NEW MEXICO
Public Education Department

7.G: GEOMETRY

Cluster Statement: A: Draw construct and describe geometrical figures and describe the relationships between them.
Additional Cluster (Students should spend much 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:**
7.G.A.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	SMP 2: Students reason abstractly and quantitatively as they are expected to think about the relationships between the numbers, not just compute them. SMP 4: Students model with mathematics by using opportunities to represent the problem, situation and/or their solution symbolically, graphically, and/or pictorially. Students can apply the geometry concepts they know to solve problems arising in everyday life, society and the workplace. This may include applying area and surface of 2-dimensional figures to solve interior design problems or surface area and volume of 3-dimensional figures to solve architectural problems.	• Solve problems involving scale drawings. • Calculate length and area from scale drawings. • Reproduce a scale drawing at a different scale. **Webb's Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Remember, Understand
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
7.G.A.2: Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	SMP 5: Students consider available tools that might include concrete models, a ruler, a protractor, or dynamic geometry software such as virtual manipulatives and simulations. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.	• Draw a geometric figure with given conditions. • Explain why a set of given conditions does (or does not) produce the desired figure. • Measure side lengths and angle measures with given tools. **Webb's Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Remember, Understand

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<table>
<tr>
<td>Standard Text

7.G.A.3: Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.</td>
<td>Standard for Mathematical Practices

SMP 6: Students attend to precision by refining their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students determine quantities of side lengths represented with variables, specify units of measure, and label geometric figures accurately. Students use appropriate terminology when referring to geometric figures.

SMP 8: Students look for and express regularity in repeated reasoning by noticing if calculations are repeated and looking both for general methods and for shortcuts.</td>
<td>Students who demonstrate understanding can:
Identify the two-dimensional cross-sections that are formed by slicing three-dimensional figures.
Describe the resulting face shape from cuts made parallel and perpendicular to the bases of right rectangular prisms and pyramids.
Webb’s Depth of Knowledge: 1-3

Bloom’s Taxonomy:
Understand, Apply, Analyze</td>
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<td><u>Previous Learning Connections</u>
In 5th grade, learners classify two-dimensional figures in a hierarchy based on properties. In 6th grade, learners understand and solve ratios and rates, generate equivalent ratios, and use ratios and rates to solve problems. In 6th grade, learners calculate perimeter & area of two-dimensional figures and find volume of 3D figures. In 6th grade, students explore the characteristics of a right rectangular prism and rectangular pyramid.</td>
<td><u>Current Learning Connections</u>
In 7th grade, learners can expand their work with expressions and equations as they write and solve equations related to similar figures, scale drawings, and the missing angle measures of triangles. In 7th grade, learners’ work with similar figures supplements the concepts they have already learned (or will be learning) when studying direct variation and proportional reasoning.</td>
<td><u>Future Learning Connections</u>
In 8th grade, learners connect their previous understanding of similar figures with the properties of translations, rotations, reflections and dilations. In 8th grade, learners build on their experimentation with triangles and start to make informal arguments about their properties, such as angle sum, exterior angles of a triangle, and angles created when parallel lines are cut by a transversal line. In 8th grade, learners build on knowledge of triangle side lengths which leads to the investigation of the Pythagorean Theorem and its converse.</td>
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<td colspan="3">Clarification Statement:
Students work to draw and construct geometric shapes, particularly triangles from given angle and side measurements. Students find relationships and connections between a 3D figure and slicing it into a plane figure. Students use scale drawings to find the actual lengths from scale drawing or redrawing a scale drawing to another scale.</td>
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Common Misconceptions:
7.G.A- To minimize errors, have students use graph paper to make their scale drawings. Students without a solid grasp of measurement units such as those for area, will have difficulty with this standard, as will students who need more help with proportional reasoning. Use the opportunity to measure the classroom or other hands on measurements to reinforce measurement units for those students.

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?*

- During a unit focused on drawing, constructing, and describing geometrical figures and describe the relationships between them, 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, learning about geometric shapes are used in cultural art and design connects the students' home connections to the mathematical principles they are learning at school.

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

- 5.NF.B.4: This standard provides a foundation for work with solving problems involving scale drawings of geometric figures because students will do best if they have procedural fluency with their use of fractions with operations. 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:

- For example, learners engaging with drawing, constructing and describing geometrical figures and describing the relationships between them benefit when learning experiences ensure information is accessible to learners through a variety of methods for navigation, such as drawing freehand with ruler and protractor, using physical manipulatives, and technologies because students may struggle with limited modalities of engaging with the geometrical figures, a selection of navigational tools across ability groups will allow students to develop conceptual understanding of the construction and relationship between geometrical figures.

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

- For example, learners engaging with drawing, constructing and describing geometrical figures and describing the relationships between them benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as encouraging and supporting opportunities for peer interactions and supports (e.g., peer-tutors) because students will deepen their conceptual understanding through the process of explaining how their geometrical figures meet certain conditions with their peers. This allows students to make connections to what they already know to what they are learning as they make sense of their understanding with each other.

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 drawing, constructing and describing geometrical figures and describing the relationships between them benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity and comprehensibility for all learners such as embedding visual, non-linguistic supports for vocabulary clarification (pictures, videos, etc.) because students' understanding is supported when math vocabulary and symbols are processed with students in multiple ways. Providing charts/materials with students creates shared language around terms and symbols and provides for clarification and deeper understanding to allow for access for all students.

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 drawing, constructing and describing geometrical figures and describing the relationships between them benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing sentence starters or sentence strips because students will be able to describe geometrical figures and the relationships between them when given the opportunity to negotiate their understanding through dialogue with peers. When educators provide sentence starters/sentence strips, students are supported in practicing the language structures and functions expected to be used with the mathematical content.

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 drawing, constructing and describing geometrical figures and describing the relationships between them 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 incorporating explicit opportunities for review and practice because student learning deepens with given opportunities to practice and review concepts. Students make connections from prior learning to new information when allowed time to manipulate the new information through multiple exposures. Students develop a variety of strategies when able to engage with concepts over time.

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 re-engaging with content during a unit on drawing, constructing, and describing geometrical figures and describing the relationships between them by clarifying mathematical ideas and/or concepts

through a short mini-lesson because when students explain their thinking and have time to process their learning misconceptions or gaps in learning can be addressed.

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 to drawing, constructing, and describing geometrical figures and describing the relationships between them by helping students move from specific answers to generalizations for certain types of problems because at times students can become too focused on the specific area within the cluster without stepping back to see the connection across the cluster, such as, students using a tool to measure the angles of triangles and are missing the larger connections of geometric principles across shapes for determining geometric conditions.

Extension

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 drawing, constructing, and describing geometrical figures and describing the relationships between them, some learners may benefit from an extension such as open ended tasks linking multiple disciplines because students benefit when math understandings are applied to other areas of content and real-world application such as architecture, art, reconstructive surgery, etc.

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?

Facilitating Meaningful Mathematical Discourse: Mathematics discourse requires intentional planning to ensure all students feel comfortable to share, consider, build upon and critique the mathematical ideas under consideration. When student ideas serve as the basis for discussion we position them as knowers and doers of mathematics by using equitable talk moves students and attending to the ways students talk about who is and isn't capable of mathematics we can disrupt the negative images and stereotypes around mathematics of marginalized cultures and languages. "A discourse-based mathematics classroom provides stronger access for every student — those who have an immediate answer or approach to share, those who have begun to formulate a mathematical approach to a task but have not fully developed their thoughts, and those who may not have an approach but can provide feedback to others." For example, when studying drawing, constructing, and describing geometrical figures and describing the relationships between them facilitating meaningful mathematical discourse is critical because the standards are asking students to solve, create and describe geometric figures which lends itself to providing opportunities to purposely plan discourse for students to share their ideas and methods. In that discourse utilizing protocols that validate students' contributions connected with home culture and home language will lower students' affective filters and allow them to take risks. The protocols need to be created in a way that removes teacher's, often unknowingly, biases. These protocols should provide students opportunities to rehearse their ideas in a small group or team and then a random process of calling on students to share their thinking to the class. This affirms that all contributions are wanted and needed to build the knowledge of the whole These types of processes affirm students that their home cultures and languages are positive assets as their contributions become a part of the curriculum. How we set up this process

is crucial. We need to have direct conversations about how different cultures talk, show body language, respond, etc. so students develop a class culture that is open and affirming.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: https://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/107

Floor Plan
Mariko has an 80:1 scale-drawing of the floor plan of her house. On the floor plan, the dimensions of her rectangular living room are 1 7/8 inches by 2 ½ inches.
What is the area of her real living room in square feet?
Answer: 208 1/3 ft^2

This type of assessment question requires students to translate between measurements given in a scale drawing and the corresponding measurements of the object represented by the scale drawing. If used in an instructional setting, it would be good for students to have an opportunity to see other solution methods, perhaps by having students with different approaches explain their strategies to the class. Students who can only solve this by first converting the linear measurements will have a hard time solving problems where only area measures are given; scaffold this by having students work in groups, partners; and/or provide prefilled worksheets.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on drawing, constructing, and describing geometrical figures and describe the relationships between them, 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, learning about geometric shapes are used in cultural art and design connects the students' home connections to the mathematical principles they are learning at school.	Science: Model the Solar System at Scale Art: Geometric Drawings/ Architectural Drawing