



CCGPS Frameworks Student Edition

Mathematics

Kindergarten Unit Three Sophisticated Shapes



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"Making Education Work for All Georgians"

Unit 3: Sophisticated Shapes (6 weeks)

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CRITICAL AREAS

The Critical Area is designed to bring focus to the standards at each grade by describing the big ideas that educators can use to build their curriculum and to guide instruction.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.


OVERVIEW

In this unit, students will:

- Recognize, name, build, draw, compare, and sort simple two- and three-dimensional shapes, describe attributes and parts of two- and three-dimensional shapes, group objects according to common properties, investigate and predict the results of putting together and taking apart simple two- and three-dimensional shapes, describe, name, and interpret relative positions in space and apply ideas about relative position, create mental images of geometric shapes using spatial memory and spatial visualization;
- Recognize and represent shapes from different perspectives, recognize geometric shapes in the environment, create and extend patterns, investigate and predict the results of putting together and taking apart two and three-dimensional shapes, pose information questions, collect data and organize and display results using objects, pictures and picture graphs.

Geometry Trajectory –Putting It All Together

Each concept builds on the previous idea and students should explore and construct concepts in such a sequence



VAN DE WALLE	<p>Level 0 *Kindergarten Level</p> <p>Visualization</p> <p>The object of thought (focus) is individual shapes.</p> <ul style="list-style-type: none"> – Students are operating on specific examples of the shapes they see. – Orientation may even change what a student observes. – The goal is to see likenesses and differences. 	<p>Level 1 Analysis</p> <p>The object of thought is classes of shapes.</p> <ul style="list-style-type: none"> – Students consider all shapes in a class instead of an individual example. – What makes a shape “a shape”? <p>The outcome is discovering properties of shapes.</p> <ul style="list-style-type: none"> – Focus on properties. – Apply ideas to entire classes of figures. 	<p>Level 2 Information Deduction</p> <p>The objects of thought are the properties.</p> <ul style="list-style-type: none"> – Students understand that properties are related. – One set of properties may relate to another property. – Students can understand logical reasoning about the properties. <p>The outcomes are relationships among properties.</p>	<p>Level 3 Deduction</p> <p>The objects of thought are the relationships among the properties.</p> <p>The products of thought are the deductive axiomatic systems.</p>	<p>Level 4 Rigor</p> <p>The objects of thought are the deductive axiomatic systems.</p> <p>The products of thought are comparisons and contrasts among different axiomatic systems of geometry.</p>
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Adapted from the *van Hiele Levels of Geometric Thought* and taken from van de Walle & Lovin *Teaching Student-entered Mathematics (k-3)*

The Big Picture in Kindergarten

STANDARDS FOR MATHEMATICAL CONTENT

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

Analyze, compare, create, and compose shapes.

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g, number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCC.K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, “Can you join these? two triangles with full sides touching to make a rectangle?”*

Classify objects and count the number of objects in each category.

MCC.K.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

(Refer to grade level overview for unpacked standards)

STANDARDS FOR MATHEMATICAL PRACTICE

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

Students are expected to:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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

ENDURING UNDERSTANDINGS

- Properties determine when shapes are alike or different.
- Geometry helps us describe, represent, and make sense of our environment.
- Shapes are everywhere.
- All objects have a shape with a specific name.
- Shapes have names.
- Shapes have sides and angles which can be counted.
- Objects can be similar to others in one way and different in other ways.
- Patterns can be created and extended using geometric shapes.
- Words can be used to describe the location of an object.
- Pictures can be used to show what is counted.
- Some shapes are flat (2 dimensional) while other shapes are solid (3 dimensional).
- Smaller shapes can be used to make larger shapes and larger shapes can be made from smaller shapes

ESSENTIAL QUESTIONS

- How are quadrilaterals and triangles different?
- How are shapes same and different?
- How can a shape be described?
- How can shapes be sorted?
- How can we describe directions (which way), distance (how far), location (where), and representation (what objects)?
- How can we describe location in our everyday life?
- How can we describe the location of a shape?
- How can we describe the location/position of an object?
- How can we describe the position of a shape?
- How can we organize information?
- How can we sort things?
- How can we use words that describe location in our everyday life?
- How can you describe triangles?
- How do direction words help us find a shape or place?
- How do shapes fit together and come apart?

- How do we describe a pattern?
- How do we identify patterns?
- How do we use shapes in school?
- What are attributes or properties of a shape or shapes?
- What are some ways that you can sort shapes?
- What happens when you change a shapes position and orientation (slides, flips, and turns)?
- What is a pattern?
- What is a shape?
- What is an attribute?
- What is the difference between a 2-dimensional and 3-dimensional shape?
- What makes shapes different from each other?
- What shapes can we see in our world?
- Where can we find shapes in the real world?
- How can a shape be described?
- Why do shapes have names?

CONCEPTS/SKILLS TO MAINTAIN

Although many students may have attended pre-school prior to entering kindergarten, this is the first year of school for some students. For that reason, no concepts/skills to maintain will be listed at this time. It is expected that teachers will differentiate to accommodate those students that may enter kindergarten with prior knowledge.

SELECTED TERMS AND SYMBOLS

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

Teachers should present these concepts to students with models and real life examples in discussions with students. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

- above
- attribute
- behind
- below
- beside
- circle
- classify

- compose
- cone
- cube
- cylinder
- describe
- in front of
- inside
- left
- property
- next to
- number
- numeral
- outside
- rectangle
- right
- set
- sphere
- square
- triangle

STRATEGIES FOR TEACHING AND LEARNING

Develop spatial sense by connecting geometric shapes to students' everyday lives. Initiate natural conversations about shapes in the environment. Have students identify and name two- and three-dimensional shapes in and outside of the classroom and describe their relative position. Ask students to find rectangles in the classroom and describe the relative positions of the rectangles they see, e.g. *This rectangle (a poster) is over the sphere (globe)*. Teachers can use a digital camera to record these relationships. Hide shapes around the room. Have students say where they found the shape using positional words, e.g. *I found a triangle UNDER the chair*. Have students create drawings involving shapes and positional words: *Draw a window ON the door* or *Draw an apple UNDER a tree*. Some students may be able to follow two- or three-step instructions to create their drawings.

Use a shape in different orientations and sizes along with non-examples of the shape so students can learn to focus on defining attributes of the shape. Manipulatives used for shape identification actually have three dimensions. However, Kindergartners need to think of these shapes as two-dimensional or “flat” and typical three-dimensional shapes as “solid.” Students will identify two-dimensional shapes that form surfaces on three-dimensional objects. Students need to focus on noticing two and three dimensions, not on the words *two-dimensional* and *three-dimensional*.

Use shapes collected from students to begin the investigation into basic properties and characteristics of two- and three-dimensional shapes. Have students analyze and compare each

shape with other objects in the classroom and describe the similarities and differences between the shapes. Ask students to describe the shapes while the teacher records key descriptive words in common student language. Students need to use the word *flat* to describe two-dimensional shapes and the word *solid* to describe three-dimensional shapes. Use the sides, faces and vertices of shapes to practice counting and reinforce the concept of one-to-one correspondence.

The teacher and students orally describe and name the shapes found on a Shape Hunt. Students draw a shape and build it using materials regularly kept in the classroom such as construction paper, clay, wooden sticks or straws.

Students can use a variety of manipulatives and real-world objects to build larger shapes with these and other smaller shapes: squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres. Kindergarteners can manipulate cardboard shapes, paper plates, pattern blocks, tiles, canned food, wooden or foam blocks, and other common items. Have students compose (build) a larger shape using only smaller shapes that have the same size and shape. The sides of the smaller shapes should touch and there should be no gaps or overlaps within the larger shape. For example, use one-inch squares to build a larger square with no gaps or overlaps. Have students also use different shapes to form a larger shape where the sides of the smaller shapes are touching and there are no gaps or overlaps. Ask students to describe the larger shape and the shapes that formed it.

COMMON MISCONCEPTIONS

Students often use incorrect terminology when describing shapes. For example, students may say a cube is a square or that a sphere is a circle. The use of two-dimensional shape names that appear to be part of a three-dimensional shape in order to name the three-dimensional shape is a common mistake. For example, students might call a cube a square because the student sees the face of the cube. Work with student to help them understand that the two-dimensional shape is a part of the object, but it has a different name.

Another common misconception is separating a square from the identified category of rectangles. A square exhibits the same characteristics of rectangles, however it is special rectangle because it sides are equal in length.

Students often mistake a change in size or orientation of a shape as a change in the name of the shape. One of the most common misconceptions in geometry is the belief that orientations are tied to shape. A student may see the second of the figures below as a triangle, but claim to not know the name of the first.



Students need to have many experiences with shapes in different orientations. For example, ask students to form larger triangles with the two triangles in different orientations.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Sort shapes into groups according to the same attributes.
- Using positional terms, students will be able to identify two and three dimensional geometric shapes and their location.
- Identify two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”) shapes.
- Draw different geometric figures.
- Use pattern blocks to produce larger and/or different shapes.
- Find and name shapes in the environment.
- Use shapes to create representations of items in the environment.
- Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
- Compose simple shapes to form larger shapes.
- Describe shapes in the environment using relative positional terms.
- Build shapes from the world using sticks, clay or other components.

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all Kindergarteners. 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.

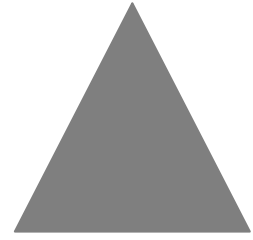
Scaffolding Task	Constructing Task	Practice Task	Performance Task
Tasks that build up to the constructing task.	Constructing understanding through deep/rich contextualized problem solving tasks	Games/activities	Summative assessment for the unit

Task Name	Task Type/ Grouping Strategy	Content Addressed
What Shape is This?	Constructing Task <i>Large group/Small group</i>	Recognize and name shapes
Going on a Shape Hunt	Constructing Task <i>Large group/Small group</i>	Recognize and name shapes

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Attributes Rule!	Constructing Task <i>Whole Group/Small Group/Individual</i>	Recognize, name, and compare shapes
Exploration of Shapes	Practice Task <i>Large group/Small group</i>	Observe shapes in the environment (flat/solid)
Copy Cat	Scaffolding Task <i>Partner</i>	Spatial relationships
Listen and Do!	Practice Task <i>Individual/Small Group</i>	Spatial relationships Recognize and name shapes
Where's Abe?	Practice Task <i>Partner/Small Group</i>	Spatial relationships Recognize and name shapes
Shape Sort	Practice Task <i>Whole Group/ Small Group/Partner</i>	Recognize, name, and compare shapes
Touch It, Count It, Chart It	Constructing Task <i>Small Group</i>	Recognize, name, and compare shapes
What's in the Bag? (Flat or Solid)	Practice Task <i>Whole Group/ Small Group/ Partner</i>	Recognize, name, and compare shapes Observe shapes in the environment
Pattern Block Pictures	Constructing Task <i>Small Group/ Partner</i>	Name, compare and compose larger shapes from smaller shapes
Geoboard Museum	Practice Task <i>Individual/ Small Group</i>	Compose and compare shapes
Build A Marshmallow Shape	Constructing Task <i>Large Group/ Small Group</i>	Recognize, name, compare and compose shapes
Tangram Challenge	Performance Task <i>Whole Group/ Individual</i>	Recognize, name, and compare shapes Compose larger shapes from simple shapes
Shapes All Around	Performance Task <i>Small Group/ Individual</i>	Recognize, compose and compare shapes
What Shape is This?	Constructing Task <i>Large group/Small group</i>	Recognize and name shapes

As this unit has no Culminating Task, you may pair/modify tasks to include all unit standards in combination.



CONSTRUCTING TASK: What Shape is This?

Approximately 2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1 Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

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

Teachers will need to allow for various ways to sort the shapes because this will be a way to build the student's understanding of the properties of shapes. Some students may have sorted only by sizes of big and little, others may have sorted by shapes. Pay special attention to any examples that show groups of shapes and more specifically, the sorting within a specific category of shape. Also notice if any examples have separated the squares/rectangles...remember squares are special rectangles... from the other four sided shapes. REMEMBER, we refer to all four sided shapes as quadrilaterals in Kindergarten AND we need to be mindful when talking about squares/rectangles, making sure to emphasize that squares are special kinds of rectangles that have all four sides the same length.

ESSENTIAL QUESTIONS

- How can we describe the location of a shape?
- How can we describe shapes in our everyday life?
- What makes shapes different from each other?
- How can you describe triangles?
- How are quadrilaterals and triangles different?
- How can shapes be sorted?

MATERIALS

- Circles, triangles (equilateral and right triangles), quadrilaterals (squares and rectangles of different sizes and colors), rhombus,
- One set of above mentioned shapes for each child – 4 of each shape
- Word cards labeled square, circle, rectangle, rhombus, and triangle.
- *When a Line Bends...A Shape Begins* by Rhonda Gowler Greene or similar book

GROUPING

Individual or Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Gather students together on carpet area. Pose this question, “What do you know about shapes? Let’s brainstorm what we know about shapes.” As students share their responses, record these on chart paper. (This group time is a chance to record all responses; we are simply gathering information at this point. A small discussion can begin, but you want to focus on gathering information for yourself as well. This is a great way to do an informal pre-assessment of the student’s knowledge of shapes. We want to quickly chart this information; we will come back to these responses after parts II and III of this task.) Once you charted their shape ideas, say “Let’s read a book to see what we can find out about shapes. This will give us information we can compare to our chart. Listen to see if you hear any of the same ideas we had in our chart or if you hear something new.” After reading a book similar to, *When a Line Bends...A Shape Begins*, by Rhonda Gowler Greene, ask students to share the new or different information they heard about shapes compared to what was listed on the chart. Use a different colored marker to add new information or mark out information that we no longer agree with based upon the story. You will need to keep this chart for future conversations with students about shapes.

Part II:

Read a new book about shapes to springboard the second part of the learning task. Other examples of shape books include *Shapes, Shapes, Shapes* by Tana Hoban and *My First Book of Shapes* by Eric Carle. Give students a bag of precut shapes. You will find a student sheet below for this part of the task. Say to the students, “Group your shapes the way you think they should go together. You should be prepared to share your thinking with a partner.” Once students have sorted their shapes for a few minutes, have them glue down their sorting. Then have students partner with their elbow buddy and compare their sorting. Encourage students to discuss their sorting methods. Next, pull students together for a class discussion. The class discussion should ensue from this part of the task about the various ways to sort the shapes.

Part 3

Begin this portion of task by reviewing the work completed yesterday. This should be a quick discussion including the charts that were made in Part I of the task. Display the same set of shapes of different sizes from Part II of the task. It is important to use these same shapes, so that students can focus on the various characteristics.

The teacher will model sorting the shapes by size, asking for students to assist in this process of determining where the shape was to be placed on the chart. After sorting the shapes by size, then say “We have sorted by size and now I am wondering what other information we can use to sort the shapes in a different way. I am going to give you a moment for think time to come up with an idea. When you have an idea, give me a thumbs-up sign.” Once you have a number of students giving you the thumbs up sign, have them partner with an elbow buddy and share their idea. Have a partner pair come to the front and share their ideas.

This part of the task will be fueled by their thinking. You may have discussions such as this: “Sam has sorted his shapes by the number of sides. Did anyone else sort their shapes by the number of sides? I see that you sorted them into a group that has shapes with four sides. Those shapes fall into a special group called quadrilaterals. This is a new word for us. Let’s practice saying that word together. It is special name for shapes. Who could help me group the quadrilaterals together? Wow, I see that there are different kinds of quadrilaterals. What are the names of these two types of quadrilaterals?” The answer to that is **NOT** rectangles and squares; it is rectangles and non rectangles! This is extremely important because **squares ARE rectangles** and need to be classified correctly as such early on in a child’s thinking about shapes. There should be some discussion with students about the group of rectangles and how rectangles themselves can be separated into two groups...ones that are squares and ones that are not squares

As student discussions continue with the number of sides, prepare three charts for the students. The charts should be labeled triangles, circles, and quadrilaterals. Have students give you information about each of the shapes. Refer students back to the chart that was created at the beginning of the task entitled “What We Know about Shapes.” Have students use some of the information from that chart to add more information to our more specific charts.

Part 4

Students will now practice using these clues to play a game with a partner. Have students spread their set of shapes out on their tables. Ask questions like, “Who can find a shape that is a quadrilateral? What about a shape that has three sides?” After modeling this for students a few times, allow students to play this game with a partner. Encourage students to identify the shapes based on the attributes of the shape by asking questions such as: “Which shape has three sides?” or “Show me the shape that has two long sides and two short sides. Show me an example of rectangles that has all sides the same length? Do we have a special name for this kind of rectangle?” To close this task, discuss the similarities and differences of the shapes. Are all **quadrilaterals** the same? Are all triangles the same? Why or Why not?

FORMATIVE ASSESSMENT QUESTIONS

- Where do you see shapes in everyday life?
- Can you show me the difference between a side and a corner?
- Can you tell me the difference between a side and a corner?
- Are all triangles the same?
- Are all four sided shapes the same?

DIFFERENTIATION

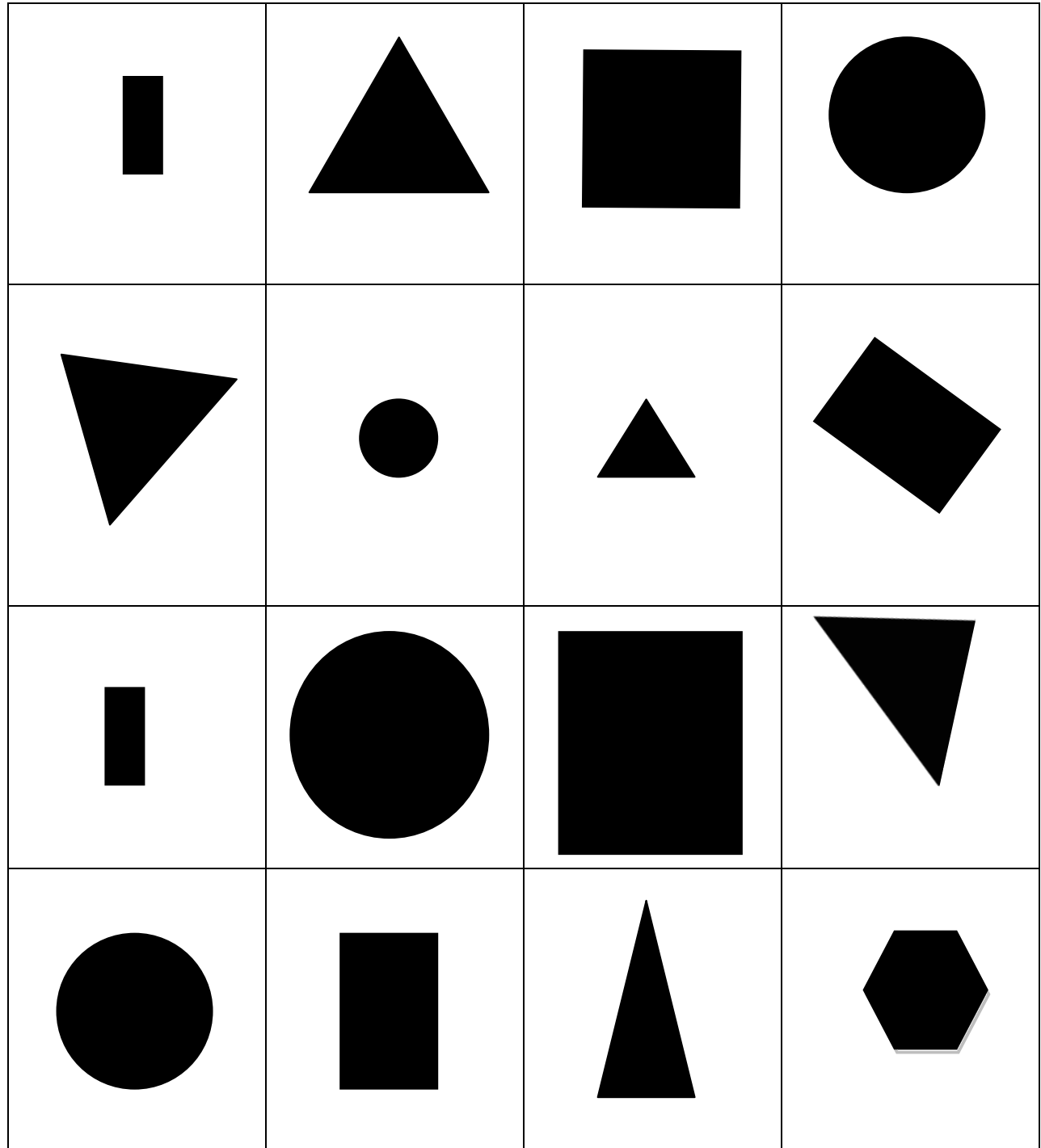
Extension

- Put out a set of blocks or pattern blocks during math centers for students to explore. Using the blocks/pattern blocks to build designs of their own is a good opportunity for them to become familiar with how the geometric shapes fit together.

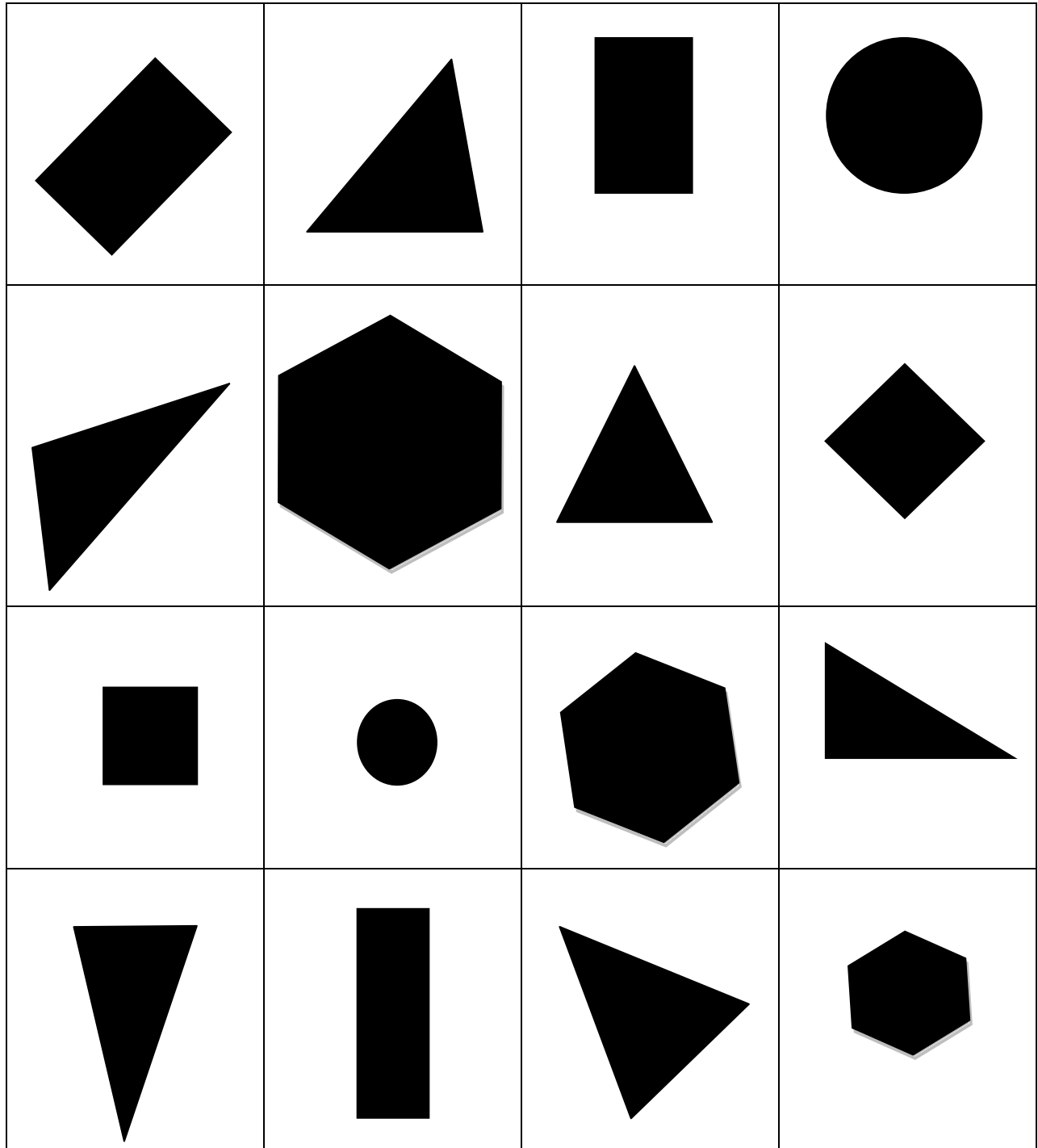
Intervention

- As the students are exploring, check for understanding by having them name a shape you point to or ask them to hand you a particular shape. Students could also show how they identify a shape by counting the sides and corners.

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CONSTRUCTING TASK: Going on a Shape Hunt Approximately 2-3 days (Adapted from Read, Write and Think)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

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:

“Children need experiences with a rich variety of both two- and three-dimensional shapes. It is useful for students to be able to identify common shapes, notice likenesses and differences among shapes, become aware of the properties that different shapes have, and eventually use these properties to further define and understand their geometric world. As students find out more about shapes over time, they can begin to appreciate how definitions of special shapes come to be” (Van de Walle, p193).

ESSENTIAL QUESTIONS:

- How can we describe the location of a shape?
- How can we describe shapes in our everyday life?
- What makes shapes different from each other?

MATERIALS:

- *The Greedy Triangle* by Marilyn Burns (Scholastic, 1995)
- *Round Trip* by Ann Jonas (Greenwillow, 1983)
- *Eight Hands Round* by Ann Whitford Paul (HarperCollins, 1991)
- Chart paper or overhead projector
- Cardstock cut to 1" x 6"
- Clipboards or other portable writing surface
- Two- and three-dimensional geometric models

GROUPING

Large group, small group and pairs

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Gather students in a large group on the carpet. Introduce or review the names of the geometric shapes that they are learning in order to activate any prior knowledge they may have on shapes. You need to focus solely on two-dimensional shapes and eventually do this activity again solely using three-dimensional shapes.

Read aloud the book that you have selected. The story should be read aloud in its entirety, pausing only to allow students to predict upcoming events. Predicting allows students to focus attention on reasoning, patterns, and problem solving while incorporating what they already know about geometric shapes with the ideas presented in the book.

Part II

Discuss the idea that shapes are not just in books but are all around us.

Introduce the Shape Hunt Chant. As you say the chant, hold up the model of a circle you have prepared for student reference. When you reach the line that says, “Do you see a circle?” ask students to point to a circle in the classroom. Finish the song.

You may wish to have students get up and move to the object they have selected instead of sitting on the carpet pointing. For example, when you say, “Do you see a circle?” pause and allow them to move to a location in the classroom where a circle is located. Once almost everyone is sitting by something, go on with “yes, we see a circle.” This is especially beneficial for students who are kinesthetic learners.

Start a list of objects that are circles in the classroom on chart paper. Model various strategies for spelling words. For example, “Maria is pointing at the clock. Can you all point to the word clock

in our classroom? Right, it's on a red card beside the clock. You read the letters while I print them on the chart. Jose is pointing at a plate in our house center. I don't see that word anywhere in our classroom. Let's try to write it together. P-p-plate. What letter do I need to print at the beginning of the word plate?" Another strategy is to point out words that are on the classroom word wall or located on posters or in other environmental print.

Repeat the shape hunt chant. You can use the same shape and ask them to choose different objects. Or you can change the shape. If you do this, start a new list on another piece of chart paper. You may want to limit the number of shapes to four or five, depending on how long each "hunt" takes the students. You might also choose to focus only on two-dimensional or only on three-dimensional shapes.

When you have gone through four or five shapes, you may choose to have students complete either the *Two-Dimensional* Task Sheet or the *Three-Dimensional* Task Sheet task sheet depending on what is most appropriate. Remind them to use classroom labels, the word wall, personal dictionaries, the charts just created, and their ability to sound out words to help them complete their work.

PART 3

Review the charts that you created with your students in Session 2.

Inform students that they will be going on a shape hunt outside the classroom. Have them brainstorm some other areas in the school where they could look for shapes such as the office, the library, the gymnasium, the cafeteria, or the hallways.

You may choose to give each student a clipboard or portable writing surface, a pencil, and either the *Two-Dimensional* Task Sheet or the *Three-Dimensional* Task Sheet or both, depending on what they used in Session 2. Review with them how to complete the sheets. Ask students to choose different objects on this shape hunt than they chose during Session 2. Bring along the models of the shapes you used in Session 2.

At each location, choose one shape for students to look for. Show them the model of the shape. If they are completing the task sheets, they should complete the appropriate section. Review with them various strategies they can use to write the words on their sheet—they can sound it out, think about words they know that are similar, or look for environmental print.

When you return to the classroom, allow students a few minutes at their seats to complete their task sheets. Remind them that they may want to check the word wall for words that they were uncertain how to spell correctly.

FORMATIVE ASSESSMENT

- How many shapes did you find?
- What types of shapes did you find?
- Did you find different kinds of the same shape?

DIFFERENTIATION

Extensions

- Send home copies of the *Two-Dimensional* Task Sheet or the *Three-Dimensional* Task Sheet and have students go on a shape hunt at home. Use geometric cutouts to create pictures. Allow students (with supervision) to use a digital camera to take pictures of all the shapes found in your classroom or your school and create a book of shapes. The book could have a section for each shape and each student could be responsible for writing the text for one page of the book.
- Have students pair up and visit the Sammy’s Shapes website where they can identify specific shapes appropriate for their grade level and locate and describe the shapes. This website can be used during math work stations or center time.
<http://primarygames.com/storybooks/sammy/start.htm>

Interventions

- Give the child a picture of a space with shapes highlighted, for example: a picture of a grocery store aisle with the outline of the cereal box bolded. Have them place cut outs or manipulatives on top of the outline.

Shape Hunt Chant

Adapted from the traditional children's song Going On a Picnic)

Going on a shape hunt,

Leaving right away.

If it doesn't rain,

We'll stay all day.

Adult: Do you see a circle?

Children: Yes, we see a circle.

Going on a shape hunt,

Here we go.

Going on a Flat Shape Hunt

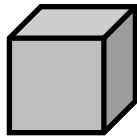
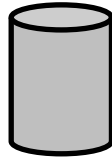
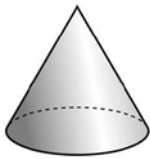
<p><u>Circle what you found:</u></p> <p>square rectangle circle</p> <p> triangle hexagon</p> <p><u>Draw the shape:</u></p> <p>My shape was a : _____</p>	<p><u>Circle what you found:</u></p> <p>square rectangle circle</p> <p> triangle hexagon</p> <p><u>Draw the shape:</u></p> <p>My shape was a : _____</p>
<p><u>Circle what you found:</u></p> <p>square rectangle circle</p> <p> triangle hexagon</p> <p><u>Draw the shape:</u></p> <p>My shape was a : _____</p>	<p><u>Circle what you found:</u></p> <p>square rectangle circle</p> <p> triangle hexagon</p> <p><u>Draw the shape:</u></p> <p>My shape was a : _____</p>

Going on a Solid Shape Hunt

Circle what you found:

sphere cube cylinder cone

Circle the shape you found:

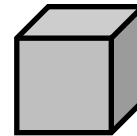
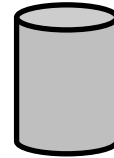
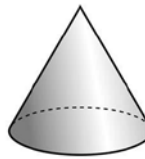


My shape
was a : _____

Circle what you found:

sphere cube cylinder cone

Circle the shape you found:

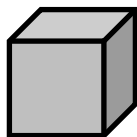
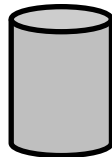
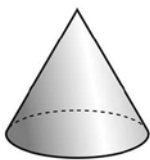


My shape
was a : _____

Circle what you found:

sphere cube cylinder cone

Circle the shape you found:

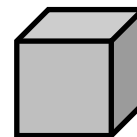
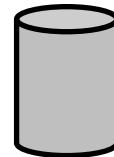
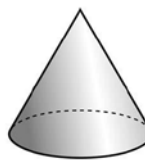


My shape
was a : _____

Circle what you found:

sphere cube cylinder cone

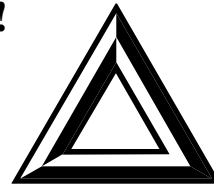
Circle the shape you found:



My shape
was a : _____

SCAFFOLDING TASK: ATTRIBUTES RULE!

Approximately 1 day



STANDARDS FOR MATHEMATICAL CONTENT

MCCK.G. 4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCCK.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count

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

As Van de Walle states, “In any sorting activity, the students should decide how to sort, not the teacher. This allows the students to do the activity using ideas *they* own and understand. By listening to the kinds of attributes that they use in their sorting, you will be able to tell what properties they know and use and how they think about shapes” (Van de Walle pg. 194)

ESSENTIAL QUESTIONS

- How can we describe the position of a shape?
- How can we use words that describe location in our everyday life?
- What is a pattern?
- What is an attribute?
- How can we sort things?
- How do we identify patterns?
- How do we describe a pattern?
- How can shapes be sorted?
- What are attributes or properties of a shape or shapes?
- How are shapes same and different?

MATERIALS

- Attribute blocks

GROUPING

Whole group, small group or partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comment: ordinal words and patterns are not mentioned explicitly in the standards however they should be integrated into lessons whenever possible.

PART 1

Gather students at a central meeting place. Discuss/review what an attribute is and allow students to provide examples. Give each student a handful of attribute blocks and have them sort the blocks and share with classmates how they sorted. Allow for ample time to explore and share.

PART 2 (Attribute Train)

Gather students together to form a circle to play the attribute train game. Begin the attribute train by placing one block in the center of the circle. Next, choose a student to add to your train by putting a block next to the first block. The next block added must have one common attribute with the block previously laid. Have a class discussion about what is the same about the two shapes and what is different. The next student in the circle repeats the steps and adds a third block to the train. Next time the train goes around have the student match 2 attributes with the previous block. (Example: *Student 1* lays an attribute block down and says “A thick, large red circle” *Student 2* lays an attribute block down and says “A skinny, small red square.” *Student 2* explains that the circle and the square are both red but different shapes).

Comment: During the lesson continue to ask the students questions about their shape and if there are any other attributes that may link their block to the previous one.

PART 3 (Guess My Sort)

Place students in pairs. One partner picks three blocks with similar attributes and shows their partner. The partner has a 2-3 guesses to identify how the blocks were sorted. If the partner correctly identifies the sorting attribute the roles switch. If not, the players’ roles remain the same. The students will be shown four attribute blocks, three of which have some similar properties or characteristics (based upon, shape, size, color, thickness.) Discuss which three belong together and why. Have students justify their reasoning. The teacher can decide how the students share their choices and their reasoning. Provide several examples, and then allow students to work on their own to create their own examples. After partners have worked together and explored the various ways to sort attribute blocks, have them expand to a group of 4 or 5 and

share the play guess my sort with a group of students. Students take turns trying to identify the sorting rule

After students have shared within small groups, have all the groups meet back at a meeting place and share the different ways they sorted their shapes. Ask students what their favorite way to sort the shapes was and create a bar graph to display the result. The data collected for this graph will usually result with the sort that students are most familiar with.

FORMATIVE ASSESSMENT QUESTIONS

- Is there another attribute you could have sorted by?
- How many attributes does the _____ have?

DIFFERENTIATION

Extension

- Students can be asked to sort shapes that have more than one matching attribute.

Intervention

- Have the students identify a list of attributes and have them pick an attribute from the list to help guide their sort



SCAFFOLDING TASK: Explorations of Shapes

Approximately 2-3 days (Adapted from Ohio DOE)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

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

“Children need experiences with a rich variety of both two- and three-dimensional shapes. It is useful for students to be able to identify common shapes, notice likenesses and differences among shapes, become aware of the properties that different shapes have, and eventually use these properties to further define and understand their geometric world. As students find out more about shapes over time, they can begin to appreciate how definitions of special shapes come to be” (Van de Walle, p193).

ESSENTIAL QUESTIONS

- How can we describe the location of a shape?
- How can we describe shapes in our everyday life?
- What makes shapes different from each other?
- How can you describe triangles?
- How are quadrilaterals and triangles different?
- How can shapes be sorted?

MATERIALS

- small collection of two-dimensional shapes or attribute blocks
- paper shapes made of different color construction paper (pre-cut)
- chart paper
- Student Needs: manila drawing paper
- Markers
- glue
- different color paper shapes
- collection of stickers

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Show students a small collection of two-dimensional shapes. It might be best to start with three rectangles, three triangles and three squares. The figures will need to be of varying sizes and color. Attribute blocks may be used if supplemented with different types of triangles (scalene, right, isosceles, obtuse, and acute).

Begin by asking students to identify each figure. Discuss characteristics of each shape. Record the characteristics on chart paper. Sometimes students may think that all shapes have sides, including circles. In the results from the field test of this task, one student tried to convince his/her teacher that the "sides of a circle could be counted the same way that you count the sides of a triangle or square." Further questioning of the student found that he/she was talking about the inside and outside of the circle. Students at this age often make associations with what they think a word means.

Next, ask students to look at a collection of shapes and sort figures into groups, explaining how the shapes in each group are alike. Possibilities include all the same shape, all the same size (different triangles, different rectangles, as well as different orientations), and all the same color. Ask students to discuss and explain differences among shapes and create collections of shapes that are all different in one way (size, color, or shape).

Ask students to look around the classroom to identify objects that have the same shape as a rectangle, square, circle, oval, triangle, etc. Stress that the surface of the desk is a rectangle, the surface of the door is a rectangle; the surface of the clock is a circle, etc. Misconceptions continue into adulthood that a ball is a circle and a block is a rectangle.

Show students several examples of the same shapes, such as different types of triangles (scalene, right, equilateral, isosceles, obtuse, and acute) in different orientations. Often, shapes are repeatedly presented to students in the same way. Students need to have experience looking and manipulating the same shape in different orientations.

PART II

Provide the students with the work mats *Shape Mats*, an assortment of stickers and the shapes discussed in class made of different colors of construction paper. Pre-cut the shapes before distributing them to the students.

Instruct the students to sort the shapes. Do not tell them how to sort the shapes.

Facilitate a discussion about the way the students sorted their shapes (color, size, shape).

Instruct the students to put squares above the line on the work mat and the triangles below the line on the same work mat. Give them time to glue the shapes on the paper. Observe where the students are placing the shapes.

Instruct the students to place a star above one of the triangles. Students sometimes confuse "above" and "below" with "up" and "down." If some students are challenged by these words, select other students to demonstrate the placement of the stickers and give an explanation. For example, some students may hold the sticker over the paper for above or under the table for below. Modeling the placement may help the students.

Ask the students where they placed the star. Give other directions for placing stickers on this mat, based on the type of stickers you have available. Ask the students about the placement. Repeat the activity with another work mat. One teacher used the following directions for the placement of the stickers.

- Put the frog above the circle.
- Put the apple below the circle.
- Put the fish on top of the circle.
- Put the smiley face beside the circle.
- Put the dinosaur inside the circle.
- Put the star outside the circle.
- Put the shark under the circle.

Observing the placement of the stickers should be done as the students are working. Questions should be asked pertaining to the placement of the stickers such as "Does 'under' the circle mean the same as 'below' the circle?" For example, some students may pick up the paper and place the sticker on the desk or place the sticker at the bottom of the paper.

FORMATIVE ASSESSMENT QUESTIONS

- Where do you see shapes in everyday life?
- Can you show me the difference between a side and a corner?
- Can you tell me the difference between a side and a corner?
- Are all triangles the same?

- Are all four sided shapes the same?

DIFFERENTIATION

Extensions

- These are ideas for all students to continue learning on this topic - in the classroom or outside of the classroom. Have a scavenger hunt for shapes that can be found in the classroom, school and community environment. Ask students to bring in objects or pictures for a featured "shape of the day or week." Ask parents to help their children identify shapes in their environment and label them. You could modify this activity for use with 3D Shapes.

Interventions

- Instruction is differentiated according to the learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s). Some children may have difficulty distinguishing shapes. Model how to trace the perimeter of shapes and encourage the children before they try to identify or describe the shape. Have the students trace the objects in shaving cream, salt, sugar, on sandpaper, or in pudding.
- Introduce two shapes at a time as follows: This is a _____ and this is a _____; show me a _____ and show me a _____; tell me what this is _____ and what this is _____



SCAFFOLDING TASK: Copycat

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

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.

BACKGROUND KNOWLEDGE

Children come to kindergarten with diverse backgrounds, experiences, and abilities. A one-size-fits-all approach to instruction will most likely slow the progress of some children and be overwhelming to others. Differentiated instruction is an effective way to offer individually, linguistically, and culturally appropriate curriculum that helps all children meet the CCGPS.

In kindergarten children learn about everyday positional descriptions-*above*, *below*, *beside*, *in front of*, *behind*, and *next to*. These are the beginnings of the standards' goal of specifying location.

ESSENTIAL QUESTIONS

- How can we describe the location of a shape?
- How can we describe location in our everyday life?
- What is a shape?
- Why do shapes have names?
- What makes shapes different from each other?

MATERIALS

- Different 2-D (Plane) Shapes
- Folders or something to obstruct view of partner's pattern creation

- *Pattern* by Henry Arthur Pluckrose and *Shape* by Henry Arthur Pluckrose

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Gather students on the carpet for a game of copycat. Read a story such as *Pattern* by Henry Arthur Pluckrose and *Shape* by Henry Arthur Pluckrose. Discuss the patterns and shapes shared in the story. Next, model for students how to create a pattern using the shape manipulatives and manila folder to hide the pattern on the other side of the folder. It is important to model for the students how to complete this task. You may want to model for the students sitting in a way that the students can see the pattern that has been created, as well as the work of the student who is creating the “copycat” version. The modeling of this process is very important to the overall understanding of giving explicit, concise directions for the spatial relationships. Have a child build a design using different colors (shapes) and allow the child to describe to the teacher using directions to recreate the design using spatial or positional words. Say to students “Tell how your partner could make a design exactly like yours without your partner seeing your design. Only use words to help. Be sure not to point, signal, or touch anything to give additional clues.” The partner may only put a block in their structure when verbal directions are given.

For example, the child might say, “Put a yellow circle beside the red circle. Then put a blue square above the yellow square.” Reverse roles and play again. Once a few children have learned how to do this, allow them to teach the game to others. “Beside” can be either left or right, or, if students can differentiate between the two, they may specify to the left or right. When your partner has finished, let him/her see your design and check that the two designs are exactly the same.

FORMATIVE ASSESSMENT QUESTIONS

- What is a positional word?
- What does location mean?
- Can you describe (on top of, underneath, beside, next to, in front of, etc...)

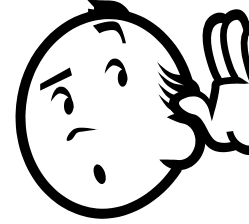
DIFFERENTIATION

Extension

- Once several children have become adept at this, teach them to play back to back. One builds, and then describes the design to the other child who attempts to build it without looking. When they agree that the design is complete, they may turn and look to see if the designs match.

Intervention

- The student gives directions to the teacher while the teacher builds and the student observes. Then role is changed and the student builds while the teacher gives directions.
- If students have a difficult time with this task, practice by playing “Simon Says” emphasizing the words above, beside, below, behind, inside, and outside. The familiarity of this game may provide a link for some students.



PRACTICE TASK: Listen and Do!

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

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

In kindergarten children learn about everyday positional descriptions-*above*, *below*, *beside*, *in front of*, *behind*, and *next to*. These are the beginnings of the standards' goal of specifying location.

ESSENTIAL QUESTIONS

- How do direction words help us find a shape or place?
- How can we describe directions (which way), distance (how far), location (where), and representation (what objects)?
- What happens when you change a shapes position and orientation (slides, flips, and turns)?
- How can we describe the location/position of an object?

MATERIALS

- Drawing paper
- Crayons or markers

GROUPING

Individual or small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students will listen to the directions and draw objects or shapes according to where something is to be placed. They will listen to entire directions the first time without drawing. While listening to the directions a second time, the students will draw.

- Draw a house on your paper. (square and triangle)
- Draw a door on your house
- Draw a dog **in front** of your house.
- Draw a tree **next to** the house.
- Draw a window **above** the door.
- Draw another window **next to** the first window. (Might need help with ordinal)
- Draw a girl **behind** the tree.
- Draw a sun **next to** the house.
- Draw a boy **below** the sun.
- Now color your picture.

Give time for students to draw, closely monitoring to see when you need to move to the next direction. Have students pair/share after the activity. As students share their work with a partner, they should be using positional words to describe the picture they drew.

FORMATIVE ASSESSMENT QUESTIONS

- How is your picture the same or different from your neighbor's?
- Which directions would look similar? How do you know?
- Which direction was the hardest for you to follow? What made it so hard?
- Which direction was the easiest to follow? Why?
- Which directional words are students having the most difficulty with?
- Can students follow a list of directions accurately?
- Are students able to explain how direction words help us find an object or place?

DIFFERENTIATION

Extension

- While on the playground, students could set up their own “Listen and Do” activity. One person would be the leader and give others directions such as; going over three objects, around one object, and under two objects, etc.
- Provide partners with pattern blocks and a folder. One student will call out directions as he or she creates a pattern train on one side of the folder. Other student will listen and

create pattern train on the other side of the folder. Once directions are finished, folder is removed and students check to see if pattern trains match.

Intervention

- Provide students with left/right reminder cards if needed. Some students may need fewer directions to begin the task and then can progress to more as they master four or five directions. Below is an example of how to structure such an activity:
- Divide a sheet of paper into fourths and then give directions specific to one box at a time. For example: “In the **top left** box, write your name. In the **top right** box draw a circle with a triangle **inside** of it. In the **bottom left** box, write the numeral three and draw three flowers. In the **bottom right** box, draw a puppy close to a boy.” Have students describe what they did using positional words.



PRACTICE TASK: Where's Abe?

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCCK.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCCK.G.2 Correctly name shapes regardless of their orientations or overall size.

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.

BACKGROUND KNOWLEDGE

In kindergarten children learn about everyday positional descriptions- *above*, *below*, *beside*, *in front of*, *behind*, and *next to*. These are the beginnings of the standards' goal of specifying location. These informal indicators of location are used for everyday interaction. (Van de Walle, pg. 213)

ESSENTIAL QUESTIONS

- How can we describe location in our everyday life?
- How can we describe the location of a shape?
- How can we describe the location/position of an object?
- How can we describe the position of a shape?

MATERIALS

- 1 penny and 25 counters
- 2 *Where's Abe?* playing boards

GROUPING

Small group or partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comment: Although money is not specifically mentioned as part of the kindergarten standards it can still be included whenever possible. The value does not need to be discussed or understood, however, it would be useful to see and know what a penny looks like and who is on it.

Each player is given a board. Player 1 has the penny and places it in any square on the board and does not identify the square to player 2. Player 1 must ensure that his board remains covered and/or out of sight from player 2. An open folder works well as a screen between the two boards. (This is similar to the game *Battleship*)

Player 2 begins to ask questions to player 1 trying to find out where player 1 has hidden Abe on the mat. (example: is Abe located above the square, is Abe located on top of the square, etc...). With each question, player 1 can only respond with “Yes” or “No”. This forces player 2 to be more specific in their questioning.

The only question that player 2 CANNOT ask is if Abe is in the same row/column as a shape. For example, the student may not ask, “Is Abe in the triangle row?” As players get comfortable with the game, have them eliminate all the squares where Abe could NOT BE hiding by covering them with counters. This will give a greater insight as to which students are beginning to understand locational and positional words. Once player 2 finds Abe the roles in the game are switched.

Before students begin to play you should model the game as both hider and finder of Abe.

FORMATIVE ASSESSMENT QUESTIONS

- Where is Abe NOT hiding?
- What positional words will help you find Abe?
- What is your strategy to finding Abe?

DIFFERENTIATION

Extension

- Limit the number of questions player 2 can ask to make their questioning more strategic. (Example: if player 2 can't locate the penny in 5 questions, player 1 hides the penny on the board again.

Intervention

- Downsize the board to a 4x4 grid as opposed to a 5x5. This would limit the possibilities of where player 1 could place the penny on the board.

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- Spell and draw a picture of positional and locational words on index cards for students to refer to as they question.

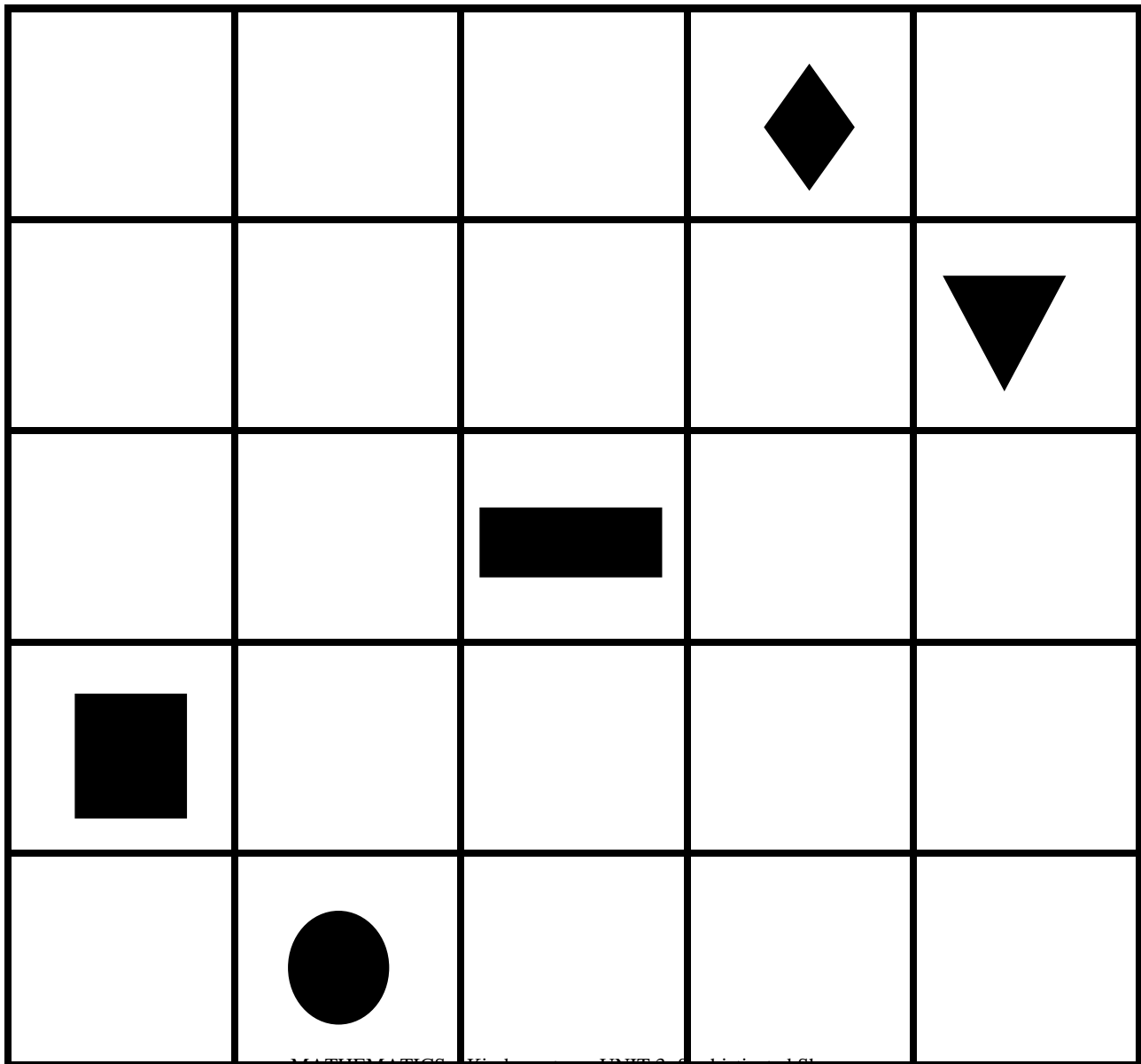
Where's Abe?

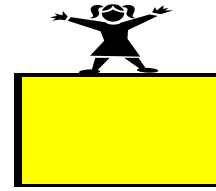
Helper Words

above
in front of

below
behind

beside
next to





PRACTICE TASK: Shape Sort

Approximately 2-3 days (adapted from Van de Walle 7.1 & 7.2)

STANDARDS FOR MATHEMATICAL CONTENT

MCCK.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

MCCK.G.2 Correctly name shapes regardless of their orientations or overall size.

MCCK.G.3 Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

MCCK.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count

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.

BACKGROUND KNOWLEDGE

Many students in kindergarten struggle to think of a triangle other than an equilateral triangle. This task provides students with an opportunity to explore and sort different shape triangle. Identifying the triangles by their geometric name (scalene, isosceles, and right) is not the focus but the attributes that make them different.

ESSENTIAL QUESTIONS

- What are some ways that you can sort shapes?
- What is an attribute?
- What makes shapes different from each other?

MATERIALS

- *Shape Sort* game board

GROUPING

Whole group, small group or partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comment: the following series of tasks could be taught in sequence and over several days.

Like and Unlike Attributes (2 players)

Before giving students the directions place 2 counters on two different shapes on the game board.

Each player is given 5 counters. On the first turn, have each partner place a counter on a different shape. Players take turns identifying the common attributes between the two shapes. Players alternate identifying attributes until one player is unable to identify a common attribute. (Example: If player 1 is unable to identify a common attribute, player 2 gets both counters). The counters are removed from the board and the steps are repeated until all ten counters have been played. The player that collects the most counters at the end of the game wins.

Making a Shape Family (3-4 players)

Have one student in the group pick a target shape and cover it with a counter. The first shape covered is the family shape. One single attribute must be identified and that attribute becomes the Grandfather Shape and has the “Family Name” (or target attribute). Each student in the group takes a turn covering a shape that belongs in the target shape family according to the common attribute. Every shape that becomes part of the family must have the same attribute (Example: each shape in the target family has only 3 corners). After no more shapes can be added to the family, have students identify another attribute from the grandfather shape. Players take turns removing counters from the shapes that do not have the second attribute that matches the grandfather shape.

Draw My Rule: (small group/whole group)

Students could draw a shape that would fit the rule made for “Shape Family” or teacher could give students rule and have them draw a shape that matches the rule. (Example: the rule for my shape is that it has 3 straight lines and none of them are the same size.

What’s My Rule? (3-4 players)

One player covers 3 shapes on the board that fit a secret attribute/rule. Once the shapes are covered, the other members of the group take turns trying to identify the secret rule. The player that identifies the secret shape becomes the player that covers the shapes and determines the secret rule for the other players to identify.

FORMATIVE ASSESSMENT QUESTIONS

- What was the rule you used to sort?
- Could you have sorted the shapes another way?

- What is an attribute?

DIFFERENTIATION

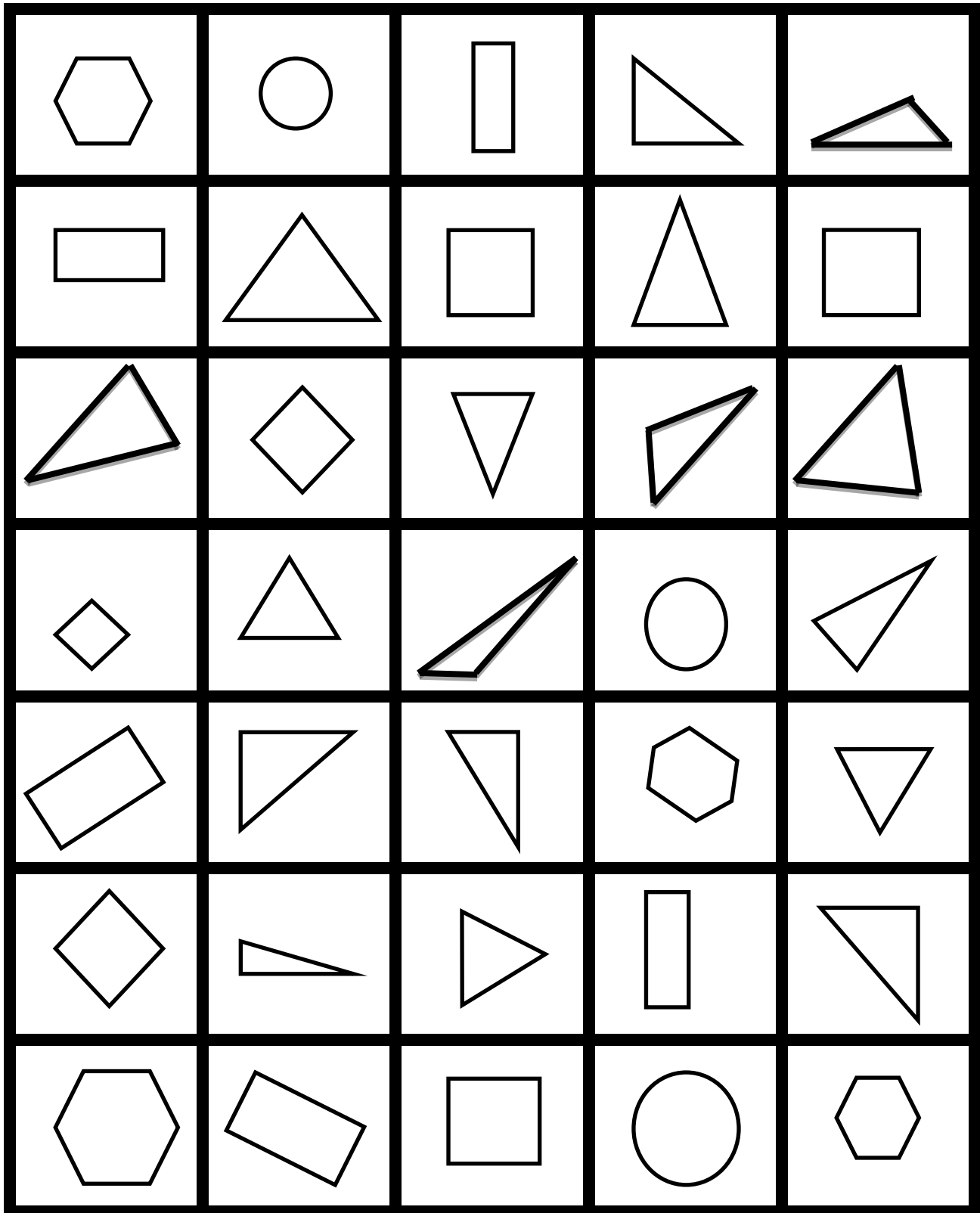
Extension

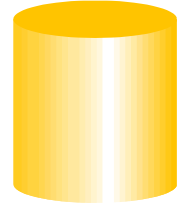
- Students can be asked to sort shapes that have more than one matching attribute.
- Have them sort just the quadrilaterals or triangle.

Intervention

- Find shapes that are similar sorting attributes more accessible to students
- Have the students identify a list of attributes and have them pick an attribute from the list to help guide.

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CONSTRUCTING TASK: Touch It, Count It, Chart It

(Approximately 1 day)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“Solid”).

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

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.

BACKGROUND KNOWLEDGE

Prepare a chart/graphic organizer to record the characteristics of the three-dimensional figures as you read the story. One way to discuss how 3-D shapes are different from 2-D shapes is to refer to 3-D shapes as having a solid body. This is why it is easy hold them in our hand. 2-D shapes are flat, which is why it is easy to draw them on paper. If you use the term “solid” when talking about 3-D shapes, then discussing “face” on the 3-D shape is a little easier.

It is natural for students to initially talk about the faces as “sides” but as **you** talk about them use the word face, **not** side. Gradually the students will pick up on this and will start calling the “sides” faces.

ESSENTIAL QUESTIONS

- Where can we find shapes in the real world? How can a shape be described?
- How can shapes be sorted?

- What are attributes or properties of a shape or shapes?
- How are shapes same and different?

MATERIALS

- Geometric solid models for: cylinder, cone, cube, and sphere
- Graphic organizer chart
- Student copy of graphic organizer
- Names of geometric solids on index cards
- Index cards (for student labeling)
- Modeling clay or play dough
- Captain Invincible and the Space Shapes by Stuart J. Murphy, or similar text

GROUPING

Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part 1

Read *Captain Invincible and the Space Shapes* by Stuart J. Murphy, or other book about 3D shapes. Pass solids (cylinder, cone, sphere, and cube) around and ask students to describe how each one looks and feels and record these characteristics in the graphic organizer. Students will complete the *Touch It, Count It, Chart It* Task Sheet. Allow students to use solids to trace around with a pencil to determine the shape of its face.

Part 2

Give each student 2-3 index cards. Have students go on a geometric solid shape hunt in the classroom to fill in the last column of the *Touch It, Count it, Chart It*, chart. Students tell the name of the solid it represents, write its name on an index card, and attach it to the item. Shapes can then be displayed in a “Solid Shapes Museum.”

As you circulate, observe the student’s choices and listen to their conversations. Help students to understand they can learn to recognize the shapes even though they are not exactly the same as the model. During their shape hunt, and as students share their 3-D findings, ask the students questions such as:

- Is this object exactly like our model? How is it the same? How is it different?
- Which solid is the hardest to find in the classroom? Why?
- What do you notice about the faces of the objects?

FORMATIVE ASSESSMENT QUESTIONS

- Are students able to talk about where we find shapes in the real world?
- How are the students describing the shapes they are finding?

- Are they able to choose something easily from the classroom without referring back to the solid example?
- Do most students choose the solid they are most familiar with, such as a rectangular prism? Which ones are they not choosing?

DIFFERENTIATION

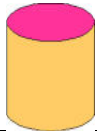

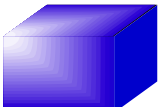
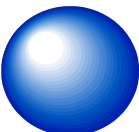
Extension

- Students could determine attributes and then use that information to graph objects from the “Shape Museum”. Students could extend their search to the rest of the school and /or use cameras to take pictures of other items that represent 3-D solids. A home connection could be made by sending a parent letter asking for students to search for solids they could bring back to school to add to the “Shape Museum.”
- Have students use modeling clay or play dough to create some of the solids the identified as the search the classroom. Students can use a model shape to replicate or compose the shape from memory.

Intervention

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

Touch It, Count It, Chart It

	Numbers of Corners	Numbers of Faces	Draw one face of the solid shape	Everyday object
<p style="font-size: 1.5em;">Cylinder</p> 				
<p style="font-size: 1.5em;">Cone</p> 				
<p style="font-size: 1.5em;">Cube</p> 				
<p style="font-size: 1.5em;">Sphere</p> 				



PRACTICE TASK: What’s in the Bag? (Flat or Solid) Approximately 2 days

STANDARDS FOR MATHEMATICAL CONTENT

MCCK.G.2 Correctly name shapes regardless of their orientations or overall size.

MCCK.G.3 Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

MCCK.G.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCCK.G.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCCK.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count

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.

BACKGROUND KNOWLEDGE

Students need to see many examples of shapes that correspond to the same geometrical concept as well as a variety of shapes that are non-examples of the concept. For example, teachers must ensure that students see collections of triangles in different positions and with different sizes of angles (see fig. 4.12) and shapes that have a resemblance to triangles (see fig. 4.13) but are not triangles. Through class discussions of such examples and non-examples, geometric concepts are developed and refined (NCTM Principles & Standards 2012).

ESSENTIAL QUESTIONS

- What is the difference between a 2-dimensional and 3-dimensional shape?
- What are some attributes of a flat shape? Solid shape?
- What is an attribute?

- How can we sort things?
- How can shapes be sorted?
- What are attributes or properties of a shape or shapes?
- How are shapes same and different?

MATERIALS

- Assorted shapes (2-dimensional and/or 3-Dimensional)
- Paper bags (same amount as shapes)

GROUPING

Whole group, small group or partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comment

The first time this task is introduced use only 2-D shapes. The second time the activity is used introduce 3-D shapes as well as 2-D. Be sure to include multiples of the same shapes but with different sizes and texture. Label 7 paper bags (A-G). Place (1) shape in each of the 7 bags and prepare 1 extra bag to model how to complete the task.

PART 1

Gather students to a meeting area and review what an attribute is and the attributes specific shapes have. After reviewing, pass the model bag around and give each student an opportunity to feel inside the bag and identify the shape without looking. Students must wait to share their prediction until all students have had a turn with the model bag. After the bag used for the demonstration has been shared with all the students, have them make a prediction as to what type of shape is inside the bag and justify why they think it is a specific shape. (Example: I think the shape in the bag is a square because I felt four corners). After all the students have made a prediction, remove the shape from inside the bag and review the attributes of the shape.

Divide the students equally into 7 groups. Each group of students starts at a different bag. Without looking, students feel the shape in the bag while trying to identify the shape's attributes. Once the students think they know what shape is inside the bag they record the attributes they felt and make a prediction by writing the name of the shape or drawing a picture of the shape. **STUDENTS SHOULD NOT LOOK IN THE BAG.** Once all the students have circulated through the 7 stations have them meet back at the carpet to share what they found and their prediction.

Although this is early in the year students can also be introduced to data and measurement. Example: If the square was in the bag, some students may say there are 3, 4, or 5 sides. Have students count and graph how many students predicted the same number.

FORMATIVE ASSESSMENT QUESTIONS

- What is the difference between a side and a face? Explain?
- How are you keeping track of the attributes when you can't see them?
- How many sides are there on the shape in the bag?

DIFFERENTIATION

Extension

- Place multiple shapes in the bag and have the student match attributes by touch.

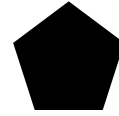
Intervention

- Place multiple shapes next to the bag at each station so that as the students feel attributes inside the bag they can try and visually match a shape to what they are seeing.



What's in the Bag?

Bag	Sides or Faces	Vertices/Corners	draw a picture or write the name
A			
B			
C			
D			
E			
F			
G			



CONSTRUCTING TASK: PATTERN BLOCK PICTURES

Approximately 2-3 days

STANDARDS FOR MATHEMATICAL PRACTICE

MCC.K.G.2. Correctly name shapes regardless of their orientations or overall size.

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”*

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.

BACKGROUND KNOWLEDGE

Although this task may seem like play, it provides for a great deal of exploration and assessment opportunities. Students begin to connect shapes to real life as they create replicas of what they have seen from real world experiences. Teachers may also begin to assess their students’ ability as it relates to counting and cardinality.

ESSENTIAL QUESTIONS

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

MATERIALS

- Pattern blocks (in bags for each student)
- Construction paper or die cuts of pattern blocks (1 bag per student with enough to create picture)
- Construction paper
- Pattern Block Picture recording sheet
- Writing Paper
- Glue sticks (1 for each student)

(The bags should contain enough shapes so that students can easily make a picture with 12 shapes.)

GROUPING

Small Group or Partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comment:

Formal discussions about a trapezoid have not necessarily occurred in kindergarten; therefore the red piece may not be familiar to your students. It is okay to introduce the more specific name for these shapes, but Kindergartener's do not have to master identification of these shapes. Keep in mind a Kindergartener does not have to be able to identify a shape as a trapezoid, but should be able to classify it as a quadrilateral through exposure in previous tasks.

Part I

Distribute zippered plastics bags that contain the pattern blocks. Have students explore and identify what smaller pattern blocks can be combined to compose a larger shapes. (Example: 2 small triangles make rhombus.) Ask the students if any of them can compose a square from smaller shapes. Students may share shapes with one another if they choose to. This should not be teacher directed and the decision to combine/share shapes should be solely that of the students. As students discover new relationships between shapes the teacher records them on chart paper.

Part II

Have students create a picture using at least a dozen of the pattern block shapes. Encourage students to combine multiple pieces together so that the picture is made up of pattern block shapes touching. After students have created a picture using the pattern blocks have them share their picture and using the Pattern Block Recording Sheet, have students place a tally mark to record the number of each shape used to create their picture. Repeat these steps until each student has created and recorded the shapes for at least 5 pictures.

Part III

After students have created five pictures and recorded their shapes using the *Pattern Block Picture* recording sheet, have them trace and cut out shapes used in their 5th picture on construction paper. (example: if a student made a flower with 4 squares and a hexagon they would cut those shapes out of construction paper.) Once students have cut out the shapes that match the ones used in their picture they recreate the picture and glue it down to construction paper.

Part IV

After the *Pattern Block Picture* recording sheet and picture are complete, have the student create questions about their own shape chart and create a graph about their picture. “Which shape did you have more/fewer of? How many more/fewer?”

Students can use the data collected from their 5 pictures or they can come together in small groups and combine the recording sheets to create a graph.

Part V

As a class, have students/groups share their pictures and graphs. As part of the sharing time, have each group identify what shape they used the most of/least of.

FORMATIVE ASSESSMENT QUESTIONS

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

DIFFERENTIATION





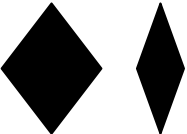
Extension

- Give students an exact amount of specific shapes that need to be used to create their picture.

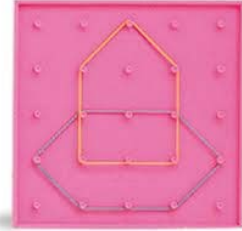
Intervention

- If tracing is too time consuming for some students, skip this part and give them the precut shapes. Ask the student to identify the name of the shape and the number of sides it has verbally.
- Students can use numerals for the number of shapes used to create their picture as opposed to tally marks.

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Picture 1					
Picture 2					
Picture 3					
Picture 4					
Picture 5					

Pattern Block Picture



PRACTICE TASK: Geoboard Museum

Approximately 1 day move

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCC.K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”*

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.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

To help students in the very early grades copy geoboard designs, suggest that they mark the dots in the corners of their shape. Encourage students to say the name for each peg, such as “second row, end peg” as they point to their geoboard. This will allow to them to match the corresponding dot on the task sheet. Because a standard for ordinal words is not explicitly stated in the CCGPS, they should be integrated whenever possible.

ESSENTIAL QUESTIONS

- What makes shapes different from each other?
- How do shapes fit together and come apart?
- What shapes can we see in our world?

MATERIALS

- Geoboards
- Rubber bands

GROUPING

Individual, small group or math work station

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Gather the students together to discuss the characteristics of shapes. How are they alike? How are they different? Have students focus on the number of sides as a way to describe a shape. Give students geoboards and rubber bands. Allow students time to explore the different shapes that can be made with the rubber bands. As students explore with the rubber bands and geoboards, ask “What happens if we combine more than one shape on the geoboard? For example, if I put two triangles together what does it look like?”

Part II

Read the *Greedy Triangle* by Marilyn Burns to students and have them model the shape as it transforms throughout the book. After reading the story, have students model the multiple ways that shapes can be represented. (be sure to include conversation about the difference appearance of shapes such as an “upside down” triangle. Students share the different shapes they have created. Discussions should include conversations about how the students have created their shapes.

Part III

Completed geoboard designs are displayed in the classroom as Geoboard Gallery. The teacher should label each geoboard with a number. Model for students how to record the shape using dot paper. Provide each student with a student task sheet and have them record what shapes they see in each picture at the museum. This part of the task will require very clear directions and modeling. You may want to take pictures for future activities.

FORMATIVE ASSESSMENT QUESTIONS

- Observe students as they create designs to see which students have figured out how to make designs using multiple shapes and which students use shapes to make abstract designs.
- We are want student to be able to create both types.
- Can most students make quadrilaterals and triangles?
- Are they sharing their findings?
- Can they create multiple shapes within their design?

DIFFERENTIATION

Extension

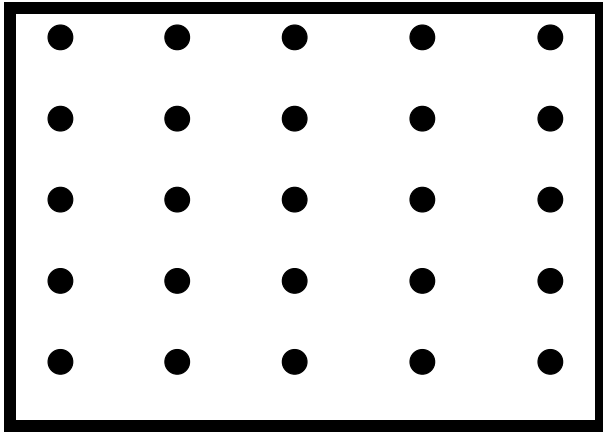
- Ask students “What happens if we combine more than one shape on the geoboard? For example if I put two triangles together what does it look like?”

Intervention

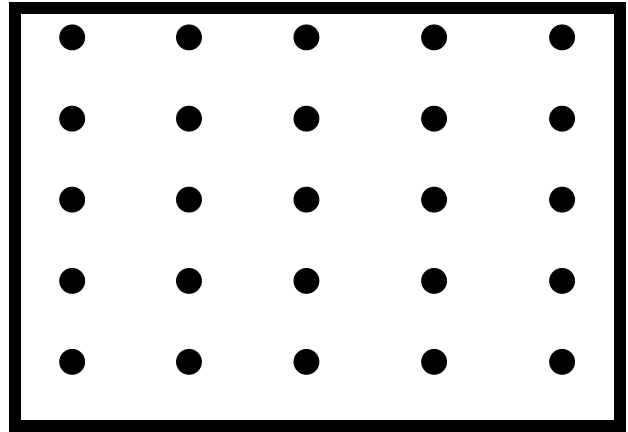
- Some students may struggle with creating shapes on the geoboard. These students can be given cards that have examples of geoboard designs to copy or provide them with toothpicks and marshmallows to demonstrate what would be happening on the geoboard.



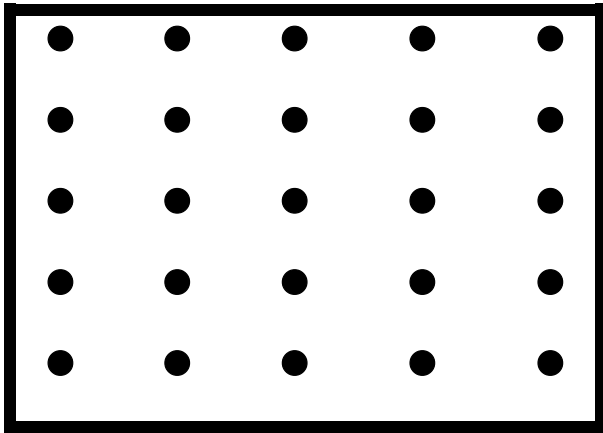
Geoboard Museum



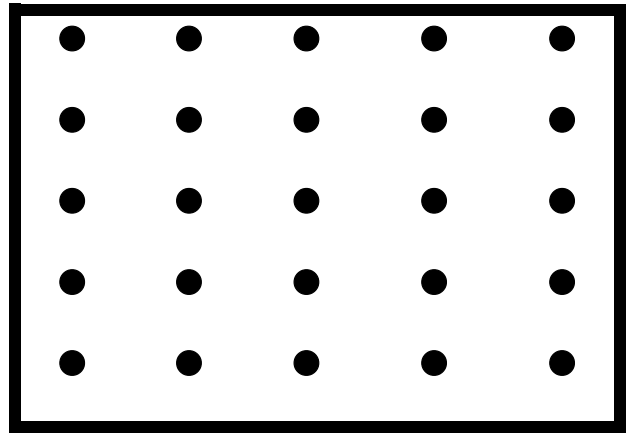
Gallery _____



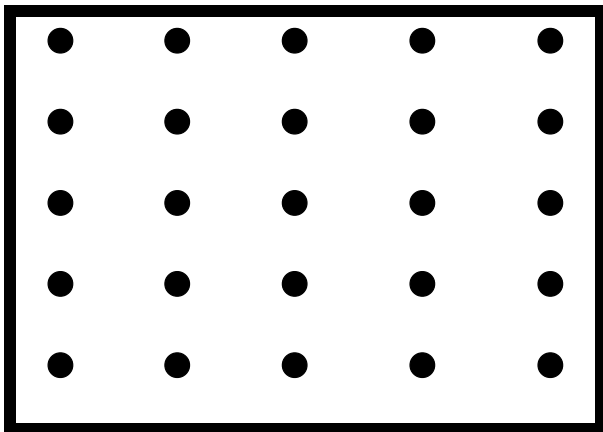
Gallery _____



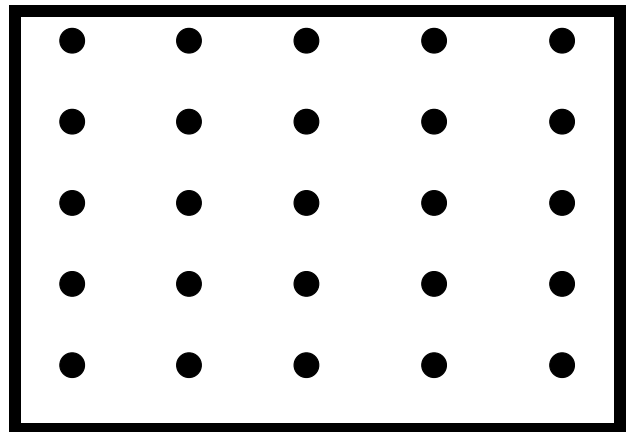
Gallery _____



Gallery _____



Gallery _____



Gallery _____



CONSTRUCTING TASK: Build a Marshmallow Shape (Approximately 3 days)

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

MCC.K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

MCC.K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”*

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.

BACKGROUND KNOWLEDGE

The students should have prior knowledge of solid geometric shapes and the vocabulary used to describe these shapes. Students will draw and name solid geometric shapes of a cube, cylinder, sphere, and cone and list the number of faces, edges, and vertices/corners of each figure.

ESSENTIAL QUESTIONS

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

MATERIALS

- Toothpicks

- 1 piece of construction paper for each student(black)
- Index cards
- Mini marshmallows (see task for choice)
- Bowls
- Small zippered plastic bags (1 per student to be used for investigation)
- *The Shape of Things* by Dayle Ann Dobbs

GROUPING

Large Group and small groups

TASK DESCRIPTION, DISCUSSION AND DEVELOPMENT

Comment: As students make a square accept both rectangle and square for the answer, (because both are correct), but make sure to discuss how calling it a square is more specific, squares are special rectangles that have all sides the same length. Then ask, “How could we use marshmallows and toothpicks to change this shape so that it is still a rectangle but it is no longer a square?” (*Note to teacher: Remember, not all rectangles are squares, but all squares are rectangles!*)

Part I

At a central meeting place, hand each student three toothpicks and marshmallows. Allow students to explore using toothpicks and marshmallows to create a line segment. This should be a quick discussion and exploration because students are going to have an extended time creating shapes in the next part of the task. Ask students what shape they could build using the 3 marshmallows and toothpicks. Allow every student the opportunity to explore and build the triangle.

Part II

Divide the class into groups. Place marshmallows and toothpicks in bowls on each table. Emphasize that their sculptures are going on display and they will be responsible for explaining the process for making the sculptures to others. Allow groups to build as many different sizes and types of shapes as possible. Each time a new shape is constructed, it is placed in the middle of the group for other members to practice constructing. However, there should be no duplicate of a shape in the center of the group. Once a new shape has been composed everyone in the group must complete that shape before moving on to discover a new one. This is an excellent opportunity for students to collaboratively work together and helping one another to work through a task.

At this point students might be fixed on solely making flat shapes. Be sure to tell the students that they **can make any shape they want** as long as they can describe what it is and how they made it. If students do not begin to build 3-D shapes, probe through questioning and guide more.

Comment: As students begin to build “solid”/3-D shapes it is suggested to let them to build as big as they possibly can as the bigger the shapes will require more problem-solving and structural support. Students will be unable to make a circle using the marshmallows and toothpicks but should be challenged to make one. Have students justify their opinion either way. This could be an excellent intro to a class discussion.

To draw to a close, have students label the names of their shapes on the index cards provided. Once all shapes have been labeled, have the students perform a gallery walk around the classroom to observe and mentally capture the shapes that other groups constructed.

As the gallery walk is taking place, students should be discussing which shape models are shared between groups and which models can be added to their collection when they return. Students can also compare which group has the most shapes.

After completing the gallery walk, allow groups the time to construct/add some of the new found shapes to their collection. After time has been given to the groups to add shapes, ask the students what they would like to graph about the shapes constructed (most shapes, least shapes, etc...). Have each group of students share the list of shapes they made and create a bar graph and discuss the results with students.

- How many groups made a cube?
- Which shape was made the most?
- Which shape was made by the fewest groups?

FORMATIVE ASSESSMENT QUESTIONS

- How many toothpicks would you need to build a _____?
- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How are these shapes different from one another? How are they alike?
- What is the difference between flat and solid?

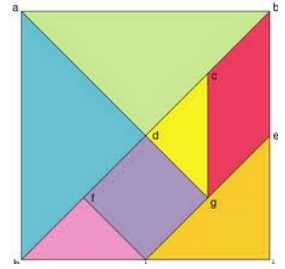
DIFFERENTIATION

Extension

- Have students create the largest possible 3-dimensional shape they can make.
- Have students make different types of triangles (scalene, isosceles, right, equilateral), and quadrilaterals (rectangle, square, rhombus, trapezoid, etc...). The key here is that shapes must be different not by size but by attributes.

Intervention

- Provide models for students who are struggling with creating shapes or allow students to use straws or pipe cleaners. Or give students models of the shapes and have them reconstruct the shape they see.



PRACTICE TASK: Tangram Challenge

Approximately 1 day

STANDARDS FOR MATHEMATICAL CONTENT

MCC.K.G.5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

MCC.K.G.6. Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”*

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.

BACKGROUND KNOWLEDGE

“Children need to freely explore how shapes fit together to form larger shapes and how larger shapes can be made from smaller shapes” (Van de Walle p. 196). Van de Walle, NCTM and numerous other resources provide supplementary material for tangrams that allow students to explore the composition and decomposition of shapes.

ESSENTIAL QUESTIONS

- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How can shapes be sorted?
- How do we use shapes in school?

MATERIALS

- Tangram puzzle set – one for each child
- *Tangram Challenge* Recording Sheet
- Example of completed tangram picture
- *Grandfather Tang’s Story* by Ann Tompert and Robert Andrew Parker or similar literature connection

- *Three Pigs, One Wolf and Seven Magic Shapes* by Maccarone and Neuhaus and *The Tangram Magician* by Lisa Campbell Ernst.

GROUPING

Individual, small group or math work station

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

To introduce this task, *Three Pigs, One Wolf and Seven Magic Shapes* by Maccarone and Neuhaus, *The Tangram Magician* by Lisa Campbell Ernst, or a similar book.

Give each student a set of tangram puzzle pieces. Have them name and describe each piece in the set. Have them tell you something about each shape. Allow time for free exploration with the shapes so students can explore how simple shapes can form larger shapes. After time has been allowed for exploration, ask students to create a square using any number of pieces, and then compare the squares with their neighbors. Record the squares by tracing them on a piece of paper, challenging students to make as many different squares as they can. Ask students to define their squares using the attributes of four equal sides.

Display the Tangram Shape Chart and demonstrate to students how to use the chart by placing some of their squares in the appropriate row on the chart. Then have students work in groups to find other shapes that can be made from tangram pieces and sketch those in the appropriate square on the chart. All students are not expected to complete the entire chart (in fact not all shapes are possible). Encourage students to continue to work on this task on their own time and have the students share one of their solutions.

Part II

Next, read *Grandfather Tang's Story*, and point out where/how the tangram shapes are used to build the cat and the man. Distribute the student page with the cat and man designs. Be sure everyone understands the challenges of placing the shapes in the right places to make the correct puzzle. Allow time for students to complete the cat and the man puzzles. Circulate around the room as students complete their tangram puzzles. Ask students to describe their puzzle pieces using the questions below.

- What shapes are your puzzle pieces?
- What do you notice about all of the triangle pieces?
- What else do you notice about the puzzle piece shapes?
- How did you decide which puzzle pieces to use for each puzzle?

FORMATIVE ASSESSMENT QUESTIONS

- Are students able to sort shapes into reasonable groups?
- Are students able to talk about what makes shapes different from each other?
- Are students able use the tangram pieces to create given shapes in more than one way?
- Are students aware of how shapes fit together and come apart?
- Can students create a definition of a given shape by using its attributes?
- Do students recognize how we use shapes in school?
- Have students correctly placed their shapes on the Tangram Shape Chart?
- How did you count the number of sides?
- How do you know this is a square (rectangle, or triangle)?
- How many pieces did you use to create this shape? Where does this shape belong on the chart? How do you know?

DIFFERENTIATION

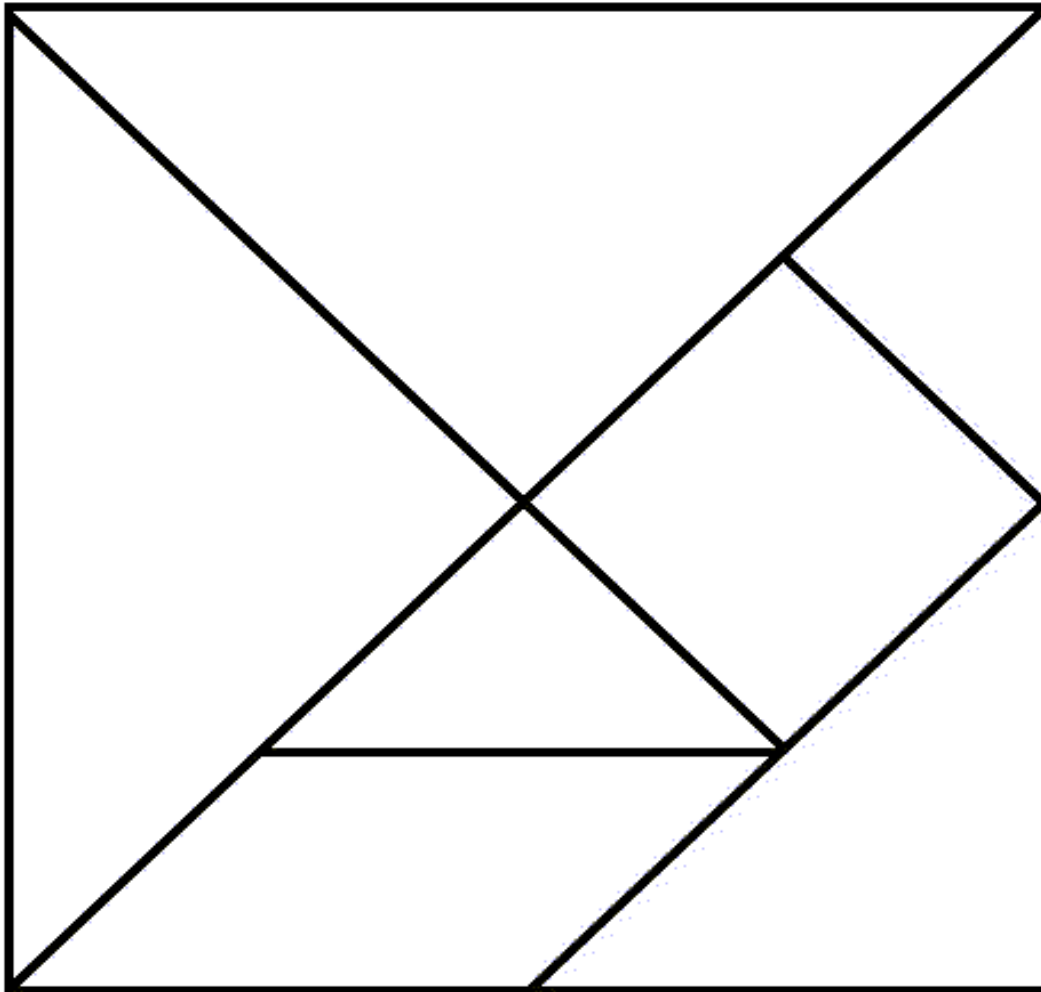
Extension

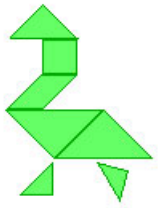
- Have students create their own tangram puzzle picture.
- Ask students to create a new character for the book, Grandfather Tang's Story and make a tangram mat for the character that can be added to the tangram center for classmates to try.
- Have students create the chart as an independent study with sketches of how the figures were created.
- Challenge students to a trapezoid with 1 to 7 pieces.

Intervention

- Have the students work with the tangram pieces to create either more simple pictures or use pictures with details (line segments) filled in.
- For each shape, provide only the pieces that will make that specific shape with the necessary pieces and have the students put them together.
- Allow student to trace the constructed shape on a separate piece of paper.

Student Tangram Puzzle




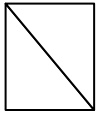




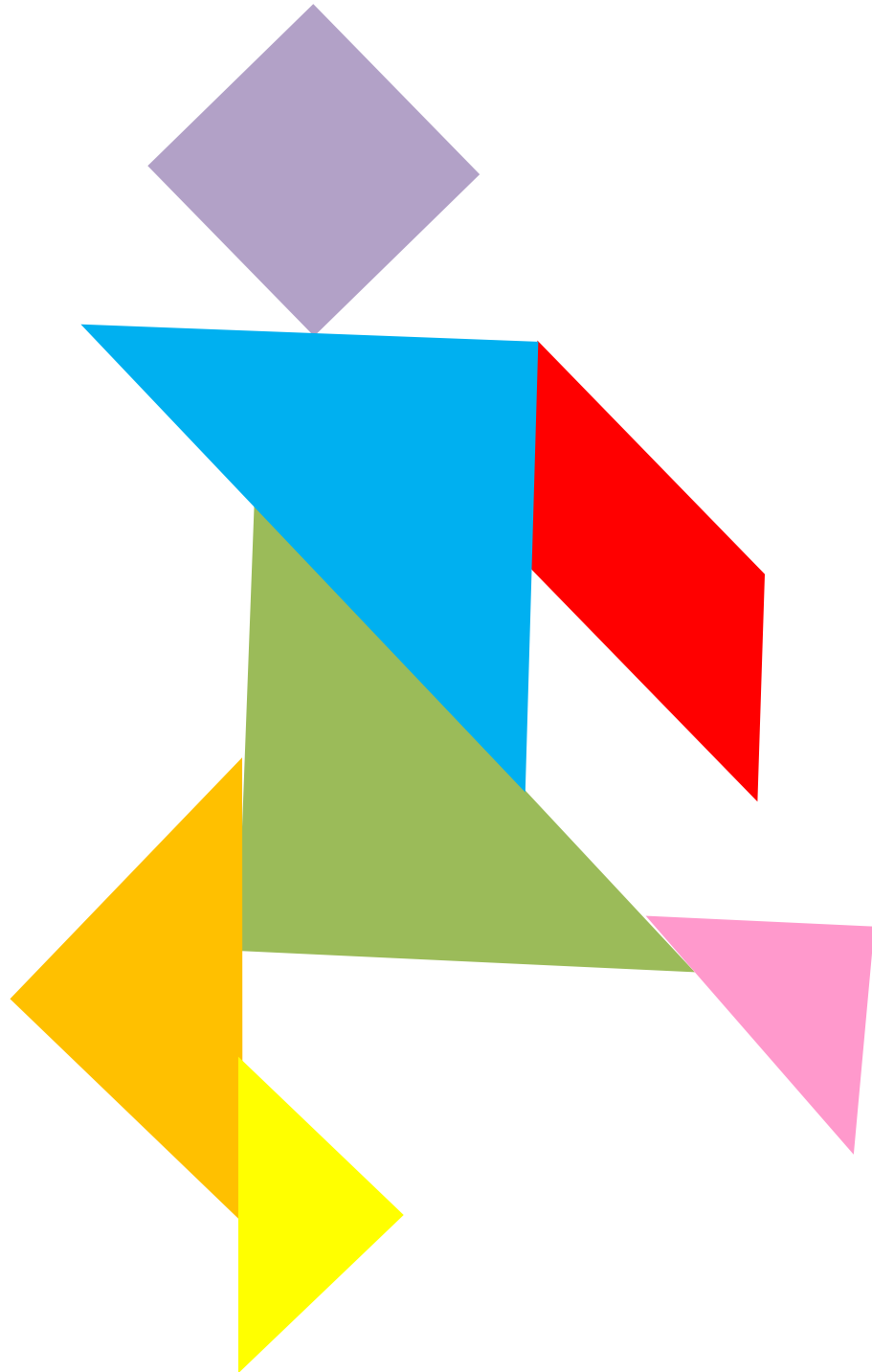
Name _____ Date _____

Tangram Challenge

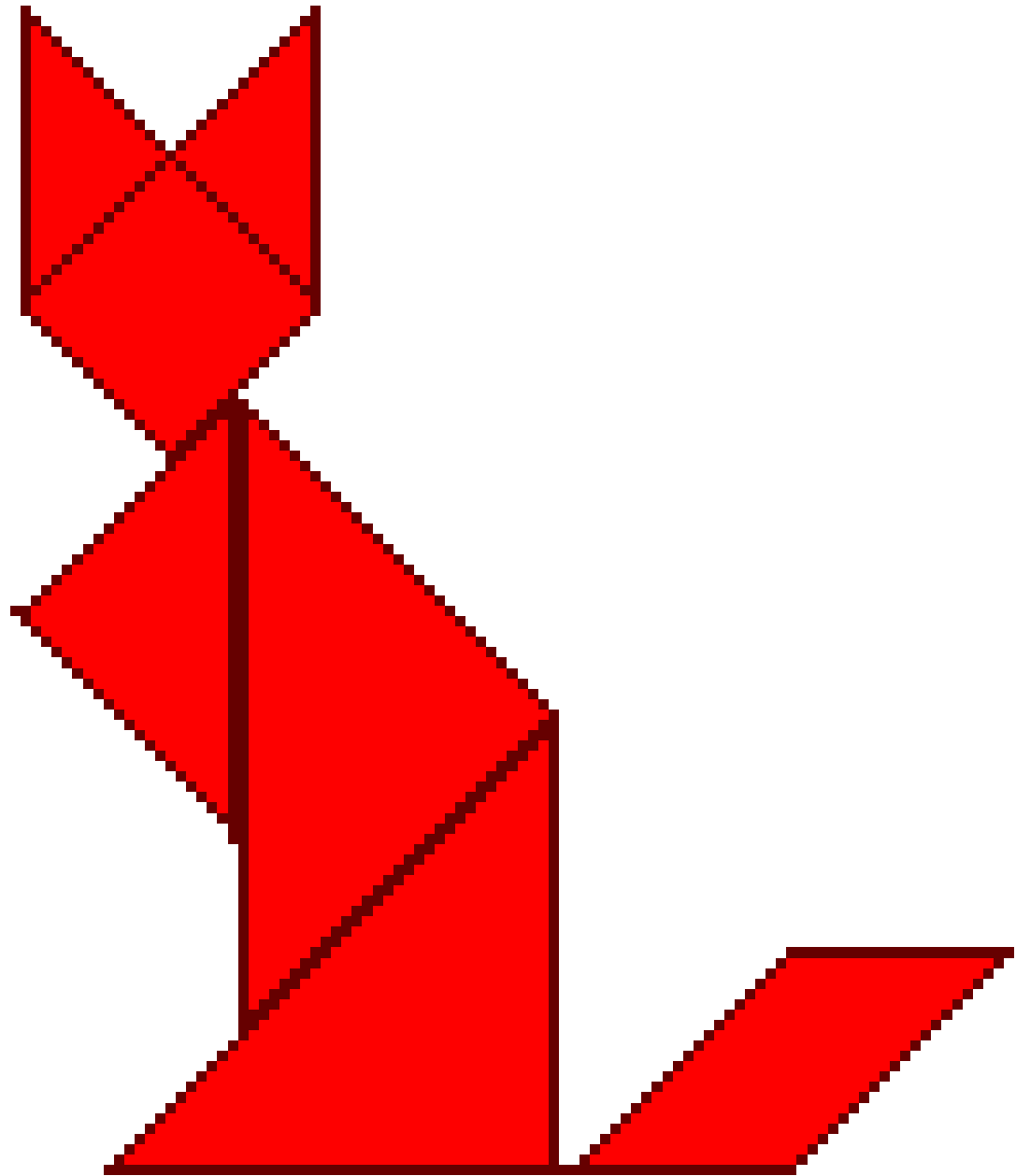
Find as many ways as possible to create the shapes below using tangram pieces. You may work with a partner or a small group. Sketch how you made the shapes in the appropriate boxes below. See the examples below.

# of pieces	Square 	Rectangle 	Triangle 
1			
2			
3			
4			
5			
6			
7			

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PERFORMANCE TASK: Shapes All Around

Approximately 2 days

STANDARDS FOR MATHEMATICAL CONTENT

- MCC.K.G.1.** Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.
- MCC.K.G.2.** Correctly name shapes regardless of their orientations or overall size.
- MCC.K.G.3.** Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).
- MCC.K.G.4.** Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).
- MCC.K.G.5.** Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
- MCC.K.G.6.** Compose simple shapes to form larger shapes. *For example, “Can you join these two triangles with full sides touching to make a rectangle?”*
- MCC.K.MD.3.** Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

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

This culminating task represents the level of depth, rigor, and complexity expected of all kindergarten students to demonstrate evidence of learning. The ways in which children describe

shapes in “Shape Sorts” and other similar activities with three-dimensional shapes provides insight into their level of geometric thinking.

ESSENTIAL QUESTIONS

- What makes shapes different from each other?
- What shapes can we see in our world?
- How can we organize information?

MATERIALS

- Student task sheet
- Digital cameras

GROUPING

Initially in small groups, then individually each student will fill in the task sheet

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

Tell students they will be going on a “field trip” throughout the school and outside to search for examples of the shapes learned in this unit of study. The teacher may start with a “field trip” within the classroom and move to the inside of the building before moving outdoors. Students will record their findings on the student task sheet.

This activity can be done individually, but works best if you can break the class up into small groups of 3-4 students and have a monitor with each group that can take digital pictures of the things they see around the school. Then they can sort the pictures on a poster board to be displayed. It is important that students sort how the pictures should be displayed (if pictures are not available have students draw pictures and label what they saw on the field trip) Students must try and find at least one example of each flat and solid shape.

Part III

After the poster is complete students can work individually to fill out the student task sheet below. Then using modeling clay and toothpicks students should construct one flat AND solid representation of an object they observed while on their trip and verbally explain how they are different and how they match what they are modeled after.

FORMATIVE ASSESSMENT QUESTIONS

- Are students able to identify and describe what makes shapes different from each other?

- Can students recognize the different shapes (circles, triangles, quadrilaterals, spheres, and cubes) in the world around them?
- Are students able to organize the information they gather on the hunt in a clear manner?

DIFFERENTIATION



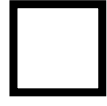





Extension

- Have students create the model from modeling clay without looking at the picture to refer to.
- Tell students that the shapes on the poster board must be sorted other than flat/solid or by shape. There can be multiple groups in the sort, just not solely based from these attributes.

Intervention

- Limit the number of shapes the students must find on the field trip or give a set list and an area in the school where you know these shapes can be found.

Shapes All Around

Shape	Picture of Shape (check off)	Where did you find it? Circle and write
		Above below beside behind in front of next to. <hr/>
		Above below beside behind in front of next to. <hr/>
		Above below beside behind in front of next to. <hr/>
		Above below beside behind in front of next to. <hr/>
		Above below beside behind in front of next to. <hr/>
		Above below beside behind in front of next to. <hr/>
 solid		Above below beside behind in front of next to. <hr/>
 solid		Above below beside behind in front of next to. <hr/>
a shape made from shapes		Above below beside behind in front of next to. <hr/>

Build (1) 3-dimensional shape you discovered on your journey. Display it here, and label it with the correct name.

My shape is a _____.

Name _____