NEW MEXICO
Public Education Department

4.G: GEOMETRY

Cluster Statement: A: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
Additional 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:**
4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	SMP3: Students can construct viable arguments and critique the reasoning of others by explaining the differences between points, lines, line segments, rays, angles, and perpendicular and parallel lines. SMP6: Students can use appropriate tools strategically when drawing points, lines, line segments, rays and angles.	• Draw/identify points, lines, line segments • Draw/identify rays • Draw/identify angles (right, acute, obtuse) • Draw/identify perpendicular lines • Draw/identify parallel lines **Webb's Depth Of Knowledge:** 1,2 **Bloom's Taxonomy:** Understand and Apply
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	SMP 3: Students can construct viable arguments and critique the reasoning of others by sorting and classifying 2D figures, including types of triangles, and explain their thinking using Tier 3 vocabulary SMP 5: Students can use appropriate tools strategically when they select tools to verify their thinking when sorting 2D figures.	• Classify 2D figures with parallel lines • Classify 2D figures with perpendicular lines • Recognize 2D figures based on angle size • Recognize and identify right triangles **Webb's Depth of Knowledge:** 1, 2 **Bloom's Taxonomy:** Understand

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Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	SMP3: Students can construct viable arguments and critique the reasoning of others by explaining why or why not figures have line symmetry SMP 6: Students can attend to precision by ensuring figures are folded EXACTLY in half	• Recognize line symmetry in 2D figures as a folded line creating two matching parts • Identify 2D figures with line symmetry • Draw lines of symmetry in 2D figures • Identify that 2D shapes can consist of more than one line of symmetry **Webb's Depth of Knowledge:** 1,2 **Bloom's Taxonomy:** Understand
<u>Previous Learning Connections</u> • Connect to recognizing attributes of quadrilaterals, including parallel lines and right angles. (3.G.1) • Connect to identifying and distinguishing between attributes and non-attributes of trapezoids, squares, rectangles, circles, hexagons, rhombuses and parallelograms and had to build and draw shapes that possess these attributes. (2.G.1) • Connect to partitioning shapes into halves. (2.G.3, 2.G.3)	**<u>Current Learning Connections</u>** • Connect to recognizing angles as geometric figures that form wherever two rays share a common endpoint, and understand concepts of angle measurement. (4.MD.5)	**<u>Future Learning Connections</u>** • Connect to understanding attributes belong to a category of two-dimensional figures belong to subcategories of that category. **(5.G.3)** • Connect to classifying two-dimensional figures based on properties. **(5.G.4)** • Connect to understanding reflection, rotation, and translation. **(8.G.2)**

Clarification Statement:

- 4.G.A.1: **Points**, **lines**, **segments**, **rays**, and **angles** are the building blocks of the **geometry.** Point and line are undefined terms because they do not have definitions. We can understand these terms by thinking of examples of what a point and line might look like. A **point** can be a tip of a pencil; it has position but no dimension. Euclid described a line by saying that through any two points there is always a line and every line contains at least two points. **Line segment** is part of a line and it contains two endpoints meaning it has a beginning and endpoints. A **line** contains an infinite number of points and has no endpoints and goes on and on forever. A **ray** is part of a line that has one endpoint and extends forever in only one direction. **Parallel lines** are lines that never cross and are the same distance apart. **Perpendicular lines** intersect to form right angles. Essential vocabulary for this standard includes: point, line, line segment, ray, parallel lines, perpendicular lines, intersecting lines, and endpoint.

- 4.G.A.2: This standard requires students to describe **parallel** and **perpendicular** lines. Students need to **classify 2D figures** based on parallel and/or perpendicular line segments as well as classify them by their **angles**. Students need to be able to classify triangles by their angles and by their side lengths. Essential vocabulary for this standard includes: parallel, perpendicular, acute, obtuse, right, right

triangle, isosceles, scalene, equilateral, and equiangular.

- 4.G.A.3: This standard requires students to recognize a **line of symmetry**. A line of symmetry divides a figure into two **congruent** mirrored parts. A figure may have multiple lines of symmetry. The folded line is called a line of symmetry. A figure is symmetrical if it has a line of symmetry. This standard also requires students to identify figures with line **symmetry.** Students are required to draw lines of symmetry within figures. Essential vocabulary for this standard includes **symmetrical**, symmetry, and line of symmetry.

Common Misconceptions

- Students may confuse lines, line segments, and rays.
- Students may confuse acute and obtuse angles.
- Students may confuse perpendicular and parallel lines.
- Students may confuse the types of triangles.
- Students may confuse matching parts that are created by halving then rotating a part of the 2D figure. Halves must fold over to match. No other movement is allowed to create a of line symmetry.
- Students may think figures can only have one line of symmetry; some figures have more than one line of symmetry. Some figures do not have any lines of symmetry.

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 rehearses new mathematical language when studying drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles because this is the first time that students are exposed to rays, angles, and perpendicular and parallel lines, and these are the building blocks of geometry, so a strong foundational understanding is crucial. This cluster has vocabulary that is cluster specific. Many of these vocabulary words are new, but some are reviewed from previous grade levels. Students need practice in using and interacting with mathematical language and embedding vocabulary for this cluster.

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 drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles because this is where students are introduced to recognizing that different figures have different attributes, including angles and lines. 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

Perception: *How will the learning for students provide multiple formats to reduce barriers to learning, such as providing the same information through different modalities (e.g., through vision, hearing, or touch) and providing information in a format that will allow for adjustability by the user?*

- For example, learners engaging with draw and identify lines and angles, and classify shapes by properties of their lines and angles benefit when learning experiences ensure information is accessible to learners with sensory and perceptual disabilities, but also easier to access and comprehend for many others such as offering alternatives for visual information such as real words and pictorial representation that students can move

around and manipulate because this standard asks students to work with two dimensional representations that can seem very abstract to students. When they can move and manipulate two dimensional shapes, they can begin to think in a more abstract way.

Build

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

- For example, learners engaging with drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles 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 develop and practice explicit awareness of and vocabulary for many concepts they have been developing, including points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Vocabulary should be used/modeled by teacher as well.

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 and identifying lines and angles, and classifying shapes by properties of their lines and angles benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as providing graphic symbols with alternative text descriptions because it is important to construct examples of these concepts, such as drawing angles and triangles that are acute, obtuse, and right to help students form richer concept images connected to verbal definitions and to have a more complete and accurate mental images and associated vocabulary for geometric ideas. It is also important to develop nonexamples to associate with this cluster vocabulary.

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 and identifying lines and angles, and classifying shapes by properties of their lines and angle 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 students will learn to apply these concepts in varied contexts. For example, they learn to use a digital protractor to measure digital angles. Practice with different types of protractors is beneficial for students.

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 and identifying lines and angles, and classifying shapes by properties of their lines and angle 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 angles are an abstract concept for students, so linking it to something relevant and connecting the concept to real world

applications will help students apply their skills into usable knowledge (e.g., using angles to engineer/design something, athletes using angles to increase performance).

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 drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles by clarifying mathematical ideas and/or concepts through a short mini-lesson because students develop explicit awareness of and vocabulary for many concepts they have been developing, including points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines, and clarifying these terms will help students form richer concept images connected to verbal definitions.

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 drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles by confronting student misconceptions because general misunderstandings regarding specific attributes exist when student are not exposed to multiple opportunities to see shapes visually.

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 open ended tasks linking multiple disciplines when studying drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles because it is important for students to link such an abstract concept into concrete situations. Students can use their knowledge of shapes and attributes to design a room/building/city, use their knowledge of lines and engineer a road system for a town, 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?

Equity Based Practice (Using and Connecting Mathematical Representations): The standard for mathematical practice, use appropriate tools strategically, provides a strong foundation to validate and bridge for students. Mathematical representations are mathematical tools. The linguistic and cultural experiences of students provide different and varied types of representations for solving mathematical problems. By explicitly encouraging students to use multiple mathematical representations students can draw on their "mathematical, social, and cultural competence"[1]. By valuing these representations and discussing them we can connect student representations to the representations of school mathematics and build a bridge for students to position them as competent and capable mathematicians. For example, when studying drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles the use of mathematical representations within the classroom is critical because students can draw on their own knowledge based on cognates, and can

[1] Boston et al., 2017, pp. 122

express their knowledge, questions, and reasoning using multiple representations. For example, a student might make the connection between parallel and paralela, and be able to represent parallel lines with the symbol II.
Standards Aligned Instructionally Embedded Formative Assessment Resources: **Source:** Illustrative Mathematics **Standard:** 4.G.A.1 **Task:** The Geometry of Letters

The Geometry of Letters

Letters can be thought of as geometric figures.

A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z

a.
How many line segments are needed to make the letter A? How many angles are there? Are they acute, obtuse, or right angles? Are any of the line segments perpendicular? Are any of the line segments parallel?

b. We can build all of these letters from line segments and arcs of circles. Build all of the capital letters with the smallest number of "pieces," where each piece is either a line segment or an arc of a circle.

c. Which letters have perpendicular line segments?

d. Which letters have parallel line segments?

e. Which letters have no line segments?

f. Do any letters contain both parallel and perpendicular lines?

g. What makes the lower case letters "i" and "j" different than all of the capital letters?

This type of assessment question requires students to work with correct geometric terminology for this standard. This standard asks the student to categorize letters dependent on their attributes, which is seen in this cluster with 2 dimensional shapes. This task can be used in within lessons for this standard or at the end of the unit. This task will allow teacher to determine vocabulary or misconceptions that will need reteach. This task can also be extended to other standards within this cluster, for example, finding and drawing lines of symmetry for letters.

Relevance to families and communities:	**Cross-Curricular Connections:**
During a unit focused on drawing and identifying lines and angles, and classifying shapes by properties of their lines and angles, 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 the different ways we use lines, angles and shapes within different careers (construction, farming, engineering). This could also be extended to shapes found in different cultural aspects (pottery, ceremonial dress, etc.)	Science: In fourth grade the NGSS recommends students will study waves and their application in technology for transfer. Students will identify rays and angles in drawings of wave propagation. The NGSS also recommends students will recognize symmetry, or lack of symmetry, in the internal and external structures of plants and animals.