NEW MEXICO
Public Education Department

K.G: GEOMETRY

Cluster Statement: B: Analyze, compare, create, and compose shapes.

Supporting Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:** • Describe a shape by telling things like the number of sides, number of vertices (corners), and other special qualities. • Describe two-dimensional shapes (circles, triangles, rectangles, and squares) by the number of sides and corners. • Compare two-dimensional shapes and describe their similarities and differences. • Compare three-dimensional shapes and describe their similarities and differences. **Depth Of Knowledge:** 1-2 **Bloom's Taxonomy:** Understand and Analyze
K.G.B.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).	SMP 3: Students can construct viable arguments by explaining how they sorted or compared a set of shapes. SMP 7: Students can look for and make use of structure by sorting objects into categories based on attributes and similarities and differences.	
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:** • Build shapes from materials in their environment. • Draw shapes in their environment.
K.G.B.5: Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.	SMP 4: Students can model with mathematics by drawing and building shapes to represent real-world objects. SMP 7: Students can look for and make use of structure by perceiving a variety of shapes in their environment and identifying and describing these shapes.	

<table>
<tr><td></td><td></td><td>Depth Of Knowledge: 2-3

Bloom's Taxonomy:
Analyze and Create</td></tr>
<tr><td rowspan="3">Standard Text

K.G.B.6: Compose simple shapes to form larger shapes. For example, "Can you join these two triangles with full sides touching to make a rectangle?"</td><td rowspan="3">Standard for Mathematical Practices

SMP 1: Students can make sense of problems and persevere in solving them by composing larger shapes and pictures from smaller shapes.

SMP 6: Students can attend to precision by using geometry vocabular to describe the shapes and pictures that have composed.</td><td>Students who demonstrate understanding can:
• Put shapes together to make new shapes (compose shapes).
• Name the new shape that results from composing two simple shapes.
• Decide which piece will fit into a space in a puzzle.</td></tr>
<tr><td>Depth Of Knowledge: 2-3</td></tr>
<tr><td>Bloom's Taxonomy:
Analyze and Create</td></tr>
<tr><td><u>Previous Learning Connections</u>
• Connect to building and describing two-dimensional shapes, such as making circles and triangles with blocks and play dough.
• Connect to sorting and matching objects with the same shape and size, and lay an object of the same shape and size on top of another to show they are the same.
• Connect to making a picture by combining shapes.
• Connect to comparing length and other attributes of objects, using the terms bigger, longer, and taller.
• Connect to arranging objects in order according to characteristics or attributes, such as height.</td><td><u>Current Learning Connections</u>
• Connect to building upon students' knowledge of identifying and describing shapes. (K.G.1-3)
• Connect to students using their knowledge of sorting by attributes to investigate measurement and data. (K.MD.1-3)</td><td><u>Future Learning Connections</u>
• Connect to reason with shapes and their defining attributes. (1.G.1)
• Connect to identification of additional shapes (trapezoids, half-circles, quarter-circles) and combining three-dimensional shapes to create larger shapes. (1.G.2)</td></tr>
<tr><td colspan="3">Clarification Statement:
K.G.B.4:</td></tr>
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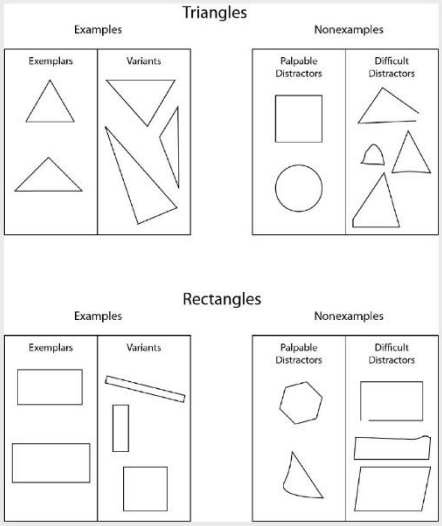
K.G.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).



Exemplars are the typical visual prototypes of the shape category.

Variants are other examples of the shape category.

Palpable distractors are nonexamples with little or no overall resemblance to the exemplars.

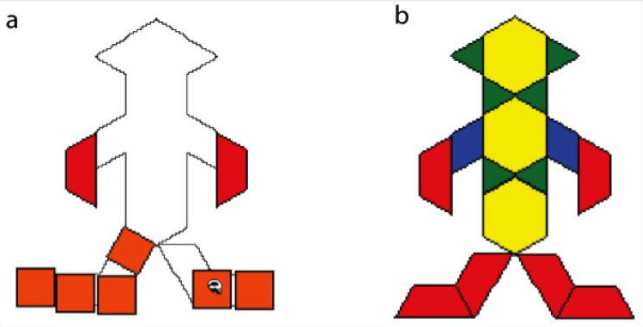
Difficult distractors are visually similar to examples but lack at least one defining attribute.

K.G.B.5: The need to explain their decisions about **shape names** or **classifications** prompts students to attend to and describe certain **features** of the **shapes**. That is, concept images and names they have learned for the shapes are the raw material from which they can abstract common features. This also supports their learning to represent shapes informally with drawings and by building them from components (e.g., manipulatives such as sticks). With repeated experiences such as these, students become more precise (MP6).

K.G.B.6:

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

Combining shapes to build pictures



Students first use trial and error (part a) and gradually consider components (part b).

A second important area for kindergartners is the **composition** of **geometric figures**. Students not only build shapes from **components**, but also compose shapes to build pictures and designs. Initially lacking competence in composing geometric shapes, they gain abilities to combine shapes–first by trial and error and gradually by considering components–into pictures. At first, **side length** is the only component considered. Later experience brings an intuitive appreciation of **angle size**. Students combine **two-dimensional shapes** and solve problems such as deciding which piece will fit into a space in a puzzle, intuitively using **geometric motions** (slides, flips, and turns, the informal names for translations, reflections, and rotations, respectively). They can construct their own outline puzzles and exchange them, solving each other's.

Common Misconceptions

- Not realizing that triangles can be inverted or rotated
- Not considering the properties of two-dimensional shapes (such as identifying all quadrilaterals as rectangles)
- Mixing up the terminology for two- and three-dimensional shapes (such as calling a cube a square)
- Not being able to see shapes from different perspectives and struggling to "move" shapes through slides, flips and turns

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (targeted)

What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?

For example, some learners may benefit from targeted pre-teaching that uses images/resources (especially those being used the first time)when studying to analyze, compare, create, and compose shapes because the students were previously taught the names and some attributes of the different 2-dimensional as well as 3-dimensional shapes, for example if the window and the door are compared students can see that both are rectangles but one is bigger than the other.

Pre-teach (intensive)

What critical understandings will prepare students to access the mathematics for this cluster?

K.G.A., These standards provide a foundation for work with the analyzing, comparing, creating, and the composition of shapes because students need to be able to identify and describe the shapes in order for them to analyze, compare, create and or compose shares. If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

Core Instruction

Access:

Interest: How will the learning for students provide multiple options for recruiting student interest?
For example, learners engaging with analyzing, comparing, creating and composing shapes benefit when learning experiences include ways to recruit interest such as providing contextualized examples to their lives because students will get motivated by playing with blocks with different shapes, and students will be imitating what they play with at home.

Build:

Effort and Persistence: How will the learning for students provide options for sustaining effort and persistence?
For example, learners engaging with analyzing, comparing, creating and composing shapes benefit when learning experiences attend to students' attention and affect to support sustained effort and concentration such as providing feedback that is frequent, timely, and specific because some students might lose concentration and they will move to something different. At the same time, it will give you information of who is moving with ease, having difficulty or unable to perform the task.

Language and Symbols: How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds)
For example, learners engaging with analyzing, comparing, creating and composing shapes benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as pre-teaching vocabulary and symbols, especially in ways that promote connection to the learners' experience and prior knowledge because students will concentrate only on the learning task and not occupy their minds with vocabulary, and or necessary symbols.

Expression and Communication: How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?
For example, learners engaging with analyzing, comparing, creating and composing shapes benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing virtual or concrete mathematics manipulatives (e.g., base-10 blocks, algebra blocks) because many students are used to playing with blocks either at home or at school, making the manipulation easier when students combine learning with playing and experimenting.

Internalize:

Comprehension: How will the learning for students support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?
For example, learners engaging with analyzing, comparing, creating and composing shapes benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as pre-teaching critical prerequisite concepts through demonstration or representations because students will see the direction that you want to take them and also some structure to a task is necessary to promote learning.

Re-teach

Re-teach (targeted)

What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?

Examine assessments for evidence of lingering misconceptions (see common misconceptions). If students exhibit one more of these misconceptions, consider addressing the misconception by: For example, students may benefit from re-engaging with content during a unit on analyzing, comparing, creating, and composing shapes by clarifying mathematical ideas and/or concepts through a short mini-lesson because if students are struggling with the names, and their attributes they will also struggle when they are required to analyze and compare shapes

Re-teach (intensive)

What assessment data will help identify content needing to be revisited for intensive interventions?

Examine assessments for evidence of students still developing the underlying ideas For example, some students may benefit from intensive extra time during and after a unit analyzing, comparing, creating, and composing shapes by offering opportunities to understand and explore different strategies because by using different strategies the students might get to the conceptual understanding for example by overlapping some shapes and finding how they are different the students might start to see the attributes of the different shapes.

Extension Ideas

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

To extend students learning about analyzing, comparing, creating, and composing shapes, some learners may benefit from an extension such as the application of and development of abstract thinking skills when studying analyze, compare, create, and compose shapes because by asking questions like what would you need to do to this square to make it a rectangle, and or can you decompose a shape into different shapes?

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?

Build/Bridge: How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

Tasks: The type of mathematical tasks and instruction students receive provides the foundation for students' mathematical learning and their mathematical identity. Tasks and instruction that provide greater access to the mathematics and convey the creativity of mathematics by allowing for multiple solution strategies and development of the standards for mathematical practice lead to more students viewing themselves mathematically successful capable mathematicians than tasks and instruction which define success as memorizing and repeating a procedure demonstrated by the teacher. For example, when studying shapes (analyzing, comparing, creating, and composing shapes) the types of mathematical tasks are critical because tasks should have many entry points, and should be opened ended so our students can and will make sense of the problems according to the background knowledge they bring. Tasks should be wide, then slowly tasks should start getting narrow into what the goal of the cluster is. In other words, refining the learning so our students can meet the cluster.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source:
http://s3.amazonaws.com/illustrativemathematics/attachments/000/008/783/original/public_task_515.pdf?1462392632
Explicit connection: Student should have multiple opportunities to explore and engage with shapes in the context of developing analysis and comparative skills, modeling and making connections to the real world and using shapes to compose larger shapes.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on analyzing, comparing, creating, and composing shapes, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, by asking the students or send a letter home to ask parents to talk about students on how shapes (analyzing, comparing, creating, and composing) are utilized in their work or around the house/family life.	Social Studies: Students should "recognize and name symbols and activities of the United States, New Mexico, and tribes." Consider providing a connection for students to model these symbols and pictures related to the activities in terms of shapes. Language Arts: Literature can offer connections about composing and decomposing shapes such as: *Changes, Changes* by Pat Hutchins.