-D shape models (for tracing)
- Student copy of graphic organizer
- Sticky notes/note cards
- *Shapes That Roll* by Karen Berman Nagel

GROUPING

Large group, Independent

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Read *Shapes That Roll* by Karen Berman Nagel or a similar book about shapes. Ask students to picture their favorite shape in their head. Tell them it can be a 2D or 3D shape. Give each student a sticky note or note card to draw the shape. Have students return to the carpet when done. Ask, "How can we organize your favorite shapes?" Have the students sort their favorite shapes, naming and describing their shape as they put it in place. Discuss results.

Part II
Tell the students you noticed that some students chose 2D shapes like triangles, while others chose 3D shapes like cubes (or another 3D shape chosen by students. If a student did not choose, you could add one as your shape). Draw everyone's attention to the sort/graph. Some of these shapes have attributes in common and some are very different. Today, you will be detectives and discover how two shapes you choose are alike and different.

Lay out a set of 3-dimensional shapes and 2-dimensional shapes. Have each student choose a shape. Then have students choose a partner and compare their shapes with each other. They will then each complete the section on their "Shape Detective" activity page. Have students do this three more times with new partners/shapes. Remind them to compare and contrast their shapes. When time is up, have students choose one section of their "Shape Detective" page to share with the class. During share time, ask, "Did you find any similarities or differences with both of your shapes?"

FORMATIVE ASSESSMENT QUESTIONS

- How would you describe the shapes you chose?
- Tell me about the faces on your shape.
- How are these shapes alike? Different?
- Are students counting sides, faces, corners?
- Do most students choose the solid they are most familiar with, such as a rectangular prism? Which ones are they not choosing?

DIFFERENTIATION

Extension

- Van de Walle's Activity 16.9, page 311, *Feeling It*, uses a box, bag, or sock to place a secret shape in. The student puts their hand in the box, without peeking, and describes the shape using mathematical language while the other students try to guess what shape it is.

Intervention

- To increase awareness of shape attributes, have students choose a 2D shape to compare and contrast with another 2D shape.
- Provide a list of defining and non-defining attributes students can refer to, to complete "Shape Detective" activity page.

Name_____ **Date**_____

Shape Detective: Draw or trace one shape in each box.

A _____ is similar to a _____because they
_____

They are not alike because _____
_____

Shape Detective: Draw or trace one shape in each box.

A _____ is similar to a _____because they
_____

They are not alike because _____
_____

Task 9

CONSTRUCTING TASK: Fractions Are As Easy as Pie!

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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. Students use models to express representations of fractional parts.**
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/COMMON MISCONCEPTIONS

Students often think of half as any part of a whole, rather than one of two equal parts and they often refer to one half as being larger than another. It is important to build on student's previous experiences and clarify the ideas they have encountered. Provide many opportunities throughout the year for children to make sense of fractions, use fractional language, and represent fractions with standard symbols (Burns 2007). Be sure to include a variety of experiences for students to divide many varied shapes of objects (circles, rectangles, squares, etc.).

ESSENTIAL QUESTIONS

- How can we divide shapes into equal parts?
- How can we be sure that we have equal parts?
- Why is it important to divide into equal parts?

MATERIALS

- Large sheet of paper to represent cake
- 3 sheets of construction paper, per student
- Crayons or counters
- Paper clips (one per child/team)
- *A Fair Bear Share* by Stuart J Murphy or similar book on fractions
- 1 copy of "Fraction Fill In" game board and spinner per student

GROUPING

Large group, small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Gather students in a common area. Hold up one sheet of paper. Tell students that the paper represents a cake that four students won at the fair and then fold it unevenly. Tear off three small pieces to give to the three random students and then give the one big piece to a fourth student. Ask, "Is this fair? Why do you say that? What should I do to make it fair?" Invite further discussion with students about situations where they have had to share things such as cookies, candy or toys, and listen for them to verbalize the importance of making sure everyone gets a fair share.

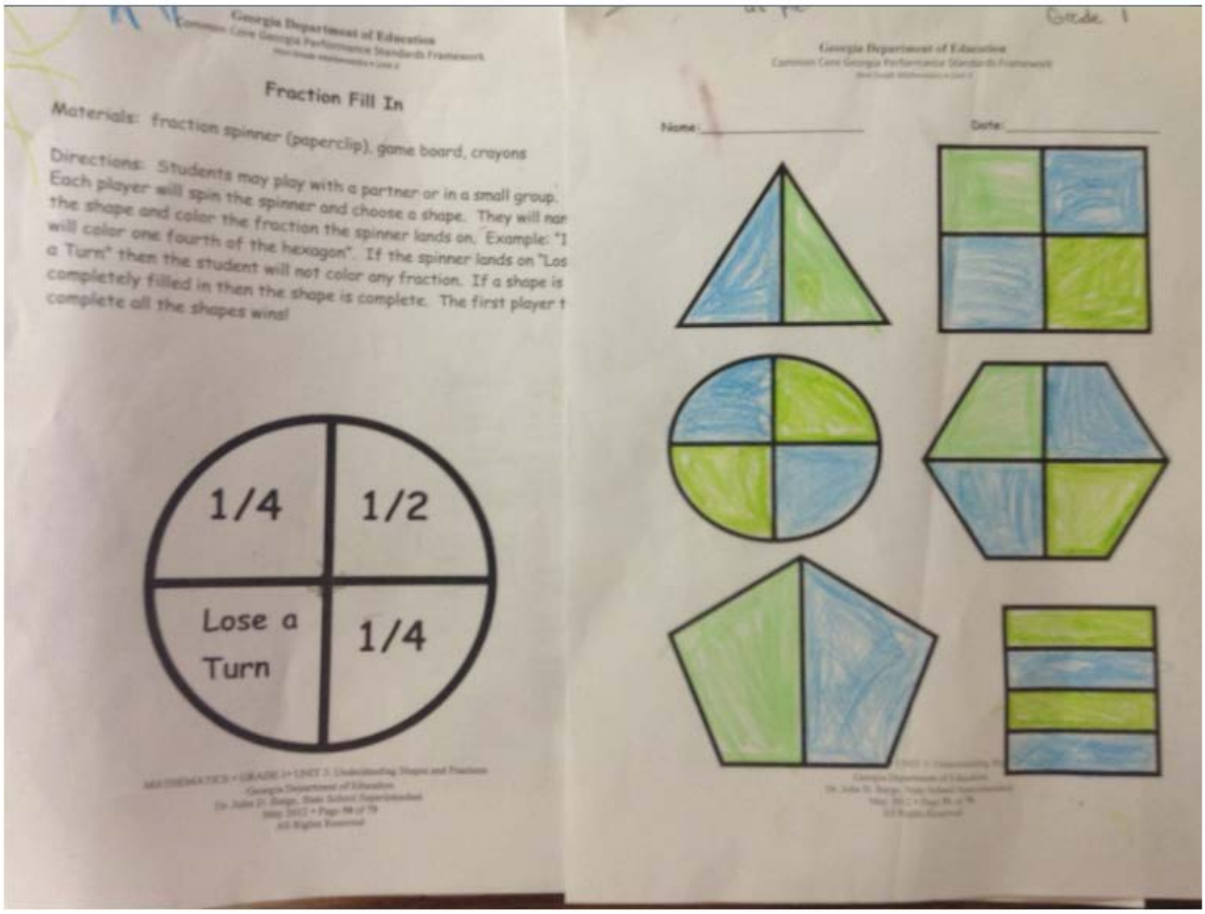
Part II
Gather students together in a common area and read *A Fair Bear Share* by Stuart J Murphy or similar book on fractions. After the story, remind students of the cake scenario you discussed before reading. Ask "Is there a way to cut the cake so it will be fair?" Allow students to share ideas.
Give each student 3 sheets of construction paper that are the same size. Tell the students that these represent 3 whole cakes. Have them label one of the sheets with the number one (because it represents one whole cake). It should also be labeled "one whole."
Next, tell the students they are going to share the second cake (piece of construction paper) with one friend. Tell them to fold the paper in a way that it will create two equal pieces. Keep in mind some students may fold their paper vertically, horizontally or diagonally. Allow all representations to be shared and discussed. Ask questions such as: "Are these two representations of ½ the same size?" How do you know? Can you prove it? Is there a way to cut one and rearrange it to fit into the other one?"
The teacher should demonstrate, through cutting and rearranging, that the two representations of ½ are the same size. Label each part of the second "cake" with both the fraction ½ and the word one-half.
For the third sheet of construction paper, tell the students they are going to share this cake with 3 friends and fold it in a way that creates four equal pieces. Some students may fold it vertically (like a fan) or vertically and horizontally (making a grid). Allow both representations to be

shared and discussed. The discussion for ¼ should be similar to the one you had related to ½. Label each part of the third "cake" with both the fraction ¼ and the words fourths and quarter. Make sure to ask students "What is happening to our pieces as we add more folds to the paper? Why is this happening? What if we shared this cake with ten people, would we get more or less cake? How do you know? Which is bigger ½ or ¼? (Or ask in this way, *Which is larger, one half or one quarter?)* Can you prove it?"

While students are working, look to see that the children are dividing the rectangles into equal portions. The measurements do not have to be exact, but they should be very close in size.

Part III- Fraction Fill In Game

Students will work with a partner to play, *Fraction Fill In* to develop proficiency with fractions. To use spinner, put a paperclip in the middle. Hold it in place with the tip of the pencil. Have the student thump the paper clip to spin and see where it lands.



FORMATIVE ASSESSMENT QUESTIONS

- How can you divide the paper into fourths and halves?
- How can we be sure the parts are equal?
- Why is important to divide things into equal parts?
- Are these parts equal? How do you know?
- Which is bigger-1/2 or ¼? How do you know?
- What does ½ look like? ¼? 1 whole?

DIFFERENTIATION

Extension

- Give each student a piece of construction paper. Have them explore making several equal parts by folding. How many equal parts can they make out of one piece of construction paper?

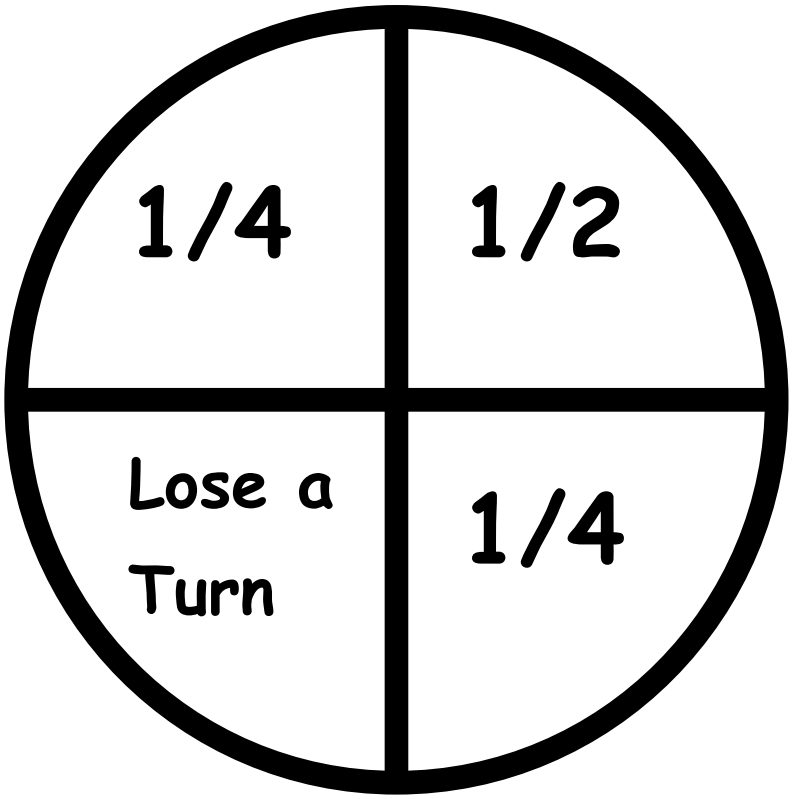
Intervention

- Have two sets of large precut rectangles. One set should already be divided into fractions and labeled. Students can match the fractional rectangle puzzle pieces to the whole rectangle shape. Using this as a guide, they will then divide, label, and color their own rectangle.
- If available, use fraction models, such as circular pie pieces or fraction rectangles to build understanding.

Fraction Fill In

Materials: fraction spinner (paperclip), game board, crayons

Directions: Students may play with a partner or in a small group. Each player will spin the spinner and choose a shape. They will name the shape and color the fraction the spinner lands on. Example: "I will color one fourth of the hexagon". If the spinner lands on "Lose a Turn" then the student will not color any fraction. If a shape is completely filled in then the shape is complete. The first player to complete all the shapes wins!



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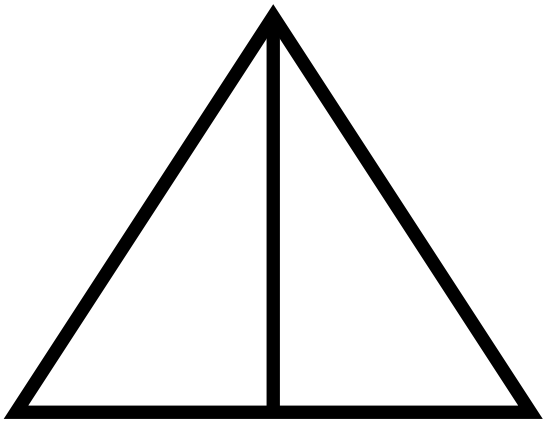
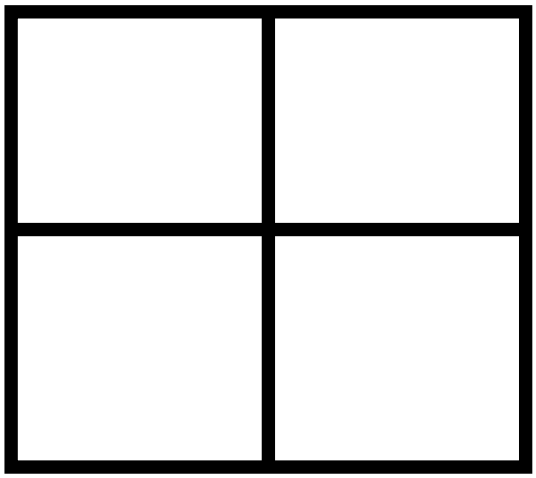
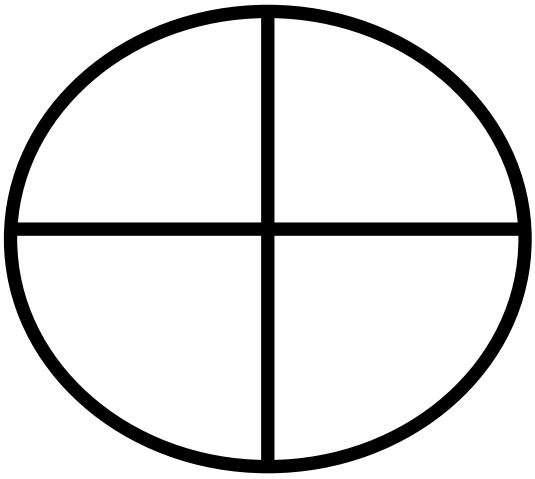
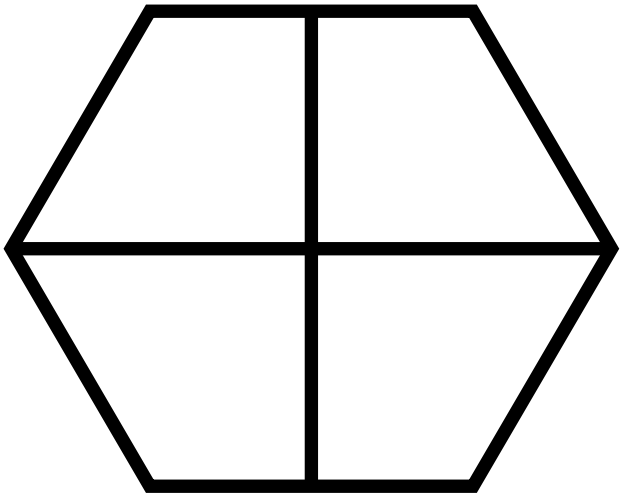
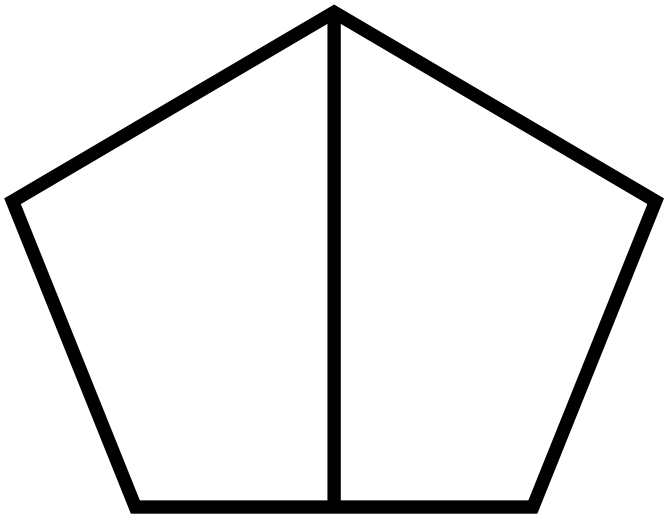
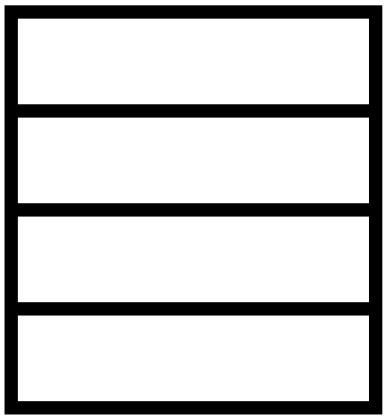












Task 10

CONSTRUCTING TASK: I Want Half!

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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. Students explain and discuss their reasoning for decomposing shapes.
4. Model with mathematics. Students use pattern blocks to compose and decompose shapes.
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/COMMON MISCONCEPTIONS

Students often think of half as any part of a whole, rather than one of two equal parts and they often refer to one half as being larger than another. It is important to build on student's previous experiences and clarify the ideas they have encountered. Provide many opportunities throughout the year for children to make sense of fractions, use fractional language, and represent fractions with standard symbols (Burns 2007). Sharing tasks should be presented in the form of a story problem. Over time, change the task difficulty by changing the numbers involved, the types of things to be shared, and with the presence or use of a model (Van de Walle & Lovin 2006).

ESSENTIAL QUESTIONS

- How can we divide shapes into equal parts?
- How can we be sure that we have equal parts?
- Why is it important to divide into equal parts?

MATERIALS

- *Give Me Half!* by Stuart J Murphy or similar book
- 5 brown rectangles, for teacher demonstration
- Bags filled with a set of pattern blocks for each pair of students
- Paper for drawing and writing
- Many sets of fractional parts (fraction strips, pattern blocks, etc.)

GROUPING

Large group, small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Have the students gather in a common area. Ask students if they have ever had to share something with someone and invite them to share their experiences with a buddy next to them. Allow a few students to share with the whole class. Next, share with the class the title of the book you are about to read, *Give Me Half!* by Stuart J Murphy or similar book. Have them make predictions about the story before reading.

At the conclusion of the story, review what it means to have half of something (that there are two equal parts*).* Discuss situations in which you would make half of something and give students a variety of examples.

Part II
Show students one brown rectangle and tell them that it represents a brownie that you made to share with another student. Invite one student to join you in front of the group. Ask students, *How can this brownie be shared equally between me and* _____ *?* Allow all students who want to share their solution to do so and discuss each. Divide the rectangle equally between you and the other student and ask, *Which two shapes can be used to create a whole rectangle? How do I know that these are fractional parts? What fraction did I create when I divided the rectangle (brownie)?*

Part III
Give each pair of students a bag full of pattern blocks. Tell them they are going to act like the children in the story and share their materials. Have students find the yellow hexagon and review its attributes. Next, ask students to find another shape in their bag that could be used to cover up only half of the hexagon. Facilitate the investigation with a discussion like, "Think about the two children in the story. If they have to share this hexagon, how much will each one get? (half) What shape represents half of the hexagon? (red trapezoid) How do you know? (It takes two to cover it up). Why didn't you say the triangle? (It takes 6 of triangles to cover it up.)
What if you only had triangles to use, could they still get half of the hexagon? Prove it: how many would each child get? (3) Would that be half of the hexagon? (yes) How do you know?

(Each person gets the same amount. Is there another shape that covers the hexagon? (yes, blue rhombus) How many does it take? (3) Would one of those three pieces make half of the hexagon? (no) How do you know? (It can't be shared equally by two people).

Part IV
In small groups, have students play "More, Less, or Equal to One Whole" (Activity 14.4, page 262. Van de Walle). Give students a collection of fractional parts and have students decide if the set is less than a whole, equal to a whole, or less than a whole.

Part V
Have students describe and illustrate something being shared equally in their math journal. They can draw a picture of the story they told their partner, what their buddy told them at the beginning of the lesson, or they can draw a picture of something else. For students having difficulty thinking of an object that can be shared, show them picture prompts to get them started.

FORMATIVE ASSESSMENT QUESTIONS

- Are students able to show what "equal shares" look like?
- (see Part III)

DIFFERENTIATION

Extension
- "Finding Fair Shares" (Activity 14.2, page 261. Van de Walle) Give students models and have them find thirds, fourths, etc using the models.

Intervention
- Provide students with paper shapes (wholes and halves.) Have students glue a half on each whole to help build the relationship.

Task 11

PRACTICE TASK: Half and Not Half

Approximately 1-2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively. Students abstractly divide groups into fractional parts.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics. Students make models of fractional parts of whole sets.
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/COMMON MISCONCEPTIONS

Students should be familiar with fractions of a whole and of a whole set.
According to Van de Walle:

> "In the primary grades the use of models to explore fractions is essential. Students can represent fraction concepts with physical materials and drawings in many different ways. Not only should students use these models, but also they should explore fractional concepts with a wide variety of models so that fractions don't simply become 'pie pieces'." (Van de Walle & Lovin 2006)

ESSENTIAL QUESTIONS

- How can you show half of something?
- How do we know when parts are equal?

MATERIALS

- *Eating Fractions*, by Bruce McMillan or a similar book about fractions
- Various examples of fractional parts and non-fractional parts (made of construction paper, fraction strips, pattern block sets, etc.) for teacher demonstration
- A set of pencils, some sharpened, some unsharpened for teacher demonstration
- Colored square tiles
- Half and Not Half recording sheet
- crayons

GROUPING

Large group, individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Gather students to a common area for math discussion. Review what it means to have a whole object and to divide it in to fractional parts. Lead students to discuss that fractional parts must be equal and that they are parts of a whole. Also review a few examples of when they have made fractional parts of a whole by dividing an object in half and then explain that you do not always have to cut or divide a whole object to have fractional parts. Explain to students that fraction of a whole, can also mean a *whole set*.

Read the book, *Eating Fractions* by Bruce McMillian. After reading, show students various examples of fractions and non-fractions. Lead a class discussion about each set of fractional and non-fractional parts by using the following questioning, "*Based on your knowledge of fractional parts, which sets of objects or whole shapes are or are not, divided into equal parts? If they are, then what fraction could name this set or part of the whole? If you do not think they are fractional parts, then justify your reasoning.*"

Part II
Show students a set of pencils, some sharpened and some unsharpened. Ask, *What fraction of the set are sharpened? Unsharpened? Have good points? Have erasers?* For each example, show students the mathematical notation that corresponds with the set (ex: If 1 of the 4 pencils is sharpened, the write ¼ for students to make the connection between the set of objects and the symbol that represents the set.). As you show students various examples of fractions with a set and write the symbol, pose the following questions:

- *What do you think the 1 stands for?*
- *What do you think the 2 (or 4) refers to?*
- *Why does this mathematical notation make sense?*

Be sure to also show students sets of objects that are more than 2 or 4. This may help them make the connection of using doubles to identify half (ex.: When shown 3 pencils without erasers within a set of 6 pencils, students will identify 3 as half of 6.).

Part III
Show students a set of square tiles. Ask students how they think fractions can be made with square tiles. Divide students into small groups and provide each group with a tub or bowl of mixed color tiles. Allow the students a few minutes to explore with the shapes. Allow students to share their thinking.

After this time, have the students select 6 tiles using two different colored tiles and make a rectangle. Tell them to draw their rectangle in their math journal and write about their observations. *Notice if students automatically took 3 of each color tiles. Did they realize that 3 is half of 6? Did they count one at a time? Did they look around before beginning? Did they check to see what a rectangle was before starting?* When students are finished recording their observations, allow a few students share their picture. Discuss the variations and ask students to compare them. (Some students may not have half, some may have 2 of one color and 4 of another, etc.)
Explain to students that half does not always mean that there are only two parts. Show students that even though there are 6 parts in the set, *half* of them are one color and the other half is another. There are an equal number of ____ (color) and ____ (color) tiles. Repeat this same activity using other even numbers until students show an understanding of half of a set of objects.
Now have the students put away their tiles and do activity again with 7 tiles. After a few minutes, stop and ask them to share what they tried and explain their thinking. Refer to the brownie activity in the previous lesson, what was a solution that worked in that situation?

Part IV
Have students independently build rectangles, matching the ones on the "Half and Not Half" activity page, to demonstrate their understanding of sets of objects that are divided in two equal parts and those that are not divided correctly into two equal parts. For the first round, they will make and color halves. Then, they will make colored rectangles that are not divided into halves. (For example, the student may color in three of the six squares of the fraction strip to show halves. In the second fraction strip, they may color in four of the squares, which is not half of six.) Have students partner share their work.

FORMATIVE ASSESSMENT QUESTIONS

- What is the difference between a half and a whole?
- How do we know these are not divided into halves?
- See questions also noted within task description

DIFFERENTIATION

Extension

- "Kids and Cookies" – http://mathlanding.org/content/kids-and-cookies
  This interactive website offers students the opportunity to work on partitioning strategies in the context of fairly sharing cookies with friends. The number of friends, the shape of the cookie, the number of cookies to share, and the number of equal pieces you can cut a cookie into can be changed.

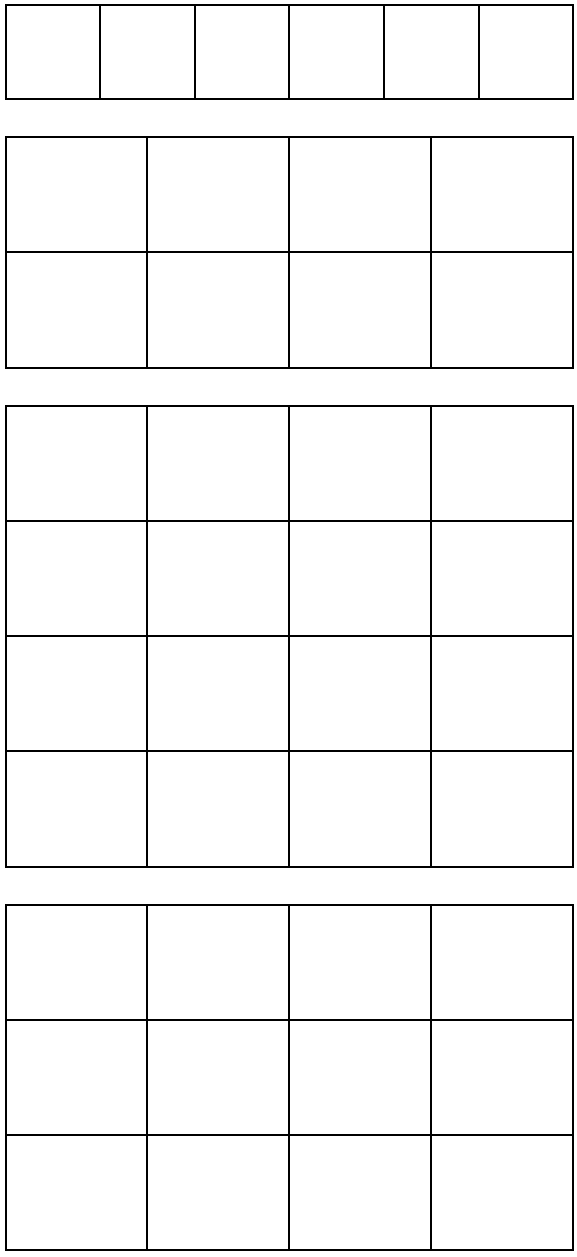
Intervention

- "Fair and Unfair Shares" (Van de Walle, Activity 14.1, page 260). Students will examine examples and non-examples of fractional parts. Students will identify the wholes that are correctly divided into requested fractional parts and those that are not. For each response, students should share their reasoning. In this activity, the wholes are already partitioned either correctly or incorrectly; the children are not involved in the partitioning.

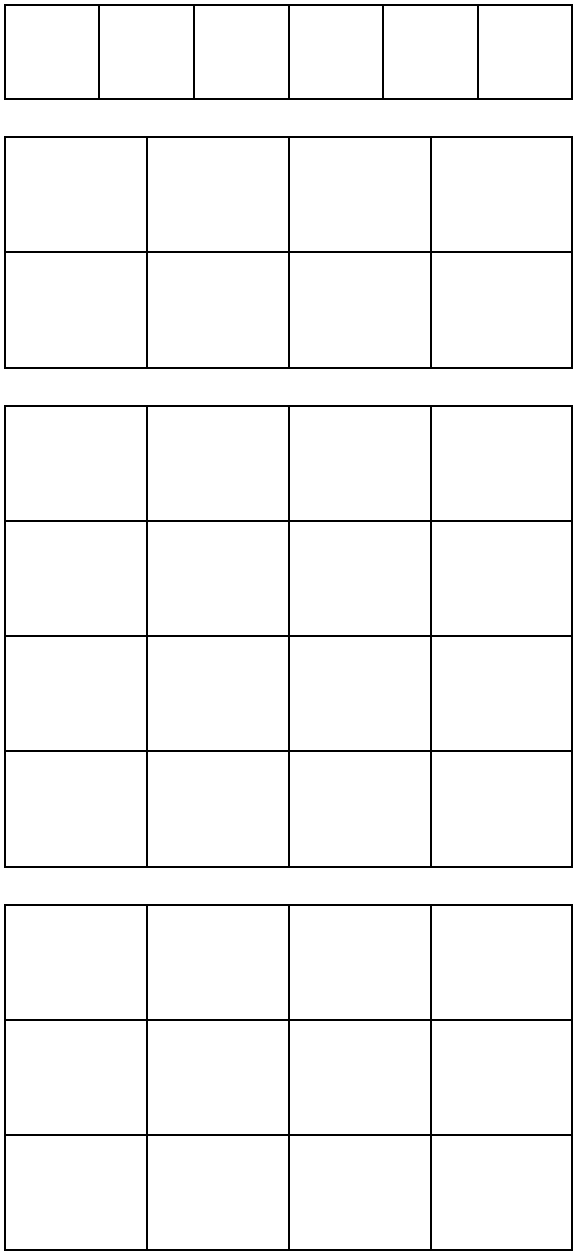
Name:_____

Half and Not Half

Half and Half



Not Half and Half



Task 12

PERFORMANCE TASK: Hands on Fractions

Approximately 1-2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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. Students represent the fractions in a book read aloud in class.**
5. **Use appropriate tools strategically. Students create fractional representations.**
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

Students should be able to identify equal and not equal parts. Students should be able to recognize a whole as parts put together.

ESSENTIAL QUESTIONS

- How can we divide shapes into equal parts?
- How can we be sure that we have equal parts?
- What do ½ and ¼ look like?

MATERIALS

- Dry erase boards/markers OR paper and markers
- Pattern blocks (enough for half of your class for warm-up activity)
- 1 spinner page per group or student depending on grouping

- Plastic knives
- Play dough or clay
- Laminated shape mats-2 sets (or activity page placed in clear sleeve)
- *Full House* by Dayle Ann Dodds
- File folders, one per student to keep
- Crayons

GROUPING

Large group, small group or partners, individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Read *Full House* by Dayle Ann Dodds or another story involving fractions. Have students work with a partner to represent (one with a dry erase board and the other with pattern blocks) the fractions in the story as you read. Students should hold up their dry erase boards as you read to informally check their representations as the other students show the fraction with pattern blocks. After each turn to make a fraction, have partners switch materials to show their understanding of fractions.

Part II
Tell students that they are going to use playdough to make food to be divided in to equal parts. Tell them that, for this situation, the playdough is a math tool and should be used as a mathematician would use it.

Then, explain that each student will choose a food card and make the food from play dough. They will spin the spinner to see how many guests are coming to eat their snack. Based on that number, students will cut the food into equal parts. They will then name the fraction for that part. For example, a student would choose the apple card and form an apple out of play dough. They will then spin the spinner. If they land on 2, they will cut their apple into two pieces and identify each part of the whole (½ and ½).

Part III
Tell students that they will get to order and make a pizza with a partner to show their understanding of fractions. Assign or have students select a partner for this activity. Explain to students that they will use their folders as "pizza boxes" to draw their partner's pizza in, made to order. Each pair will take turns ordering a pizza giving only three orders. For example, Tonya and Ross are partners. Ross opens his file folder and blocks Tonya from seeing his drawing of her pizza as she calls out the orders to him. Once he is finished drawing her pizza, he will show her the pizza for her to check his work. Remind students to use math language when giving orders such as, *"I would like cheese on the whole pizza, pepperoni on half, and bell peppers on a fourth of my pizza."* Once the students complete the pizza to their partner's satisfaction, they switch roles and repeat the activity. Students should be encouraged to represent their partner's

pizza a variety of ways (the pizza in the shape of a circle or rectangle; pizza toppings separated or layered).

Part IV
Allow partners to share their pizzas with the whole class and to compare them. Lead students to discuss how each student interpreted their partner's orders. *Did students layer the pepperoni and green peppers, or keep them separate? Did some students layer all of the toppings on the same side?* Discuss variations and have students justify their creations.

FORMATIVE ASSESSMENT QUESTIONS

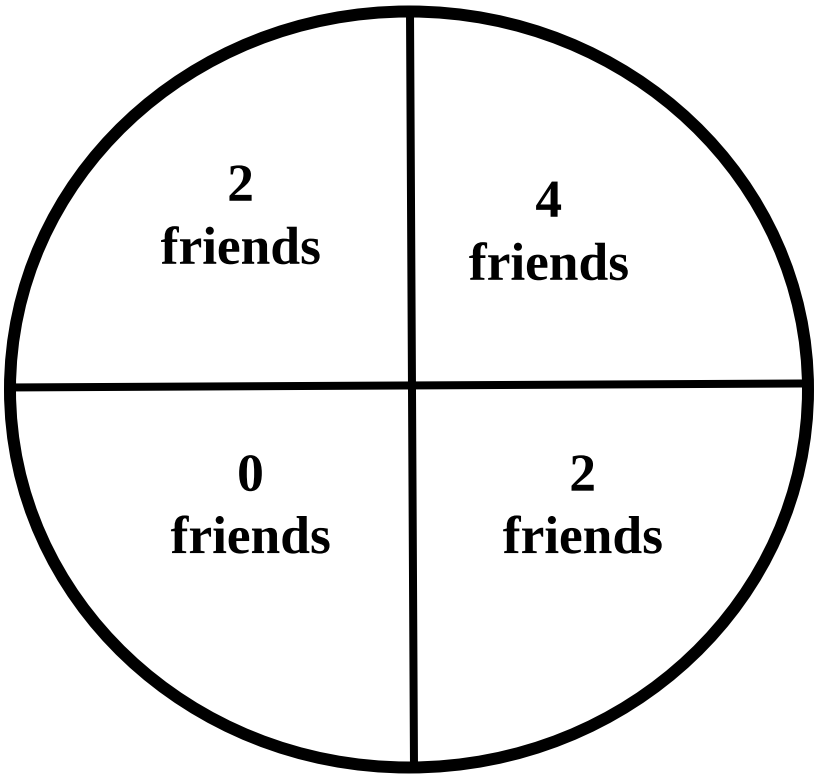
- Are students identifying all parts as a fractional piece of the whole?
- Are students using terms "quarter of, ¼, ½, etc?"
- Are students correctly identifying each fractional part?

DIFFERENTIATION

Extension
- Have students view PowerPoint of real life scenes to recreate and identify the fractional parts. http://www.tpsnva.org/teaching_materials/learning_experience/print.php?experiences_key=4353
- "More, Less, or Equal to One Whole" (Van de Walle, Activity 14.4, page 262) Students will be given a collection of fractional parts and indicate the kind of fractional part they have. Then they will decide if the collection (there should be several collections for this task) is equal to one whole, less than one whole, or more than one whole.

Intervention
- Give students a paper plate that has been divided (by drawing a line down the middle and across) in to fourths. Give them simplified directions of the task, such as:
    - Apply sauce and cheese to the whole pizza.
    - Put pepperoni on 1/4 of the pizza.
    - Sprinkle olives on half of the pizza.
    - Put green peppers on ¼ of the pizza

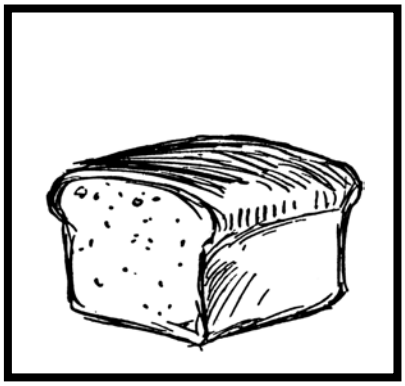
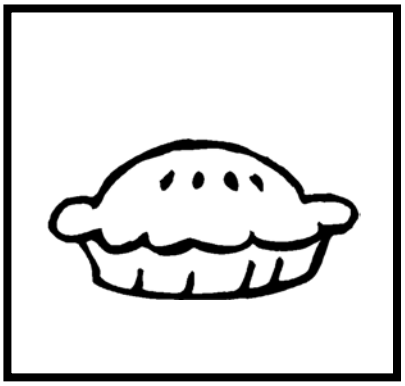
Hands on Fractions Spinner



Hands on Fractions






Task 13

PERFORMANCE TASK: Sweets For The Sweet!

Approximately 2-3 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively. Students solve real word problems.
3. Construct viable arguments and critique the reasoning of others. Students defend their answers to questions with viable arguments.
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/COMMON MISCONCEPTIONS

Students should have had prior experience with the steps involved in problem solving and a variety of problem solving situations. Students should be familiar with how to use a variety of manipulatives to help with representations in problem solving. Students should also be able to take an object and be able to create the fractional part.

ESSENTIAL QUESTIONS

- How can we divide shapes into equal parts?
- What is half of a whole?
- What is a fourth of a whole?

MATERIALS

- *Eating Fractions* Bruce McMillan
- Sweets For The Sweet task sheet

GROUPING

Large group, individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Gather students to a common area and read the book, *Eating Fractions* by Bruce McMillan, or a similar text. After reading, lead students in a discussion about the various items in the book that were divided equally. *How were they divided? How do you know they were equal? What fractions are you familiar with that you identified in the story? What did the story make you think of? What experiences have you had using fractions and food?*

Part II
Students should work independently to solve this task. Prior to beginning this task the teacher should model an example on chart paper to review the steps in problem solving. Discuss how this problem can be solved (what symbols to use for toppings, to represent fractions, etc.) Discuss different plans for solving the problems. Allow students to share strategies such as draw a picture, act it out, make a list, guess and check, find a pattern, create a chart, work backwards, etc.

Mrs. McKenney is making a pan of brownies for her party. There are 5 friends coming to the party. 3 of her friends like chocolate frosting on their brownies. Mrs. McKenney and one of her friends like nuts and 2 friends like plain brownies. What fraction of the brownies will have nuts? Frosting? Be plain? Explain your mathematical thinking using pictures and words.

Observe students as they work. Students should record their strategies and solutions. Encourage them to use pictures, words, and numbers to explain their solutions and justify their thinking.

After ample work time, have students share their ideas. Discuss the similar plans and the unique plans. This is an open-ended question and will have different combinations of responses.

FORMATIVE ASSESSMENT QUESTIONS

- What is your plan to solve this problem?
- How did drawing pictures help you solve this problem?
- Can you write using fractional notation or use words to communicate your thinking?

DIFFERENTIATION

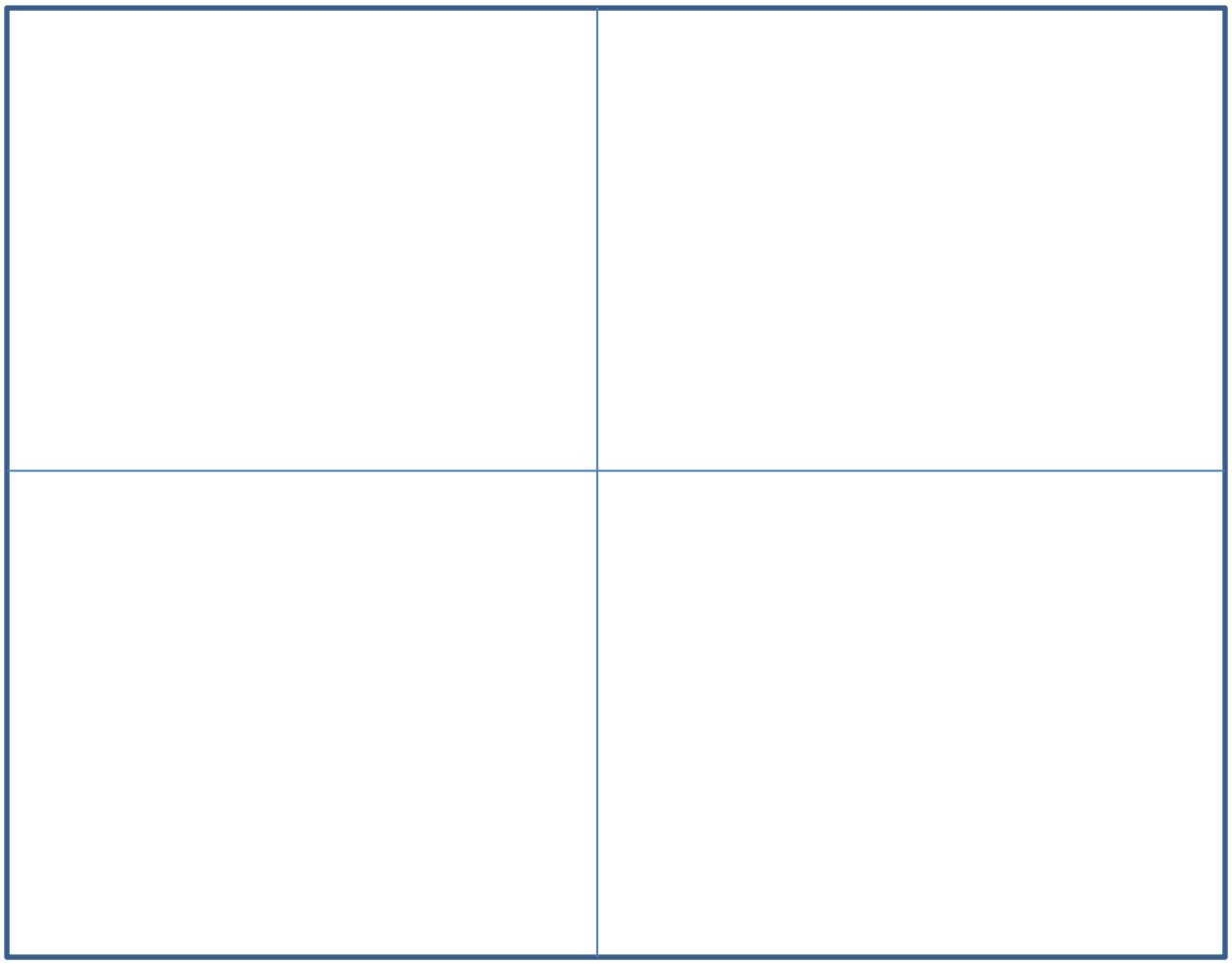
Extension

- Mrs. McKenney is making a pan of brownies for her party. There are 5 friends coming to the party. Some of her friends like nuts, Mrs. McKenney and a friend like chocolate frosting, and the rest like their brownie plain. What fraction of the brownies will have nuts? Frosting? Be plain? Explain your mathematical thinking using pictures and words.

Intervention

- Mrs. McKenney is making a pan of brownies to share with 3 of her friends. Half of the people sharing the brownies like chocolate frosting on their brownies, a fourth like nuts on their brownies, and a quarter like their brownies plain. Show what the pan of brownies might look like.

Brownie Workmat



Name:_____ Date:_____

Sweets For The Sweet!

Mrs. McKenney is making a pan of brownies for her party. There are 5 friends coming to the party. 3 of her friends like chocolate frosting on their brownies. Mrs. McKenney and one of her friends like nuts and 2 friends like plain brownies. What fraction of the brownies will have nuts? Frosting? Be plain? Explain your mathematical thinking using pictures and words.

Task 14

*3 ACT TASK: Let's Eat!

APPROXIMATE TIME: One class session

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them. Students are asked to analyze and explain the meaning of the problem, actively engage in problem solving, show patience and positive attitudes, ask if their answers make sense, and check their answers with a different method.
2. Reason abstractly and quantitatively. Students are asked to explain their thinking and examine the reasonableness of their answers.
3. Construct viable arguments and critique the reasoning of others. Students are given the chance to share and critique the questions and strategies of fellow classmates.
4. Model with mathematics. Students will use the information given to develop a mathematical model to solve their problems.
5. Use appropriate tools strategically. Students can use concrete models strategically (and flexibly) to visualize, explore, and compare information.
6. Attend to precision. Students will explain their thinking using mathematics vocabulary and use appropriate notation.
7. Look for and make use of structure. Students will use their understanding of parts of a whole to help them determine how the girls will share the sandwich.

ESSENTIAL QUESTIONS
In order to maintain a student-inquiry-based approach to this task, it may be beneficial to wait until Act 2 to share the EQ's with your students. By doing this, students will be allowed the opportunity to be very creative with their thinking in Act 1. By sharing the EQ's in Act 2, you will be able to narrow the focus of inquiry so that the outcome results in student learning directly related to the content standards aligned with this task

- How can we be sure we have equal parts?
- Why is it important to divide into equal parts?

.

MATERIALS

- Act 1 Photo: 

- Act 2 Infographic: 

- Act 3 Photo: 

GROUPING

Whole group/student pairs/ individual task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will view a picture and tell what they notice. Next, they will be asked to share what they wonder about or are curious about. These questions should be recorded on a board or class chart. Students will then use mathematics to answer their own questions. Students will be given information to solve the problem based on need.

Background Knowledge and Common Misconceptions

This task follows the 3-Act Math Task format originally developed by Dan Meyer. More information on this type of task may be found at http://blog.mrmeyer.com/category/3acts/. A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 CCGPS Mathematics Wiki.

Students often think of half as any part of a whole, rather than one of two equal parts and they often refer to one half as being larger than another. It is important to build on student's previous experiences and clarify the ideas they have encountered. Provide many opportunities throughout the year for children to make sense of fractions, use fractional language, and represent fractions with standard symbols (Burns 2007). Be sure to include a variety of experiences for students to divide many varied shapes of objects (circles, rectangles, squares, etc.).

This task should help develop student "intellectual need" of dividing shapes and fractional parts. Students will use what they know to determine how much of the sandwich each child will eat. Some students may decide that the girls will share the sandwich equally, some will predict the girls will share the sandwich based on how much food they would need for a child that size, and others will predict that the girls will share the sandwich other ways for a variety of reasons.

Part I

Act 1 – Whole Group - Pose the conflict and introduce students to the scenario by showing Act I video or picture. **(Dan Meyer** http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**

"Introduce the central conflict of your story/task clearly, visually, viscerally, using as few words as possible."

1. Show Act 1 Photo to students.
2. Ask students what they notice in the photo, what they wonder about, and what questions they have about what they saw in the picture. Consider doing a think-pair-share so that students have an opportunity to talk with each other before sharing questions with the whole group.
3. Share and record students' questions. The teacher may need to guide students so that the questions generated are math-related.
4. Ask students to estimate answers to their questions (think-pair-share). For the question "How will the girls share the sandwich?", students write down their predictions in their math journal. This is an excellent time to informally assess a student's understanding of quantity sizes and equal parts, in addition to practice with writing fraction notation. Next, students discuss the questions and determine the information they need.

Anticipated questions students may ask and wish to answer:

- How many parts of the sandwich are there?
- Are the girls the same age?
- How many different ways can the girls share the sandwich?
- How much of the sandwich will each girl eat?

Act 2 – Student Exploration - Provide additional information as students work toward solutions to their questions. **(Dan Meyer** http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**

"The protagonist/student overcomes obstacles, looks for resources, and develops new tools."

- During Act 2, students review the main question(s) from Act 1 and decide on the facts, tools, and other information needed to answer the question(s). When students decide what they need to solve the problem, they should ask for those things. It is pivotal to the problem solving process that students decide what is needed without being given the information up front.
- The teacher provides guidance during this phase. Some groups might need scaffolds to guide them. The teacher should question groups who seem to be moving in the wrong direction or might not know where to begin. Questioning is an effective strategy that can be used, with questions such as:
    - What is the problem you are trying to solve?
    - What do you think affects the situation?
    - Can you explain what you've done so far?
    - What strategies are you using?
    - What assumptions are you making?
    - What tools or models may help you?
    - Why is that true?
    - Does that make sense?

Important note: Although students will only investigate the main question(s) for this task, it is important for the teacher to not ignore student generated questions. Additional questions may be answered after they've found a solution to the main question, or as homework or extra projects.

Additional Act 2 Information: See Act 2 Infographic

Act 3 – Whole Group – Share solutions and strategies.

1. Students to present their solutions and strategies and compare them.
2. Reveal the solution in Act 3 photo. 

3. Lead discussion to compare these, asking questions such as:
    - How reasonable was your estimate?
    - Which strategy was most efficient?
    - Can you think of another method that might have worked?
    - What might you do differently next time?

Act 4, The Sequel - "The goals of the sequel task are to a) challenge students who finished quickly so b) I can help students who need my help. It can't feel like punishment for good work. It can't seem like drudgery. It has to entice and activate the imagination." Dan Meyer
http://blog.mrmeyer.com/2013/teaching-with-three-act-tasks-act-three-sequel/

For Act 4, reference other student-generated questions that could be used for additional classwork, projects or homework.

FORMATIVE ASSESSMENT QUESTIONS

- What models did you create?
- What do your models represent?
- Tell me about the strategies you used to determine how much of the sandwich each girl ate.

Part II
Journal Writing: Have students reflect on the task and write (or blog) about what they perceived to challenging about the task and enjoyable about the task. Pose questions like, *How did you determine how much of the sandwich each girl would eat? What does this remind you of? What are times when you have had to share something?*

DIFFERENTIATION

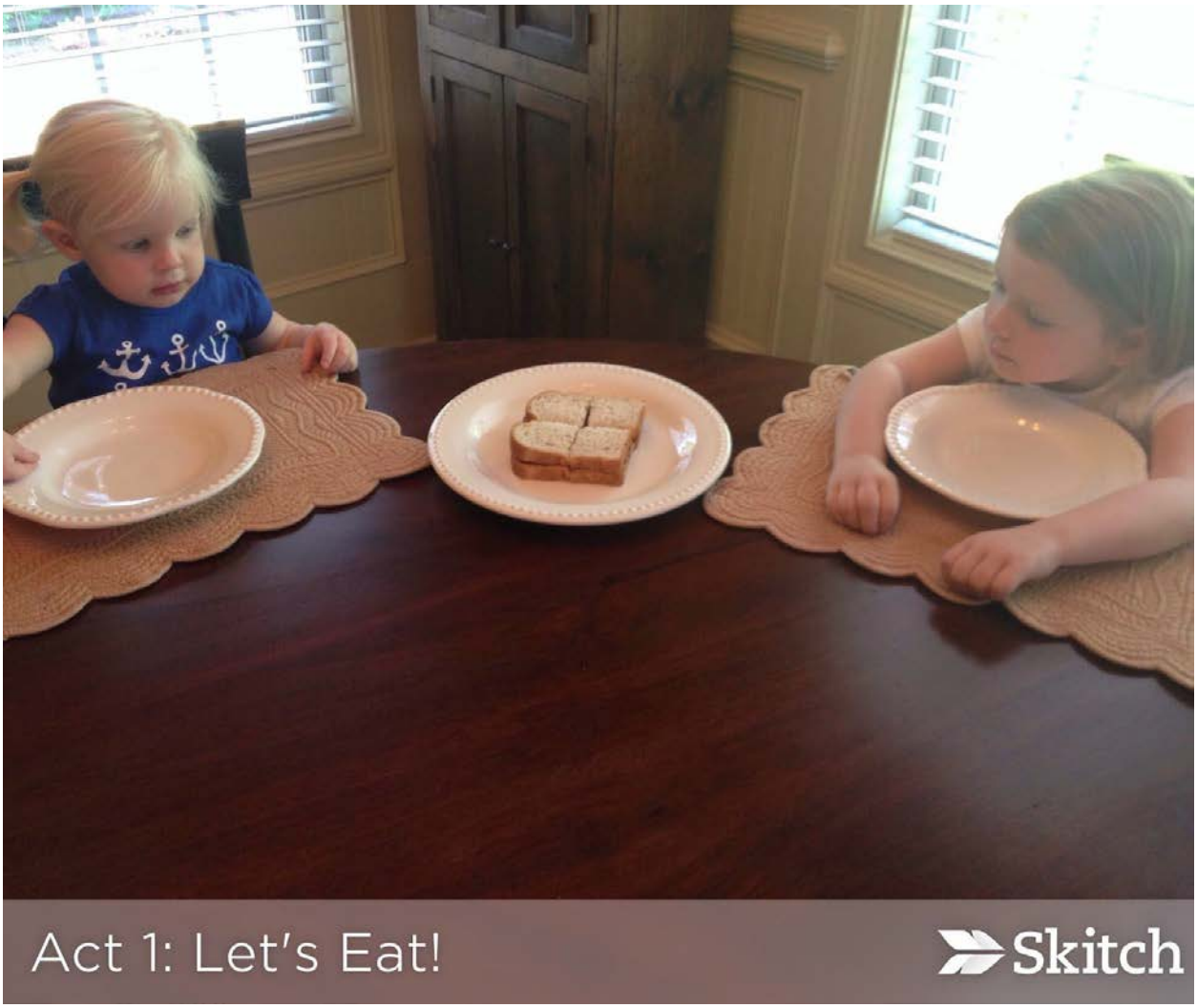
Extension

What are other ways the sandwich could have been divided equally? Allow students to recreate the problem using a different sandwich and perhaps a different amount of students to share the sandwich. The photos for this task were edited using Skitch, which is user friendly for students of this age. (Skitch: http://evernote.com/skitch/)

Intervention

Give students fraction models (a square divided into fourths) for students to use when solving this problem. The students could use the models to role play with a partner and record their thinking in their journal. If students use a blog, they could make an Educreation video using a video of the models and record their thinking using the recording feature of the app. (Educreations: http://www.educreations.com/) (Kidblog: http://kidblog.org/home/)

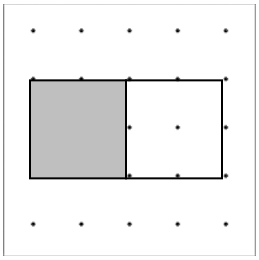
Act 1 Photo:



Act 2 Infographic:

Act 3 Photo:

Task 15



CONSTRUCTING TASK: Geoboard Fractions

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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. Students will model using shapes that can be divided into fractional parts and shapes that cannot be divided.**
5. **Use appropriate tools strategically. Students utilize geoboards to model shapes and fractional pieces.**
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

If students have not had prior experience using geo boards, you will need to show them how to use the geo boards safely and properly.

ESSENTIAL QUESTIONS

- How can you divide shapes into halves and fourths?

MATERIALS

- Geoboards and rubber bands
- Small Geoboards Recording sheet, one per student
- Crayons/pencils

GROUPING

Large group, individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Distribute a piece of construction paper to all students. Demonstrate for them how to correctly fold their paper in half and have them do the same. Have them open up their paper to discover that halves were created by folding the paper equally. Next, demonstrate for them how to fold the paper again to create fourths. Discuss why these are considered fractional parts. Repeat the same procedure with various other shapes that can be divided equally in to halves and fourths. Then, give students other shapes that cannot be divided equally in to fourths, such as a triangle.

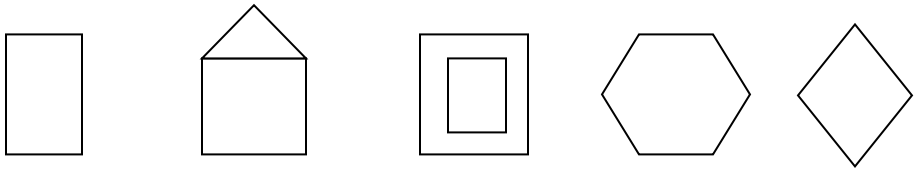
Part II
Gather students to a common area to discuss the use geoboards and making shapes. Start off the conversation by explaining to students the importance of safety when using rubber bands and how to properly place them on the boards. Model for students how to place the rubber bands on the geoboard and invite a few volunteers to model this procedure for their classmates. Once students seem to have an understanding of safety procedures, move the discussion to review various shapes the students have worked with in kindergarten and throughout this unit. As students recall the shapes they are familiar with, make a list on the board. Ask, *What clues could you give another student so that they could build a shape on the geoboard? What information would you and your partner need to know about specific shapes in order to build them correctly?*

Explain to students that they will work with a partner to create shapes on the geoboard. Tell them that they will take turns naming details about a shape's attributes as the other partner builds the shape on the geoboard. Once the shape is complete, the other partner will check their work and then switch roles. Model this procedure by inviting a student to come to the front of the group. Give them a geoboard and begin calling out details of a shape for them to build. As the student is building the shape, make comments about the student's technique and point out the safety measures being practiced. Once the student is finished, model how to check their work aloud (For example, "I called out the details of a trapezoid to Heather. I see that there are four sides, four vertices, and it is shaped like a trapezoid. She built the shape correctly!"). Before giving each pair of students a geoboard and materials, review safety procedures once again and what the dialogue between students should sound like while working (only one partner giving clear clues at a time, while the other builds).

Part III
Gather students back to a common area for a discussion of fractions and shapes. Invite students to share what they know about fractions and how shapes can be divided in to fractional parts. Lead students to discuss the various shapes that can be grouped to form

another shape (ex: two triangles to form a square, two trapezoids to form a hexagon, two squares to form a rectangle, etc.).

Part IV
Model a shape or design on the geo board (see examples below) and students will independently recreate it on their geo board.



They will then record the shape in the first column on their recording page with a crayon and pencil. Then have the students divide the shape in half and record what they see in the second column. Finally, students will divide the original shape into four equal parts and record. Repeat with different shapes. Have students partner share their fractions describing their shapes and how they divided them.

FORMATIVE ASSESSMENT QUESTIONS

- Could you split the shape another way and still have equal parts?
- How many equal parts do you have?
- What strategies did you use to determine that you have equal parts?
- How we record the name of the fractional part?

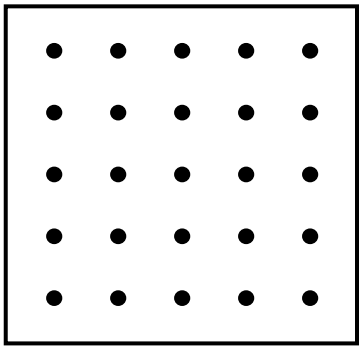
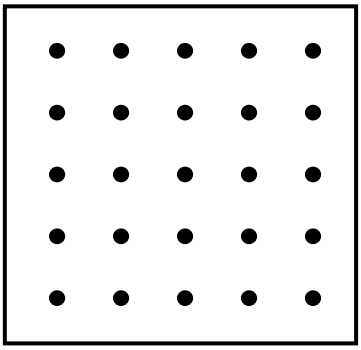
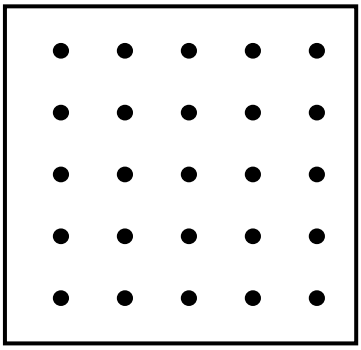
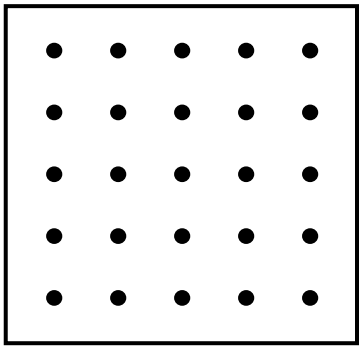
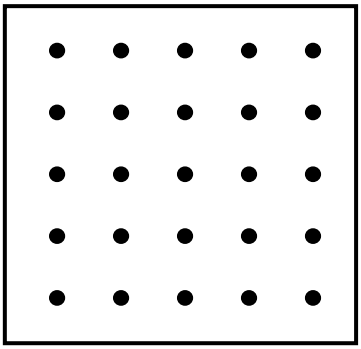
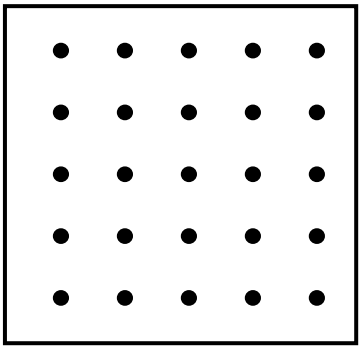
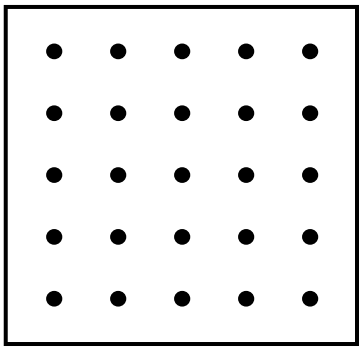
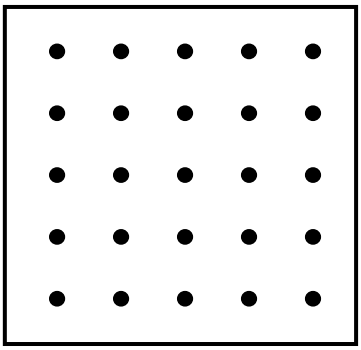
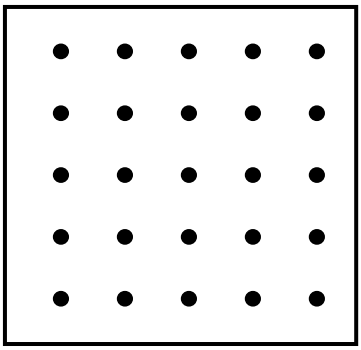
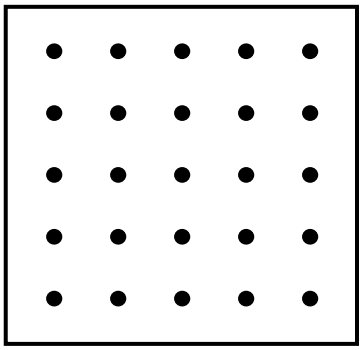
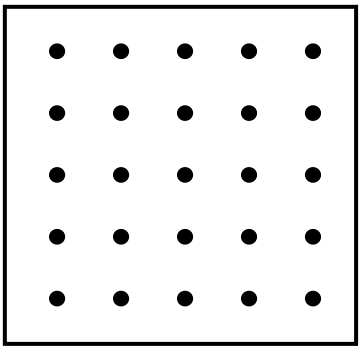
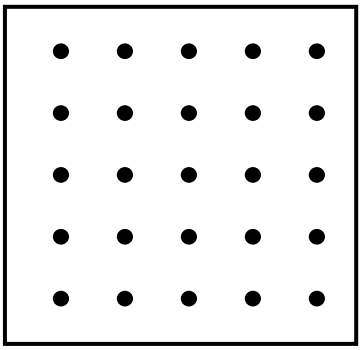
DIFFERENTIATION

Extension
- Have students work with a partner to build shapes on the geoboard. Partner 1 will call out attributes of a shape to partner 2 as he or she creates the shape on the geoboard. Then, once the shape is correctly made to partner 1's satisfaction, partner 2 will hand over the geoboard and give directions to partner 1 of how to divide the shape in to equal parts.

Intervention
- "Geoboard Copy" (Van de Walle, page 313, Activity 16.11) – Using their own geoboards, students copy shapes, designs, and patterns from prepared cards. Begin using one band; then create more complex designs.

Name:_____ **Date:_____**

Small Geo Boards

	Shape	Halves (1/2)	Fourths (1/4)
1			
2			
3			
4			

Task 16

PERFORMANCE TASK: Lily's Birthday

Approximately 1 day

STANDARDS FOR MATHEMATICAL PRACTICE

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively. Students solve real world word problems using strategies and reasoning skills.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics. Students use their mathematical reasoning to help solve problems.
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/COMMON MISCONCEPTIONS

Students should have had prior experience with the steps involved in problem solving and a variety of problem solving situations. Students should be familiar with how to use a variety of manipulatives to help with representations in problem solving.

ESSENTIAL QUESTIONS

- What happens when I share an amount?
- How can things be divided into equal parts?

MATERIALS

- Lily's Birthday task sheet
- Manipulatives

GROUPING

Independent

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Students should work independently to solve this task. Prior to beginning this task the teacher should model an example on chart paper to review the steps in problem solving. Discuss different plans for solving the problem. Allow students to share strategies such as draw a picture, act it out, make a list, guess and check, find a pattern, create a chart, work backwards, etc.

Lily is having her birthday party and wants colored birthday candles on her cake. She wants some pink and some blue. What are all of the possibilities of cakes that Lily could have at her birthday party? Design cakes that show what fraction of the candles on the cake are pink and blue. Show your mathematical thinking using words and pictures.

Observe students as they work. Students should record their strategies and solutions. Encourage them to use pictures, words, and numbers to explain their solutions and justify their thinking.

After ample work time, have students share their ideas. Discuss the similar plans and the unique plans. This is an open-ended question and will have different combinations of responses based on which birthday a student decides Lily is celebrating, and how exhaustively a student responds.

Part II
Read the problem aloud to the students. Review the processes for problem-solving and ask students to solve the problem using pictures, numbers, and words. Select a few students to share their results.

FORMATIVE ASSESSMENT QUESTIONS

- What is your plan to solve this problem?
- How did drawing pictures help you solve this problem?
- Can you write fractional notation or use words to communicate your thinking?

DIFFERENTIATION

Extension
- Lily is having a birthday party. She wants colored candles on her cake. What fraction of the candles are pink? Blue? Green?

Intervention

- Lily is having her 4th birthday party. She wants colored candles on her cake. What fraction of the candles are pink? Blue? Show your mathematical thinking using pictures and words.

Name:_____ Date:_____

Lily's Birthday

Lily is having her birthday party and wants colored birthday candles on her cake. She wants some pink and some blue. What are all of the possibilities of cakes that Lily could have at her birthday party? Design cakes that show what fraction of the candles on the cake are pink and blue. Show your mathematical thinking using words and pictures.

Task 17

PERFORMANCE TASK: Connecting Shapes and Fractions

Approximately 2 days

STANDARDS FOR MATHEMATICAL PRACTICE

MCC1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

MCC1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.

MCC1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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. Students create shapes and fraction models.**
5. **Use appropriate tools strategically. Students utilize geoboards as tools to create representations of shapes and fractions.**
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE/COMMON MISCONCEPTIONS

Students should be familiar creating shapes on the geoboards. Students should also be familiar with dividing shapes into equal parts.

ESSENTIAL QUESTIONS

- How can shapes be divided in to equal parts?
- How can shapes be divided into halves and quarters?

MATERIALS

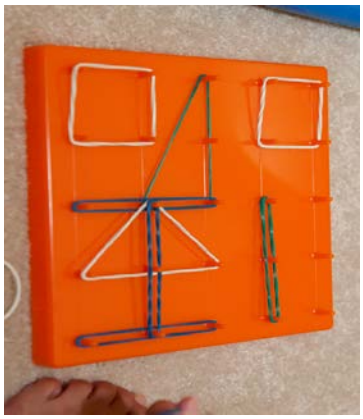
- Geoboard and bands
- Recording sheet
- Crayons
- Pencils

GROUPING

Large Group, Individual

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Give each student a geo board and bands. Review with students how to safely use the geo board as a math tool. Next, tell them you will call the name of a shape and they will make it on their board. When they think they have it, they are to hold it up and show you. Start with a triangle and follow with a square, rectangle, and trapezoid.
Part II
Tell them you will call out a shape AND a fraction and they will make it on the geo board. Start with a rectangle divided in to halves. Then, repeat this same task with other shapes and ask them to divide the shape (use terms like fourths, quarters, and halves).
Part III
Ask the class if they see a connection between shapes and fractions. They will use their geo boards to create a picture with shapes. They will also divide the shapes into halves and fourths with their bands. Students will then record the design on the geo board and write a story about it. Try one together first.



Guess what? I traveled the sea in a triangle sailboat. I saw two islands and one long eel. I wasn't scared though.

FORMATIVE ASSESSMENT QUESTIONS

- Tell me about the shapes and fractions you used?
- Did you combine any shapes?
- How many _____'s did you use? (triangles, squares, etc)

DIFFERENTIATION

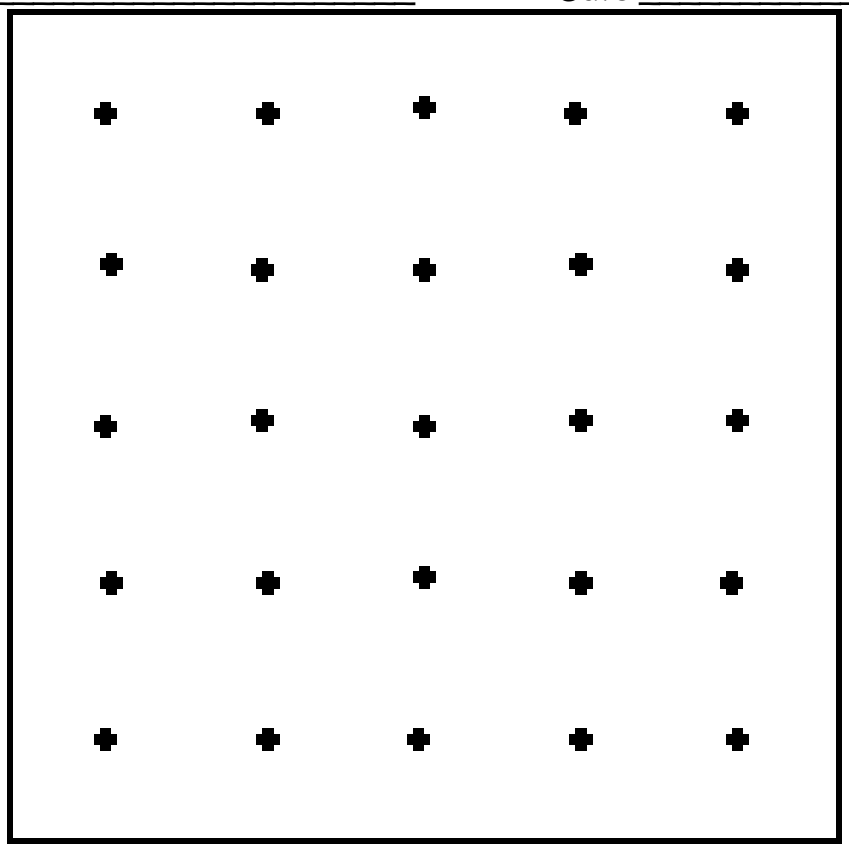
Extension

- Have students draw their design and label the shapes and fractional parts.

Intervention

- Provide students with precut shapes to cut/glue and create picture. Provide story starters.

Name:_____ Date:_____



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