Georgia Standards of Excellence Curriculum Frameworks

Mathematics

GSE Third Grade

Unit 4: Geometry

Georgia Department of Education

Richard Woods, Georgia's School Superintendent

"Educating Georgia's Future"

Table of Contents

IF YOU HAVE NOT READ THE THIRD GRADE CURRICULUM OVERVIEW IN ITS ENTIRETY PRIOR TO USE OF THIS UNIT, PLEASE **STOP** AND CLICK HERE: https://www.georgiastandards.org/Georgia-Standards/Frameworks/3rd-Math-Grade-Level-Overview.pdf Return to the use of this unit once you've completed reading the Curriculum Overview. Thank you.

OVERVIEW

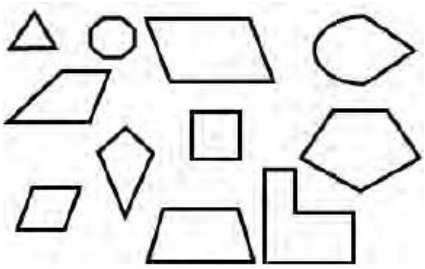
In this unit students will:

- Further develop understandings of geometric figures by focusing on identification and descriptions of plane figures based on geometric properties.
- Identifies examples and non-examples of plane figures based on geometric properties.
- Identify differences among quadrilaterals.
- Understand that shapes in different categories may share attributes and those attributes can define a larger category (example: rhombuses, rectangles, and others have four sides and are all called quadrilaterals).
- Expand the ability to see geometry in the real world.
- Can draw plane figure shapes based on attributes.
- Further develop understanding of partitioning shapes into parts with equal areas.
- Partitions shapes in several different ways into equal parts of halves, thirds, fourths, sixths, and eighths and recognizes the partitioned parts have the same area.
- Use data collected to make bar and picture graphs.
- Interpret line plots.
- Find the perimeter of polygons; use addition to find perimeters; solve for an unknown length and recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.

Third grade students will describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language.

Mathematically proficient students communicate clearly by engaging in discussion about their reasoning, using appropriate mathematical language. Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same size square units required to cover the shape without gaps or overlaps. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

In second grade, students identify and draw triangles, quadrilaterals, pentagons, and hexagons. Third graders build on this experience and further investigate quadrilaterals (technology may be used during this exploration). Students recognize shapes that are and are not quadrilaterals by examining the properties of the geometric figures. They conceptualize that a quadrilateral must be a closed figure with four straight sides and begin to notice characteristics of the angles and the relationship between opposite sides. Students should be encouraged to provide details and use proper vocabulary when describing the properties of quadrilaterals. They sort geometric figures (see examples below) and identify squares, rectangles, and rhombuses as quadrilaterals*.



Students should classify shapes by attributes and by drawing shapes that fit specific categories. For example, parallelograms include: squares, rectangles, rhombi, or other shapes that have two pairs of parallel sides. Also, the broad category, quadrilaterals, includes all types of parallelograms, trapezoids and other four-sided figures.

Students should also use this standard to help build on their understanding of fractions and area. Students are responsible for partitioning shapes into halves, thirds, fourths, sixths and eighths. Given a shape, students partition it into equal parts, recognizing that these parts all have the same area. They identify the fractional name of each part and are able to partition a shape into parts with equal areas in several different ways.

As an ongoing process throughout all third-grade units, students should continue to develop understanding of representing and interpreting data using picture and bar graphs. They should also continue their work in generating measurement data by measuring lengths with rulers marked with halves and fourths of an inch. In second grade, students measured length in whole units using both metric and U.S. customary systems. It is important to review with students how to read and use a standard ruler including details about half and quarter marks on the ruler. Students should connect their understanding of fractions to measuring to one-half and one-quarter inch. Third graders need many opportunities measuring the length of various objects in their environment. This standard provides a context for students to work with fractions by measuring objects to a quarter of an inch.

With geometry, many student misconceptions might occur. The four content goals for geometry include shapes and properties, transformation, location, and visualization (see Van de Walle, page 205.) Students often have a difficult time recognizing shapes if the shape has been transformed by a translation, reflection, or rotation. Students may also identify a square as a “non-rectangle” or a “non-rhombus” based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

Third grade should prepare students to be able to easily transition into fourth grade geometry. In fourth grade students will be required to draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. Students in fourth grade will classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category and identify right triangles. Recognizing a line of symmetry for a two-

dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts will also be a part of fourth grade.

http://www.learner.org/courses/learningmath/geometry/session10/index35.html - Lesson for the teacher to learn more about teaching Geometry to elementary students. The lesson includes ideas for lessons, video of classrooms, etc.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

This section provides examples of learning experiences for this unit that support the development of the proficiencies described in the Standards for Mathematical Practice. The statements provided offer a few examples of connections between the Standards for Mathematical Practice and the content Standards of this unit. The list is not exhaustive and will hopefully prompt further reflection and discussion.

Students are expected to:
1. Make sense of problems and persevere in solving them. Students make sense of problems involving the attributes of shapes.
2. Reason abstractly and quantitatively. Students demonstrate abstract reasoning about perimeters when considering the values of these numbers in relation to distance.
3. Construct viable arguments and critique the reasoning of others. Students construct and critique arguments regarding shape attributes and perimeters.
4. Model with mathematics. Students use inch tiles and charts to solve real world perimeter problems.
5. Use appropriate tools strategically. Students select and use tools such as inch counters, TanGrams, and geometric shapes to represent attributes and perimeter.
6. Attend to precision. Students use clear and precise language when discussing the attributes of shapes.
7. Look for and make use of structure. Students look closely to discover a pattern or structure when sorting shapes based on common attributes.
8. Look for and express regularity in repeated reasoning. Students demonstrate repeated reasoning by showing the relationship between partitioning shapes and perimeter.

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

CONTENT STANDARDS

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

Reason with shapes and their attributes.

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a

larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MGSE3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Represent and Interpret Data

MGSE3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

MGSE3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

MGSE3.MD.7 Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

For more detailed information about unpacking the content standards, unpacking a task, math routines and rituals, maintenance activities and more, please refer to the Grade Level Overview.

BIG IDEAS

- Identify and describe properties of two-dimensional shapes using properties that are shared between the shapes.
- Generalize that shapes fit into a particular classification.
- Compare and classify shapes by their sides and angles and connect these with definitions of shapes.
- Geometric figures can be classified according to their properties.
- Quadrilaterals can be classified according to the lengths of their sides.
- Recognize shapes that are and are not quadrilaterals by examining the properties of the geometric figures.
- Conceptualize that a quadrilateral must be a closed figure with four straight sides and begin to notice characteristics of the angles and the relationship between opposite sides
- Provided details and use proper vocabulary when describing the properties of quadrilaterals.
- Sort geometric figures and identify squares, rectangles, and rhombuses as quadrilaterals.
- Classify shapes by attributes and by drawing shapes that fit specific categories. (e.g.; parallelograms include: squares, rectangles, rhombi, or other shapes that have two pairs of parallel sides.
- The broad category "Quadrilaterals" includes all types of parallelograms, trapezoids and other four-sided figures.
- Relate fraction work to geometry by expressing the area of a shape as a unit fraction of the whole.
- Shapes can be partitioned with equal areas in a variety of ways to show halves, thirds, fourths, sixths, and eighths.
- The length around a polygon can be calculated by adding the lengths of its sides.
- The space inside a rectangle or square can be measured in square units.

ESSENTIAL QUESTIONS

- How do the attributes help us identify the different quadrilaterals/shapes?
- How it is possible to have a shape that has fits into more than one category?
- What does it mean to partition a shape into parts?
- What is the relationship between perimeter and area?

CONCEPTS/SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Represent and solve problems involving multiplication and division
- Understand properties of multiplication and the relationship between multiplication and division

- Multiply and divide within 100
- Solve problems involving the four operations, and identify and explain patterns in arithmetic
- Use place value
- Recognize basic geometric figures and spatial relationships of triangle, quadrilateral (squares, rectangles, and trapezoids), pentagon, hexagon, cube, trapezoid, half/quarter circle, circle, cone, cylinder, sphere

Fluency: Procedural fluency is defined as skill in carrying out procedures flexibly, accurately, efficiently, and appropriately. Fluent problem solving does not necessarily mean solving problems within a certain time limit, though there are reasonable limits on how long computation should take. Fluency is based on a deep understanding of quantity and number.

Deep Understanding: Teachers teach more than simply "how to get the answer" and instead support students' ability to access concepts from a number of perspectives. Therefore, students are able to see math as more than a set of mnemonics or discrete procedures. Students demonstrate deep conceptual understanding of foundational mathematics concepts by applying them to new situations, as well as writing and speaking about their understanding.

Memorization: The rapid recall of arithmetic facts or mathematical procedures. Memorization is often confused with fluency and automaticity. Fluency implies a much richer kind of mathematical knowledge and experience.

Number Sense: Students consider the context of a problem, look at the numbers in a problem, make a decision about which strategy would be most efficient in each particular problem. Number sense is not a deep understanding of a single strategy, but rather the ability to think flexibly between a variety of strategies in context.

Fluent students:

- flexibly use a combination of deep understanding, number sense, and memorization.
- are fluent in the necessary baseline functions in mathematics so that they are able to spend their thinking and processing time unpacking problems and making meaning from them.
- are able to articulate their reasoning.
- find solutions through a number of different paths.

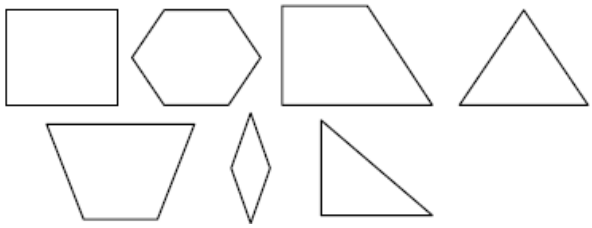
For more about fluency, see:
http://www.youcubed.org/wpcontent/uploads/2015/03/FluencyWithoutFear-2015.pdf
https://bhi61nm2cr3mkdgk1dtaov18-wpengine.netdna-ssl.com/wp-content/uploads/nctm-timed-tests.pdf

STRATEGIES FOR TEACHING AND LEARNING:

In earlier grades, students have experiences with informal reasoning about particular shapes through sorting and classifying using their geometric attributes. Students have built and drawn shapes given the number of faces, number of angles and number of sides.

The focus now is on identifying and describing properties of two-dimensional shapes in more precise ways using properties that are shared rather than the appearances of individual shapes.

These properties allow for generalizations of all shapes that fit a particular classification. Development in focusing on the identification and description of shapes' properties should include examples and non-examples, as well as examples and non-examples drawn by students of shapes in a particular category. For example, students could start with identifying shapes with right angles. An explanation as to why the remaining shapes do not fit this category should be discussed. Students should determine common characteristics of the remaining shapes.



In Grade 2, students partitioned rectangles into two, three or four equal shares, recognizing that the equal shares need not have the same shape. They described the shares using words such as, halves, thirds, half of, a third of, etc., and described the whole as two halves, three thirds or four fourths. In Grade 3 students will partition shapes into parts with equal areas (the spaces in the whole of the shape). These equal areas need to be expressed as unit fractions of the whole shape, i.e., describe each part of a shape partitioned into four parts as ¼ of the area of the shape.

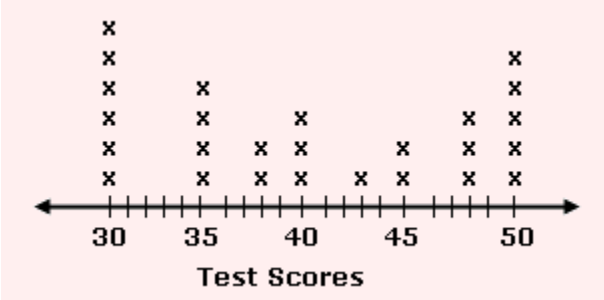
Have students draw different shapes and see how many ways they can partition the shapes into parts with equal areas.

http://www.learner.org/courses/learningmath/geometry/pdfs/session9/vand.pdf - Geometric Thinking from John Van de Walle

Also in the unit, students will use what they have learned in second grade about representing the length of several objects by making a line plot. In second grade, students would have rounded their lengths to the nearest whole unit. A line plot shows data on a number line with an **X** or other mark to show frequency.

Examples of Line Plot

- The line plot below shows the test scores of 26 students.



The count of cross marks above each score represents the number of students who obtained the respective score. For students in second and third grade, they will use the data from measuring with rulers to create line plots.

Area and Perimeter…

- Students can cover rectangular shapes with tiles and count the number of units (tiles) to begin developing the idea that area is a measure of covering. Area describes the size of an object that is two-dimensional. The formulas should not be introduced before students discover the meaning of area.
- The area of a rectangle can be determined by having students lay out unit squares and count how many square units it takes to completely cover the rectangle completely without overlaps or gaps. Students need to develop the meaning for computing the area of a rectangle. A connection needs to be made between the number of squares it takes to cover the rectangle and the dimensions of the rectangle. Ask questions such as:
    - What does the length of a rectangle describe about the squares covering it?
    - What does the width of a rectangle describe about the squares covering it?
- The concept of multiplication can be related to the area of rectangles using arrays. Students need to discover that the length of one dimension of a rectangle tells how many squares are in each row of an array and the length of the other dimension of the rectangle tells how many squares are in each column. Ask questions about the dimensions if students do not make these discoveries. For example:
    - How do the squares covering a rectangle compare to an array?
    - How is multiplication used to count the number of objects in an array?
- Students should also make the connection of the area of a rectangle to the area model used to represent multiplication. This connection justifies the formula for the area of a rectangle.
- Provide students with the area of a rectangle (i.e., 42 square inches) and have them determine possible lengths and widths of the rectangle. Expect different lengths and widths such as, 6 inches by 7 inches or 3 inches by 14 inches.

**For additional assistance see the Unit Webinar:
https://www.georgiastandards.org/Archives/Pages/default.aspx

SELECTED TERMS AND SYMBOLS

The following terms 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. These terms 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. Mathematics Glossary

- 2-dimensional
- 3-dimensional
- acute angle
- attributes
- closed figure
- congruent
- cubes, cones, cylinders and rectangular prisms (as subcategories of 3-dimensional figures)
- polygon
- line plot
- obtuse angle
- open figure
- parallel
- parallelogram
- partition
- polygon
- properties
- quadrilateral
- rectangle
- rhombi, rectangles, and squares (as subcategories of quadrilaterals)
- rhombus/rhombi
- right angle
- square
- three-sided
- unit fraction
- area
- overlap
- plane figure
- side length
- square centimeter
- square foot

- square inch
- square meter
- square unit
- tiling

Due to the preponderance of advantages, inclusive definitions are used. For example, the inclusive definition of trapezoid specifies that it is a quadrilateral with at least one pair of parallel sides.

Additional resources for finding definitions for common geometry terms:
http://www.amathsdictionaryforkids.com/dictionary.html

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all third-grade students. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them. The following is a description of the types of tasks you will see in this unit and their purpose.

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.
Performance Task	Tasks which may be a formative or summative assessment that checks for student understanding/misunderstanding and or progress toward the standard/learning goals at different points during a unit of instruction.
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.
Intervention Table	The Intervention Table provides links to interventions specific to this unit. The interventions support students and teachers in filling foundational gaps revealed as students work through the unit. All listed interventions are from New Zealand's Numeracy Project.
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.
CTE Classroom Tasks	Designed to demonstrate how the Georgia Standards of Excellence and Career and Technical Education knowledge and skills can be integrated. The tasks provide teachers with realistic applications that combine mathematics and CTE content.
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.

Task Name	Type of Task/ *Grouping Strategy*	Skills	Standard	Brief Description
Show What You Know	**Scaffolding**/ *Individual*	Describing, Drawing Shapes	MGSE3.G.1	In this task, students will draw pictures to show what they already know about the shapes that they will be studying throughout this unit.
Move It Around	**Scaffolding**/ *Partner*	Identifying Attributes	MGSE3.G.1	In this task, students will create different polygons using triangles and describe their shapes based on common attributes.
Shape Sorter	**Scaffolding**/ *Group/Partner*	Comparing/Contrasting, Classifying Shapes	MGSE3.G.1	In this task, students will sort shapes based on common attributes.
What Makes A Shape?	**Constructing**/ *Group/Partner*	Sorting and Classifying Shapes	MGSE3.G.1	In this task, students begin the process of exploring shapes for their many attributes and use critical vocabulary to describe and compare those shapes through higher-level thinking skills.
Properties of Quadrilaterals	**Constructing**/ *Group/Partner*	Defining Quadrilaterals	MGSE3.G.1	In this task, students will look at examples of rhombuses, rectangles, and squares to make property lists of quadrilaterals.
Can You Find It?	**Practice**/ *Individual/Partner*	Identifying Shape	MGSE3.G.1	In this task, students will recognize shapes that are not only regular geometric figures, but irregular as well.
Score It!	**Practice**/ *Individual/Partner*	Identifying Shapes Within Other Shape	MGSE3.G.1	In this task, students will look for shapes within other shapes.
Geoboard Geometry Guru	**Constructing**/ *Group/Individual*	Defining Shapes	MGSE3.G.1	In this task, students begin exploring how to create plane figures using straight lines and angles and then discover common features of rectangles, squares, and triangles.
Quadrilateral Riddles	**Practice**/ *Individual/Partner*	Defining Quadrilaterals	MGSE3.G.1	In this task, students will use the mathematical vocabulary developed through this unit to describe the attributes of quadrilaterals.

School Mosaic	**3 Act-Task** *Whole Group*	Defining Quadrilaterals Identifying Attributes	MGSE3.G.1	In this task, students will look at a picture and tell what they noticed. Next, they will be asked to discuss what they wonder about or are curious about. Students will then use mathematics to answer their own questions.
What Do You See?	**Practice**/ *Individual*	Comparing/Contrasting Shapes	MGSE3.G.1	In this task, students will look for shapes within intersecting lines.
What's the Connection?	**Constructing**/ *Groups of 4*	Comparing Quadrilaterals	MGSE3.G.1	In this task, students will use what they have learned about shapes to make a set of cards that are related to each other in a similar way.
Attributes of Shapes FAL	**Formative Assessment Lesson**	Attributes of Shapes	MGSE3.G.1	In this assessment students use the attributes of shapes to view shapes as members of both specific sub categories and larger, more general, categories.
Pattern Block Fractions	**Constructing**/ *Partner*	Partitioning Shapes	MGSE3.G.2	In this task, students will use pattern blocks to partition shapes into different shapes.
How Many Different Ways?	**Practice**/*Individual*/ *Partner*	Combining Shapes to Fill an Area	MGSE3.G.1 MGSE3.G.2	In this task, students will discover different ways land could be partitioned into equal shares.
Picture Pie	**Practice**/*Individual*/ *Partner*	Using Shapes to Create Art	MGSE3.G.2	In this task, students will partition a circle into equal areas. They will then use these pieces to create pictures
I Have, Who Has?	**Practice**/*Group*	Using Pictorial Representation of Fractions	MGSE3.G.2	This task will help students further develop their understanding of partitioning shapes into parts with equal area by using halves, thirds, fourths, sixths, and eighths.
A Whole Lot of Garden Hose	**Career-Based Task**	Perimeter and Area	MGSE3.OA.7 MGSE3.MD.6 MGSE3.MD.7	In this lesson students will be given a set length of irrigation hose and asked to identify the greatest possible area where farming can take place.
Pentomino Perimeters	**Constructing**/ *Whole Group*/ *Partner*	Determining Perimeter and Area, Finding Different Perimeters with Same Area	MGSE3.MD.7 MGSE3.MD.8	In this task, students will explore area and perimeter and their relationship through the use of pentominoes.

Rectangles Rule	**Constructing**/ *Individual*	Finding Different Areas, Keeping Perimeters the Same	MGSE3.MD.7 MGSE3.MD.8	In this task, students will use given perimeters to draw rectangles and compare areas of various rectangles.
How Big is a Desk?	**Constructing**/*Whole Group/Partner*	Estimating and Measuring Perimeter and Area, Using Different Units of Measurement	MGSE3.MD.7 MGSE3.MD.8	In this task, students will use square units to estimate and measure the perimeter and area of a figure and compare the perimeter and area using different units.
Guess Who's Coming to Dinner?	**Constructing**/*Small Group*	Making Different Rectangles, Finding Different Perimeters with Same Area	MGSE3.MD.7 MGSE3.MD.8	In this task, students will manipulate squares to alter the perimeter of given shapes in order to maximize seating potential. Students will then determine the size table cloth needed for the table of their choice.
Measure My Shapes	**Scaffolding/ Constructing/** *Individual/Partner*	Measuring Sides to Create Line Plots	MGSE3.MD.4	In this task, students will use rulers to measure side lengths of different shapes. They will use this data to create a line plot.
Pattern Block Graphing	**Constructing**/ *Individual/Partner*	Constructing Shapes to Create Pictures, Collect Data and Create Graphs	MGSE3.MD.3	In this task, students will use pattern blocks to create pictures and then collect data from their picture. Afterwards, they will represent this data in a picture and bar graph.
My Geometric Book	**Constructing**/ *Individual/Partner/ Group*	Reasoning with Shapes, Partitioning Shapes	MGSE3.G.1 MGSE3.G.2	In this task, students will use a vocabulary graphic organizer to make a booklet that demonstrates all that they have learned about standard including shapes and partitioning shapes into equal areas.
Choice Board	**Culminating Task**/ *Individual/Partner/ Group*	Reasoning with Shapes, Partitioning Shapes, Representing and Interpreting Data	MGSE3.G.1 MGSE3.G.2 MGSE3.MD.3 MGSE3.MD.4	In this task, students will be given a choice board to demonstrate their understanding of the content covered in this unit

INTERVENTION TABLE

The Intervention Table provides links to interventions specific to this unit. The interventions support students and teachers in filling foundational gaps revealed as students work through the unit. All listed interventions are from New Zealand's Numeracy Project.

Cluster of Standards	Name of Intervention	Snapshot of summary or Student I can statement. . .	Materials Master
Measurement and Data Geometric Measurement: understand concepts of area and relate area to multiplication and to addition MGSE3.MD.3 MGSE3.MD.4 MGSE3.MD.7 MGSE3.MD.8	Smiley Face	Solving multiplication problems using skip counting by twos, fives, and tens.	
	Blank Grids	Solving multiplication problems using skip counting by twos, fives, and tens.	
	Three's Company	Solve multiplication problems by using repeated addition.	
	Animal Arrays	Solve multiplication problems by using repeated addition.	
	Turn Abouts	Change the order of factors to make multiplication facts.	
	Number Strips	Solve multiplication problems by skip counting in twos, fives, and tens.	
	The Great Cover Up	cover a shape with non-standard area units and count the number used	The Great Cover Up PDF
Geometry Reason with shapes and their attributes MGSE3.G.1 MGSE3.G.2	Fraction Wafers	Find unit fractions of regions.	
	Fraction Pieces	Identify the symbols for halves, quarters, thirds, fifths, and tenths including fractions greater than 1.	
	Creating Fractions	Find unit fractions of regions	
	Making Fractions with Geoboards	Identify the symbols for halves, quarters, thirds, fifths, and tenths including fractions greater than one.	
	Fair Shares	Find fractions of sets by sharing.	
	Foil Fun	make, name and describe polygons and other plane shapes	
	Arty Shapes	Describe shape attributes	

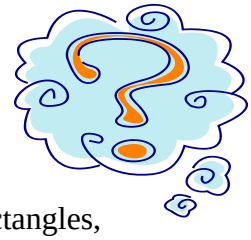
FORMATIVE ASSESSMENT LESSONS

Formative Assessment Lessons are designed for teachers to use in order to target specific strengths and weaknesses in their students' mathematical thinking in different areas. A Formative Assessment Lesson (FAL) includes a short task that is designed to target mathematical areas specific to a range of tasks from the unit. Teachers should give the task in advance of the delineated tasks and the teacher should use the information from the assessment task to differentiate the material to fit the needs of the students. The initial task should not be graded. It is to be used to guide instruction.

Teachers are to use the following Formative Assessment Lessons (FALS) Chart to help them determine the areas of strengths and weaknesses of their students in particular areas within the unit. The chart lists each FAL to use for a specific task or task along with the content addresses.

Formative Assessments	Content Addressed	Pacing (Use before and after these tasks)
Attributes of Shapes FAL	Sorting and Classifying Shapes Based on Common Attributes	Move It Around Shape Sorter What Makes a Shape? Properties of Quadrilaterals Can You Find It? Score It! Geoboard Geometry Guru Quadrilateral Challenge Quadrilateral Riddles What Do You See? What's The Connection?

SCAFFOLDING TASK: SHOW WHAT YOU KNOW! Return to Task Table



In this task, students will draw pictures to show what they already know about the shapes that they will be studying throughout this unit.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students should have had experience with identifying two-dimensional shapes (no matter the position, orientation, or size) and begin to use the properties of the shapes to further develop understanding of shapes. These properties can include number of sides, number of corners (vertices), and may have included the length of the sides. Two-dimensional shapes include triangles, quadrilaterals (square, rectangle, and trapezoids), circles, pentagons, and hexagons. In third grade, students will further develop their understanding of two-dimensional shapes by looking at the different categories and the attributes that shapes might share.

COMMON MISCONCEPTIONS

Students may identify a square as a “nonrectangle” or a “nonrhombus” based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- How do the attributes help us identify the different shapes?
- What are some different ways to identify shapes?

MATERIALS

- Student Copy of "Show What You Know" Recording Sheet

GROUPING

Individual Activity

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

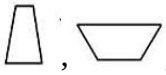
Part I (SMP 1, 4, and 6)
Students will use the recording sheet to show their current understanding of two-dimensional/plane shapes. This activity could be used as a formative assessment throughout this unit to show what students know at the beginning of the unit, during the unit, and at the end of the unit. If there is room to reuse the same sheet, have students changed the color of their writing utensil to show growth, or have students draw a line under the information after each assessment.

This activity will also help you guide students in their development of their Geometric Thinking based on the van Hiele levels. More on the topic can be read in the Van de Walle 3-5 resource book on pages 206 - 208

Part II (SMP 1, 2, 3, 6, and 7)
The Recording Sheet is a graphic organizer that can help you understand what students know about two-dimensional shapes. Place the following questions on chart paper for a class discussion:

- What are some differences between the shapes listed?
- Are any of the shapes alike?
- Can you give me an example of a (name a shape?) What about a non-example?
- Are all of these shapes the same?

FORMATIVE ASSESSMENT QUESTIONS:

- How did you determine the similarities and differences in the shapes?
- Is that the only way that shape could be represented?
- What if _____
  _____
  _____?
  Example: What if I added another side? What if this shape looked like
  
  Is it still a trapezoid?

DIFFERENTATION

Extension

- Students that need an extension with this activity might be able to use vocabulary to describe the sides and vertices of the different shapes. They might also be able to see that some of the shapes belong together in the same class and may be able to describe the properties of the shapes that belong in the same class.

Intervention

- Students that struggle with this activity may not know different ways in which shapes can be described (attributes, properties) and only know a shape based on its appearance. Teachers may want to create an anchor chart with terms used in discussion so that students who struggle can refer to the anchor chart. Examples of these words might be: sides, corners/vertices, polygon, congruent, angle. Students should help produce the anchor chart.
- Intervention Table

Name _____ **Date** _____

Plane Shapes

Use the space below to write, draw, or describe what you know about the shapes.

Rectangle	Square	Rhombus
Triangle	Trapezoid	Quadrilaterals
Pentagon	Hexagon	Circle

SCAFFOLDING TASK: MOVE IT AROUND

Return to Task Table

Adapted from The Super Source CD-Rom/ETA Cuisenaire

In this task, students will create different polygons using triangles and describe their shapes based on common attributes.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

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.

BACKGROUND KNOWLEDGE

Students should have had experience with identifying two-dimensional shapes (no matter the position, orientation, or size) and begun to use the properties of the shapes to further develop understanding of shapes. These properties can include number of sides, number of vertices, and may have included the length of the sides. Two-dimensional shapes include triangles, quadrilaterals (square, rectangle, and trapezoids), circles, pentagons, and hexagons.

ESSENTIAL QUESTIONS

- Do you think shapes could be grouped together in the same family or classification? Explain.
- How do you know the difference between shapes if several of them have the same number of sides?

MATERIALS

- Math Journals
- Chart Paper

- Small Tangram triangles (4 per student; these can be paper copies if manipulative is unavailable.)
- Tangram tracing paper

GROUPING

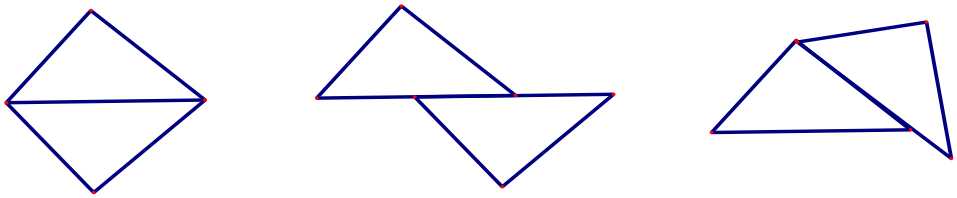
Groups (4 students per group works well)/Individual

NUMBER TALK

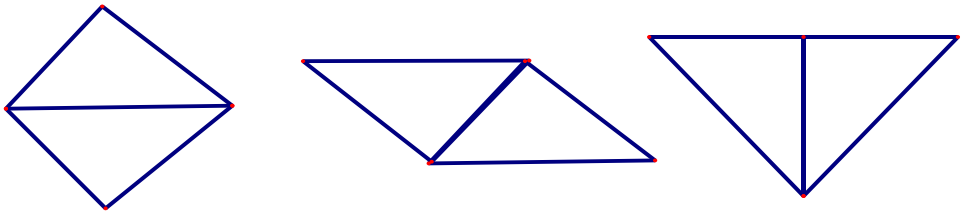
By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot. (2007)

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

PART I: (SMP 1, 2, 3, 4, 5, and 7)
Display the following shapes using the small triangles in the Tangram set**.** Ask the students which shapes are created when the edges of the triangles match.



Ask three different students to create shapes where the edges of the triangles match completely (examples below).



Ask the students how they know that the shapes are different. Explain to them that closed shapes with line segments meeting to make an angle are called polygons.

PART II (SMP 1, 2, 4, 5, 6, and 7)
Students will be arranged in partners and asked to create as many polygons as they can using all four of the triangles provided. The students can trace this onto the TanGram tracing paper or the teacher can die cut the triangles ahead of time so students can glue the polygons on paper. Cut out the shapes and have the students discuss how they determined the new polygons.

PART III (SMP 1, 2, 3, 6, and 7)
After shapes have been cut out from the tracing paper or glued to construction paper, come together as a group and have them discuss the various ways that the shapes could be sorted according to common attributes. Place their ideas in a column on the white board, or you can use chart paper to place the group headings on. Have students place their shapes under the group headings where they believe they fit. The students will continue pasting the shapes until there are several in each category.

Once the shapes have been grouped, lead a class discussion with the following questions:

- How can you describe some of the angles in the shapes you created?
- How else could you have sorted the polygons?
- Could any of the polygons fit in more than one category?
- Do you think that all of the shapes that can be made with four triangles have been posted?

FORMATIVE ASSESSMENT QUESTIONS

- Describe your shape to me.
- How might this shape fit with these?
- Did you see the shape in a different way?

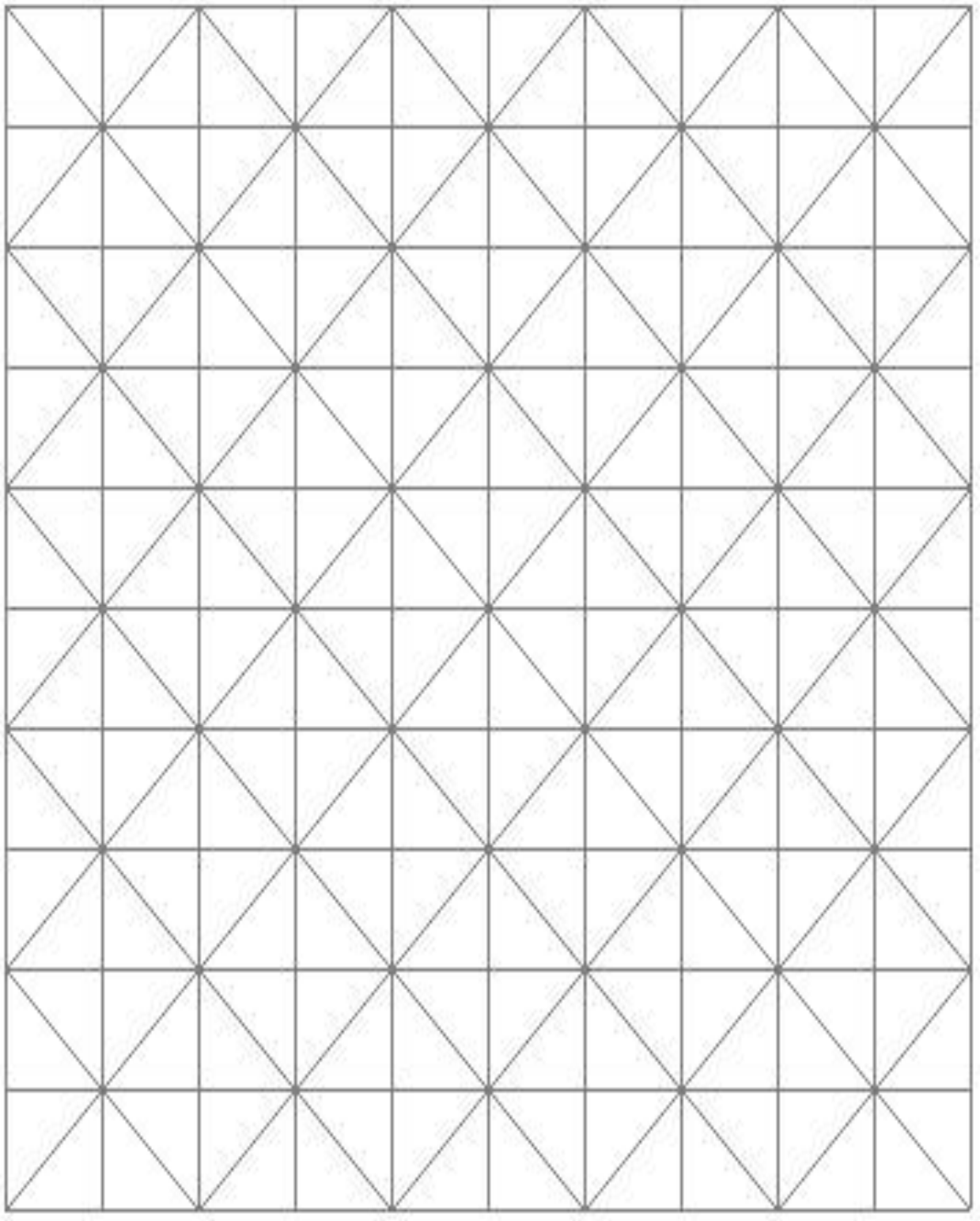
DIFFERENTIATION

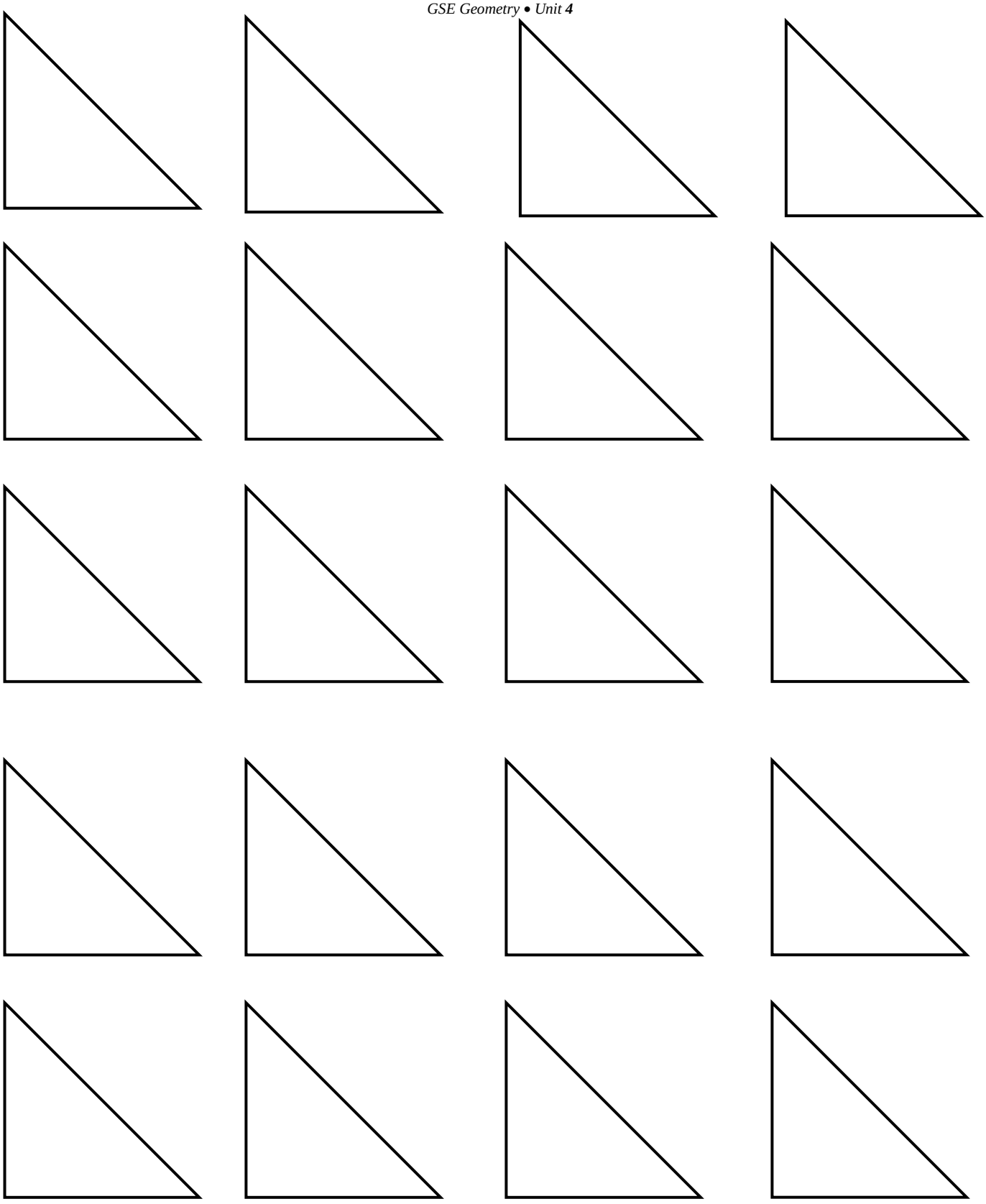
Extension

- Have students use three parallelograms to show the polygons that can be made and group them according by agreed upon attributes.

Intervention

- For students that struggle, have them use only two triangles to create polygons and discuss the attributes observed.
- Intervention Table





CONSTRUCTING TASK: SHAPE SORTER

Return to Task Table

Adapted from Activity 8.1 in Teaching Student Centered Mathematics 3-5, by John Van de Walle and LouAnn Lovin

In this task, students will sort shapes based on common attributes.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.

BACKGROUND KNOWLEDGE

Students should have had experience with identifying two-dimensional shapes (no matter the position, orientation, or size) and begun to use the properties of the shapes to further develop understanding of shapes. These properties can include number of sides, number of corners (vertices), and may have included the length of the sides. Two-dimensional shapes include triangles, quadrilaterals (square, rectangle, and trapezoids), circles, pentagons, and hexagons.

COMMON MISCONCEPTIONS

Students may identify a square as a “nonrectangle” or a “nonrhombus” based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- Do you think shapes might be grouped together in the same family or classification? Explain.
- How do you know the difference between shapes if several of them have the same number of sides?

MATERIALS

- An assortment of shapes for sorting https://wps.ablongman.com/ab_vandewalle_math_6/0,12312,3547876-,00.html (41-47)
- Or see the attached sheets
- Math Journals
- Chart Paper

GROUPING

Groups (4 students per group works well)/Individual

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot. (2007)

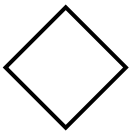
TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION (SMP 1, 2, 3, 4, 5, 6, and 7)

1. Divide students into groups of four. Each group of students should have an assortment of shapes. These shapes should be regular and irregular shapes. Once students are in groups, each student will pick a shape and tell 2 or 3 things they find interesting about the shape (No right or wrong answer.) You might want the students to write in their journals before sharing.
2. After all students share about their first shape, students will pick a second shape from the group's assortment. Each student will then try to find something that is the same about the two shapes and something that is different about the shapes chosen. Students may journal this before sharing with their group (see example of Compare/Contrast Matrix below). After comparing/contrasting the two shapes, students will share with their group. Students within the same group should begin to create a list of words that are common among the shapes. All words that describe the shapes should be accepted (pointed, curvy, lines look like train track, etc.) and then you can introduce the correct math vocabulary.

Example of Compare/Contrast Matrix

My Shapes are the	Attribute	Shape # 1	Shape #2
Same			
Different			

Student Example of Compare/Contrast Matrix

My Shapes are the:	Attribute	Shape # 1	Shape #2
			
Same	**Has 4 corners**	**Yes**	**Yes**
Different	**All sides are the same length**	**Yes**	**No**

3. Allow all groups to share with the class the similarities and differences between the shapes. Make a class anchor chart of words that describe shapes. This anchor chart might include the words: sides, angles, corner/vertices, and the names of shapes.
4. The group will continue exploring the shapes by selecting one shape at random and placing it in the center of the group. The task for the group is to find all of the other shapes that are like the target shape (which is the shape that is in the center of the group) according to the same rule. Students might say, "This shape is like the target shape because it has ____ and _____." Example: This shape is like the target shape because it has curves and one straight side. Challenge students to use the same target shape but sort the shapes using a different property. For students that struggle with this challenge, have them refer back to the anchor chart to pick another property.

FORMATIVE ASSESSMENT QUESTIONS

- Why does this shape belong with these shapes and not in this other group?
- How might this shape fit with these?
- Do you agree with your group members' decisions about the categories chosen for each shape? Did you see the shape in a different way?

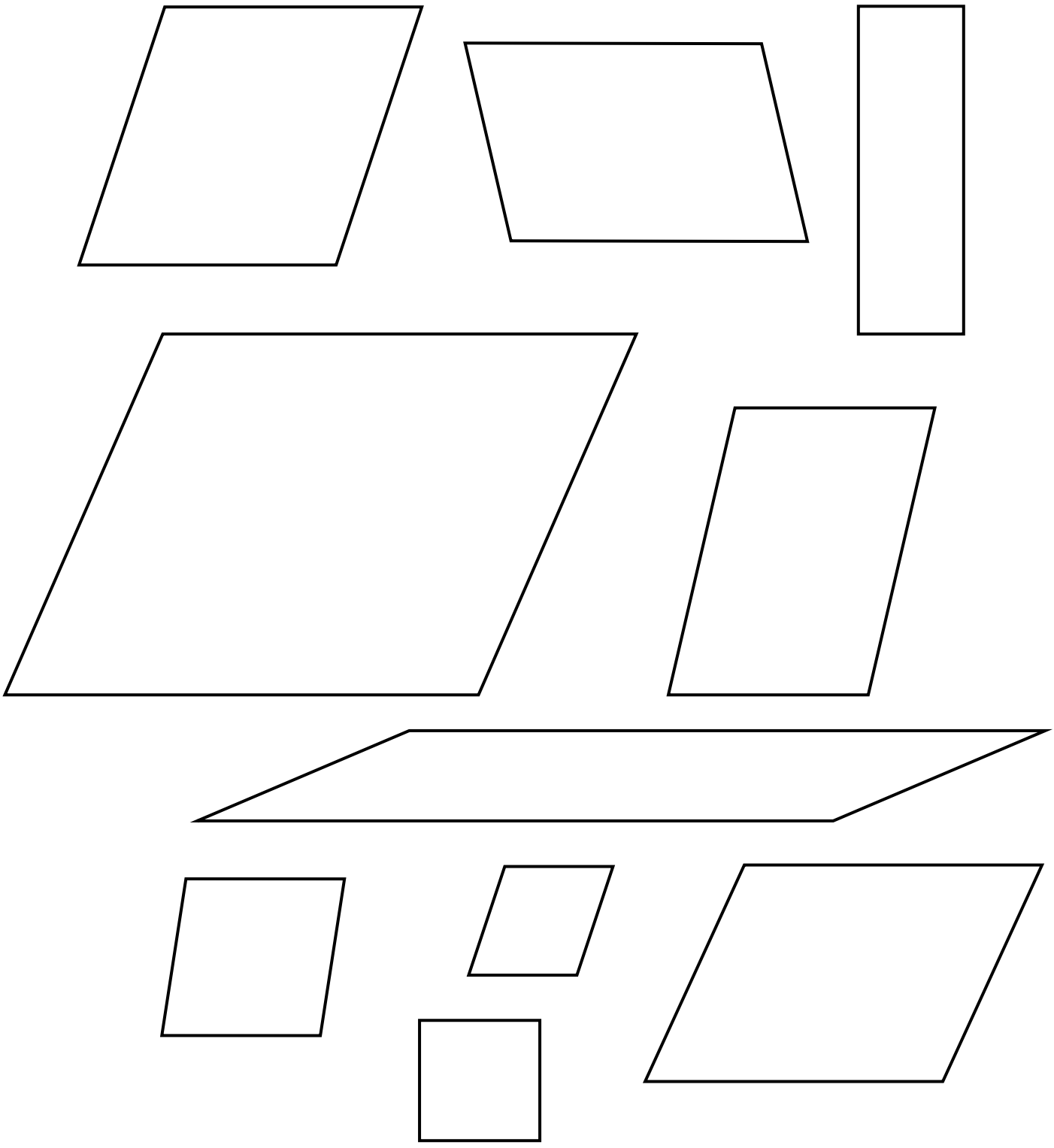
DIFFERENTIATION

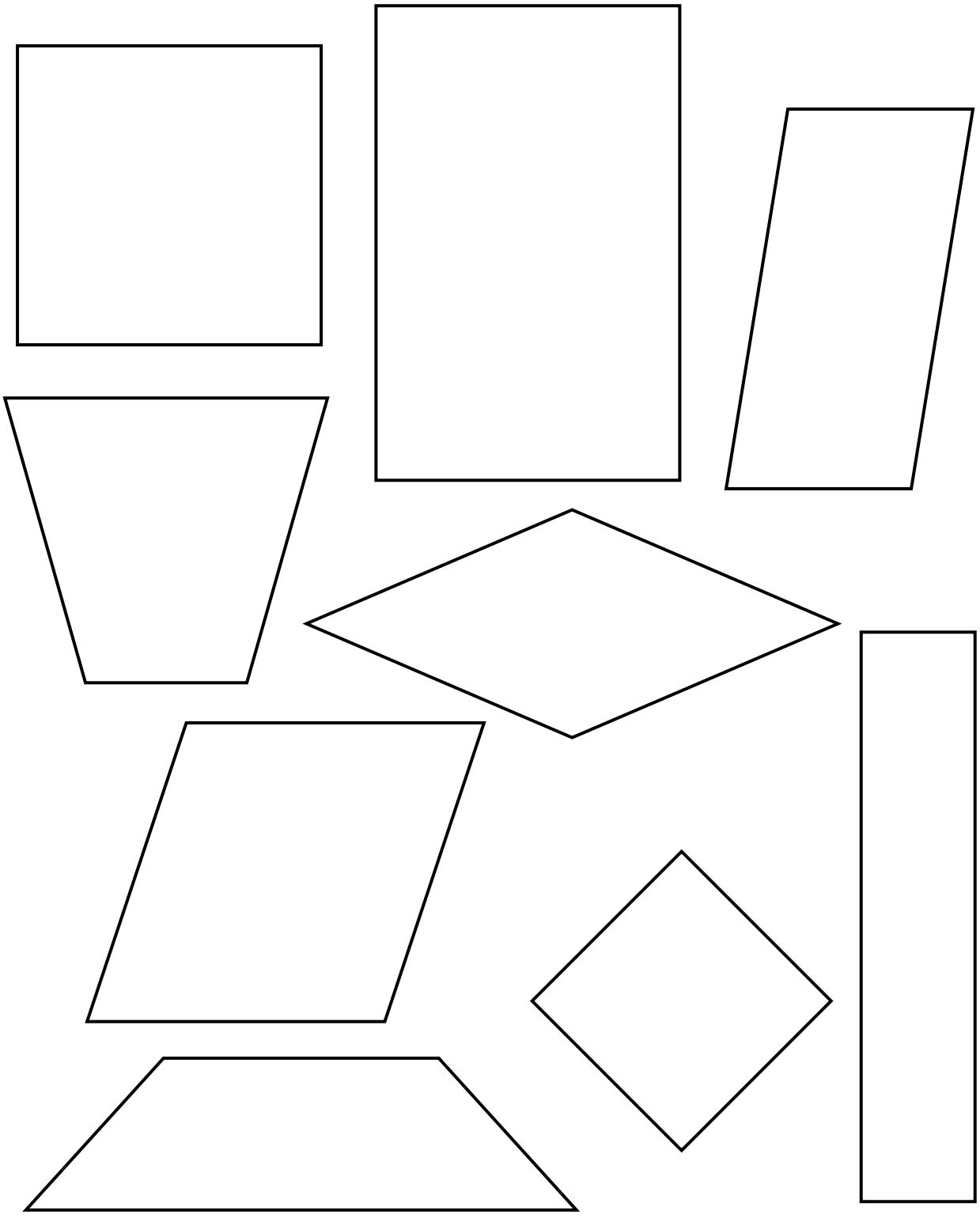
Extension

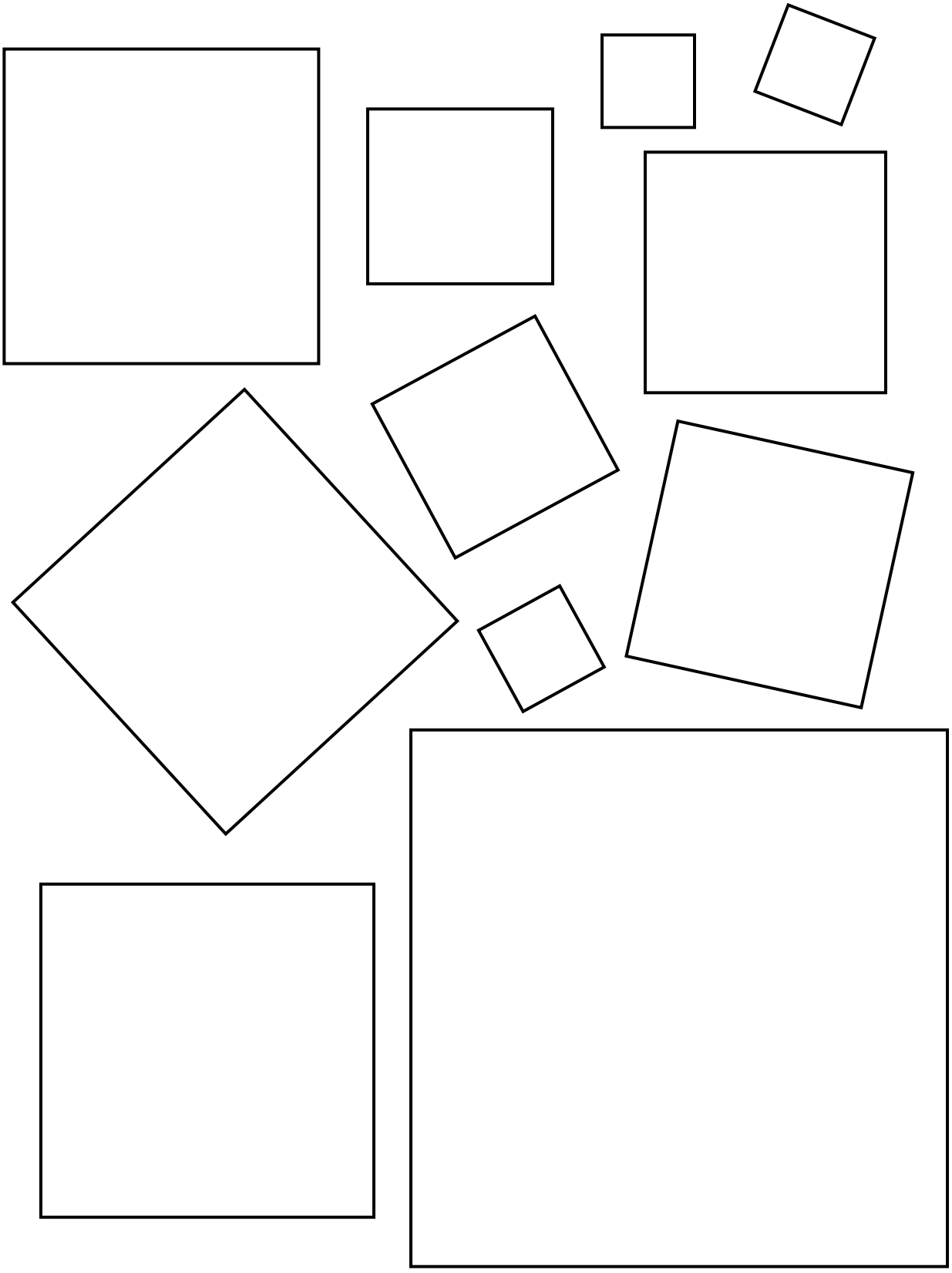
- Students that need the extension might want to compare 3 shapes using the Compare/Contrast Matrix. They may be ready for more sophisticated vocabulary to describe the sides and corners (parallel, perpendicular, right angle, obtuse angle, acute angle, line symmetry, etc.)

Intervention

- Students that struggle with this activity are still Level 0 thinkers in the Van Hiele Levels of Geometric Thoughts. Students in this level need experiences where they can observe, feel, build (compose), take apart (decompose), or work with both two and three-dimensional shapes in some manner. To help students advance, the focus should be on specific characteristics or properties to help student develop an understanding of geometric properties. Effective questioning techniques will help students clarify their thinking. Examples of questions: Can you draw a triangle that looks different than this one? Is this rectangle  like this one  ? How are they different? Explain why this shape  is like this one  ? The shapes used for the sort can be used with the struggling learner for many different activities.
- Intervention Table

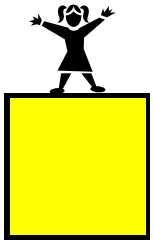






CONTRUCTING TASK: WHAT MAKES A SHAPE?

Return to Task Table



In this task, students begin the process of exploring shapes for their many attributes and use critical vocabulary to describe and compare those shapes through higher-level thinking skills.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.

BACKGROUND KNOWLEDGE

Students should have had experiences with common plane figures and the identification of their sides and angles. Students should also be familiar with grouping and ways to express their findings using common graphic organizers.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- How can I use attributes to compare and contrast shapes?
- Why are the attributes of shapes important?
- How it is possible to have a shape that has fits into more than one category?

MATERIALS

- Glue and scissors
- *The Greedy Triangle* by Marilyn Burns or other book about shape attributes
- "What Makes a Shape? Shapes for Sorting" student sheet, copied on colored paper
- "What Makes a Shape? Venn Diagram" student recording sheet, copied on white paper

GROUPING

Whole Group/Partner Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (SMP 6)

Teachers may want to begin this task by reading a book about shape attributes such as *The Greedy Triangle*. While reading, questions should be posed to the students that lead to the discovery of shape attributes – their similarities and differences. A list of attributes may be generated on the board throughout the reading or each student may be asked to keep a list of attributes. These words may already be on an anchor chart from the previous task.

Part II (SMP 1, 2, 3, 4, 5, 6, and 7)

When students are working in pairs, the teacher should monitor the questioning and discussion between the students, and if necessary, model a discussion prior to or during the work time. Students will follow the directions below from the "What Makes a Shape?" student recording sheet:

1. Cut out the shapes below.
2. Sort the shapes in different ways. (Use the list of attributes to help you think of different ways to sort the shapes.)
    - Students may sort shapes by such attributes as number of vertices, or size of angles. Responses should clearly indicate how the shapes were grouped. Exemplary responses would include the use of a graphic organizer, explanations or labels that are clear, and appropriate mathematical vocabulary.
3. Choose two attributes and label the Venn diagram.

4. Sort your shapes in the Venn diagram leaving any shapes that don't fit outside of the Venn diagram.
5. Once you have checked your work, glue the shapes on the Venn diagram.
6. Write to explain your thinking and to describe any observations you made.

Once students have completed their Venn diagrams, encourage them to share their work. A few students can be selected during the work time to share their work and explain their thinking. Or if students have had experience sharing their work, they can be placed in small groups and each student can share their work with their group.

FORMATIVE ASSESSMENT QUESTIONS

- How could you describe this figure in relationship to another figure?
- Why did you place the figure here? (Indicate a section of the Venn diagram.)
- How do you know this shape is in the correct place?
- Choose one plane figure and tell me how it is used in the world and why its attributes are important in that use.
- Can you choose a shape not included and tell me where it would fit on your paper and why?

DIFFERENTIATION

Extension

- Have students select different ways to compare/contrast the shapes, then compare their way of sorting with another student.
- Use solid figures instead of plane figures.
- Incorporate a writing opportunity by having students write a compare/contrast paragraph using 2 shapes.

Intervention

- Select a smaller sample of shapes. Provide the labels and a graphic organizer for students or do the reverse in a discovery model and set out some of the shapes in the organizer and let students determine the correct labels, then sort the remaining shapes.
- If students are having difficulty participating in productive conversations, the teacher should model using think-alouds or self-questioning strategies.
- Intervention Table

TECHNOLOGY CONNECTION

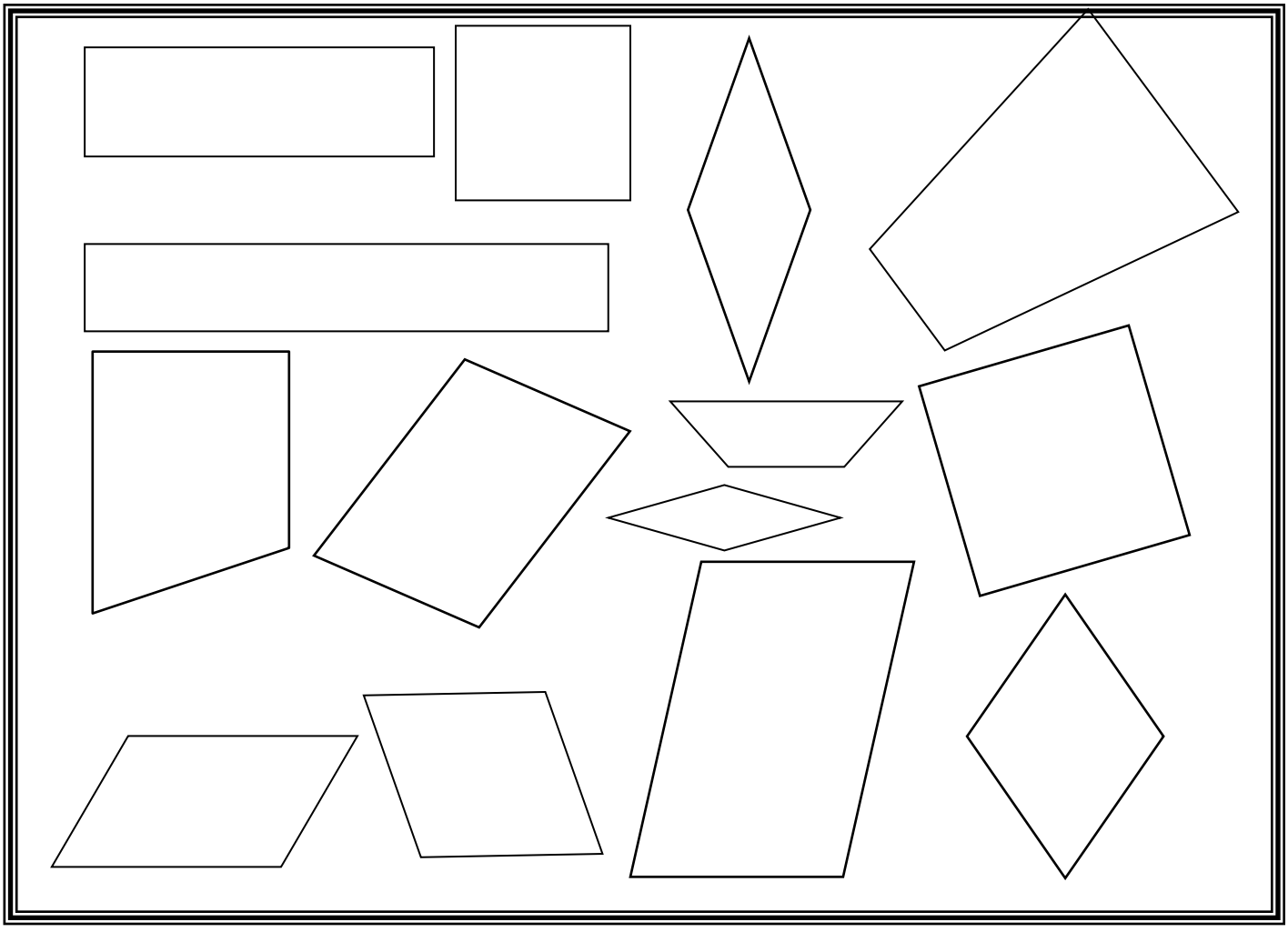
- https://www.mathlearningcenter.org/resources/apps/geoboard *Geoboard
- http://www.mathcats.com/explore/polygons.html - Explore Polygons
- http://www.math-play.com/Polygon-Game.html - Name the Shape

Name _____ Date _____

What Makes a Shape?

Shapes for Sorting

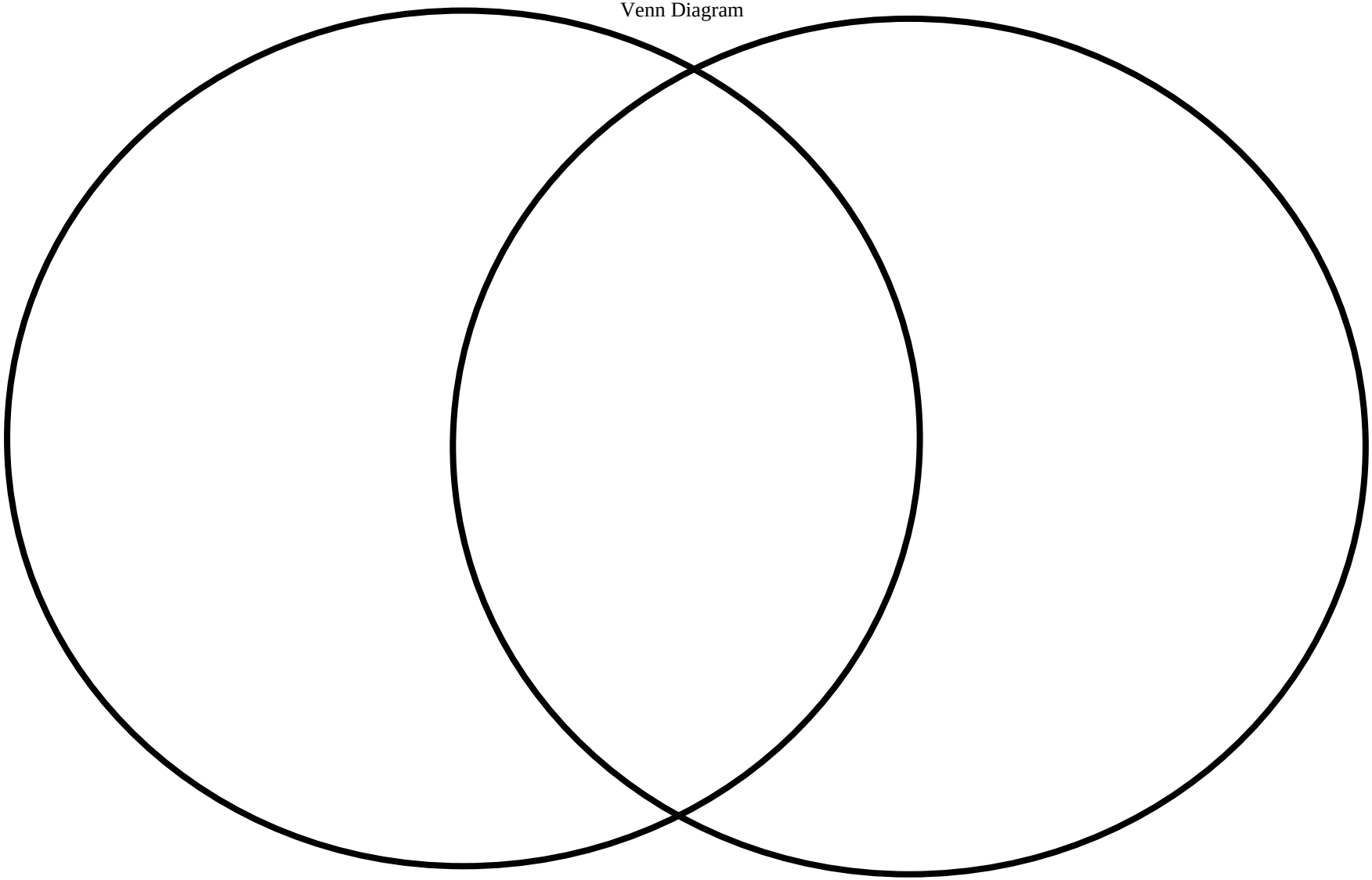
1. Cut out the shapes below.
2. Sort the shapes in different ways. (Use the list of attributes to help you think of different ways to sort the shapes.)
3. Choose two attributes and label the Venn diagram.
4. Sort your shapes in the Venn diagram leaving any shapes that don't fit outside of the Venn diagram.
5. Once you have checked your work, glue the shapes on the Venn diagram.
6. Write to explain your thinking and to describe any observations you made.



Name _____ Date _____

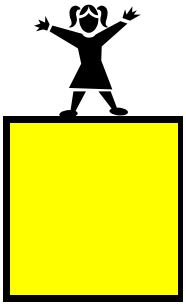
What Makes a Shape?

Venn Diagram



CONSTRUCTNG TASK: PROPERTIES OF QUADRILATERALS Return to Task Table

Adapted from Property Lists for Quadrilaterals Van de Walle Activity 8.8



In this task, students will look at examples of rhombuses, rectangles, and squares to make property lists of quadrilaterals.

CONTENT STANDARDS

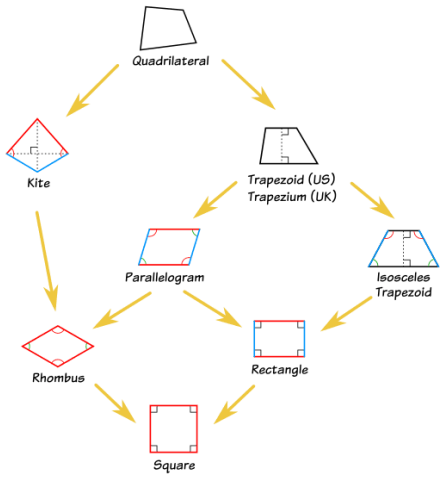
MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Throughout this unit, the goal for third grade students is to begin to understand that quadrilaterals are all four-sided closed polygons. While angles and lines have not been studied yet (this will be addressed in 4th grade standard MGSE4.G.1), it is important for students to begin to see that angles can be square (right), skinny (acute) or fatter than a square (obtuse). Use index cards, set squares, or corners of paper to compare angles. Accept terms students use as a teachable moment, when appropriate. The same applies with talking about the sides. Students may say opposite sides or the sides that run into each other. Within the broad category of quadrilaterals are trapezoids, parallelograms, rhombuses, rectangles, and squares. Through many activities, students need to begin to understand the categories of two-dimensional shapes (see Van de Walle page 221 for descriptions).



For Teacher Reference ONLY – Taken from

http://www.regentsprep.org/regents/math/geometry/GP9/LQuad.htm

Quadrilateral: A quadrilateral is any four-sided figure. Do not assume any additional properties for a quadrilateral unless you are given additional information.

Trapezoid: A trapezoid has *at least* one set of parallel sides.

Parallelogram: A parallelogram has 2 sets of parallel sides, 2 sets of congruent sides, opposite angles congruent, consecutive angles supplementary, diagonals bisect each other and the diagonals form 2 congruent triangles

Rectangle: The rectangle has all of the properties of the parallelogram, PLUS 4 right angles, and diagonals congruent

Rhombus: The rhombus has all of the properties of the parallelogram, PLUS 4 congruent sides, diagonals bisect angles, diagonals perpendicular

Square: The square has all of the properties of the parallelogram AND the rectangle AND the rhombus.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- Is it possible for a square to be a rectangle? Why?
- Why do some quadrilaterals look so much alike?
- Is a rectangle a rhombus? Why?
- Why can some shapes be called by different names?

MATERIALS

- Student Recording Sheet
- Index Cards (used to compare angles and sides)
- Rulers or Tape Measures

GROUPING

Partner or Group

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 5, 6, and 7)

Students will use the index card to check angles, compare side lengths and draw lines if needed. Encourage students to use "at least" when describing how many of something the shape has. For example, a rectangle has at least 4 square corners. Have students compare sides by using a ruler to measure (length), and angles (square, smaller than square, larger than square). Some students may begin to see diagonals and symmetries of the shapes. Have groups share what they discovered together (remember that defending arguments and critiquing the reasoning of others is a major part of mathematic instruction!) and create a class list for each shape.

FORMATIVE ASSESSMENT QUESTIONS

- Did you notice anything particular about squares?
- How do you know that a quadrilateral is a rhombus or a rectangle?
- Why do you think that a rectangle, rhombus, and a square are all parallelograms?

DIFFERENTIATION

Extension

- As this task exists currently, it is considered to be at level 1 of the van Hiele geometric thinking, which is appropriate for third grade. According to Van de Walle, most fourth and fifth graders will still be at a level 0 or 1. Students that need an extension might consider doing Activity 8.11 called Minimal Defining Lists on page 230 or Activity 8.12 called True or False? On page 231 in the 3-5 Van de Walle resource book.

Intervention

- This task will be difficult for the majority of your students. By working with a partner, the struggling learner can begin to understand that some shapes fit into several categories because of the properties that they share. For instance, a square is a rectangle, a rhombus, a parallelogram and a quadrilateral because it shares properties. Many examples may need to be provided for the struggling learner. Technology can provide many opportunities for the student. See Technology Connections.
- Intervention Table

TECHNOLOGY CONNECTIONS

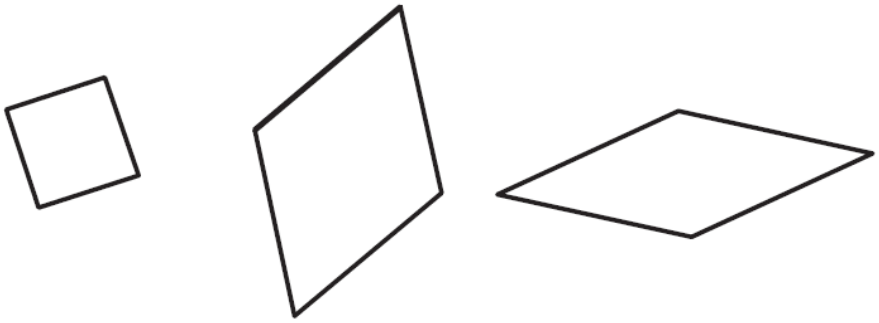
- http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html - allows students to move corners to make sizes.
- http://www.interactivestuff.org/match/maker.phtml?featured=1&id=24 – matching game
- http://www.mathplayground.com/matching_shapes.html - matching games (includes kite)

Name:_____ Date:_____

Quadrilaterals

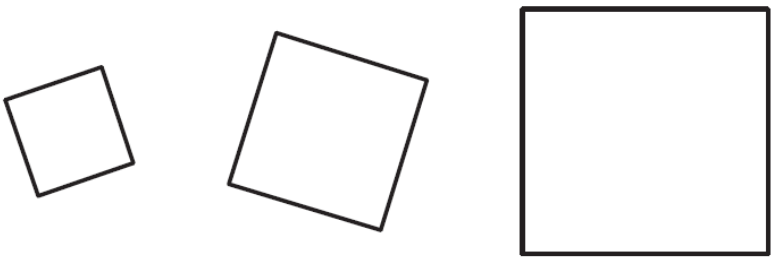
Directions: Look at of the different shapes. Write down anything you notice about the type of shape. Look at the corners (angles) and the sides. Use an index card corner (square corner) to write down what you notice about the corners. Also use the index card to help you measure the length of the sides. Begin to define rhombus, square, rectangle and parallelogram.

These are all rhombuses.



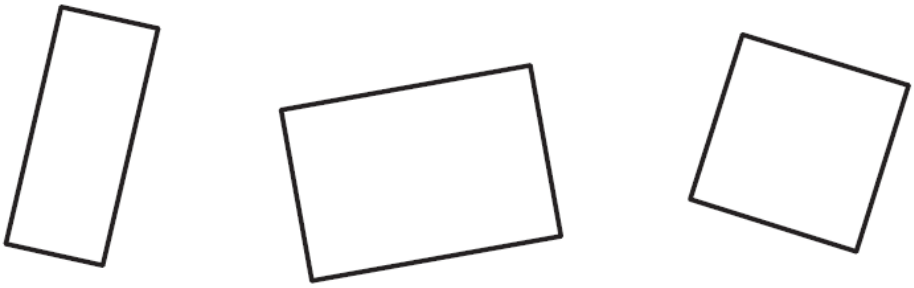
Observations about rhombuses

These are all squares.



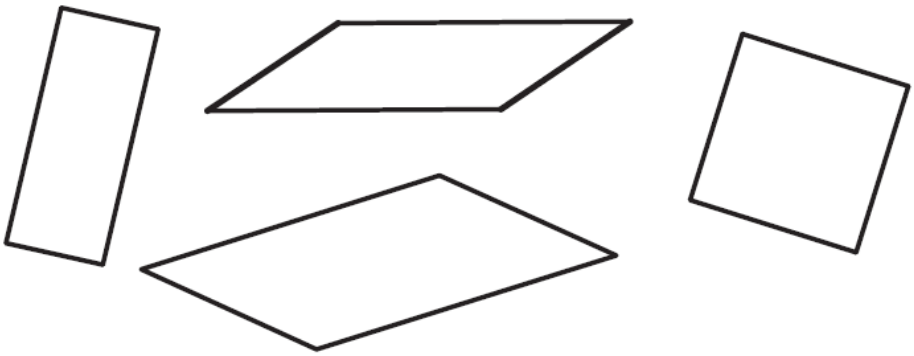
Observations about squares

These are all rectangles.



Observations about rectangles.

These are all parallelograms.



Observations about parallelograms.

PRACTICE TASK: CAN YOU FIND IT?.....Return to Task Table
Adapted from North Carolina Math Instructional Resources

In this task, students will recognize shapes that are not only regular geometric figures, but irregular as well.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students often have trouble seeing shapes within other shapes. They also have a difficult time if the shape is a different orientation than is seen most often. Most students will be able to draw the shapes requested. For those that struggle, provide models of the shapes requested.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- What are some ways that a hexagon (or pentagon) can look?
- Do rectangles and squares always look the same? How do you know?

- Does the direction that a shape is facing change the way it looks? Does it change the shape's name?

MATERIALS

- Can You Find It? Student Resource Sheet or http://wps.ablongman.com/wps/media/objects/3464/3547873/blackline_masters/BLM_40.pdf
- Color pencils or crayons

GROUPING

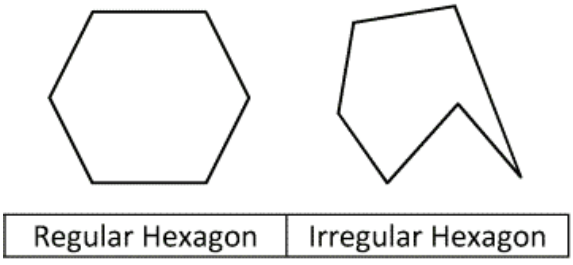
Individual/Partner

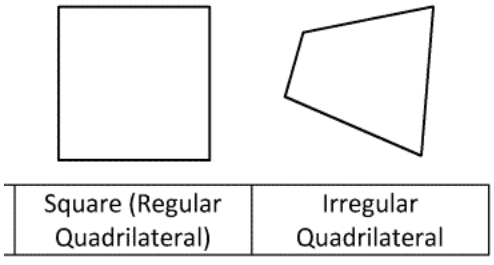
NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 6, and 7)

You may wish to open this lesson by reading a book such as *Shape Spotter* by Megan Bryant, *The Story of Goldie Locks and the Three Squares* by Grace Maccarone, or a similar book. Then, students will use the *Can You Find It?* student resource sheet to locate a rectangle, square, triangle, hexagon, pentagon, a quadrilateral that does not look like a regular rectangle/square, trapezoid, rhombus, hexagon, and trapezoid. They may color each shape a different color and then put some type of marking on all of the quadrilaterals, or you may want them to color all quadrilaterals the same color. Many students struggle to see irregular shaped polygons as fitting into the category with the regular shaped polygons. For instance, most students only know that a hexagon looks like but a hexagon is **any** six-sided closed figure. An important part of the task is to allow students to compare their drawings. This will help students who struggle with orientation of shapes.





FORMATIVE ASSESSMENT QUESTIONS

- Did all of your quadrilaterals have a square corner?
- Do all of your shapes look like a classmate's shapes? How were they different? How are they alike? What attributes help you know that the shapes are still the same?
- How do you know you drew a square and a rhombus?

DIFFERENTIATION

Extension

- Students who need an extension can draw different quadrilaterals and label them. They could also try drawing the shapes in a different orientation or direction. For example, if the trapezoid looks like  , have students draw the trapezoid like  .

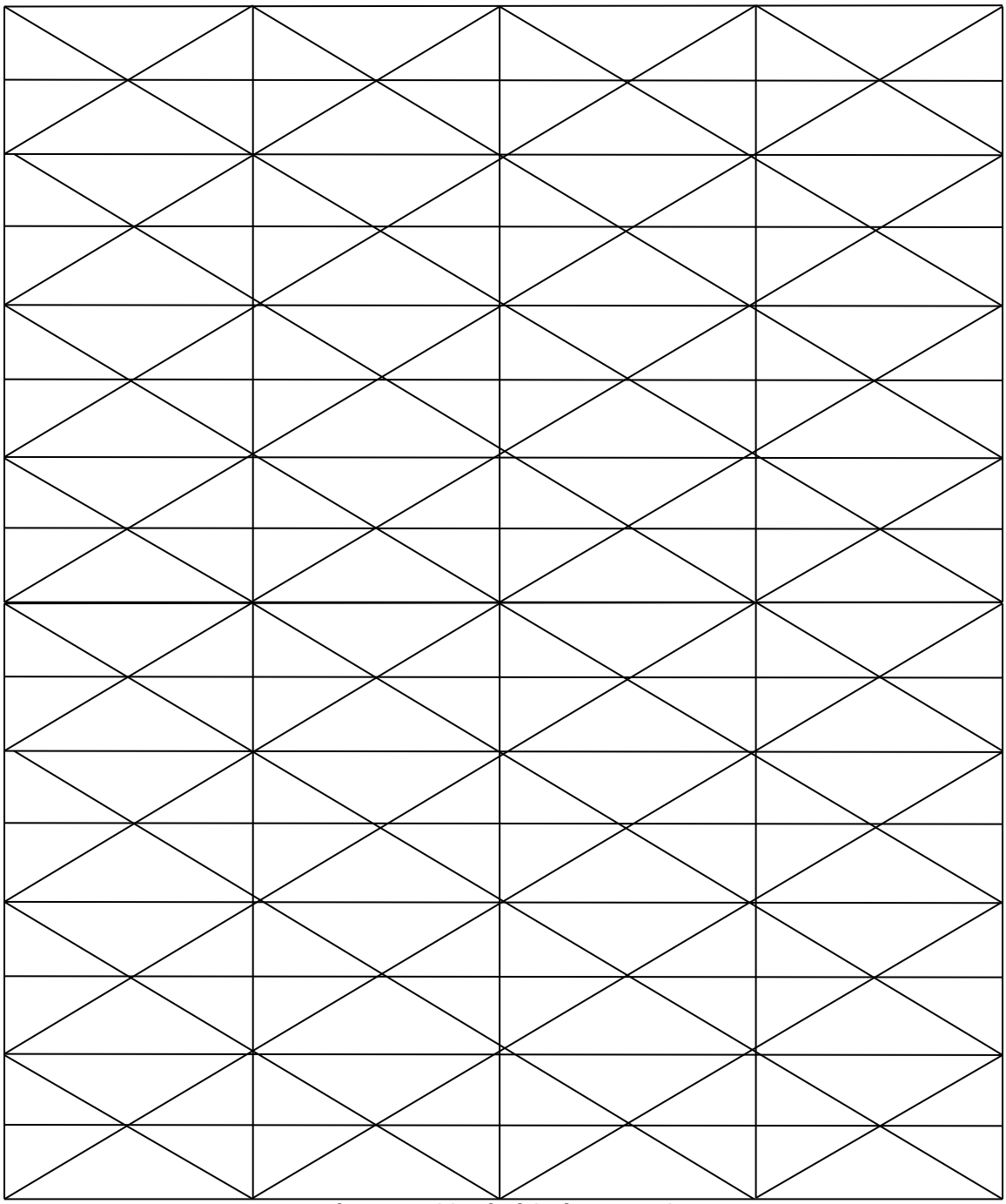
Intervention

- Provide models of the shapes for students to be able to place on the grid to trace around. Remind students that shape names also tell the number of sides. For instance, a quadrilateral is any closed figure with 4 sides and a hexagon means any closed figure with 6 sides.
- Intervention Table

CAN YOU FIND IT?

Find the shapes listed below. Once you find it, use different colors to shade in or trace around the shape. Also color code the directions.

• Rectangle • Square	• Triangle • Hexagon • Pentagon	• Quadrilateral that does not look like a Rectangle or Square • Trapezoid • Rhombus	• A Different looking Trapezoid • A Different looking Hexagon



PRACTICE TASK: SCORE IT!

Return to Task Table

Adapted from NC Math and from http://nrich.maths.org/191

In this task, students will look for shapes within other shapes.

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students often struggle with finding shapes if the shape looks different than what is typically seen. In this activity, students are encouraged to find the triangles, quadrilaterals, pentagons, and hexagons seen in two different figures. This will help to continue to build student's spatial sense and geometric reasoning. It takes many experiences with shapes to be able to further develop these skills with students.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- How might finding shapes within other shapes help me in life?
- Do quadrilaterals have to look like rectangles? How do you know?

MATERIALS

- Printed copies of the student sheet OR use technology to display student sheet
- Math Journal or paper to keep track of number of shapes and total score

GROUPING

Individual or Partner

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 4, 6, and 7)

This is a practice task that could be included in a center or small group activity where all students are not working on it at the same time. In Figure A, students will review the properties of triangles, quadrilaterals, pentagons, and hexagons as they find the shape within the figure. In Figure B, students will locate all of the rectangles and squares within the figure. Some students might be able to solve this by simply tracing over the shape with their pencils. Others might need to draw the shapes on paper. For the struggling student, you may want to get tracing paper or lightweight paper to have students trace over the lines to find all of the shapes.

FORMATIVE ASSESSMENT QUESTIONS

- How could you make sure you find all of the shapes within other shapes?
- How do you think this type of task helps you for the future?
- Do you struggle with finding shapes that are irregular?

DIFFERENTIATION

Extension

- Allow students to create another type of figure like either A or B. Once they know how many shapes are in their large shape, allow other students to solve for the answer. You may also want to visit Figure 8.6 on page 216 of the Van de Walle resource to have students make different shapes with the mosaic puzzle that is in the black line masters. There are several different rectangle and parallelograms that could be created.

Intervention

- Suggestions: Tracing paper or lightweight paper to trace the lines; colored pencils and have student change colors for each type of shape; allow student to have their own copier paper that has either figure multiple times (to cut out or trace over)
- Intervention Table

Name _____ **Date** _____

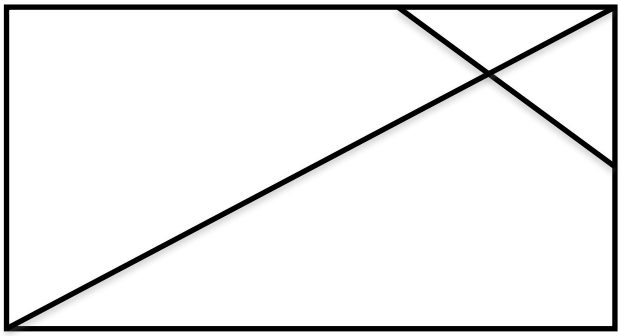
Score It!

Direction: Use Figure A and find all of the triangles, quadrilaterals, pentagons and hexagons. Once you believe you have found all of the shapes, give the appropriate amount of points to each shape found. Find the highest possible score. Once you have it, compare your score to the others in your group. Is it different? Why?

Score This Figure:

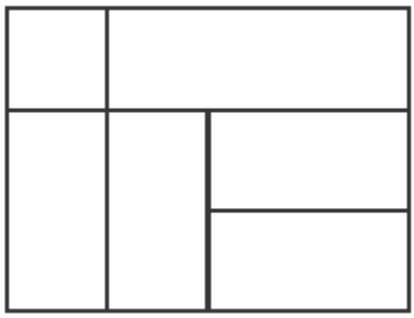
2 points for Triangles
3 points for Quadrilaterals
4 points for Pentagons
5 points for hexagons

Figure A

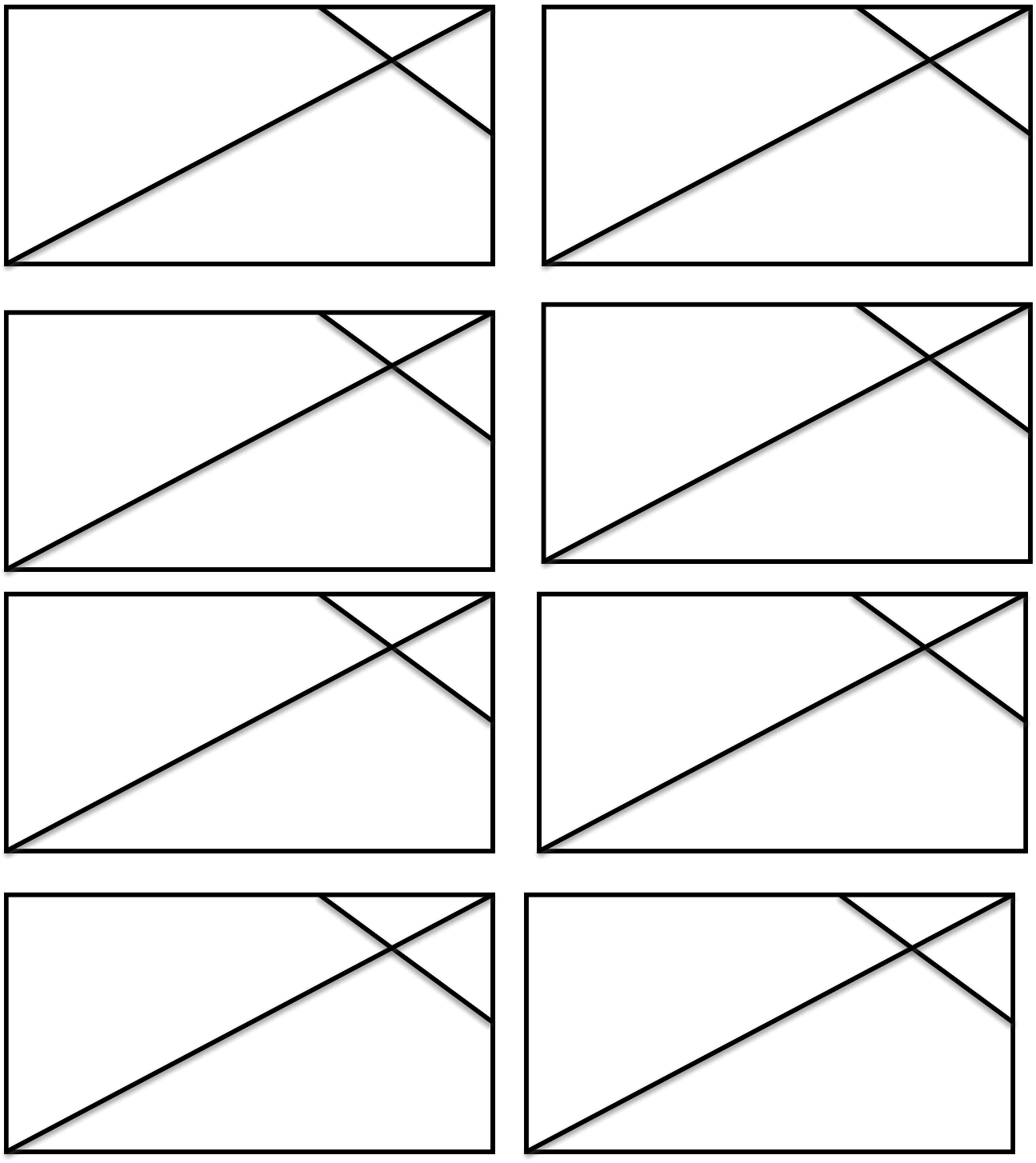


Directions: Use Figure B and find all of the rectangles. Remember what you have learned about rectangles and squares. Do you see any shapes that are similar to each other?

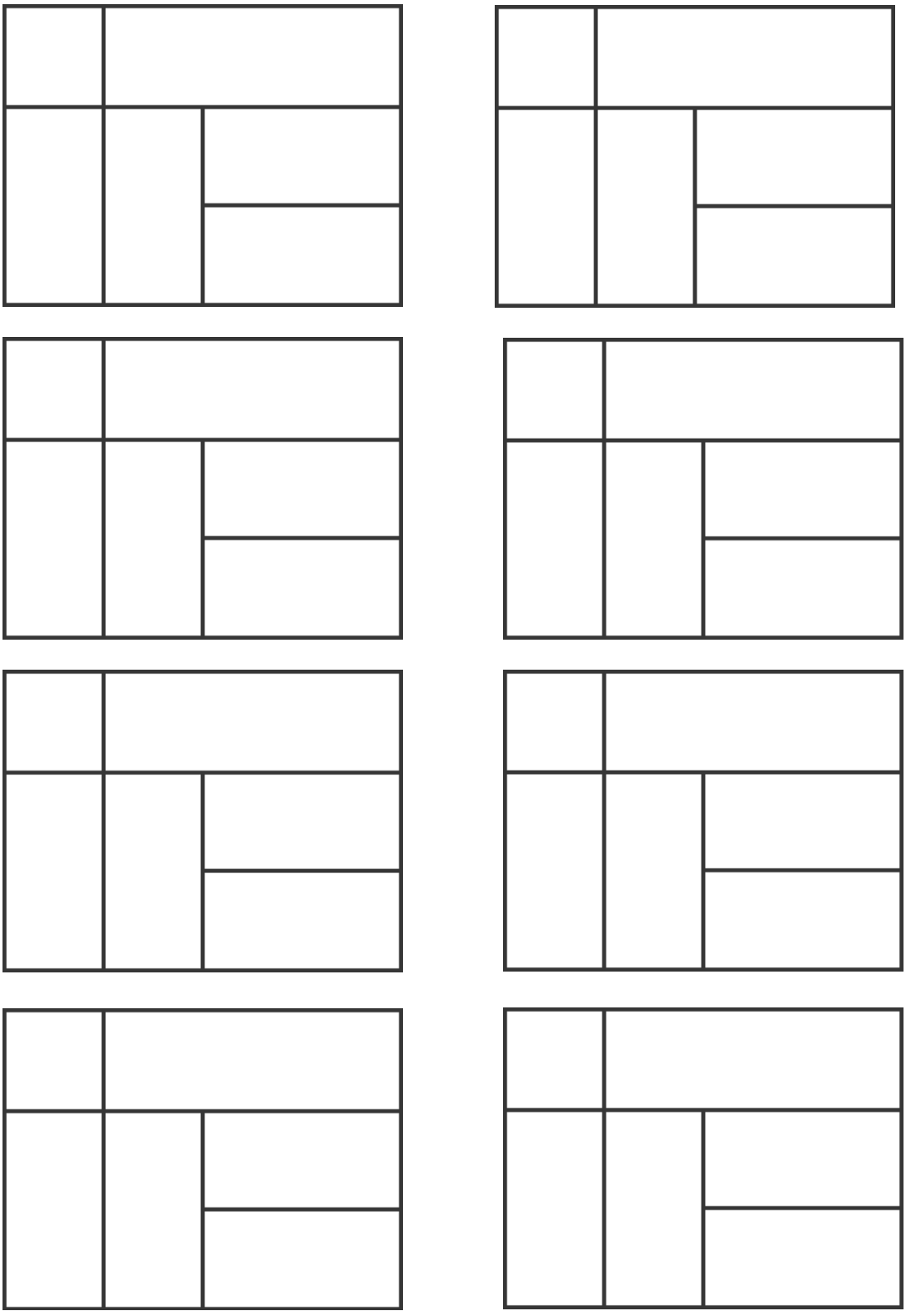
Figure B



Copier Sheet: Print to give each student their own copy of the design.

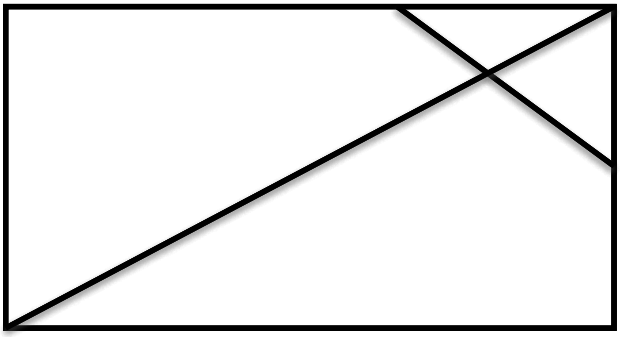


Copier Sheet: Print to give each student their own copy of the design.



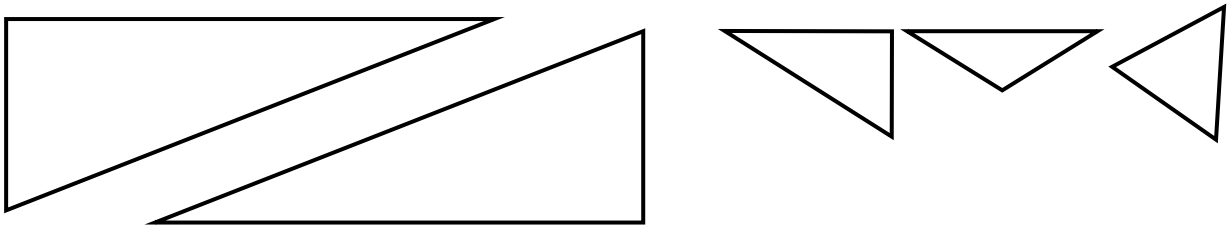
Teacher Answer Key for Figure A:

Figure A:

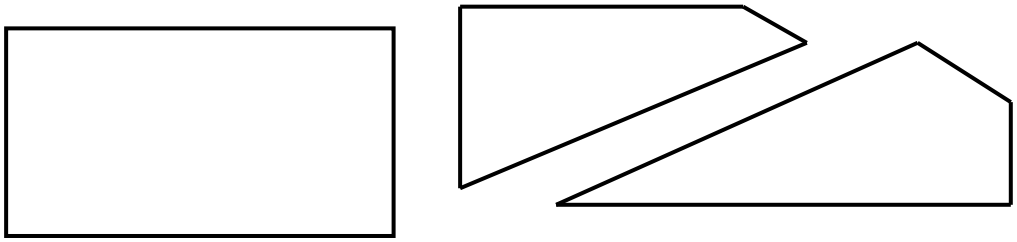


There are 5 triangles, 3 quadrilaterals, 3 pentagons, 2 hexagons for a total of 41 points.

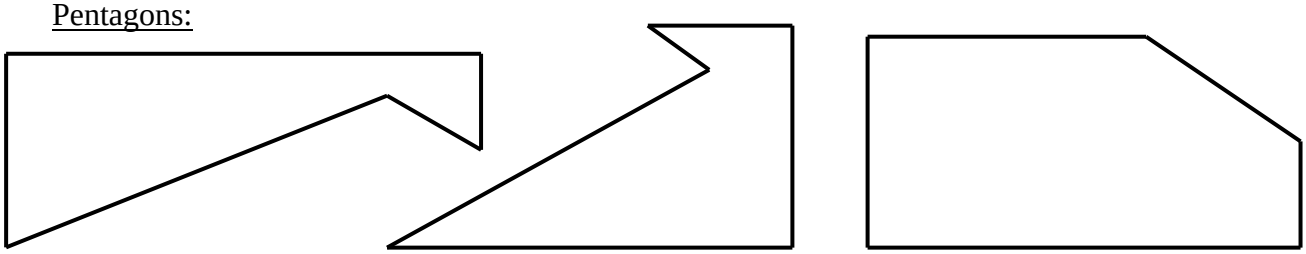
Triangles:



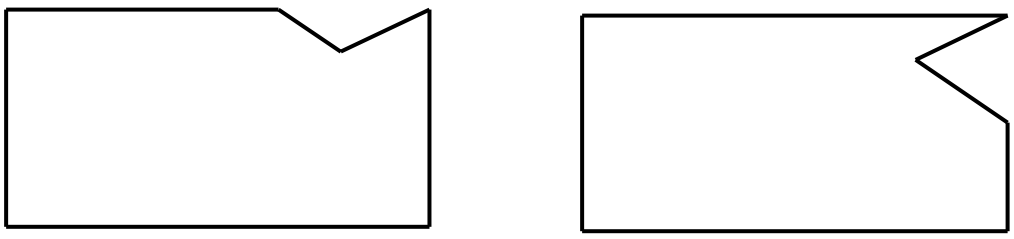
Quadrilaterals:



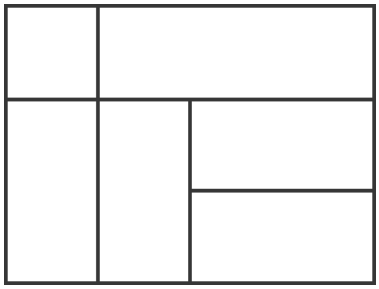
Pentagons:



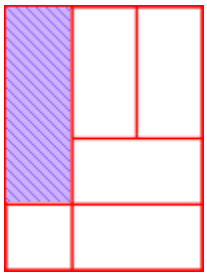
Hexagons:



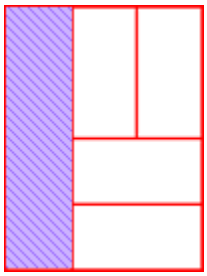
Teacher Answer Key for Figure B:



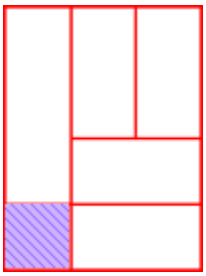
14 solutions



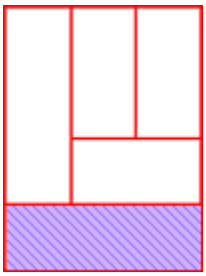
1



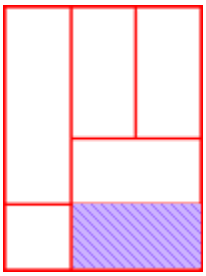
2



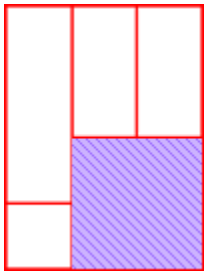
3



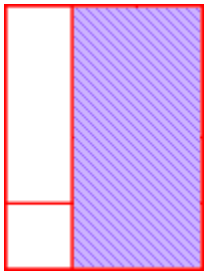
4



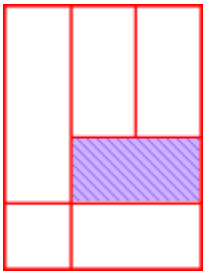
5



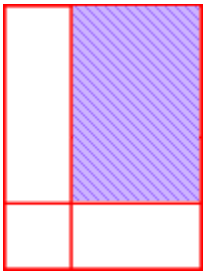
6



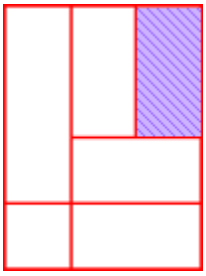
7



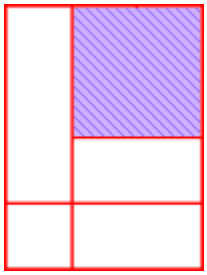
8



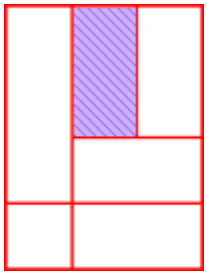
9



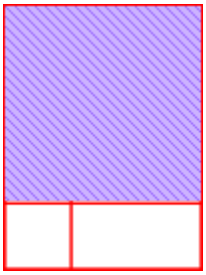
10



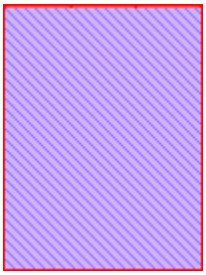
11



12



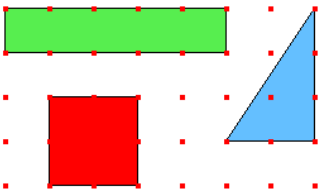
13



14

CONSTRUCTING TASK: GEOBOARD GEOMETRY GURU……. Return to Task Table

In this task, students begin exploring how to create plane figures using straight lines and angles and then discover common features of rectangles, squares, and triangles.



CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MGSE3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.

BACKGROUND KNOWLEDGE

Students should begin to use what they have learned about properties from the previous activities to be able to begin to classify shapes. Begin with shapes learned in previous grades and move up to focusing on quadrilaterals.

Before beginning this task, students should be familiar with common quadrilaterals and the identification of their sides and angles. Also, they should be able to use a geoboard and transfer that information to paper. Some students may need specific instructions on how to transfer figures to the paper (e.g. counting the spaces between dots and directionality). Finally, students should be able to make multiple representations of the same shape with variance in size and orientation, and still determine it to be the same shape based on its attributes.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- How can I use attributes to compare and contrast shapes?

MATERIALS

- Geoboards
- Rubber bands
- "Geoboard Geometry Guru" student recording sheet (3 per student)

GROUPING

Whole Group/Individual Task

NUMBER TALK

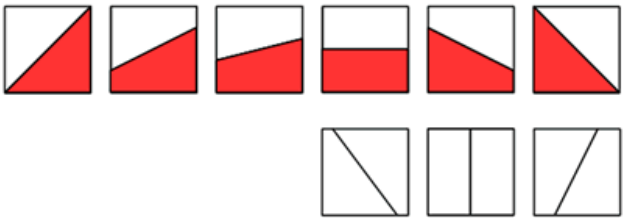
By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (SMP 1, 4, 5, and 6)

Students should be given the opportunity to explore freely with the geoboard and rubber bands before working this task. Also, teachers may want to begin this task by giving students opportunities to explore the geoboard by making a variety of shapes, lines, and angles. Throughout this task teachers should promote the key vocabulary of open figure, closed figure, polygon, rhombus/rhombi, rectangle, square, quadrilateral, parallelogram, and trapezoid. Also, students should be encouraged to use these key vocabulary words. At the completion of this task the class will have created definitions for rectangle, square, rhombus, and trapezoid. These can be posted in the classroom along with each shape's attributes.

Part II (SMP 1, 2, 3, 4, 5, 6, and 7)
Have students return to the geoboard and begin to explore partitioning the shapes into equal parts. Is it possible to make all of the quadrilaterals into equal parts of two, three, four, six, and eight? Guide students through making sense of equal parts/areas. An anchor chart may be drawn to show how each quadrilateral can be partitioned into equal areas. Remember that each shape can be partitioned in multiple of ways. For instance, a square can be divided into half in all of these different directions:



In addition to recording the defining properties, the shapes that students have drawn on the geopaper might be used as a formative assessment for MGSE3.G.2. Have students use the drawn shapes or the geoboards to show what they know about partitioning a shape into halves, thirds, fourths, sixths and eighths. Allow students to show a variety of ways to partition the shapes. It is important that students continue to develop their understanding of equal areas. More activities will follow that continue the exploration for MGSE3.G.2

Part III (SMP 1, 2, 3, 4, 5, 6, and 7)
Students should be challenged to make different 4-sided shapes that describe one or more properties of shapes. Pose questions to students like: Can you make a shape with just one square corner and four sides? Can you make a shape with 2 square corners (or 3, 4, 5, etc. square corners?) Can you make a shape that has two pairs of sides that go the same way or are parallel? Show student's examples so that students can begin to understand that there is more than one way to make a shape with the same properties. The focus should be on looking at the different quadrilaterals that can be created. Students are asked to create all of the different rectangles they can find on the geoboard and then record them on geoboard paper. Ask students to say aloud or write as many complete sentences as they can that begin with "All (or none, or some) of the rectangles…." in order to draw general conclusions about the shapes. After general conclusions have been stated or recorded, the teacher can lead the students to create an appropriate definition for a rectangle. Follow the same procedures to create an appropriate definition for a square, rhombus, parallelogram, and trapezoid (review from 2nd grade).

*Note: This activity might take more than 1 day in order for students to get to explore each shape and think about what makes each shape different. For a more descriptive table, please see Table 8.1 "Categories of Two- Dimensional Shapes" on page 221 and Figure 8.11 "Classifications of Two-Dimensional Shapes" in the 3-5 Van de Walle text, page 222.

Shape		Description
Classified by sides	Equilateral	All sides are congruent.
	Isosceles	At least two sides are congruent.
	Scalene	No two sides are congruent.
Classified by angles	Right	Has a right angle
	Acute	All angles are smaller than a right angle.
	Obtuse	One angle is larger than a right angle.
Quadrilaterals		Polygon with exactly four sides
Trapezoid		At least one pair of parallel sides
Parallelogram		Two pairs of parallel sides
Different Classes of Parallelograms	Rectangle	Parallelogram with a right angle.
	Rhombus	Parallelogram with all sides congruent
	Square	Parallelogram with a right angle and all sides congruent.

FORMATIVE ASSESSMENT QUESTIONS

- What is your definition of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- What are the attributes of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- How can you change this shape by changing only one attribute?
- Is this shape still a (rectangle…or any shape) if I turn the geoboard slightly? (Look to see if orientation confuses students)
- Show half (or thirds, fourths, sixths, eighths) in a different way.

DIFFERENTIATION

Extension

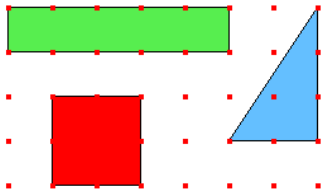
- Have students create a morph chain of a shape changing one attribute at a time and label each morphed shape with its description. (For example: small, red equilateral triangle morphs into a small, blue, equilateral triangle and then into a small, blue, isosceles triangle, etc.)

Intervention

- Provide the definition of the shape first and deconstruct the definition while creating each part of the shape until the shape is complete. Then have students create a congruent shape. Finally ask students to create a non-congruent shape, changing one attribute.
- Intervention Table

Name _____ Date _____

Geoboard Geometry Guru

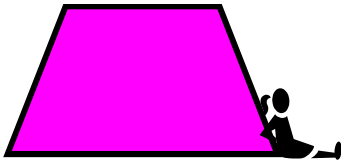


PRACTICE TASK: QUADRILATERAL RIDDLES

Return to Task Table

Adapted from Pennsylvania DOE activity Attributes of Two-Dimensional Shapes

In this task, students will use the mathematical vocabulary developed through this unit to describe the attributes of quadrilaterals.



CONTENT STANDARDS

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students have had some opportunities to look at quadrilaterals and begin to understand the categories that the shapes fit in based on the properties of the shapes. Additional time in studying the shapes may be needed based on the van Hiele levels of Geometric Thinking. Additional information about the levels may be found in the Van de Walle Resource book on pages 206-208.

COMMON MISCONCEPTIONS

Students may identify a square as a “nonrectangle” or a “nonrhombus” based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- How can we use two- dimensional shapes to solve problems?
- How do attributes help us describe shapes?
- Why is it important to know what quadrilaterals are and the differences between them?

MATERIALS

- Display the Riddle sheet using a document reader/ overhead projector or write the sentences on the board for students to copy.
- Varied of quadrilaterals for visuals

GROUPING

Independent or Partner Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 6, and 7)

In this task, students will use the mathematical vocabulary developed through this unit to describe the attributes of quadrilaterals. Students will use 2 quadrilaterals to fill out the riddle. The riddle follows the pattern:

If I were a _____, I would have _____. I would have _____, but I would not have _____ because that would be_____.

The first three blanks refer to one quadrilateral; the last two blanks refer to the other quadrilateral.

Example: If I were a square, I would have 4 sides. I would have 4 corners, but I would not have only one set of parallel lines (or lines that run in the same direction) because that would be a trapezoid.

Throughout this unit, students should begin to identify and describe the attributes of various quadrilaterals beyond the common characteristic. What makes a square a rectangle but a rectangle can't be a square?

FORMATIVE ASSESSMENT QUESTIONS/PROMPTS

- What part of the task was the hardest for you?
- How would you explain to your parents or guardians the difference between the quadrilaterals?

- Why should you know that different shapes can be in the same category?
- When would you use this information as an adult?

DIFFERENTIATION

Extension:

- Have students further investigate the difference between parallelograms and trapezoids. Then have them can write a riddle based on their findings.

Intervention:

- Allow students to use other shapes with the quadrilaterals.
- Intervention Table

TECHNOLOGY CONNECTIONS

- http://illuminations.nctm.org/LessonDetail.aspx?id=L350
  Complete lesson on rectangles and parallelograms
- http://illuminations.nctm.org/LessonDetail.aspx?id=L813
  Shape Up Lesson from Illumination

Name _____ **Date** _____

Quadrilateral Riddle

Choose two quadrilaterals that are similar but have at least one difference. The first three lines of the riddle refer to one quadrilateral and its attributes. The last two lines of the riddle refer to the second quadrilateral and its attribute(s) that make it different from the first quadrilateral. Use specific math vocabulary to describe the attributes.

If I were a _____

I would have _____.

I would have _____,

but I would not have _____

because that would be _____.

Optional: try another riddle using two new quadrilaterals.

If I were a _____

I would have _____.

I would have _____,

but I would not have _____

because that would be _____.

3ACT TASK: SCHOOL MOSAIC

Return to Task Table

APPROXIMATE TIME: 1 class period

CONTENT STANDARDS

MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICE

1. **Make sense of problems and persevere in solving them.** Students must make sense of the problems using attributes of shapes.
2. **Reason abstractly and quantitatively.** Students demonstrate abstract reasoning when categorizing shapes based upon attributes.
3. **Construct viable arguments and critique the reasoning of others.** After writing down their own questions, students discuss their question with partners, creating the opportunity to construct the argument of why they chose their question, as well as critiquing the questions that others came up with. Also, students construct and critique arguments regarding shape attributes
4. **Model with mathematics.** Once given the information, the students use that information to develop a mathematical model to solve their question.
6. **Attend to precision.** Students use clear and precise language when discussing the attributes of shapes.
7. **Look for and make sense of structure.** Students look closely to discover a pattern or structure when sorting shapes based on common attributes.
8. **Look for and express regularity in repeated reasoning.** Students demonstrate repeated reasoning by showing the relationship between the shapes they have found and their attributes.

BACKGROUND KNOWLEDGE:

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.

Throughout this unit, the goal for third grade students is to begin to understand that quadrilaterals are all four sided closed polygons. While angles and lines have not been studied yet (this will be addressed in 4th grade standard MGSE4.G.1), it is important for students to begin to see that angles can be square (right), skinny (acute) or fatter than a square (obtuse). Use index cards, set squares, or

corners of paper to compare angles. Accept terms students use as a teachable moment, when appropriate. The same applies with talking about the sides. Students may say opposite sides or the sides that run into each other. Within the broad category of quadrilaterals are trapezoids, parallelograms, rhombuses, rectangles, and squares. Through many activities, students need to begin to understand the categories of two-dimensional shapes (see Van de Walle page 221 for descriptions)

COMMON MISCONCEPTIONS:

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

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 I use attributes to compare and contrast shapes?
- Why are the attributes of shapes important?
- How do attributes help us describe shapes?
- How do the attributes help us identify the different shapes?

MATERIALS

- Act 1 School mosaic picture (Picture taken from: http://www.art4space.co.uk/2010/07/wow-streatham-well-primary-school/)
- Act 1 close-up picture
- Student recording sheet

GROUPING

Individual/Partner and or Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will view the picture and tell what they noticed. Next, they will be asked to discuss what they wonder about or are curious about. These questions will be recorded on a class chart or on the board and on the student recording sheet. Students will then use mathematics to answer their own questions. Students will be given information to solve the problem based on **need**. When they realize they don't have the information they need, and ask for it, it will be given to them.

Task Directions:

Act 1 – Whole Group - Pose the conflict and introduce students to the scenario by showing Act I 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."

- Show Act 1 School mosaic picture to students. (You may choose to also show your students the Act 1 close-up picture.)
- Ask students what they noticed in the picture, what they wonder about, and what questions they have about what they saw in the picture. Do a think-pair-share so that students have an opportunity to talk with each other before sharing questions with the whole group.
- Share and record students' questions. The teacher may need to guide students so that the questions generated are math-related.

Anticipated questions students may ask and wish to answer (*main questions to be answered)**:**

- How many different shapes are in the picture?
- *What shapes make up the picture?

Important note: As the facilitator, you may choose to allow the students to answer their own posed questions, one question that a fellow student posed, or a related question listed above. For students to be completely engaged in the inquiry-based problem-solving process, it is important for them to experience ownership of the questions posed.

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.

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 decide on the facts, tools, and other information needed to answer the question(s) (from Act 1). 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.

- 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?

Act 3 – Whole Group – Share solutions and strategies.

- Students to present their solutions and strategies and compare them.
- 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, share ideas below (see extensions) or reference other student-generated questions that could be used for additional classwork, projects or homework.

FORMATIVE ASSESSMENT QUESTIONS

- Does the direction that a shape is facing change the way it looks? Does it change the shape's name?
- What is your definition of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- What are the attributes of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- In what ways can you categorize the shapes you have found?
- Why should you know that different shapes can be in the same category?
- What organizational strategies did you use?

DIFFERENTIATION

Extension

- Have students find examples and non-examples of the shapes that they find according to the shapes attributes.
- Have students select different ways to compare/contrast the shapes, then compare their way of sorting with another student.
- Incorporate a writing opportunity by having students write a compare/contrast paragraph using 2 shapes.

Intervention

- Provide students with examples of each type of shape (triangles, quadrilaterals- square, rectangle, and trapezoids, circles, pentagons, and hexagons) to help them find the shapes in the picture.
- Use a smaller portion of the picture for students to find shapes.
- Intervention Table

Act 1 Picture:

Act 1 close-up picture:

Task Title: _____Name:_____
Adapted from Andrew Stadel

ACT 1

What did/do you notice?
What questions come to your mind?

Main Question: _____

ACT 2

What information would you like to know or need to solve the MAIN question?

Record the given information (measurements, materials, etc…)

If possible, give a better estimation with this information: _____

Act 2 (con't)

Use this area for your work, tables, calculations, sketches, and final solution.

ACT 3

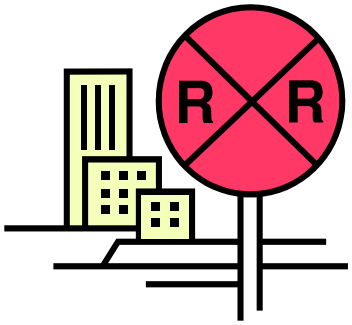
What was the result?

PRACTICE TASK: WHAT DO YOU SEE?

Return to Task Table

Adapted from the lesson Shapely Lines from http://nrich.maths.org/7009

In this task, students will look for shapes within intersecting lines.



CONTENT STANDARDS

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students will continue to develop their understanding of shapes through this art activity. It will help you understand if students see all four-sided figures as quadrilaterals, all five-sided figures as pentagons, etc. This understanding from the students will show if they are developing understanding of geometric figures and progressing through the Van Hiele Levels of Geometric Thinking.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSSENTIAL QUESTIONS

- What might a quadrilateral look like?
- How do you know if a shape is a _____(square, rectangle, rhombus, trapezoid, parallelogram etc) quadrilateral?
- Does a _____ (include any shape) always look the same?
- What is the difference between a regular and an irregular polygon?

MATERIALS

- Plain Paper
- Pencil
- Ruler
- Color Pencils
- Student Sheet

GROUPING

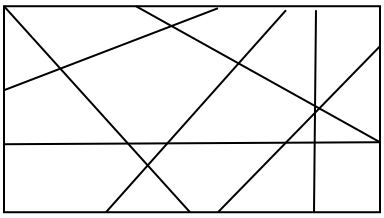
Individual Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 6, and 7)

In this task, students will use a plain sheet of paper and a ruler to draw lines in all directions across the page. For example: their paper may look like this:



Students will then use colored pencils or crayons and color each type of shape a different color. For instance, I might want all my triangles to be green, all quadrilaterals purple, all pentagons red, etc. Some students may even want to separate their quadrilaterals and color all squares one color, rectangles a different color, etc. After coloring, students will then answer the questions on the student sheet about the different shapes they made from their lines. Some students will

struggle to remember that a quadrilateral is any 4-sided figure, a pentagon is any 5-sided figure, a hexagon is any 6 sided figure.

FORMATIVE ASSESSMENT QUESTIONS

- Did you notice any patterns with your shapes?
- Did you have more of one shape than the others? Why do you think that?
- Did you have any irregular shaped polygons?

DIFFERENTIATION

Extension

- Students that had a good understanding of quadrilaterals may want to color or design each type of quadrilateral with a different color/design.

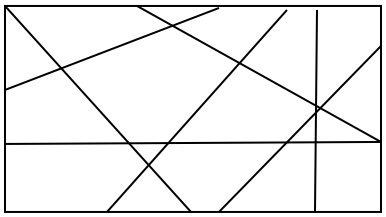
Intervention

- Students might need a demonstration of how to hold a ruler and draw a straight line. Others may need help holding the ruler as they draw straight lines. Students that are struggling to understand the differences in the types of shapes may need help to find all of the shapes that are alike.
- Intervention Table

Student Sheet

Name: _____Date: _____

Directions: On a plain sheet of paper, use your pencil and a ruler to draw straight lines on your piece of paper to make an interesting pattern. You may use as many lines as you want but remember you will have to color each shape. Here is my example:



Now, use you color pencils or crayons to decorate each type of shape. For example, color or use some type of design to decorate all of your triangles the same. Change your color and/or design for all of your quadrilaterals. Continue until you have colored all of your shapes a unique color or design. Make sure to include a key to show what color you used for each shape.

Answer the following questions about your design.

1. Do you have any triangles? If so, how many?_____

2. Do you have any quadrilaterals? If so, how many? _____

3. Do you have any pentagons? If so, how many? _____

4. Do you have any hexagons? If so, how many?_____

5. Did you have any other shapes? If so, list them: _____

What do you see in your own pattern? _____

PRACTICE TASK: WHAT'S THE CONNECTION?

Return to Task Table

Adapted from the lesson, Quad Math from http://nrich.maths.org/6998/note

In this task, students will use what they have learned about shapes to make a set of cards that are related to each other in a similar way.

CONTENT STANDARDS

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students have begun to learn more about quadrilaterals and their properties. It will help you understand if students see all four-sided figures as quadrilaterals, all five-sided figures as pentagons, etc. This understanding from the students will show if they are developing understanding of geometric figures and progressing through the Van Hiele Levels of Geometric Thinking.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- What are some things you have learned about quadrilaterals?
- How do you know the difference between a square, a rectangle, a trapezoid, and a rhombus?
- What might an irregular shaped quadrilateral look like?

MATERIALS

- A Rule card for every group of 4 players
- Page 1 and 2 for every group of 4 players
- Math Journal

GROUPING

Group of 4 – a 5th person could be in the group as a rule keeper or communicator for the group.

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in number talks to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DECRIPTION (SMP 1, 2, 3, 6, and 7)

Students must follow the rules on the Rule Cards to play this game. They will help each other to form a group of 4 cards that relate to each other. To play, students will get into groups of 4. If there is a need, there can be a 5th person in each group who will act as the Rule Keeper or the communicator at the end. Distribute a rule card and the 16 cards to each group of players. Within the groups, distribute the 16 cards so that each player gets 4 cards. Place all cards face up and in front of each player where all players can see the cards. REMEMBER, the rules of the game include: no talking during the game, players can only give cards to a teammate (not take cards from a teammate), must have 2 cards in front of them at all times, and the team is successful when all 4 players have 4 cards that relate to each other. The goal of the game is that students will need to end up with a set of four cards in front of them that are related to each other in a similar way. The task is only successful if everyone on the team has completed their set.

For the teacher information only: the 16 cards consist of 4 squares, 4 rectangles, 4 trapezoids, and 4 irregular shaped quadrilaterals. Some groups may see a set consists of having 1 of each type of shape while others may see a set as having only one type of set. Either is correct **IF** students are able to explain their set.
When complete, have students write in their math journal their experience of the activity.

FORMATIVE ASSESSMENT QUESTIONS

- How are your cards related?
- What could have made this task easier?
- Is there another way to form a set with these cards?
- Did you all agree on the set to begin with or did you have to trade cards several times?
- What if a rhombus had been added to the deck of cards? Could you have still formed a set?

DIFFERENTATION

Extension

- Create a similar game using more shapes, including rhombus and kite.

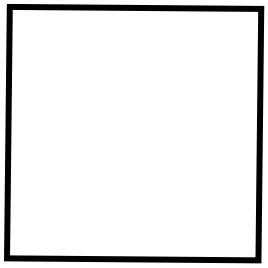
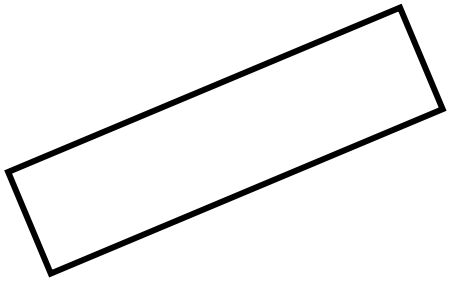
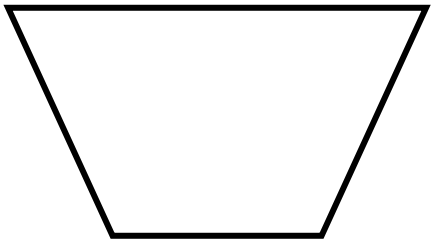
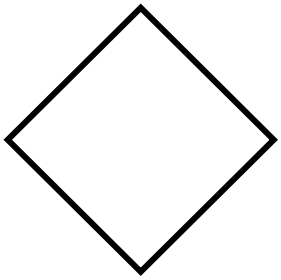
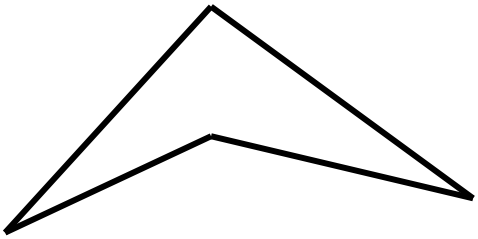
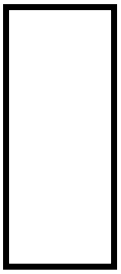
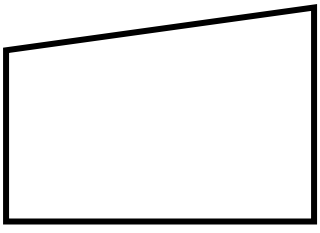
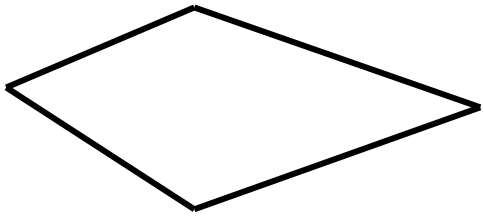
Intervention

- If student struggled to create sets that were related, have them talk about the cards and sort into groups based on their discussions. Make a chart to help the struggling student start to see the differences in the shapes.
- Intervention Table

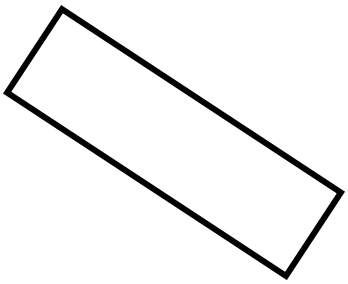
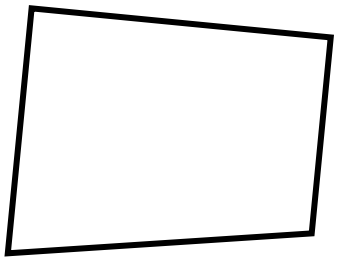
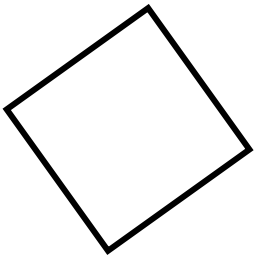
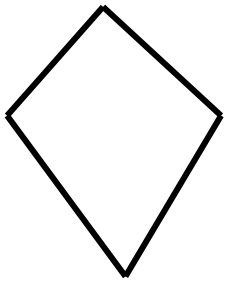
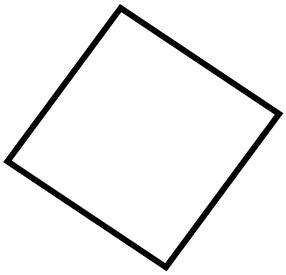
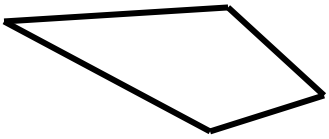
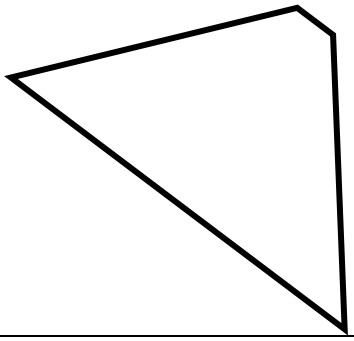
WHAT'S THE CONNECTION? Rule Cards

Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.
Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.
Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.
Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.

WHAT'S THE CONNECTION? Playing Cards Page 1

WHAT'S THE CONNECTION? Playing Cards Page 2

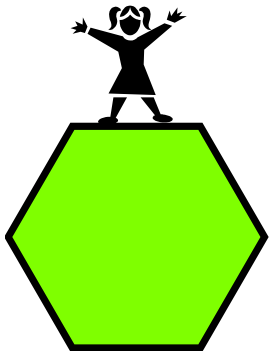
	
	
	
	

CONSTRUCTING TASK: PATTERN BLOCK FRACTIONS

Return to Task Table

Adapted from the Lesson "Fun with Pattern Blocks" from NCTM's Illuminations
http://illuminations.nctm.org/LessonDetail.aspx?ID=L343

In this task, students will use pattern blocks to partition shapes into different shapes.



CONTENT STANDARDS

MGSE3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

BACKGROUND KNOWLEDGE

Up to this point, students have not worked with written fractions. They have partitioned circles and rectangles into equal shares using the words halves, thirds, half of, a third of, etc., but have not written fractions in fractional form (1/2).

Concepts about fractions are basic to mathematics but can pose challenges for students. In elementary schools, the most frequently used fraction models are the region and set models. This lesson exposes students to the region model and gives an opportunity for them to develop a thorough understanding of this model in multiple applications. As students work with a variety of fraction models in contexts that promote reasoning and problem solving, they develop a more thorough understanding of fractions and the relationships among them.

As the students work to understand fraction relationships using the region model, it is appropriate to work with concepts on a continuum from concrete to abstract. This lesson first exposes the students to a concrete representation of the region model through work with pattern blocks. As the students move toward more abstract work, it is appropriate to introduce semi-concrete representations. Having the students record fraction relationships pictorially gives them the opportunity to be exposed to such a model.

COMMON MISCONCEPTIONS

When partitioning a whole shape into parts, it is important to understand that the size of the parts must be equal, but the shape of the parts do not have to be the same. This task allows students to experience fractional parts that are not necessarily the same shape, but are the same size.

ESSENTIAL QUESTION

- How do the relationships discovered with the pattern blocks help us understand fractions and area?

MATERIALS

- Pattern Blocks (only hexagons, trapezoids, rhombuses and triangles are needed)
- Pattern Block Relationships Recording Sheet

GROUPING

Partner Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 4, 5, and 6)

For this lesson, the students need a set of pattern blocks. (Only the hexagons, trapezoids, rhombuses, and triangles are needed. The students do not use the square or the rhombus for this lesson.) If the students are seated at tables, one complete set of pattern blocks should serve an entire group.

The most common regions studied at the elementary grade levels are the rectangle and circle. The "region" represents the "whole," and parts of the region are all congruent. The students should be exposed to a variety of shapes and not limited to the rectangle and circle. It is important that the students work with a variety of regions so that they do not think of the region as only "pieces of a pie." For this reason, pattern blocks are an appropriate tool for work with the region model.

The students should use pattern blocks to answer the questions on the Pattern Block Relationship Sheet. Have the students record as many fraction relationships as possible. You may choose to have them record the relationships in a math journal to which they may refer to later. Each pair should

record relationships on chart paper to share with the whole class. As each pair shares, have the students add to their journal any relationships they may have missed.

As the students work to understand fraction relationships using the region model, it is appropriate to work with concepts on a continuum from concrete to abstract. This lesson first exposes the students to a concrete representation of the region model through work with pattern blocks. Having the students record fraction relationships pictorially gives them the opportunity to be exposed to such a model.

FORMATIVE ASSESSMENT QUESTIONS

It is important to know whether the students can do the following:

- understand that a fraction is part of a whole
- state the relationship between the pattern block shapes [e.g., that there are three triangles in one red trapezoid]
- identify fractions when the whole (region) and a part of the region are given
- represent the fractional relationship between the pattern block shapes using standard form of the written notation (e.g., the green triangle is *x* of the blue rhombus.)

The students' recordings can be used to make instructional decisions about their understanding of fraction relationships. Areas needing additional work can be developed during subsequent lessons. Fractions will be explored more in Unit 6.

- How many triangles does it take to make a hexagon?
- Show me more than one way to make a trapezoid. Write the fraction that each pattern block represents.
- Does 1/3 represent the triangle in the rhombus and the hexagon? How do you know?

DIFFERENTIATION

Extension

- If students understand the areas of the whole, some students might be ready to explore when the whole changes. Instead of representing the whole with one yellow hexagon, the students explore fractional relationships when two, three, and four yellow hexagons constitute the whole. See “Expanding our Pattern Block Repertoire” lesson from Illuminations http://illuminations.nctm.org/LessonDetail.aspx?ID=L346.

Intervention

- Most students should have used the fraction ½ on numerous occasions. Lead the students in identifying and defining the numerator and denominator. Ask the students to explain what the top number in the fraction represents. [Students should indicate that this top number is the numerator and shows the number of parts of the whole.] The students should also identify the purpose of the bottom number, or denominator, as the number that indicates the number of parts into which the whole is divided. Since students are working in partners, all students should receive support from the peer or the teacher can guide the student through effective questioning.
- Intervention Table

TECHNOLOGY CONNECTIONS

- https://apps.mathlearningcenter.org/pattern-shapes/ *Pattern Block Fractions

Pattern Block Relationships

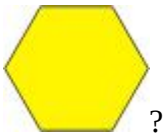
NAME _____Date_____

How many triangles  are in one rhombus  ? _____

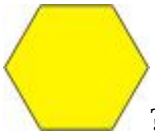
What would be the fraction of 1 triangle in the rhombus?_____

How many triangles  are in one trapezoid  ? _____

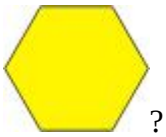
What would be the fraction of 2 triangles in the trapezoid?_____

How many triangles  are in one hexagon  ? _____

What would be the fraction of 4 triangles in the hexagon?_____

How many rhombuses  are in one hexagon  ?_____

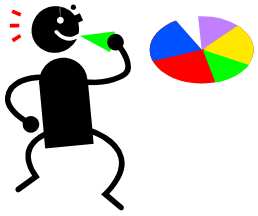
What would be the fraction of 3 rhombi in the hexagon? _____

How many trapezoids  are in one hexagon  ? _____

What would be the fraction of 1 trapezoid in the hexagon? _____

PRACTICE TASK: HOW MANY DIFFERENT WAYS?

Return to Task Table



In this task, students will discover different ways land could be partitioned into equal shares.

CONTENT STANDARDS:

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MGSE3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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

BACKGROUND KNOWLEDGE

Students should continue to develop their understanding of shapes by being given ample opportunities to explore with shapes and how they can be combined (composed) or (decomposed.)

COMMON MISCONCEPTIONS

When partitioning a whole shape into parts, it is important to understand that the size of the parts must be equal, but the shape of the parts do not have to be the same. This task allows students to experience fractional parts that are not necessarily the same shape, but are the same size.

ESSENTIAL QUESTIONS

- Is it possible to find more than 1 way for shapes to fit together to make another shape?
- What does it mean to partition a shape into parts?
- What do you know about pattern blocks that would help me understand how to fill an area?

MATERIALS

- How Many Ways Can You Find? Recording Sheet
- Isometric Grid Paper (see the following pages or print from http://wps.ablongman.com/wps/media/objects/3464/3547873/blackline_masters/BLM_38.pdf) or Math Journal
- Pattern Blocks

GROUPING

Individual or Partner

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 4, 5, 6, 7, and 8)

In this task, students will discover different ways a plot of land can be divided to share equally among Uncle John's nieces and nephews. Students have the option of dividing it between 2, 3, 4, 6, or 8 people. They may circle the number they are using for the task.

FORMATIVE ASSESSMENT QUESTIONS

- Have you shown all of the different ways you could divide the parcel of land? How do you know?
- How would we do this task with other shapes?
- Looking at your different solutions, how are they alike? How are they different?
- Why did you decide to divide the land this way?

DIFFERENTIATION

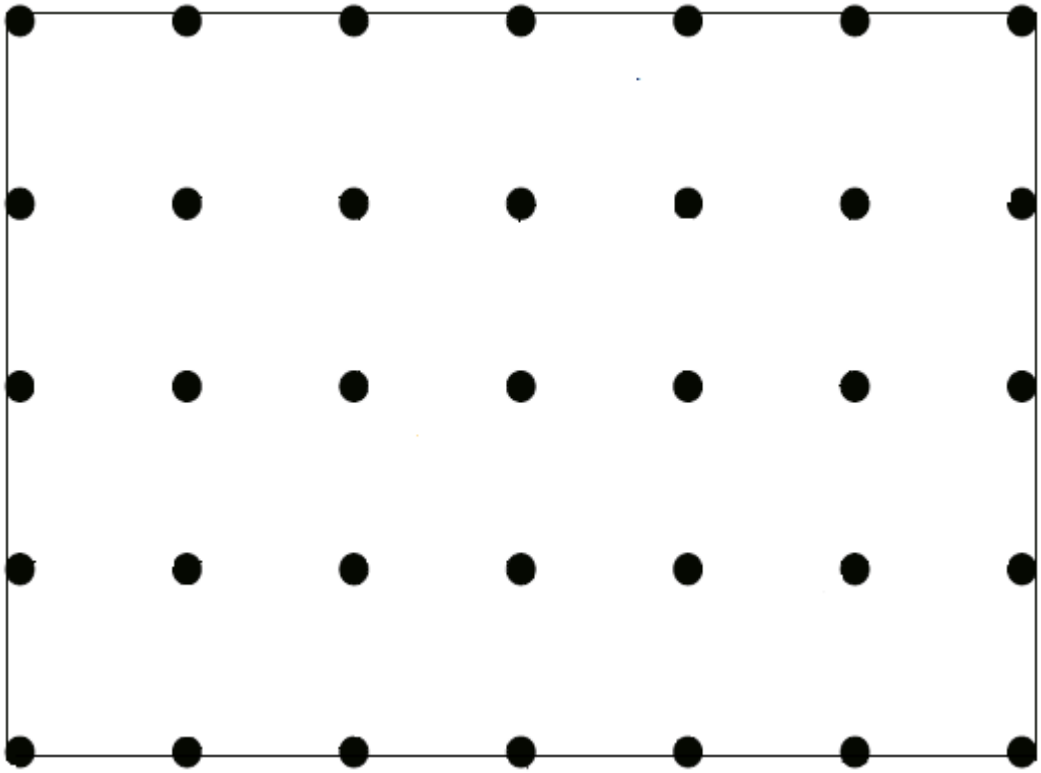
Extension

- Students can determine how to divide the parcel of land between five people.

Intervention

- Students may only divide the parcel of land between 4 students.
- Intervention Table

Great Uncle John has a parcel of land that measures 6 miles by 4 miles. In his will, he left the land to be divided equally among his (2, 3, 4, 6, or 8) nieces and nephews. However, he forgot to partition the land. Please help the nieces and nephews determine which parcel of land is theirs. Be sure to give everyone an equal amount of land. Use the blueprint below to help you.



How much land did Great Uncle John leave his nieces and nephews?

What does each person's share look like?

How do you know that each person's share is equal?

How did you determine the amount of land each person will get?

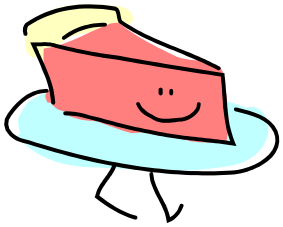
Is there another way that the land could have been divided?

PRACTICE TASK: PICTURE PIE

Return to Task Table

In this task, students will partition a circle into equal areas. They will then use these pieces to create pictures.

CONTENT STANDARDS



MGSE3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students in 2nd grade will have started partitioning shapes (circles and rectangles) into equal areas of two, three, or four equal shares. In third grade, students will further develop this area by dividing shapes into halves, thirds, fourths, sixths and eighths. This activity gives students the opportunity to create pictures using fractional pieces of shapes.

In Picture Pie, Ed Emberley shows how a circle, which is divided into different fractional pieces, can be used to make pictures and patterns of all kinds.

In Picture Pie 2, Ed Emberley uses the included stencil to demonstrate how to draw a variety of things including pigs, wolves, clowns, bugs, and much more. You'll also find step-by-step instructions in both books. If these books are not available, you may use the shapes provided to create stencils, using file folders or stock paper, for students to trace around. You may shrink the pieces provided by using your copier machine to reduce each of the shapes if you wish to create smaller animals.

Clipart of circles and fractional pieces are obtained from
http://etc.usf.edu/clipart/sitemap/fractions.php
If rectangle or squares are needed, more polygons can be found at the same website.

COMMON MISCONCEPTIONS

When partitioning a whole shape into parts, it is important to understand that the size of the parts must be equal, but the shape of the parts do not have to be the same. This task allows students to experience fractional parts that are not necessarily the same shape, but are the same size.

ESSENTIAL QUESTIONS

- How can common shapes be used to create pictures?
- Is there a way to use parts of shapes to help create shapes?

MATERIALS

- Ed Emberley's books Picture Pie: A Circle Drawing Book , Picture Pie 2: A Drawing Book and Stencil or similar books with pictures made from shapes, or Ed Emberley's Website.
- Circles (see the following pages) or print smaller circle pieces from http://wps.ablongman.com/ab_vandewalle_math_6/0,12312,3547876-,00.html Blackline Masters 24, 25, 26

GROUPING

Individual or Group

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 4, 5, 6, and 7)

To begin this task, either share Ed Emberly's books (*Picture Pie* or *Picture Pie 2*) or visit his website: http://www.edemberley.com/pages/main.aspx?section=db&subSection=capPages, http://www.edemberley.com/pages/main.aspx?section=db**.**

Students will decide on a picture that they want to create. There is one circle included. Students should create fractional pieces by folding the circle into halves, quarters, and eighths. This activity may take several days but can be used in a center or small group activity.

Once students finish their animals, they will create a chart to demonstrate their understandings of the fractional pieces. For example: In my animal, I used…. 6 ½ circles, 5 ¼ circles, etc.

FORMATIVE ASSESSMENTS QUESTIONS

- What was difficult about this task?
- How many of each shape did you use?
- Did you have more ½ or 1/4 shapes?
- Did you discover a faster way of making your shapes?

DIFFERENTIATION

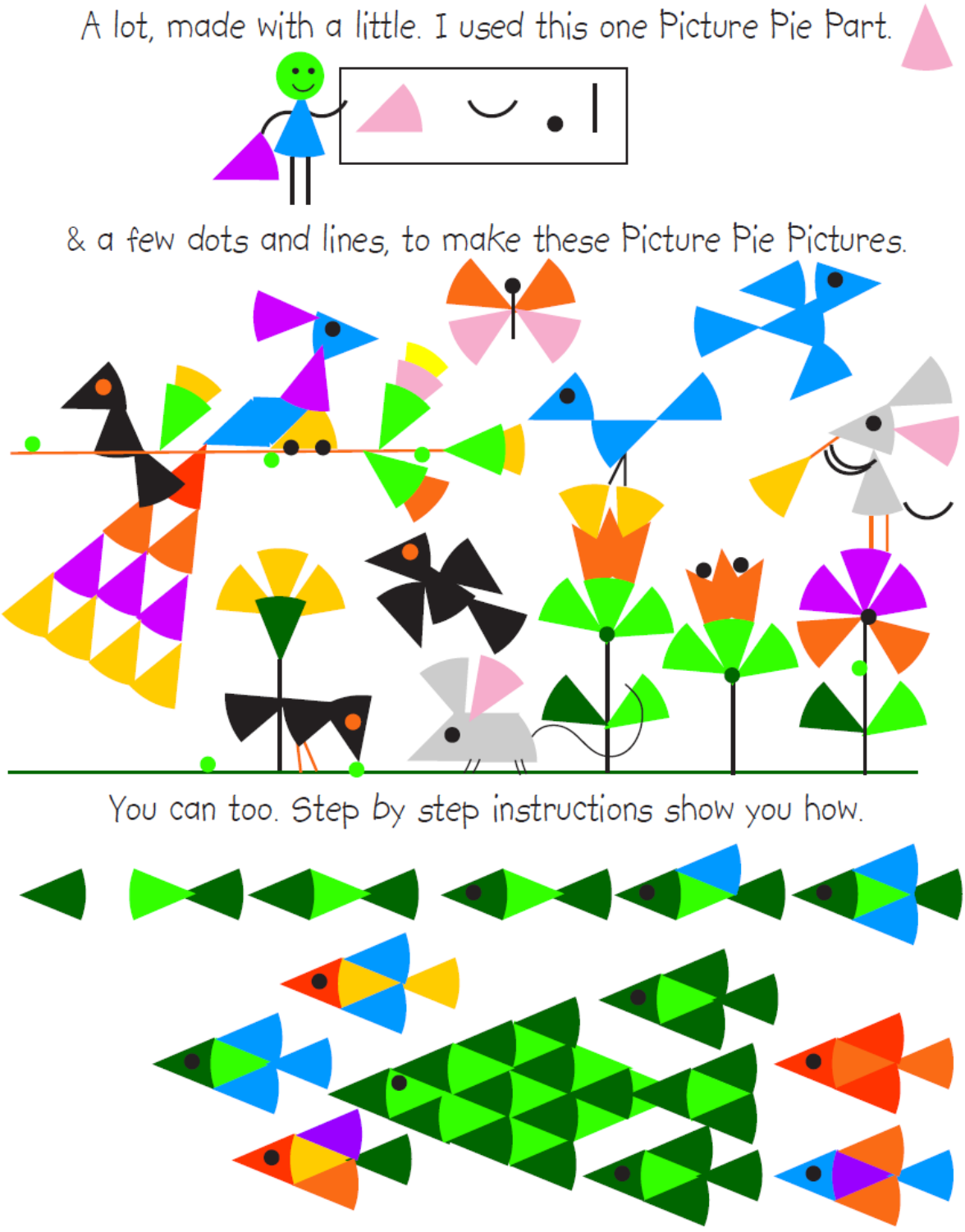
Extension

- Students should be allowed to create their own animals if desired.

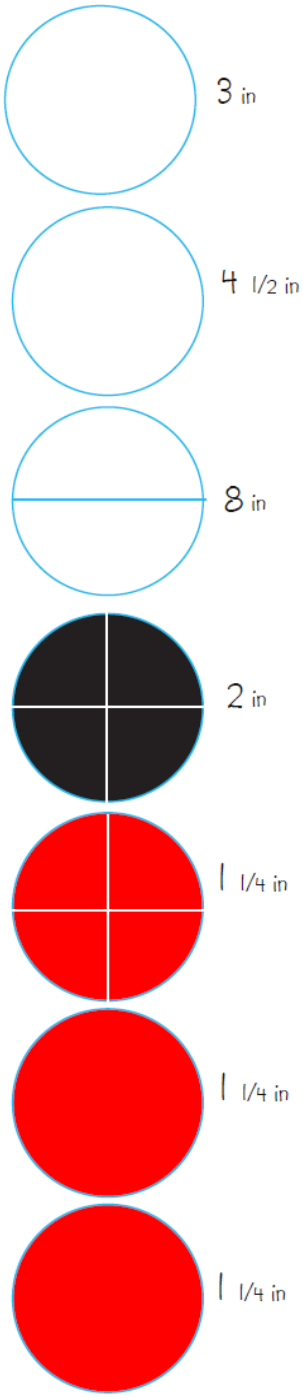
Intervention

- Students that struggle with this activity will probably need to have an example in front of them. They may also need a demonstration on how to lay the stencil onto a piece of paper to trace around. If they need help to hold the stencil while tracing, consider allow a peer to help, tape the edges of the stencil in a few spots, or use a heavy object to hold the stencil in place.
- Intervention Table

Examples of Picture Pie Pictures

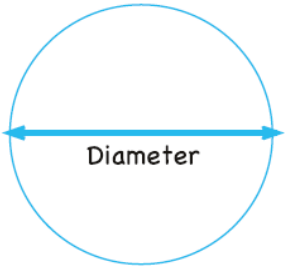


From www.edemberly.com



SCRATCH BUILT

To make this Picture Pie snowman from scratch you will need to make the following seven circles.
Colors as shown.
Diameter as shown.
Divided as shown.

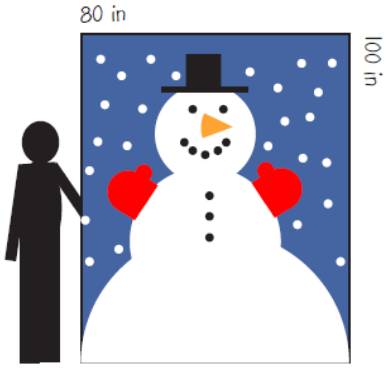


This snowman has been designed to fit on a standard sheet of construction paper, as shown.

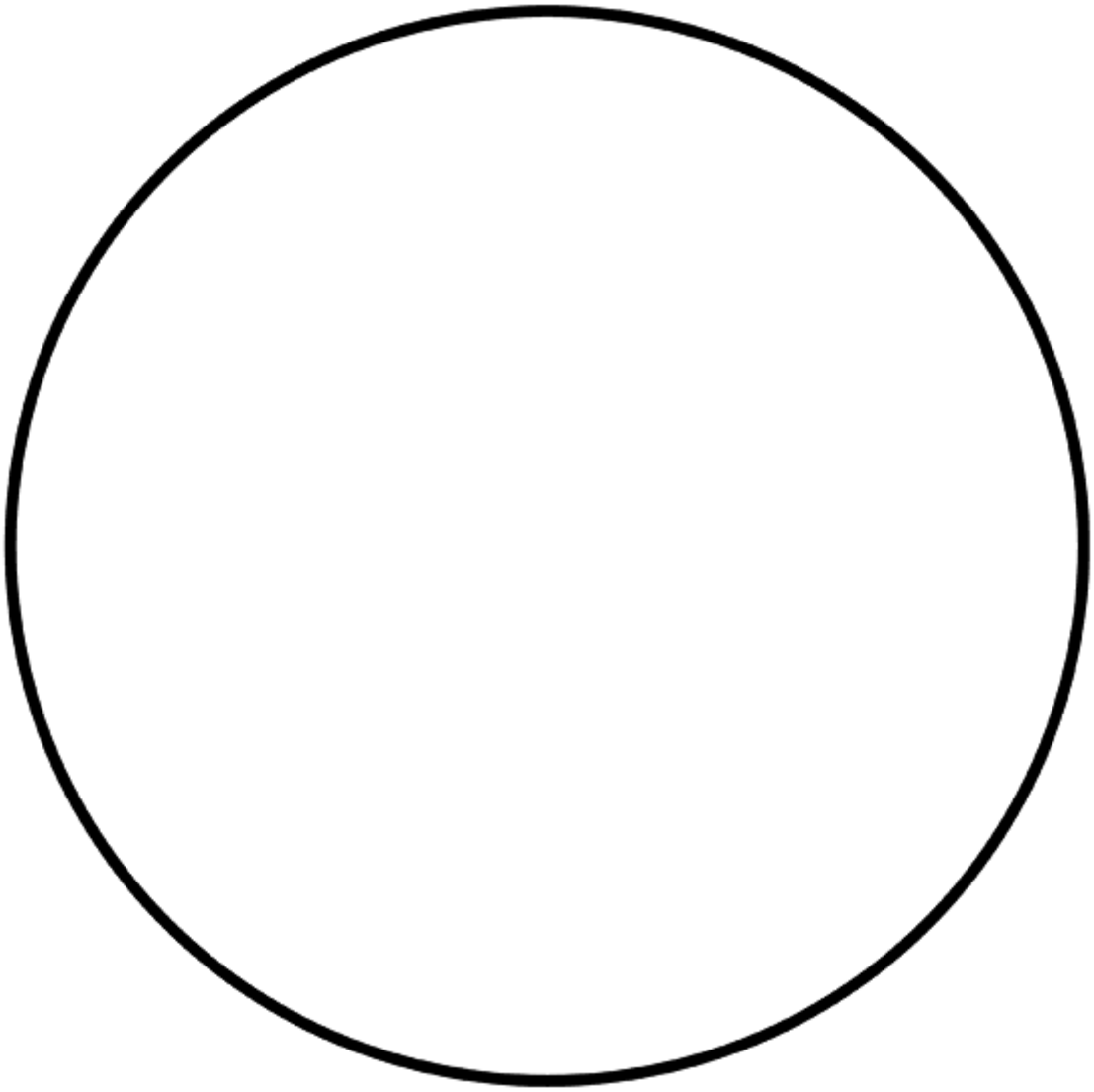
For the 8X10 size only, You can save time, by using a standard office punch to make the mouth, eyes, and buttons.

Double all measurements to make this same exact snowman fit a 16X20 inch background.

Multiply all measurements by 10, to make this same exact snowman fit an 80 X 100 inch background.



Fraction Pieces



One Whole

PRACTICE TASK: I HAVE, WHO HAS?

Return to Task Table

Adapted from Mathwire.com's Game I have, Who Has?

This task will help students further develop their understanding of partitioning shapes into parts with equal area by using halves, thirds, fourths, sixths, and eighths.

CONTENT STANDARDS

MGSE3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
6. Attend to precision.

BACKGROUND KNOWLEDGE

Students should have had experience dividing circles and rectangles into two, three, and four equal shares in third grade. Before this task, students should be able to recognize fractions in both pictorial and written fractional form.

COMMON MISCONCEPTIONS

When partitioning a whole shape into parts, it is important to understand that the size of the parts must be equal, but the shape of the parts do not have to be the same. This task allows students to experience fractional parts that are not necessarily the same shape, but are the same size.

ESSENTIAL QUESTIONS

- What is the purpose of studying fractions?
- How do you know if a shape shows _____(halves, thirds, fourths, sixths, or eighths?)
- Describe what a fraction looks like in a shape?

MATERIALS

- I Have, Who Has Game Cards

GROUPING

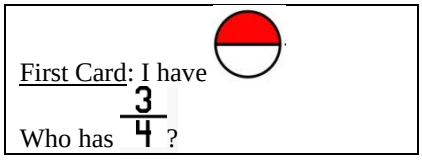
Whole Group

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

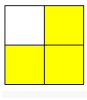
TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, and 6)

Print out and cut apart the three pages of I Have, Who Has? game cards. Randomly distribute **ALL** of the cards. There are 24 cards. Some students may have more than 1 card. If there are not enough cards, partner students up so that at least all partners get 1 card. Begin with the 1st card that says



Students will read the card aloud. Each player must pay attention to his/her card to know when it is their turn. Continue to play until the last card is read. The last card says that it is the last card. While the pictures are in color, the cards will print clearly if printed in gray scale.

FORMATIVE ASSESSMENT QUESTIONS

- How did you know what fraction you had?
- Why was it important to listen carefully?
- Is it possible to show each fraction in a different way? Show me your fraction in a different way.
- How could you help a friend who thought  meant 1/3?

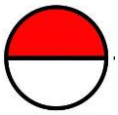
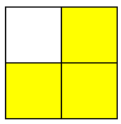
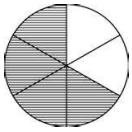
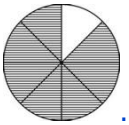
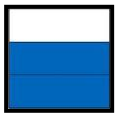
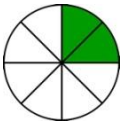
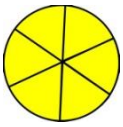
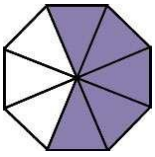
DIFFERENTIATION

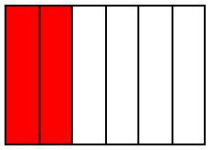
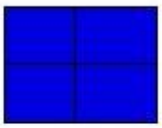
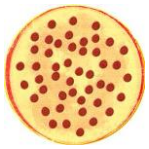
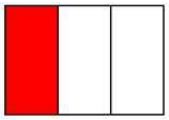
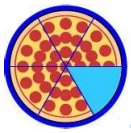
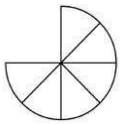
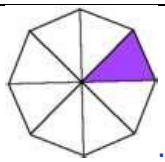
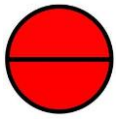
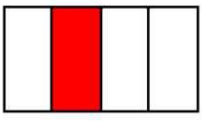
Extension

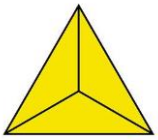
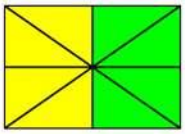
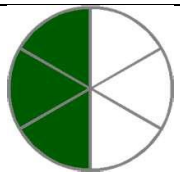
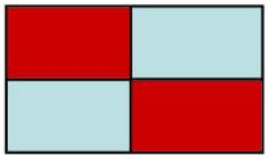
- Students may recreate the game with their own illustrations. They could also create a board game using fraction cards similar to these.

Intervention

- Students that struggle with fractions may need peer assistance during this game. Before beginning, give the student support by using questioning techniques to help them discover the fraction picture. They may need to write the fraction on the card or in their journal to help them remember the fraction as they play the game. It is possible to send a copy of this game home with the student to practice.
- Intervention Table

First Card: I have  Who has $\frac{3}{4}$?	I have  . Who has $\frac{4}{6}$?
I have  Who has $\frac{7}{8}$?	I have  . Who has $\frac{2}{3}$?
I have  Who has $\frac{2}{8}$?	I have  Who has $\frac{3}{8}$?
I have  Who has $\frac{6}{6}$?	I have  Who has $\frac{1}{6}$?
I have  . Who has $\frac{5}{8}$?	I have  Who has $\frac{2}{6}$?

I have  Who has $\frac{4}{4}$?	I have  Who has $\frac{1}{1}$?
I have  Who has $\frac{1}{3}$?	I have  Who has $\frac{5}{6}$?
I have  Who has $\frac{6}{8}$?	I have  Who has $\frac{1}{8}$?
I have  Who has $\frac{2}{2}$?	I have  Who has $\frac{1}{4}$?
I have  Who has $\frac{8}{8}$?	I have  Who has $\frac{3}{3}$?

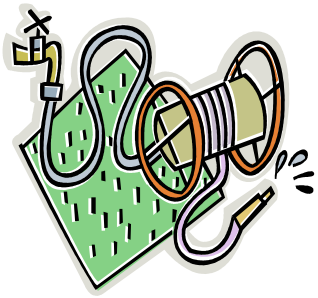
I have  . Who has $\frac{4}{8}$?	I have  Who has $\frac{3}{6}$?
I have  Who has $\frac{2}{4}$?	I have  Who has $\frac{1}{2}$? This is the last card.

PERFORMANCE TASK (Career-Based): A WHOLE LOT OF GARDEN HOSE

Return to Task Table

In this lesson students will be given a set length of irrigation hose and asked to identify the greatest possible area where farming can take place. Through the construction of various representations students should begin to recognize that the closer the sides are in equal length the greater the area.

CONTENT STANDARDS



Multiply and divide within 100.

MGSE3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

MGSE3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

MGSE3.MD.7 Relate area to the operations of multiplication and addition.
a. Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.

STANDARDS FOR MATHEMATICAL PRACTICE

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

BACKGROUND KNOWLEDGE

The area of a rectangle can be determined by having students lay out unit squares and count how many square units it takes to completely cover the rectangle completely without overlaps or gaps. Students need to develop the meaning for computing the area of a rectangle. A connection needs to be made between the number of squares it takes to cover the rectangle and the dimensions of the rectangle.

The concept of multiplication can be related to the area of rectangles using arrays. Students need to discover that the length of one dimension of a rectangle tells how many squares are in each row of an array and the length of the other dimension of the rectangle tells how many squares are in each column. Ask questions about the dimensions if students do not make these discoveries. Students should also make the connection of the area of a rectangle to the area model used to represent multiplication.

COMMON MISCONCEPTIONS

- Students may confuse perimeter and area when they measure the sides of a rectangle and then multiply. They think the attribute they find is length, which is perimeter. Pose problems situations that require students to explain whether they are to find the perimeter or area.

ESSENTIAL QUESTIONS

- How are area and perimeter related? How are they different?
- How are the perimeter and area of a shape related?
- How can rectangles have the same perimeter but have different areas?
- What methods can I use to determine the area of an object?
- How can I demonstrate my understanding of the measurement of area and perimeter?

MATERIALS

- "A Whole Lot of Hose" recording sheet
- 36 connecting cubes or 36 inches of string

GROUPING

Individual task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION (SMP 1, 2, 3, 4, 5, 6, 7 and 8)

Setting the scene:
Begin with students by reviewing/discussing the difference between area and perimeter. Ask students for specific examples of when they would need to know or use their understanding of

either types of measurement. In this conversation lead students to discuss irrigation and farms and how or when farmers would need to apply their understanding.

Pose students with the following problem and be sure to discuss only the context of the problem and not how it can be solved.

> *Farmer Joe went to Tractor Supply and could only afford to buy one irrigation hose that was 36 feet in length. He wanted to create a rectangular vegetable garden using the 36-foot hose to help frame it in. What are some of the dimensions of the garden that farmer Joe could create? Which garden dimensions produced the greatest possible area to plant vegetables in?*

After presenting the context to students, give them the manipulative (connecting cubes or string) to begin constructing and recording possible dimensions of the garden. Be sure that students are drawing and labeling their diagram and writing equations for their model.

9 Possible Solutions

Dimension	1x17	2x16	3x15	4x14	5x13	6x12	7x11	8x10	9x9
Area	$17sq^2$	$32sq^2$	$45sq^2$	$64sq^2$	$65sq^2$	$72sq^2$	$77sq^2$	$80sq^2$	$81sq^2$

It is extremely important that during the closing students are given the opportunity to share their solution strategy and make conjectures based from their findings such as:

- How they used the commutative property to be more efficient thinkers
- As the length got shorter the width got longer
- The closer all sides are to being equal in length the greater the area

These ideas can also be explored and discussed through formative assessment questions if not brought up by the students.

FORMATIVE ASSESSMENT

- What does the length of a rectangle describe about the squares covering it?
- What does the width of a rectangle describe about the squares covering it?
- How do the squares covering a rectangle compare to an array?
- How is multiplication used to count the number of objects in an array?
- How do the side lengths of a rectangle impact the shapes area?

DIFFERENTIATION

Extension

Part 1-A part of the extension students can continue exploring distributive property in context by using the following scenario:

> *What if Farmer Joe wanted to create 2 gardens using his 36 feet of hose (one for green vegetables and one for non-green vegetables)? What could be some of the dimensions of his two gardens? Which dimensions would ensure that Farmer Joe would get the most "area for his hose"?*

Be sure that students are drawing and labeling their diagram and writing equations for their model.

Part 2- Pose the following solution from a fictitious student down the hallway and ask the students which is right:

> *"I want to share two solutions from students down the hallway in Mr. X's room. The solutions involved using the 36 feet of hose and making the 2 gardens. One student said they had two gardens with the dimension 2x11 and 2x3 and Mr. X said they were right. Another student had two gardens with the dimensions 2x12 and 2x3 and Mr. X said they were right too. Is Mr. X wrong to say they are both right?"* ***Pose only the problem in words for the students to explore and discuss. The students must construct the models to match the solutions.***

Allow students to explore this concept for a while. If no student has discovered joining gardens ask them "*What would happen if we joined the gardens?"* Students should identify that by sharing a side between two gardens they are able to increase the length of the other side making both solutions in Mr. X's class possible.

2 solutions from the students in Mr. X's class			
Non-Joining Garden		Joining Garden	
2x11	2x3	2x12	2x3

Intervention

- Students can be use graph paper to help represent the concrete use of manipulatives. Instead of using a hose length of 36 students can use a hose length of 24 or 12. It is important to understand that by shortening the length of hose does not reduce the level of rigor in the task however it does make the numbers more manageable and accessible to struggling learners.
- Intervention Table

A Whole Lot of Garden Hose

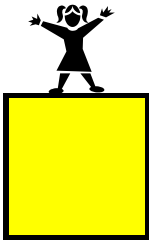
Farmer Joe went to Tractor Supply and could only afford to buy one irrigation hose that was 36 feet in length. Farmer Joe wanted to create a rectangular vegetable garden using the 36 feet of hose to help frame it in. What are some of the dimensions of the garden that farmer Joe could create?

Which garden dimensions produced the greatest possible area to plant vegetables in? Show your mathematical thinking using models and equations.

CONSTRUCTING TASK: PENTOMINO PERIMETERS

Return to Task Table

In this task, students will explore area and perimeter and their relationship through the use of pentominos.



APPROXIMATE TIME: 2 Days

CONTENT STANDARDS

MGSE3.MD.7 Relate area to the operations of multiplication and addition.

MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
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.

BACKGROUND KNOWLEDGE

Students should be given the opportunity to explore pentomino pieces freely before working this task. To further explore pentominos, ask students to sort the pentomino pieces and determine the common attributes of the set (i.e. each piece has an area of 5 square units and all sides meet to form a right angle). Also, ask students to sort the shapes by perimeter. Students should notice that all of the pieces have a perimeter of 12 linear units with the exception of one shape that has a perimeter of 10 linear units. Discuss why only one piece has a different perimeter. Be sure students determine that shapes can have the same area but have different perimeters and vice versa. Use the correct terminology of square units and linear units in discussions.

In preparation for working with pentominos, teachers may need to discuss how to manipulate the pieces by turning or flipping them. To be successful with this task, students will need to understand how to find the perimeter and area of a figure. Also, students will need to understand the definition of a polygon so that they will be able to create a polygon using pentominos.

COMMON MISCONCEPTIONS

Students may confuse perimeter and area when they measure the sides of a rectangle and then multiply. They think the attribute they find is length, which is perimeter. Pose problems situations that require students to explain whether they are to find the perimeter or area.

ESSENTIAL QUESTIONS

- How are the perimeter and area of a shape related?
- How does combining and breaking apart shapes affect the perimeter and area?

MATERIALS

- "Pentominos Perimeters" student recording sheet (2 pages)
- Pentominos (may use paper copies)
- *Racing Around,* by Stuart J. Murphy, or similar book about finding perimeter

GROUPING

Whole Group/Partner Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talk and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

One way to introduce the concept of perimeter is to read *Racing Around,* by Stuart J. Murphy, or a similar book about finding perimeter.

Part II (SMP 1, 3, 4, 5, 6, and 7)

Students will follow the directions below from the "Pentomino Perimeters" student recording sheet.

1. In each box below, choose three pentominoes and create a polygon. Trace your polygon in the box.
2. Find the area and perimeter of each polygon. Be sure to include the correct label for each measure.
3. Write how you found the area and perimeter of your polygons.
4. Explain what you noticed about the areas and perimeters of your polygons.

CHALLENGE:

- Using 3 pentomino pieces, what is the longest perimeter you can make? Sketch it below and explain how you know it has the longest possible perimeter.
- Using 3 pentomino pieces, what is the largest area you can make? Sketch it below and explain how you know it has the largest possible area.

FORMATIVE ASSESSMENT QUESTIONS

- How does the area compare to the perimeter of this shape?
- What units are used to measure each polygon? Why?
- What generalizations can you make about the relationship of perimeter and area of shapes?
- Look at the shapes of other classmates. How does your area and perimeter differ from theirs? If there is a difference, why is it so?

DIFFERENTIATION

Extension

- Ask students to complete the challenge on the student recording sheet.
- Challenge students to find 4 pieces that create a 4 x 5 rectangle or 5 pieces that form a 5 x 5 square. For more extension activities, see the following web site: http://people.rit.edu/mecsma/Professional/Puzzles/Pentominoes/P-A.html

Intervention

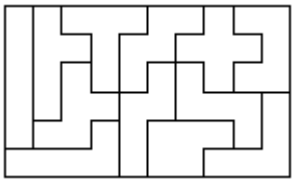
- Have students copy and draw the square units inside a pentomino piece and then label the perimeter and area for further understanding.
- Use a visual model for students to copy.
- Intervention Table

TECHNOLOGY CONNECTION

- http://people.rit.edu/mecsma/Professional/Puzzles/Pentominoes/P-A.html
  Provides several beginner problems with solutions for pentominoes.
- http://puzzler.sourceforge.net/docs/pentominoes.html
  Solutions to several pentomino puzzles such as the one below.

Name_____ Date _____

Pentomino Pandemonium



1. In each box below, choose three pentominoes and create a polygon. Trace your polygon in the box.

A.	B.
C.	D.

2. Find the area and perimeter of each polygon. Be sure to include the correct label for each measure.

	Polygon A	Polygon B	Polygon C	Polygon D
Area				
Perimeter				

3. Write to tell how you found the area and perimeter of your polygons.

_____

_____

_____

_____

_____

4. Write to explain what you noticed about the areas and perimeters of your polygons.

_____

_____

_____

_____

_____

_____

5. CHALLENGE: Using 3 pentomino pieces, what is the longest perimeter you can make? Sketch it below, and explain how you know it has the longest possible perimeter.

_____

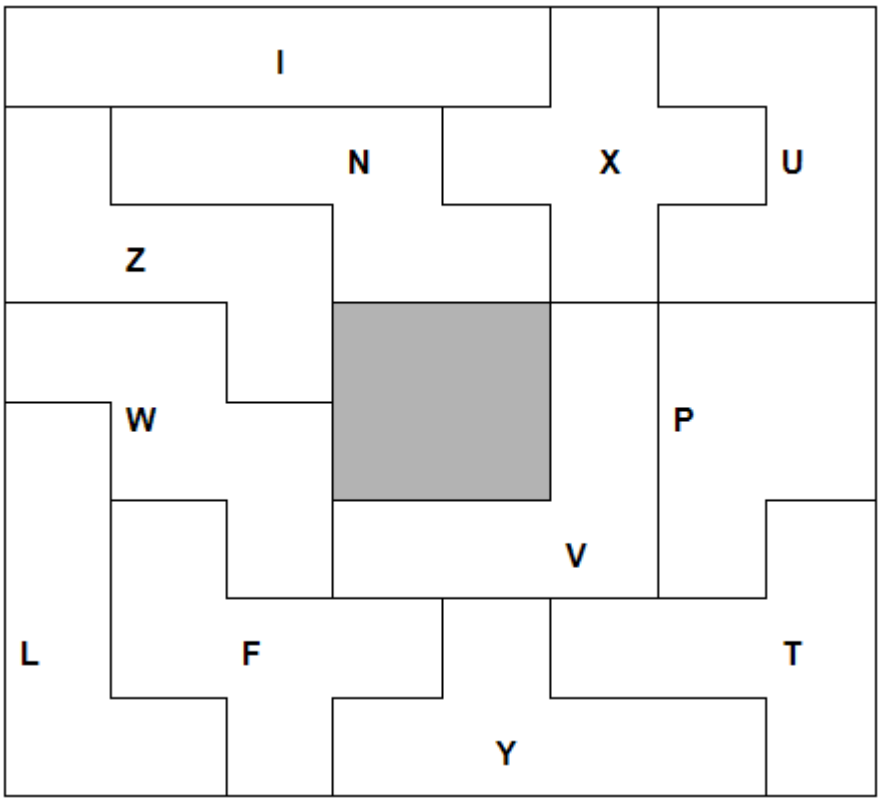
_____

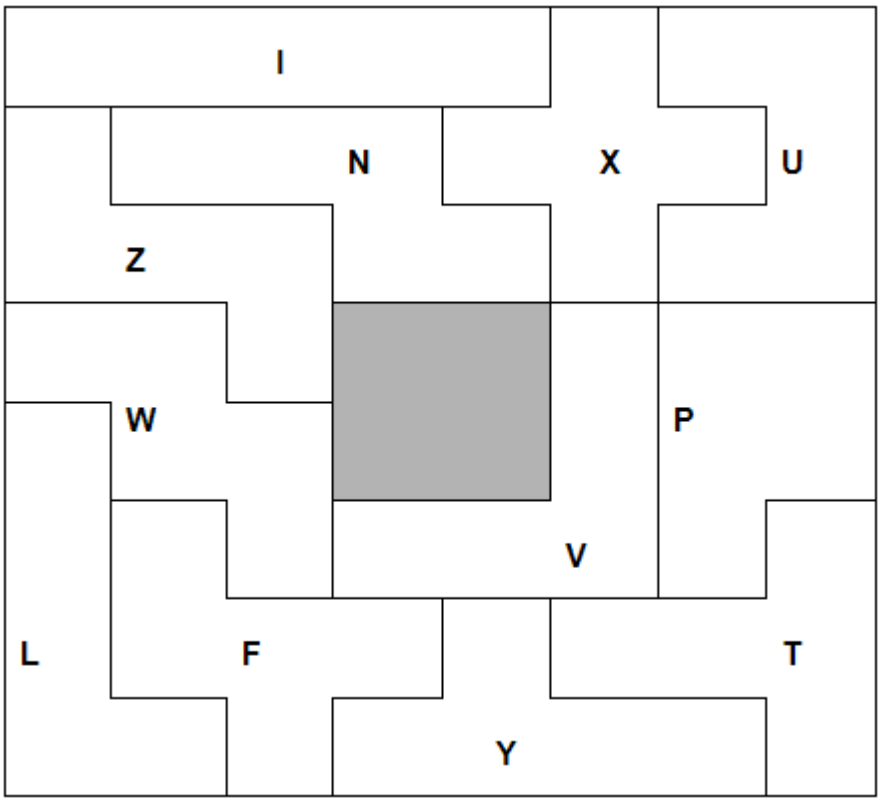
6. CHALLENGE: Using 3 pentomino pieces, what is the largest area you can make? Sketch it below and explain how you know it has the largest possible area.

_____

_____

Pentomino Pieces

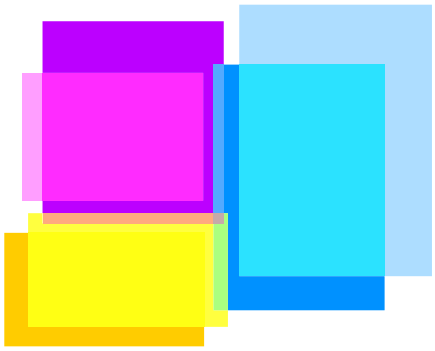




CONSTRUCTING TASK: RECTANGLES RULE!

Return to Task Table

In this task, students will use given perimeters to draw rectangles and compare areas of various rectangles.



APPROXIMATE TIME: 1 Day

CONTENT STANDARDS

MGSE3.MD.7 Relate area to the operations of multiplication and addition.

MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

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.
6. Attend to precision.

BACKGROUND KNOWLEDGE

When drawing rectangles with a given perimeter, it might be helpful for some students to share methods of finding rectangles with the correct perimeter. Some students might use trial and error or an organized list; others might realize they need to find two numbers that add up to half of the perimeter. By sharing strategies, some students might be able to use more efficient methods. However, allow students to use a method that makes sense to them.

Once students have finished with the task, post the students' work so that students can see several different examples of rectangles with the same perimeter arranged in order by area. Ask students to compare their work with others and engage them in a discussion of the relationship between perimeter and area. Students should notice that the narrower the rectangle, the smaller the area. Also, students should notice that the largest area is found in rectangles that are squares or as close to a square as possible, given the perimeter. Students may also notice properties of rectangles: four right angles, four sides, and opposite sides equal.

Students should have had prior experience determining area and perimeter.

COMMON MISCONCEPTIONS

Students may confuse perimeter and area when they measure the sides of a rectangle and then multiply. They think the attribute they find is length, which is perimeter. Pose problems situations that require students to explain whether they are to find the perimeter or area.

ESSENTIAL QUESTIONS

- What is the relationship between perimeter and area?
- How can rectangles have the same perimeter but have different areas?

MATERIALS

- "Rectangles Rule" student recording sheet
- Construction paper
- Glue and scissors

GROUPING

Individual Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 4, and 6)

Students will follow the directions below from the "Rectangles Rule" student recording sheet. Assign each pair of students a perimeter. Possible perimeters are 12, 18, 24, 34, and 36.

Directions:

1. On the dot paper below, draw all the rectangles you can with the same perimeter.
2. Find the area and record it inside the rectangle. Show how you found the area.
3. Cut out the rectangles and order them from smallest area to largest area.
4. Glue them on construction paper in order.
5. Write a paragraph explaining what you notice about how the shape of a rectangle and its area are related.

Once completed, have students discuss the strategies they used to complete the task.

FORMATIVE ASSESSMENT QUESTIONS

- Have you found all of the rectangles possible? How do you know?
- What strategies are other students using to find rectangles with the given perimeter?
- What do you notice about the shape of the rectangles?
- How are shape and area related?
- Other than perimeter, what do all of these rectangles have in common?

DIFFERENTIATION

Extension

- Given a rectangle with a perimeter of 36 units, what is the smallest possible area it could have? What is the largest possible area? How do you know?

Intervention

- Use graph paper or geoboards instead of dot paper to count the square units.
- Intervention Table

TECHNOLOGY CONNECTION

- http://highered.mcgraw-hill.com/sites/0072532947/student_view0/grid_and_dot_paper.html
  Printable dot and graph paper

Name _____ Date _____

Rectangles Rule

Directions:

1. On the dot paper below, draw all the rectangles you can with the same perimeter.

   My perimeter is _____.

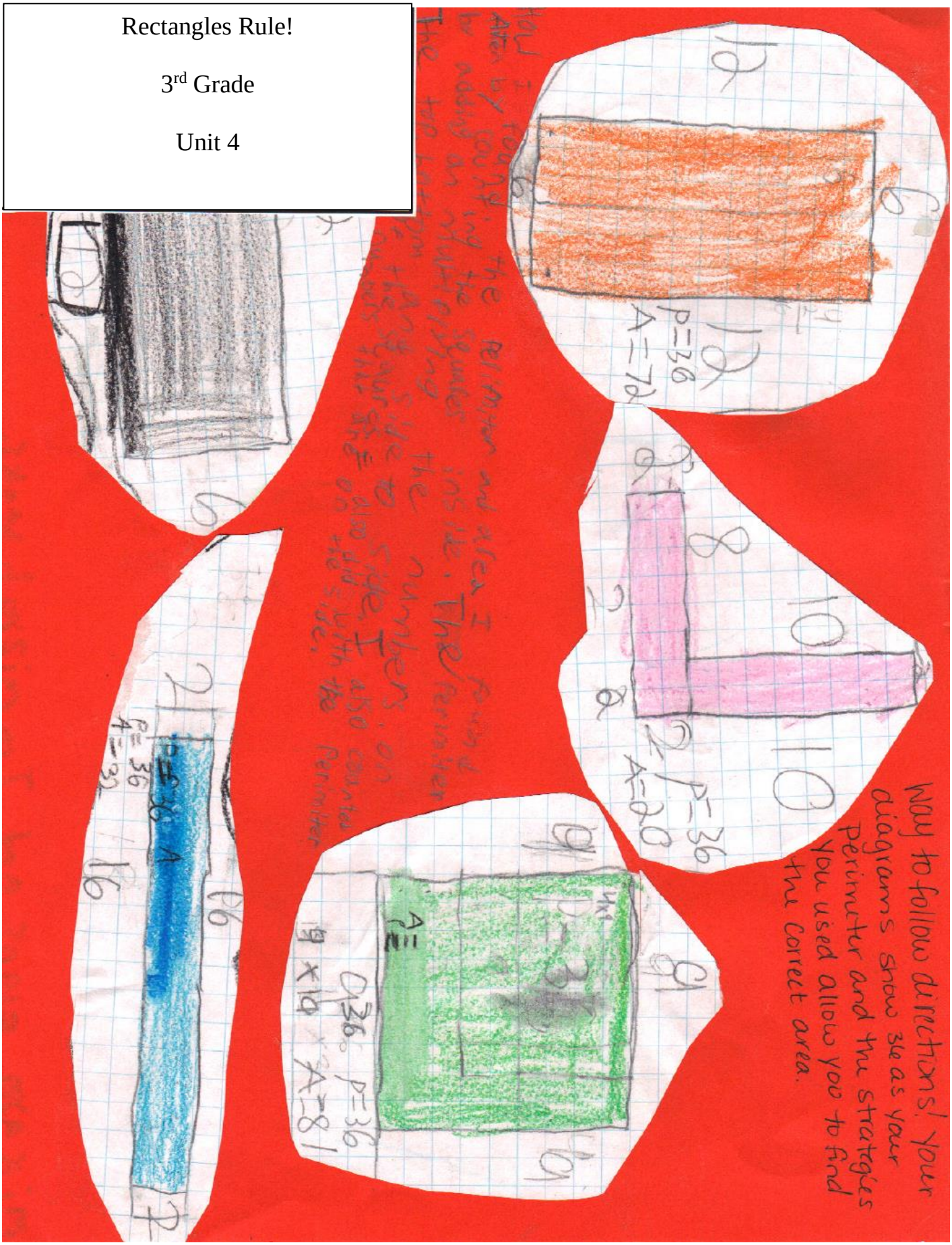
2. Find the area and record it inside the rectangle. Show how you found the area.
3. Cut out the rectangles and order them from smallest area to largest area.
4. Glue them on construction paper in order.
5. Write a paragraph explaining what you notice about how the shape of a rectangle and its area are related.

(if you need more dot paper, please ask)

Rectangles Rule!

3rd Grade

Unit 4



CONSTRUCTING TASK: HOW BIG IS A DESK?

Return to Task Table

In this task, students will use square units to estimate and measure the perimeter and area of a figure and compare the perimeter and area using different units.

APPROXIMATE TIME: 2-3 Days

CONTENT STANDARDS

MGSE3.MD.7 Relate area to the operations of multiplication and addition.

MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

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

BACKGROUND KNOWLEDGE

It is very likely that the multiplication involved for finding area will be larger than a 1-digit number by a 2-digit number. Students may use calculators for this activity. The goal of this task is to explore the relationship between the size of linear units used to measure and the resulting perimeter and area. Therefore, the use of a calculator is appropriate.

Students should recognize that as the size of the unit of measure increases the number of units required to describe perimeter and area decreases. Conversely, as the size of the unit of measure decreases the number of units required to describe perimeter and area increases. In other words, if the pieces are smaller, you will need more of them to cover the same area; and if the pieces are larger you will need fewer of them to cover the same area.

Students should have had several opportunities to work with the perimeter and area of a rectangle and understand the difference between linear and square units.

COMMON MISCONCEPTIONS

Students may confuse perimeter and area when they measure the sides of a rectangle and then multiply. They think the attribute they find is length, which is perimeter. Pose problems situations that require students to explain whether they are to find the perimeter or area.

ESSENTIAL QUESTIONS

- How do the measure of lengths change when the unit of measure changes?
- How are the perimeter and area of a shape related?
- What methods can you use to determine the area of an object?

MATERIALS

- Square units (i.e. centimeter cubes, 1-inch square tiles, 1x1 foot square pieces of paper)
- *Bigger, Better, Best! by Stuart J. Murphy or a similar book about measuring area*
- Calculator

GROUPING

Whole Group/Partner Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (SMP 6)
As an introduction to this task, read *Bigger, Better, Best! by Stuart J. Murphy or a similar book about measuring area*. Then, review perimeter and area and the units that can be used for each (linear units vs. square units). Throughout the lesson, emphasize the key vocabulary used in determining perimeter and area. Create an anchor chart as students discuss vocabulary and concepts.

Part II (SMP 1, 2, 4, 5, 6, 7, and 8)
Students will follow the directions below from the "How Big Is a Desk?" student recording sheet.

How would you describe the size of your desk? You will measure your desk using one inch tiles, a one foot ruler, and one centimeter cubes.

- Before measuring, look at the one-inch tiles and record an estimate for the length and width of your desk in the table below.
- Use the tiles to find the actual measurement and record it in the table below.
- Find the perimeter of your desk using the tiles (or a method of your choice) and record it below.
- Find the area of your desk using the tiles (or a method of your choice) and record it below.
- Repeat steps 1 through 4 for the ruler and then for the centimeter cubes. Note: There are probably not enough centimeter cubes to measure the area of the desks. What other method could be used?

Part III (SMP 1, 3, 6, and 7)

My Desk

	Length		Width			
	Estimate	Actual	Estimate	Actual	Perimeter	Area
1 Inch Tiles						
1 Foot Ruler						
1 Centimeter Cubes						

1. Write to explain how you found the perimeter of your desk. What is a different way to find perimeter?
2. Write to explain how you found the area of your desk. What is a different way to find area?
3. What happened to the perimeter and area of the desk as different units of measure were used?

Once all students are finished with the task, hold a class or small group discussion for students to have a chance to listen to the strategies used by fellow classmates, as well as answer/ask questions to each other such as "How did you get that?" and "Why is that true?".

FORMATIVE ASSESSMENT QUESTIONS

- What unit is the most appropriate to use to measure the desk? Why?
- What method would you choose to use when measuring a rectangle? Why?
- Describe how you found the perimeter of your desk.
- Describe how you found the area of your desk.

DIFFERENTIATION

Extension

- Have students use 3" squares and/or 6" squares (cut from paper) to use as one square unit. In a math journal, ask students to estimate the area and perimeter of their desk and explain how they determined their estimates. Then ask them to find the area of their desk by tiling or multiplying.

Intervention

- Have one inch and one centimeter grid paper available for those students who would like to "tile" their desks to find the area. If the grid paper is cut into 10 x 10 squares, counting to find the area will be easier. Or, have students measure a smaller item, such as a tissue box.
- Intervention Table

TECHNOLOGY CONNECTION

- http://www.shodor.org/interactivate/activities/ShapeExplorer/?version=1.6.0_07&browser=MSIE&vendor=Sun_Microsystems_Inc.&flash=10.0.32
  Randomly generated rectangles for which the perimeter and the area can be found

Name _____ Date _____

How Big Is Your Desk?

How would you describe the size of your desk? You will measure your desk using one inch tiles, a one foot ruler, and one centimeter cubes.

- Before measuring, look at the one inch tiles and record an estimate for the length and width of your desk in the table below.
- Use the tiles to find the actual measurement and record it in the table below.
- Find the perimeter of your desk using the tiles (or a method of your choice) and record it below.
- Find the area of your desk using the tiles (or a method of your choice) and record it below.
- Repeat steps 1 through 4 for the ruler and then for the centimeter cubes. Note: There are probably not enough centimeter cubes to measure the area of the desks. What other method could be used?

My Desk

	Length		Width			
	Estimate	**Actual**	**Estimate**	**Actual**	**Perimeter**	**Area**
1 Inch Tiles						
1 Foot Ruler						
1 Centimeter Cubes						

1. Write to explain how you found the perimeter of your desk. What is a different way to find perimeter?

_____

_____

_____

2. Write to explain how you found the area of your desk. What is a different way to find area?

_____

_____

3. What happened to the perimeter and area of the desk as different units of measure were used?

_____

_____

_____

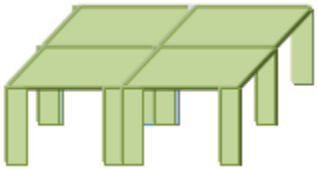
_____

_____

_____

CONSTRUCTING TASK: GUESS WHO'S COMING TO DINNER? Return to Task Table

In this task, students will manipulate squares to alter the perimeter of given shapes in order to maximize seating potential. Students will then determine the size table cloth needed for the table of their choice.



APPROXIMATE TIME: 2-3 Days

CONTENT STANDARDS

MGSE3.MD.7 Relate area to the operations of multiplication and addition.

MGSE3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

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.

BACKGROUND KNOWLEDGE

Student responses to the "Guess Who's Coming to Dinner?" task should reflect a variety of solutions. Student work should demonstrate that they paid close attention to the details of the problem. Work should be clearly labeled to show guests' names. Written explanation should be easily understood. Ask students to share their solutions along with highlights of their group's discussion that occurred while finding their solutions.

Students should have had experience with area and perimeter and understand the different uses for each. As students manipulate the squares, they will discover that when two separate squares (tables of four) are rearranged into a rectangle, two seating spaces are lost where the squares are joined together. Other observations about joining tables will become apparent as students manipulate the squares. Some students may recognize that as the perimeter gets smaller, the rectangle gets closer and closer to a square.

Remind students that most of the pentominoes had a perimeter of 12 units, except for the one in which most of the squares shared two sides. This information may be helpful when working on this task.

COMMON MISCONCEPTIONS

Students may confuse perimeter and area when they measure the sides of a rectangle and then multiply. They think the attribute they find is length, which is perimeter. Pose problems situations that require students to explain whether they are to find the perimeter or area.

ESSENTIAL QUESTIONS

- How are the perimeter and area of a shape related?
- How does combining and breaking apart shapes affect the perimeter and area?

MATERIALS

- *Spaghetti and Meatballs For All* by Marilyn Burns or similar book about perimeter
- "Guess Who's Coming to Dinner?" student recording sheet
- 8 colored squares per group (about 2-inch squares)
- 1 large paper per group (about 18 x 24)

GROUPING

Small Group Task

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I (SMP 1, 4, 5, and 6)
As an introduction to this task, read *Spaghetti and Meatballs for All*. In the story, relatives come to dinner and begin rearranging tables which results in losing seating places. After reading the book, have groups use the squares to model some of the events in the book. Discuss changes in area and/or perimeter caused by the moves.

Part II (SMP 1, 2, 3, 4, 5, 6, and 7)
Students will follow the directions below from the "Guess Who's Coming to Dinner?" student recording sheet.

Pretend that four people live at your house (Your mom, dad, sister, and you). Aunt Sue, Uncle John and their six children (Jamal, Kevin, Carl, Annie, Stephanie, and Maxine) are coming for dinner. Uncle Kenny is coming, too. He is bringing his wife (Aunt Jenny) and four kids (Earl, Charles, Jasmine and Justine).

Mom has six square folding tables she can use but you don't have to use all of them. (Each folding table seats four, one on each side.) You can put two or more of the folding tables together to form a rectangle if you like.

Job #1:
Your job is to work with a partner to decide on a seating arrangement that is best for your family and guests. When finished, draw a picture of the table arrangement and label each place to show who will be sitting there. Mom has the following rules:

- There should be no empty seats.
- There must be at least one grown-up at each table.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

Part III (SMP 1, 2, 6, and 7)

Job #2
Next, you need to determine what size tablecloth your mom needs in order to cover the table. Each side of each square is 3 feet long. The table cloth should be a perfect fit.

FORMATIVE ASSESSMENT QUESTIONS

- How does the area compare to the perimeter of this shape?
- How does combining or pulling apart shapes affect the perimeter and area of your pieces?
- What happens when you combine squares?
- What strategies are you using to make sure each guest has a seat?

DIFFERENTIATION

Extension

- Ask students work with a total of 24 dinner guests and 8 square tables.
- Challenge students to find more than one way to solve the problem.
- Ask students to describe how area and perimeter are alike and/or different.

Intervention

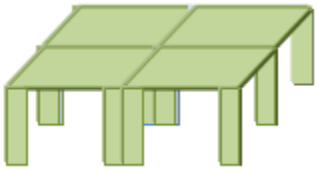
- As students try out a possible solution, have them trace the squares on a separate piece of paper and label the area and length of sides to determine the perimeter. Continue with this until the perimeter matches the number of guests. Then have students use name cards to move the guests around until a suitable solution is found.
- Intervention Table

TECHNOLOGY CONNECTION

- http://www.learner.org/courses/learningmath/measurement/session9/part_a/index.html An interactive task for ***teachers*** to explore area and perimeter.

Name _____ Date _____

Guess Who's Coming to Dinner?



Pretend that four people live at your house (Your mom, dad, sister, and you). Aunt Sue, Uncle John and their six children (Jamal, Kevin, Carl, Annie, Stephanie, and Maxine) are coming for dinner. Uncle Kenny is coming, too. He is bringing his wife (Aunt Jenny) and four kids (Earl, Charles, Jasmine and Justine).

Mom has six square folding tables she can use but you don't have to use all of them. (Each folding table seats four, one on each side.) You can put two or more of the folding tables together to form a rectangle if you like.

You have two jobs to make this family feast a success.

Job #1:
Your job is to work with a partner to decide on a seating arrangement that is best for your family and guests. When finished, draw a picture of the table arrangement and label each place to show who will be sitting there. Mom has the following rules:

- There should be no empty seats.
- There must be at least one grown-up at each table.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

Job #2
Next, you need to determine what size tablecloth your mom needs in order to cover the table. Each side of each square is 3 feet long. The table cloth should be a perfect fit.

Write a few sentences to describe what happened to the perimeter as tables were pushed together. Then explain why the arrangement you chose is the best possible arrangement.

Guess Who's Coming to Dinner?

3rd Grade

Unit 4

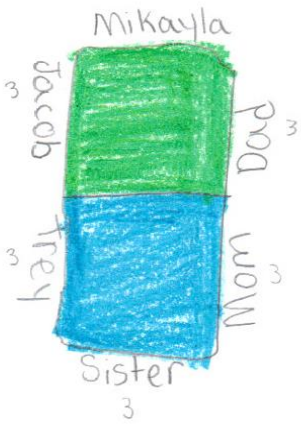
total
Kids
adults

Ashlyn

e need 54
ings of table
cloth

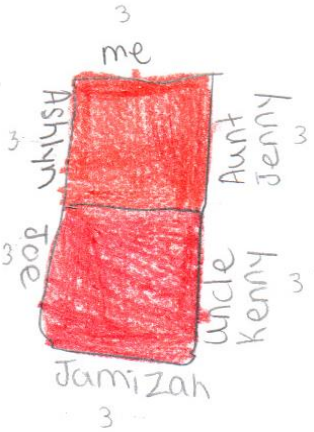
Mikayla' Ethan
Unkle Kenny Aunt
Jenny Ty Jacob
Jamizyah Trey

3+3+3+3+3+3=18
3x6=18
A=18
P=18

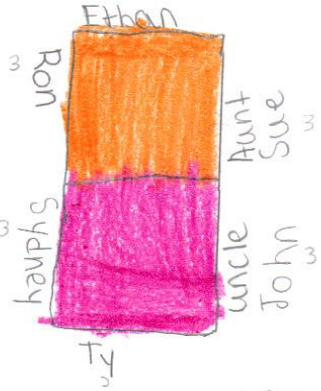


18
18
+18
54

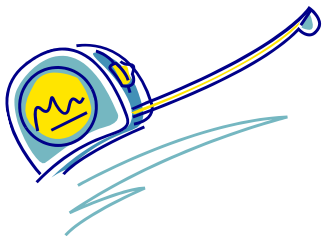
3+3+3+3+3+3=18
3x6=18
A=18
P=18



3+3+3+3+3+3=18
3x6=
A=18
P=18



On number one the area and perimeter were the same. All of them were 54 total.



SCAFFOLDING/CONSTRUCTING TASK: MEASURE MY SHAPES

Return to Task Table

In this task, students will use rulers to measure side lengths of different shapes. They will use this data to create a line plot.

CONTENT STANDARDS

MGSE3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

1. Make sense of problems and persevere in solving them.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

BACKGROUND KNOWLEDGE

Students in second grade will have had some experience with rulers and measuring inch and ½ inch. Later in 3rd grade, students will also learn to use the ruler to measure ¼ inch. In this activity, student will use rulers to measure the length of the shape's sides. After recording their information, students will make a line plot with the data collected.

Data and graphing are not isolated concepts. They can and should be integrated with the majority of mathematics. If students are going to plot their own points when creating line plots, there needs to be a discussion about the importance of keeping the size of the X the same. This should be a discussion as it becomes an issue throughout the task.

COMMON MISCONCEPTIONS

When studying line plots, it is important for students to realize that the x axis is always a number line. Line plots are not to be used with categorical data.

ESSENTIAL QUESTIONS

- How might I begin at any number on ruler to measure length?
- Explain how a line plot is made.

MATERIALS

- Student Recording Sheet
- Rulers
- Plain Paper or Math Journal to make Line Plot

GROUPING

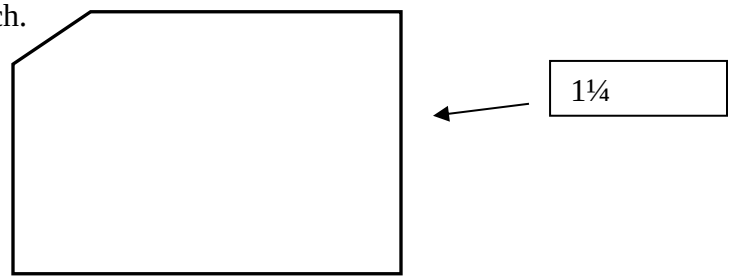
Partner or Individual

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 4, 5, and 6)

Students will use rulers to measure each side of the shapes on the Student Recording Sheet. All measurements are to the nearest inch or ½ inch except for the pentagon shape below. The right side is 1 ¼ inch. This is good opportunity to preview Unit 6 with measuring to the nearest quarter inch.



There are 3 different types of rulers that can be printed from http://www.eduplace.com/math/mthexp/g3/visual/pdf/vs_g3_144.pdf. Print on stock paper and laminate to make sturdier.

After students record the length, you may wish to have them record the data in a chart. Students should also use the data to make a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. At this point, students should be able to mark the whole numbers and halves as a review from second grade. You may wish to allow students to help construct a line plot together and add the quarter for the pentagon measurement. For more information about line plots, see the instructional strategies at the beginning of this unit or see page 333 in the Van de Walle resource book.

FORMATIVE ASSESSMENTS QUESTIONS

- How would you measure the shapes if you had a broken ruler?
- How would you explain to your parents/friends how you obtained your data?
- Explain why you made the line plot.

DIFFERENTIATION

Extension

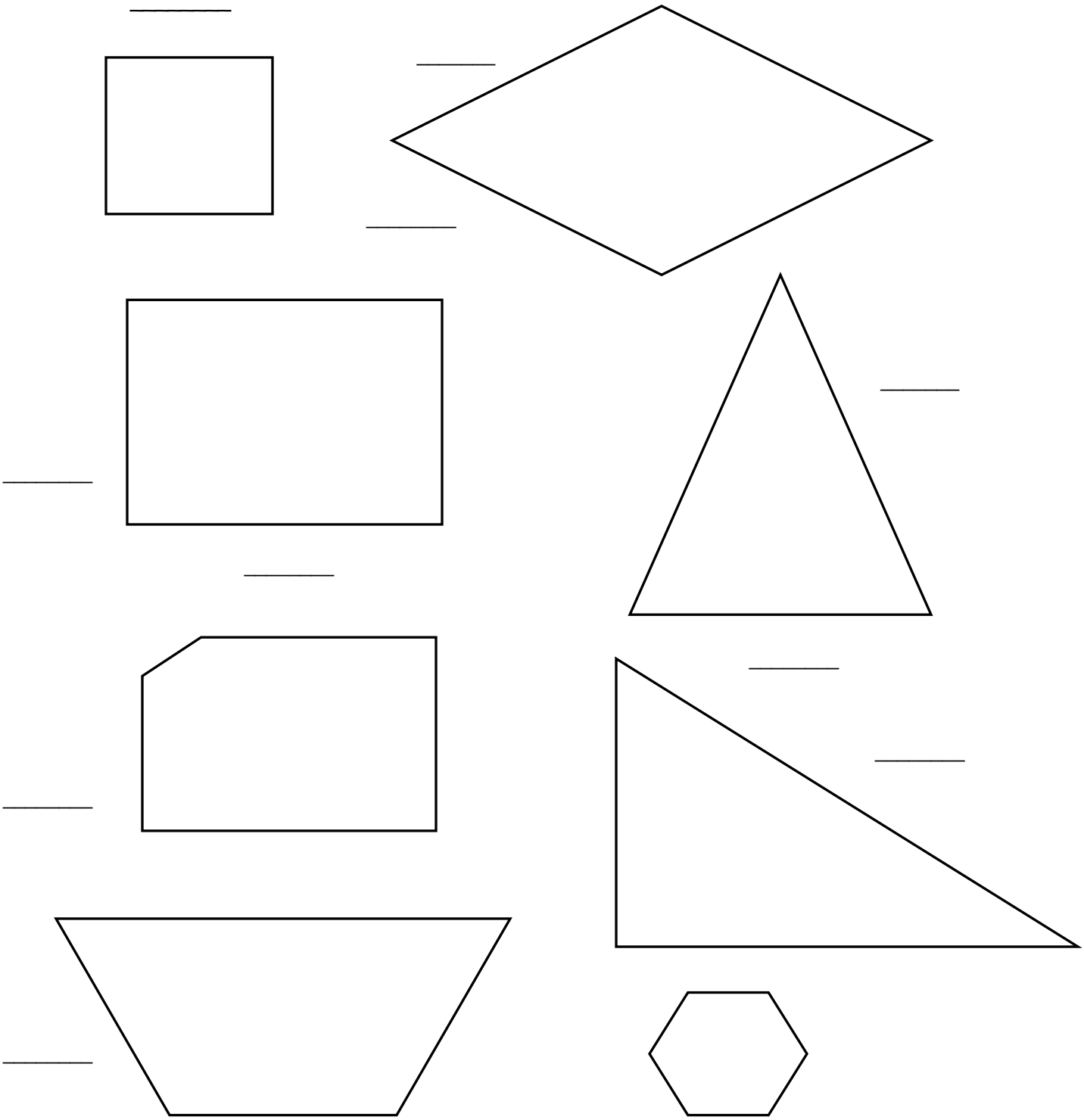
- Students could use the measurement of the sides to determine the perimeter of the shapes. Keep in mind that there will be sides that contain ½ and ¼ inches. It is best for students to reason through this concept based on their understanding of fractions and partitioning of shapes developed in second grade. It is a reasonable expectation that students will be able to approach this by using drawings and manipulatives, and not the standard algorithm.

Intervention

- Students who struggle may not be lining up the ruler correctly. They may also not know where halves are located on a commercially produced ruler. You may want to print out the rulers provided above or use a paint marker/permanent marker to show halves on the ruler. This suggestion also applies when you begin to teach quarters on the ruler.
- Intervention Table

Student Sheet

Directions: Using a ruler, measure each side of these shapes to the nearest inch, ½ inch, or ¼ inch. Write your information on the lines along each side. Then, use the information to make a line plot.



CONSTRUCTING TASK: PATTERN BLOCK GRAPHING

Return to Task Table

Images used from http://www.kellyskindergarten.com/math/math_activities.htm

In this task, students will use pattern blocks to create pictures and then collect data from their picture. Afterwards, they will represent this data in a picture and bar graph.

CONTENT STANDARDS

MGSE3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.

BACKGROUND KNOWLEDGE

Throughout each unit, students should continue to develop their understanding of collecting and representing data. In 1st grade students organized, represented and interpreted data up to three categories. Students used collected data to answer questions and solve simple problems. In 2nd grade students, created picture and bar graphs to represent data. Refer to the Unit 1 Overview for grade level appropriate examples for graphs. Students solved simple put-together, take-apart, and compare problems using information presented in graphs. Data and graphing are not isolated concepts. They can and should be integrated with the majority of mathematics.
*Note: Line plot graphs would not be appropriate for this type of data, because it is categorical.

COMMON MISCONCEPTIONS

Students may read the mark on a scale that is below a designated number on the scale as if it was the next number. For example, a mark that is one mark below 80 grams may be read as 81 grams. Students realize it is one away from 80, but do not think of it as 79 grams.

Although intervals on a bar graph are not in single units, students count each square as one. To avoid this error, have students include tick marks between each interval. Students should begin each scale with 0. They should think of skip counting when determining the value of a bar since the scale is not in single units.

ESSENTIAL QUESTIONS

- In what ways can I represent data from a picture?
- How can I show what materials were used to create a picture?
- How do I know which interval is most appropriate to use in a scaled bar/picture graph?

MATERIALS

- Pattern Block Pictures
- Isometric paper to represent their picture once created https://wps.ablongman.com/ab_vandewalle_math_6/0,12312,3547876-,00.html (38 & 39))

GROUPING

Individual or Partner

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I (SMP 1, 4, 5, and 6)
Students will use the pattern block pictures to recreate a picture. You may use these examples or pattern block puzzles available from numerous resources including pattern books and the internet. This activity will help students to continue to develop their spatial sense. Students will not be able to use the picture to recreate the pattern block picture because it is not to scale. If you have students that need the pictures to scale, please visit http://www.kellyskindergarten.com/math/math_activities.htm to locate the pictures.

Part II (SMP 1, 2, 3, 4, 6, and 7)
Once students create the pictures, they will use that information to create a scaled bar graph and picture graph to represent their data. Have students create questions that classmates can answer about their data. For example, how many more rhombi are used than triangles? Are there more hexagons or small rhombi used in my graph? Allow students time to analyze and interpret the data of their classmates.

FORMATIVE ASSESSMENT QUESTIONS

- Did you find it difficult to recreate the picture?
- Why did you decide to use ___ (2, 5, or 10) as the scale for your graphs? Was that your first choice? Was there a better number to use?
- Were classmates able to analyze and interpret your data?

DIFFERENTIATION

Extensions

- Students may want to create their own pictures with the pattern blocks.

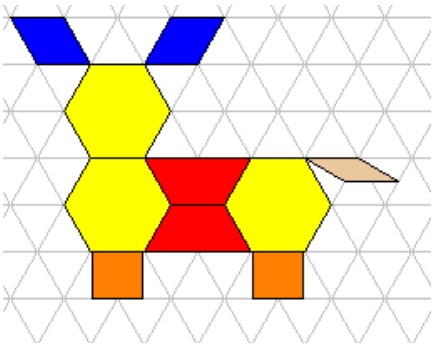
Interventions

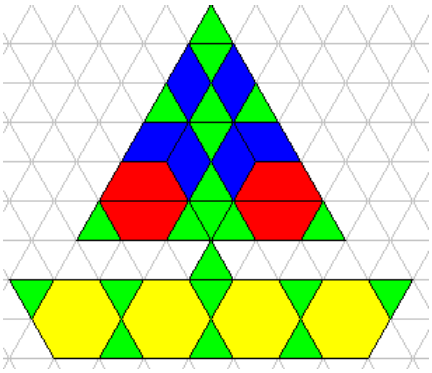
- Students might struggle with this activity for several reasons. If a student struggles with recreating one of the pattern block pictures, print out the picture from http://www.kellyskindergarten.com/math/math_activities.htm. If the student struggles with assigning a scale, have students make a tally chart to show how many of each shape. Based on that information, a student can usually see a number that would be good to use. While five is a good benchmark, students should experience different intervals. For students that struggle, 2 is a better scale interval to show ½ of a number.
- Intervention Table

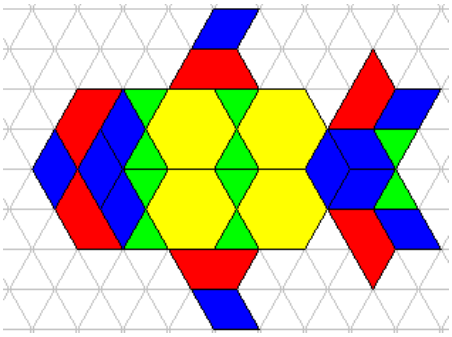
TECHNOLOGY CONNECTIONS

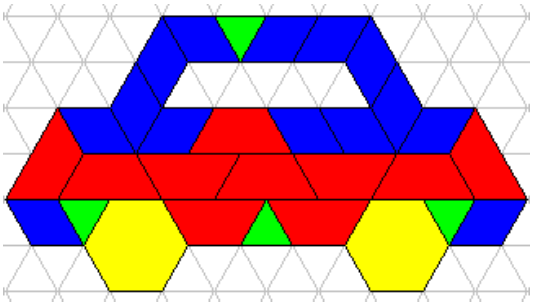
- http://nces.ed.gov/nceskids/createagraph/
  Create a bar graph online.
- http://www.softschools.com/math/data_analysis/pictograph/make_your_own_pictograph/
  Create a Picture Graph

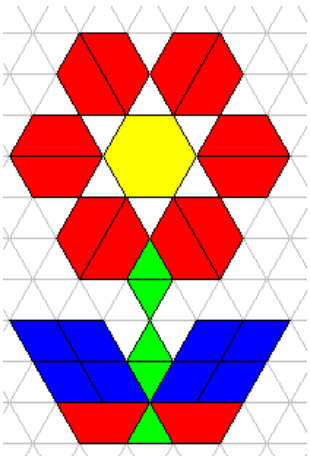
Samples of Pattern Block Pictures

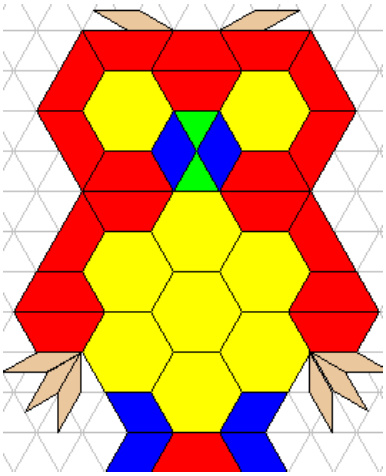












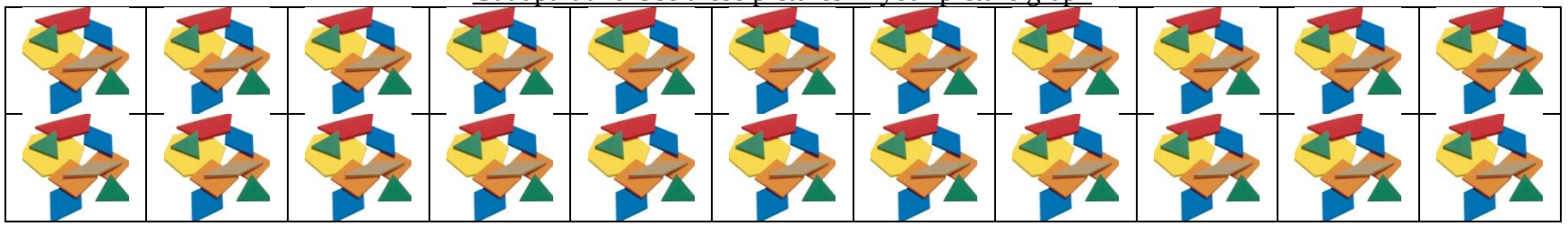
Name _____ Date _____

Pattern Block Picture Data

Use your pattern block picture to fill in the picture graph. Remember to complete the key. Use a scale interval of 2, 5, or 10. Make sure you think about your scale before beginning to complete your graph.

Title:_____	
Hexagon	
Rhombus	
Trapezoid	
Square	
Small Rhombus	
Triangle	
Key  = _____ Pattern Blocks	

Cut apart and Use these pictures in your picture graph



CONSTRUCTING TASK: MY GEOMETRIC BOOK

Return to Task Table

In this task, students will use a vocabulary graphic organizer to make a booklet that demonstrates all that they have learned about the MGSE3.G standard including shapes and partitioning shapes into equal areas.

CONTENT STANDARDS

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MGSE3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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.

BACKGROUND KNOWLEDGE

At this point, students should be able to describe shapes and sort the shapes according to their attributes. They should know quadrilaterals are polygons with four sides. Quadrilaterals include rectangles, rhombi, and squares. These shapes are a particular type of quadrilateral (parallelograms). Students should identify rhombus, rectangle, square, etc. as examples of quadrilaterals. They should also draw examples of quadrilaterals that do not belong to any subcategory (not rhombi, rectangles, or squares, etc.) such as trapezoids and/ or various sizes and shapes of convex and concave quadrilaterals.

COMMON MISCONCEPTIONS

Students may identify a square as a “nonrectangle” or a “nonrhombus” based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are

characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

ESSENTIAL QUESTIONS

- What are some differences between the quadrilaterals?
- How are the quadrilaterals alike?

MATERIALS

- Plain Paper
- Crayons, Markers, Color Pencils

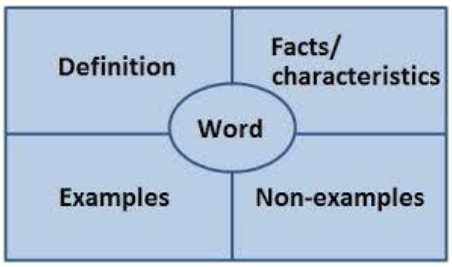
GROUPING

Individual or Partner

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 4, 5, 6, and 7)



Students will use a vocabulary graphic organizer like the one to the right to make a booklet that demonstrates all that they have learned about the MGSE3.G standard including shapes and partitioning shapes into equal areas.
Students could include the words: **triangles, quadrilaterals, pentagons, hexagons, trapezoid, square, rhombus, halves, thirds, fourths, sixths, eighths.** Allow students to make a chart of words that they have learned through this unit. They should be allowed to pick from this list. Share the rubric that is attached with students and then set a deadline for when they should have the project done.

FORMATIVE ASSESSMENT QUESTIONS/PROMPTS

- What did you learn from this unit?
- How will you remember it until next year?
- Which task did you like the most? The least?
- Is there a resource that you liked the most?

- Where can you find facts and characteristics of shapes?

DIFFERENTIATION

Extensions

- Allow for creativity including making models of the vocabulary words.

Interventions

- Students should consult their math journals or anchor charts that were created to help them complete this task. The Frayer model sheet is provided so that students that struggle do not have to recreate the graphic organizer but can focus on filling it in.
- Intervention Table

Rubric for Vocabulary Words

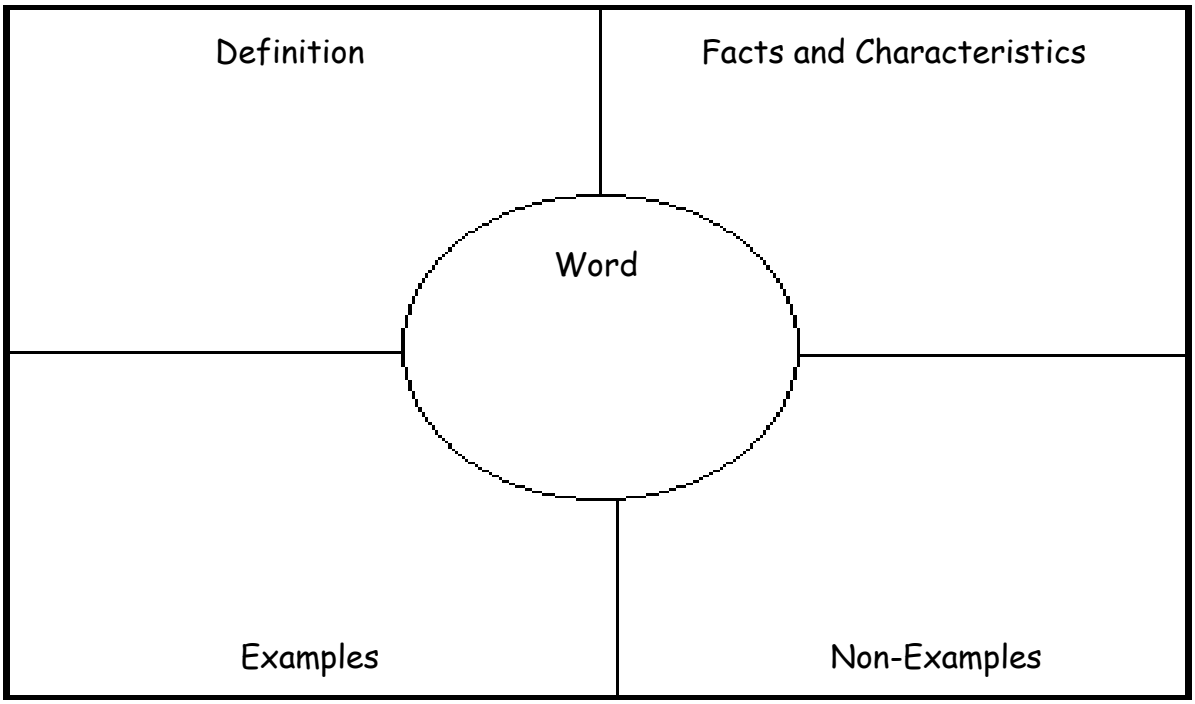
Name: _____ Date:_____

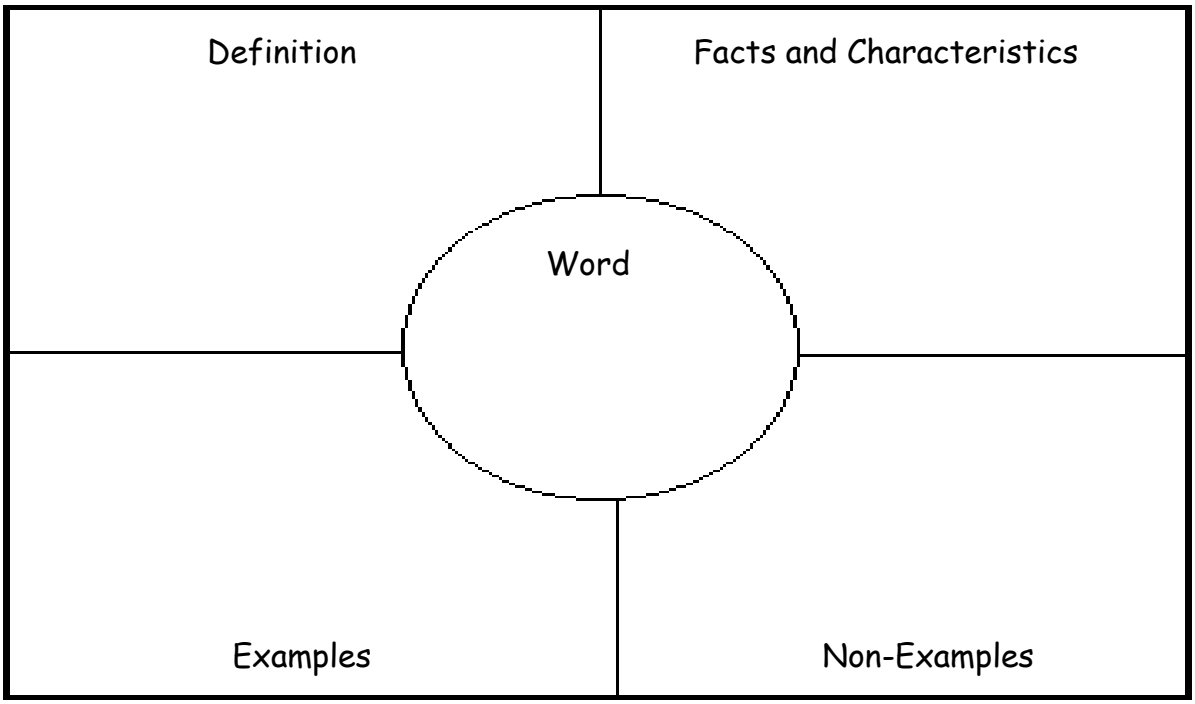
Indicator	3	2	1
Words Identified	Identified more than 5 words.	Identified 3 or 4 words.	Identified less than 3 words.
Definitions	Definitions were detailed and accurately matched the meaning of the word.	Definitions accurately matched the meaning of the word.	Most definitions accurately matched the meaning of the word.
Facts and Characteristics	Facts and Characteristics were detailed and accurately matched the meaning of the word.	Facts and Characteristics accurately matched the meaning of the word.	Most facts and characteristics accurately matched the meaning of the word.
Example and Non-examples	Example and Non-examples were detailed and accurately matched the meaning of the word.	Example and Non-examples accurately matched the meaning of the word.	Most examples and non/examples accurately reflected the meaning of the word.
Appearance	Responses were neatly written and easy to read.	Responses were fairly neatly written and readable.	Responses were not neatly written and difficult to read.

Rubric for Vocabulary Words

Name: _____ Date:_____

Indicator	3	2	1
Words Identified	Identified more than 5 words.	Identified 3 or 4 words.	Identified less than 3 words.
Definitions	Definitions were detailed and accurately matched the meaning of the word.	Definitions accurately matched the meaning of the word.	Most definitions accurately matched the meaning of the word.
Facts and Characteristics	Facts and Characteristics were detailed and accurately matched the meaning of the word.	Facts and Characteristics accurately matched the meaning of the word.	Most facts and characteristics accurately matched the meaning of the word.
Example and Non-examples	Example and Non-examples were detailed and accurately matched the meaning of the word.	Example and Non-examples accurately matched the meaning of the word.	Most examples and non-examples accurately reflected the meaning of the word.
Appearance	Responses were neatly written and easy to read.	Responses were fairly neatly written and readable.	Responses were not neatly written and difficult to read.

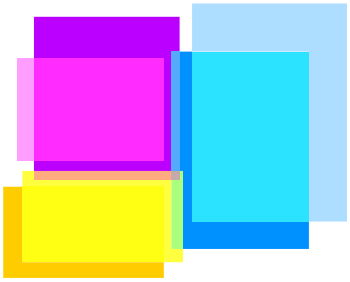




CULMINATING TASK: CHOICE BOARD

Return to Task Table

In this task, students will be given a choice board to demonstrate their understanding of the content covered in this unit. In order to show mastery, students should complete one task from each letter (A, B, C) from the choice board. Activity A will show standard MGSE3.G.1. Activity B will show standard MGSE3.G.2. Activity C will show standards MGSE3.MD.3 and MGSE3.MD.4



CONTENT STANDARDS

MGSE3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MGSE3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

MGSE3.MD. 3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

MGSE3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICES (SMP)

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

BACKGROUND KNOWLEDGE

Throughout this unit, students have reasoned with shapes and their attributes, including learning about quadrilaterals and partitioning all shapes into equal areas. Students have also had the chance to represent and interpret data through scaled picture and bar graphs. They should have also

generated measurement data and displayed the data on a line plot. Since this is the culminating task for the unit, students should be able to show what they know from this unit.

COMMON MISCONCEPTIONS

Students may identify a square as a "nonrectangle" or a "nonrhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

When partitioning a whole shape into parts, it is important to understand that the size of the parts must be equal, but the shape of the parts do not have to be the same. This task allows students to experience fractional parts that are not necessarily the same shape but are the same size.

ESSENTIAL QUESTIONS

- What do you know about a quadrilateral that you didn't know at the beginning of this unit?
- How can you show what you have learned about quadrilaterals and other shapes?
- How would you explain to a younger student about the different shapes and how some shapes can share attributes?
- Can all shapes be split into halves, thirds, fourths, sixths and eighths? Prove it.

MATERIALS

- Choice Board Activity Sheet
- Rubric

GROUPING

Individual/ Group/Partner

NUMBER TALK

By now number talks should be incorporated into the daily math routine. Continue utilizing the different strategies in number talks and revisiting them based on the needs of your students. In addition, Catherine Fosnot has developed "strings" of numbers that could be included in a number talk to further develop mental math skills. See Minilessons for Early Multiplication and Division by Willem Uittenbogaard and Catherine Twomey Fosnot (2007).

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION (SMP 1, 2, 3, 4, 5, 6, 7, and 8)

Students will be given the Choice Board Activity sheet and the Rubric for the Choice Board Activity. Read each of the activities with the students and discuss the rubric that students will be scored with. In order to show mastery of the standards that are presented in this unit, students should complete at least one activity with each letter. Activity A will show standard MGSE3.G.1. Activity B will show standard MGSE3.G.2. Activity C will show standards MGSE3.MD.3 and MGSE3.MD.4 Allow students several days (make a deadline within your class) to create, finalize, and present their activity from the Choice Board Activity Sheet. Assist students during the creation stage.

FORMATIVE ASSESSMENT QUESTIONS

- How will you show your classmates what you have learned through this unit?
- Is there something that still confuses you about shapes, data, or measurement?
- Would you rather work with a partner for this task? How will you make sure you both are represented through the final project?

DIFFERENTATION

Extension

- Students that need the extension may wish to do more than one or two of the activities. Students could be given time outside the classroom to work on additional activities.

Intervention

- Students may need assistance with many of the activities. Support these students by allowing them to work with a partner or providing additional support
- Intervention Table

Geometry Choice Board

Student Directions: Show what you have learned from this unit. Pick one activity with an **A**, one activity with a **B**, and one activity with a **C** from the following activities to demonstrate to your classmates what you have learned.

A Pretend you are square. Write a letter to another quadrilateral (rectangle, rhombus, or parallelogram) telling her/him why you should be a part of his/her class. List specific likenesses/differences.	**A** Design a power point presentation on Quadrilaterals. Use at least five vocabulary terms in your power point that you have learned through this unit. Include the definitions and pictures.	**B** Make a poster that shows shapes partitioned into equal areas of half, thirds, fourths, sixths, and eighths. Remember to show a variety of shapes and show the same shape partitioned in several ways.
C Draw 5 shapes onto a piece of paper. Walk around your classroom or school for 10 minutes. Tally each shape that was seen. Create a bar graph or picture graph with this data. Remember to use a scale other than one to represent your data.	**A/B** Design a bulletin board idea for our classroom. Show examples of posters, worksheets, or projects from this unit that should be shown. Be sure to include examples for MGSE3.G.1 and MGSE3.G.2 Turn in an example mini sheet of what the bulletin board would look like.	**A** Find a website or game online that gives information about quadrilaterals. Give a small presentation explaining what you can learn about quadrilaterals from the website.
A/B Create a game for all of the shapes learned. Also include partitioning of the shapes in the game. Think of the cards needed, pieces and game board you want to use. Attach written instructions for how to play.	**C** Find 15 items around the room and measure them to the nearest inch or ½ inch. Make a table and create a line plot showing your data.	**C** Survey your class and another class about their favorite shape. Display the information using a bar graph and a picture graph. Remember to use a scale other than one to represent the data.

Rubric for Choice Board Activity

CATEGORY	**Outstanding**	**Good**	**Fair**	**Poor**
Content	Presentation content is engaging and interesting and appropriate for the intended audience.	Presentation content contains interesting information, but has limited appropriateness for the audience.	Presentation content has relevance, but is not appropriate for the audience.	Content is not relevant and does not focus on learning assessment.
Preparation	The presenter is well prepared with all necessary materials. Includes more than one activity for A, B, and C.	Most of the necessary materials are readily available. Includes at least one activity for A, B, and C.	Some of the necessary materials are unavailable or cannot be located. Includes only 2 activities.	The presenter displays a lack of preparation and lacks necessary materials. Only includes 1 activity for A, B or C.
Presentation	Presentation is engaging and easily understood and clearly stated for the audience.	Presentation is understood, but offers limited engagement of the audience.	Presentation has value, but is not engaging for the audience.	Presentation is not engaging and does not offer worthwhile information for the audience.
Relevance	Presentation demonstrates a clear connection to the student and his/her success in math.	Presentation is relevant, but no support is given for "why" the assessment is relevant to success in math.	Presentation has little relevance to the child's success in math.	Presentation is not relevant to the child's success in math.
Impact	This presentation will have a significant impact on my students' success in math.	This presentation will have a positive impact on my students' success in math.	This presentation will have a minor impact on my students' success in math.	This presentation will have no impact on my students' success in math.
Mathematics	All content was mathematically correct, and student could explain why	One or two mathematical inaccuracies.	3 mathematical inaccuracies.	More than 3 mathematical inaccuracies.