NEW MEXICO
Public Education Department

7.G: GEOMETRY

Cluster Statement: B: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
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:**
7.G.B.4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	SMP 1: Students can make sense of problems and persevere in solving them by solving problems involving geometric principles. SMP 4: Students can model with mathematics by using geometric models to solve problems.	• Explain the relationships between radius and diameter. • Explain that the ratio of circumference to diameter can be expressed as pi. • Apply formulas to determine area, circumference, diameter, and radius of a circle to solve real-world problems. • Solve real world problems involving circumference and area of a circle.
		Webb's Depth of Knowledge: 1-2
		Bloom's Taxonomy: Understand, Apply
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
7.G.B.5: Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	SMP 1: Students can make sense of problems and persevere in solving them by solving problems involving geometric principles. SMP 4: Students can model with mathematics by using geometric models to solve problems.	• Use understandings of angles (supplementary, complementary, vertical, adjacent) and deductive reasoning to write and solve equations. • Write and solve equations based on a diagram of intersecting lines with some known angle measures. • Justify angle measurements using facts about complementary, supplementary, vertical and/or adjacent angles.
		Webb's Depth of Knowledge: 1-2
		Bloom's Taxonomy: Understand, Apply

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<table>
<tr>
<td>Standard Text

7.G.B.6: Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.</td>
<td>Standard for Mathematical Practices

SMP 1: Students can make sense of problems and persevere in solving them by solving problems involving geometric principles.

SMP 4: Students can model with mathematics by using geometric models to solve problems.</td>
<td>Students who demonstrate understanding can:
• Calculate the area, volume and surface area of two-dimensional and three-dimensional objects.
• Explain why the formula works and how the formula relates to the measure (area and volume) and the figure.
• Solve real-world problems involving geometry concepts such as area, volume, and surface area.
• Justify their solutions to problems involving area, volume, and surface area

Webb's Depth of Knowledge: 1-2

Bloom's Taxonomy:
Apply</td>
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<td><u>Previous Learning Connections</u>
• In 4th grade, students learned how to find the area of rectangles, special quadrilaterals, triangles, and polygons. In 6th grade, students began to explore volume, finding the volume of rectangular prisms, find surface area using nets, and find volume of rectangular prism.</td>
<td><u>Current Learning Connections</u>
• Throughout 7th grade, students will use their knowledge of angle measurements along with algebra to determine missing information about particular geometric figures.</td>
<td><u>Future Learning Connections</u>
• In 8th grade, learners use the formulas from within this cluster to find the volume of cones, cylinders, and spheres.</td>
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<td colspan="3">Clarification Statement:
Students work on geometric problem solving. Students use basic information such as area, surface area, and volume formulas and facts about types of angles (supplementary, complementary, vertical, and adjacent) to solve real-world problems.</td>
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<tr>
<td colspan="3">Common Misconceptions
7.G.B- The formulas for the area of a circle and the circumference of a circle are often confused by students. Teaching students to memorize these formulas without any understanding of how they relate to a circle increases the chance for confusion. Build the understanding before presenting the formulas.</td>
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<td colspan="3">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?</td>
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- For example, some learners may benefit from targeted pre-teaching that introduces new representations (e.g., scaled images) when studying Real-Life And Mathematical Problems Involving Angle Measure, Area, Surface Area, And Volume because students can use this skill to solve real-world mathematical problems.

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

- 6.G.A.1: This standard provides a foundation for work with solving Real-Life and Mathematical Problems Involving Angle Measure, Area, Surface Area, And Volume because solving problems involving areas and volumes provide a context for developing and using equations. 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 solving real-life and mathematical problems involving angle measure, area, surface area, and volume benefit when learning experiences include ways to recruit interest such as utilizing classroom instructional routines to involve all students because providing instructional routines consistently that support the output of all students' voices send the message that all students are capable and their ideas are valued so in the long run students will persevere in challenging work.

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

- For example, learners engaging with solving real-life and mathematical problems involving angle measure, area, surface area, and volume benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as constructing communities of learners engaged in common interests or activities because students will gain skills of communication and collaboration in the activities that this cluster lends itself to as students apply their mathematical understandings to solving real-live problems.

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 solving real-life and mathematical problems involving angle measure, area, surface area, and volume benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as making connections to previously learned structures because students have had previous learnings in the area most of the areas of this cluster and explicit instruction that makes connections for students with this content will support students to connect previously learned knowledge to new knowledge.

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 solving real-life and mathematical problems involving angle measure, area, surface area, and volume benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing virtual or concrete mathematics manipulatives because students will benefit in giving explanations and descriptions of their created concrete and virtual geometric representations.

Internalize

Executive Functions: *How will the learning for students support the development of executive functions to allow them to take advantage of their environment?*

- For example, learners engaging with solving real-life and mathematical problems involving angle measure, area, surface area, and volume benefit when learning experiences provide opportunities for students to set goals; formulate plans; use tool and processes to support organization and memory; and analyze their growth in learning and how to build from it such as providing differentiated models of self-assessment strategies because the ability to self-assess and apply adaptive reasoning supports students to become flexible critical thinkers as these standards are expecting students to apply a geometric concepts to a variety of real-life problems. For example, students can receive feedback from peers and reassess the accuracy of their work.

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 solving Real-Life And Mathematical Problems Involving Angle Measure, Area, Surface Area, And Volume by critiquing student approaches/solutions to make connections through a short mini-lesson because they can see multiple ways to solve a problem or reasons why a solution is incorrect or correct.

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 some students may benefit from intensive extra time during and after a unit solving Real-Life And Mathematical Problems Involving Angle Measure, Area, Surface Area, And Volume by offering opportunities to understand and explore different strategies because they can see multiple ways to solve a problem or reasons why a solution is incorrect or incorrect and find new ways to approach a problem

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 For example, some learners may benefit from an extension such as in-depth, self-directed exploration of self-selected topics when studying solving Real-Life And Mathematical Problems Involving Angle Measure,

	Area, Surface Area, And Volume because there are many applications of geometry in life that a student might have interest in, for example, building a treehouse

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?

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". 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 Solving real-life and mathematical problems involving angle measure, area, surface area, and volume the use of mathematical representations within the classroom is critical because understanding how to read or interpret geometry drawings and the nomenclature for representations can allow students to draw on their experiences.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: http://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/107
The circumference of a circle is approximately 37.7 centimeters. Enter the radius of the circle, in centimeters. Round your answer to the nearest tenth.
Answer Key: 6.0

This type of assessment question requires students to work with area (begins in grade 3 where they develop an understanding of area as a two-dimensional measurement.) By grade 6, students extend that earlier work and find areas of triangles, special quadrilaterals and other polygons. This item shows the expectation for grade 7 where students are expected to know the formula for the circumference of a circle and use it to solve problems. Some assessment programs provide the circumference formula for items like the one shown, and others use a more literal interpretation of the phrase ''know the formulas'' found in standard 7.G.B.4 and do not provide those formulas for students. Item specifications or other documentation for specific programs can be helpful in determining the approach a particular assessment takes on this standard.

Relevance to families and communities:	**Cross-Curricular Connections:**[1]
During a unit focused on solving real-life and mathematical problems involving angle measure, area, surface area, and volume, 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,	*Science and Technology*: Science and math are intimately connected, particularly in fields such as chemistry, astronomy and physics. Students who can't master basic arithmetic skills will struggle to read scientific charts and graphs. More complex math, such as geometry, algebra and calculus, can help students solve chemistry problems,

[1] Thompson, Van. (2020, June 24). How Is Mathematics Used in Other Subjects?. *sciencing.com*. Retrieved from https://sciencing.com/how-is-mathematics-used-in-other-subjects-9861185.html

learning about how geometry problems are used in real life to solve an issue like, purchasing a new air conditioner gives students a connection on different ways solving real-life and mathematical problems involving angle measure, area, surface area, and volume are used in the home and community.	understand the movements of the planets and analyze scientific studies. Math is also important in practical sciences, such as engineering and computer science. Students may have to solve equations when writing computer programs and figuring out algorithms. Nursing majors may have great bedside manner. but they also need to know how to precisely calculate dosages to pass their courses. *Social Studies:* Social studies classes, such as history, often require students to review charts and graphs that provide historical data or information on ethnic groups. In geography classes, students might need to understand how the elevation of an area affects its population or chart the extent to which different populations have different average life spans. Knowledge of basic mathematical terms and formulas makes statistical information accessible *Literature and Writing:* Literature might seem like a far cry from math but mastering basic arithmetic can enable students to better understand poetry. The meter of poetry, the number of words to include in a line and the effect that certain rhythms have on the reader are all products of mathematical calculations. At a more mundane level, math can help students plan reading assignments in literature classes by discerning their average reading time and estimating how long it will take them to read a particular work. The linear, logical thinking used in mathematical problems can also help students write more clearly and logically. *Art/Music:* Students interested in pursuing careers in theater, music, dance or art can benefit from basic mathematical knowledge. Musical rhythm often follows complex mathematical series, and math can help students learn the basic rhythms of dances used in ballet and theater performances. Art thrives on geometry, and students who understand basic geometric formulas can craft impressive art pieces. Photographers use math to calculate shutter speed, focal length, lighting angles and exposure time.