NEW MEXICO
Public Education Department

3.G: GEOMETRY

Cluster Statement: A: Reason with shapes and their attributes.
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:**
3.G.A.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	SMP 3: Students can construct viable arguments and critiques the reasoning of others by recognizing and applying attributes to justify classification of shapes and support their claim that some shapes may fit in many categories & a category may be subset of a larger category (i.e. a rhombus is a subset of parallelograms which is a subset of quadrilaterals), as well as support their argument that some shapes do not belong to any of the subcategories. SMP 6: Students can attend to precision by accurately using attributes to help classify shapes and see that some shapes fit in many categories & a category may be a subset of a larger category (i.e. a rhombus is a subset of parallelograms which is a subset of quadrilaterals). SMP7: Students can look for and make use of structure by identifying a quadrilateral as any closed figure with four straight sides. Furthermore, the student will apply attributes of angles (right or not) and the relationship between opposite sides being parallel or equal in length to more specifically classify and draw shapes as trapezoids, parallelograms, rectangles, rhombuses, and squares. The experience of sorting, discussing, and describing attributes of shapes will help	• Investigate characteristics of and compose triangles and quadrilaterals. • Decompose quadrilaterals. • Recognize and draw both examples and non-examples of a variety of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids. • Communicate their reasoning by explaining their thinking and sharing their solutions • Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). **Depth of Knowledge: 2** **Bloom's Taxonomy: Understand, apply**

<table>
<tr><td></td><td>students understand geometric structure and categories</td><td></td></tr>
<tr><td rowspan="3">Standard Text

3.G.A.2
Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as $\frac{1}{4}$ of the area of the shape.</td><td rowspan="3">Standard for Mathematical Practices

SMP4: Students can model with mathematics: Students analyze shapes to identify and draw cut lines that demonstrate equal pieces and name the parts and whole.

SMP6: Students can attend to precision by how they draw and cut different shapes (circles, rectangles, graph paper shapes) into pieces of equal area, how they would label each of those pieces or a set of those pieces as a unit fraction of the whole. Students can also use accurate vocabulary to explain their models as a representation of fractional parts and wholes.</td><td>Students who demonstrate understanding can:
Partition shapes into equal parts understanding that the parts have equal areas
Write a unit-fraction or a non-unit fraction for partitioned shapes
Know that shapes can be partitioned into equal areas
Describe the area of each part as a fractional part of the whole
Relate fractions to geometry by expressing the area of part of a shape as a unit fraction of the whole</td></tr>
<tr><td>Depth of Knowledge: 1-2</td></tr>
<tr><td>Bloom’s Taxonomy: Remember, Understand</td></tr>
<tr><td><u>Previous Learning Connections</u>

Connect to the many experiences with specific attributes of shapes such as triangles, hexagons and cubes. They have learned the difference between defining attributes and non-defining attributes.
Connect to drawing shapes having specified attributes, such as a given number of angles or a given number of equal faces. They identified triangles, quadrilaterals, pentagons, hexagons, and cubes. (2.G.1)</td><td><u>Current Learning Connections</u>

Connect to understanding a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. (3.NF.1)
Connect to understanding a fraction as a number on the number line; represent fractions on a number line diagram. (3.NF.2)
Connect to partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape. (3.G.2)</td><td><u>Future Learning Connections</u>

Connect to understanding angles of geometric shapes and angle measurements.
Connect to drawing points, lines, line segments, rays, angles (right, obtuse, acute) and perpendicular and parallel lines in 2-D figures. (4.G.1)
Connect to angles as geometric shapes which are formed when two rays share a common endpoint and understand concepts of angle measurement. (4.MD.5)</td></tr>
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Clarification Statement:
Students should **categorize** shapes by **attribute**. They can name **rhombuses, squares,** and **rectangles** as types of **quadrilaterals**. They can also draw an example of a quadrilateral that is not a rhombus, rectangle, or square. Students should break shapes into **equal parts** to illustrate **fractions**. They can tell you that one part of that shape is a part of a whole. For example: A student may have a circle. They will draw lines in that circle to break it into 3 equal parts. The student can tell you that one of the four pieces is 1/3 of the circle.

Common Misconceptions
Students may have difficulty recognizing the subtle differences between shapes such as the size of angle where two sides meet.

Students might mistakenly mislabel types of quadrilaterals due to vocabulary difficulty.

Students may be able to tell that squares and rectangles are related shapes but they may mistakenly label a rectangle as a kind of square rather than the other way around.

Students might be confused with the concept that equal shares of identical wholes may not have the same shape.

Students may also not understand an area model represents one out of two or three or four fractional parts without the understanding the parts are equal shares.

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 reasoning with shapes and their attributes because this will engage visual learners and help students to relate vocabulary of shapes and their attributes to concrete examples.

Pre-teach (intensive) *What critical understandings will prepare students to access the mathematics for this cluster?*

- 2.G.A.1: This standard provides a foundation for work with reasoning with shapes and their attributes because this standard asks students to begin reasoning with shapes as well as laying the groundwork for key vocabulary that will be repeated in the current work of the grade. 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 reason with shapes and their attributes benefit when learning experiences include ways to recruit interest such as supporting culturally relevant connections (i.e home culture) because it helps create support for student understanding by building connections through background knowledge and language to support mathematical concepts.

Build
Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with reason with shapes and their attributes benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that emphasizes effort, improvement, and achieving a standard rather

than on relative performance because students need to feel empowered to self-regulate by creating motivation to reach their goals through support and guidance.

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 reason with shapes and their attributes 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 are able to benefit from learning experiences that create a safe environment to learn and understand that attends to students as individual learners.

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 reason with shapes and their attributes benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as composing in multiple media such as text, speech, drawing, illustration, comics, storyboards, design, film, music, dance/movement, visual art, sculpture, or video because it's important to provide multiple modalities for expression, so students are able to express knowledge, ideas, and concepts in the learning environment.

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 reason with shapes and their attributes 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 making explicit cross-curricular connections (e.g., teaching literacy strategies in the social studies classroom) because the more connections that students make the more meaningful and relevant connections can be made and retained to the subjects and skills they are 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?*

- For example, students may benefit from re-engaging with content during a unit on reasoning with shapes and their attributes by clarifying mathematical ideas and/or concepts through a short mini-lesson because this standard is heavy with mathematical vocabulary and allowing students time to clarify their understanding of these ideas will be key in helping them to meet the standard.

Re-teach (intensive) *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit reasoning with shapes and their attributes by offering opportunities to understand and explore different strategies because this will allow students to find methods for reasoning with shapes that fit their mental schema as individual learners.

Extension

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

- For example, some learners may benefit from an extension such as the opportunity to understand concepts more quickly and explore them in greater depth than other students when studying

reasoning with shapes and their attributes because this allows them to explore higher level applications of reasoning with shapes and to move at a pace that is more appropriate for them rather than working with the rest of the class and then receiving "extra" work.

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?

Task: When planning with your HQIM, consider how to modify tasks to represent the prior experiences, culture, language and interests of your students to "portray mathematics as useful and important in students' lives and promote students' lived experiences as important in mathematics class." Tasks can also be designed to "promote social justice [to] engage students in using mathematics to understand and eradicate social inequities (Gutstein 2006)." For example, when studying reasoning with shapes and their attributes the types of mathematical tasks are critical because there are a great many concrete ways in which this area of study can be applied to students' lives and experiences therefore there is a rich groundwork on which to build understanding of the content through tasks that are aimed at student experiences.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: http://tasks.illustrativemathematics.org/content-standards/3/G/A/2/tasks/1502
Halves, Thirds, and Sixths Task
Addresses Standard 3.G.A.2 - Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.
The purpose of this task is for students to use their understanding of area as the number of square units that covers a region (3.MD.6), to recognize different ways of representing fractions with area (3.G.2), and to understand why fractions are equivalent in special cases (3.NF.3.b).

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on reasoning with shapes and their attributes, 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, for example, studying the architecture of different cultures to investigate how shapes and their attributes are utilized in different ways.	Language Arts: Read *Keeping Quilt* by Patricia Polacco. Explore geometry of quilt designs. Student create a quilt design using plane shapes. Art: Architecture/design by finding shapes in buildings.