NEW MEXICO
Public Education Department

1.G: GEOMETRY

Cluster Statement: A: Reason with shapes and their attributes.

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:**
1.G.A.1: Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	SMP 6: Students can attend to precision by using clear, specific definitions to define attributes. SMP 7: Students can look for and make use of structure by identifying similarities and differences based on defining and non-defining attributes.	• Explain the difference between defining attributes (e.g., sides, angles, faces) and non-defining attributes (e.g., color, orientations, overall size). • Identify two-dimensional shapes including rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles • Identify three-dimensional shapes cubes, right rectangular prisms, right circular cones, and right circular cylinders. • Construct and draw a shape when given defining attributes. **Depth of Knowledge:** 1-2 **Bloom's Taxonomy:** Remember, Apply and Analyze
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
1.G.A.2: Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.	SMP 1: Students can make sense of problems and persevere in solving them by recognizing created composite shapes as a combination of single shapes. SMP 5: Students can use tools by using manipulatives, such as pattern blocks, to build composite shapes.	• Create new shapes using two-dimensional and/or three-dimensional shapes. • Identify the name of the composite shape as well as the names of each shape that forms it. • Solve shape puzzles, create shape designs, and maintain a shape as a unit. **Depth of Knowledge:** 2-3

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

1.G.A.3: Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.</td><td rowspan="3">Standard for Mathematical Practices

SMP 6: Students can attend to precision by using terms such as halves, fourths and quarters to describe the partitioning of shapes.

SMP 7: Students can look for and make use of structure by recognizing that as they create more parts the parts get smaller.</td><td>Students who demonstrate understanding can:
• Partition (divide) a circle and rectangle into two and four equal parts.
• Describe the equal parts of a circle and rectangle with words (halves, fourths, and quarters).
• Describe the whole by the number of equal parts (e.g., two halves make a whole).
• Explain the more equal parts in circle or rectangle, the smaller the parts.</td></tr>
<tr><td>Depth of Knowledge: 1-2</td></tr>
<tr><td>Bloom's Taxonomy:
Understand, Apply and Analyze</td></tr>
<tr><td><u>Previous Learning Connections</u>
• Connect to naming regular shapes (squares, circles, rectangles, triangles, hexagons, cubes, cones, cylinders and spheres) and analyzing and comparing these shapes using formal and informal language. (K.G.1-3)
• Connect to composing simple shapes to form larger shapes. (K.G.6)</td><td><u>Current Learning Connections</u>
• Connect to telling and writing time to the hour and to the half-hour and thinking about equality, including the idea of equal shares. (1. MD.3)</td><td><u>Future Learning Connections</u>
• Connect to working with shapes, drawing and analyzing shapes with a given number of angles and faces and identifying triangles, quadrilaterals, hexagons and cubes. (2.G.1)
• Connect to partitioning shapes into equal shares, adding in thirds and deepening understanding of part and whole relationship by stating that a whole can be made up of three thirds, four fourths, etc. and that the equal shares of identical wholes do not have to be the same shape. (2.G.2-3)</td></tr>
<tr><td colspan="3">Clarification Statement:</td></tr>
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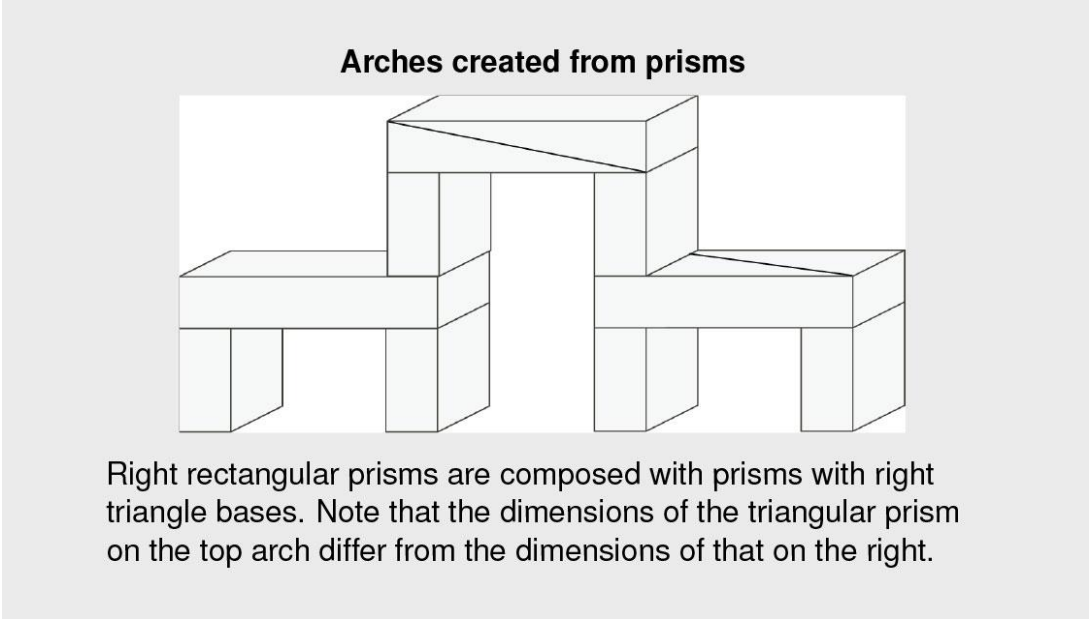
- 1.G.A.1:



[Students] differentiate between **geometrically defining attributes** (e.g., "**hexagons** have six **straight sides**") and **nondefining attributes** (e.g., color, overall **size**, or **orientation**). For example, they might say of this **shape**, "This must go with the **squares**, because all four sides are the **same**, and these are **square corners**. It doesn't matter which way it's turned" (MP3, MP7). They explain why the variants shown earlier (p. 6) are members of familiar shape **categories** and why the difficult distractors are not, and they draw examples and nonexamples of the shape categories (MP7, MP8).

- 1.G.A.2: From the early beginnings of informally matching shapes and **solving** simple shape puzzles, students learn to intentionally **compose** and **decompose plane** and **solid figures** (e.g., putting two **congruent isosceles triangles** together with the explicit purpose of making a **rhombus**), building understanding of **part-whole relationships** as well as the **properties** of the original and **composite shapes**. In this way, they learn to perceive a combination of shapes as a single new shape (e.g., recognizing that two isosceles triangles can be combined to make a rhombus, and simultaneously seeing the rhombus and the two triangles).

Common Misconceptions

● Students may find the terms closed and unclosed (open) confusing.

● Students may have difficulty visualizing or filling in shape puzzles.

● Students may believe the size of the shares is directly related to the number of shares. For example, since there are four fourths in a whole and only two halves in a whole, fourths must be bigger.

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 reasoning about shapes and their attributes because students are being introduced to new language that is connected to shapes, such as partition, fourths, halves, and quarters. Rehearsing the new language prior to teaching the concepts will allow students to have the opportunity to be exposed to it prior to it being taught to them.

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

- K.G.B.4: This standard provides a foundation for work with reasoning about shapes and their attributes because students have been exposed to analyzing and comparing shapes according to their attributes. 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 reasoning about shapes and their attributes benefit when learning experiences include ways to recruit interest such as creating an accepting and supportive classroom climate because shapes and attributes can be a challenging concept for some students, so it is important for students to feel safe to take risks as they begin to explore new shapes and their attributes.

Build

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

- For example, learners engaging with reasoning about shapes and their attributes benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as creating cooperative learning groups with clear goals, roles, and responsibilities because this will allow students to work together as they begin to learn about different shapes and their attributes. Also, students would be able to work together as they discover how to partition shapes into half, fourths and quarters.

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 reasoning about 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 embedding visual, non-linguistic supports for vocabulary clarification (pictures, videos, etc.) because it would be helpful for students to see the various shapes they are learning and their attributes. Also, students need to see visuals of the different ways a shape can be partitioned into halves, fourths and quarters.

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 reasoning about shapes and their attributes benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing sentence starters or sentence strips <sentence frames for using in an example> because this will provide a level of support for students to start to describe various types of shapes according to their attributes..

Internalize

Self-Regulation: *How will the design of the learning strategically support students to effectively cope and engage with the environment?*

- For example, learners engaging with reasoning about shapes and their attributes benefit when learning experiences set personal goals that increase ownership of learning goals and support healthy responses and interactions (e.g., learning from mistakes), such as offering devices, aids, or charts to assist students in learning to collect, chart and display data about the behaviors such as the mathematical practices for the purpose of monitoring and improving because it would be helpful for students to organize the various types of shapes and their attributes in a chart to display their understanding. Also, a chart will be able to provide support to students that need to see how shapes can be partitioned in different ways (halves, fourths and quarters).

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 about shapes and their attributes by revisiting student thinking through a short mini-lesson because students might not have a strong understanding of the various types of attributes the different shapes have. Also, students might need to be exposed to partitioning shapes into fourths, halves and quarters as this is a new concept for 1st graders.

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 about shapes and their attributes by confronting student misconceptions because students might be confused on the various types of attributes of the shapes. Also, students may have misconceptions on how to partition shapes into halves, fourths and quarters depending on the wording that is used.

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 reasoning about shapes and their attributes because students can get a deeper understanding of shapes and partitioning shapes when working with an open ended task.

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 reasoning about shapes and their attributes the use of mathematical representations within the classroom is critical because promoting collaborative teaching and learning with student-to-student and student-to-teacher dialogues to encourage students' participation. For example, a teacher might plan "turn and talks" during a math lesson to help students discuss their understanding of the content using appropriate terminology.

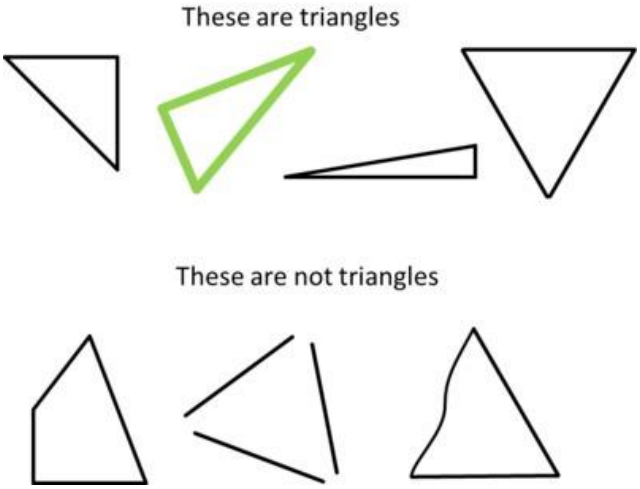
Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: https://tasks.illustrativemathematics.org/content-standards/1/G/A/1/tasks/752

All vs. Only some

First pose the question:

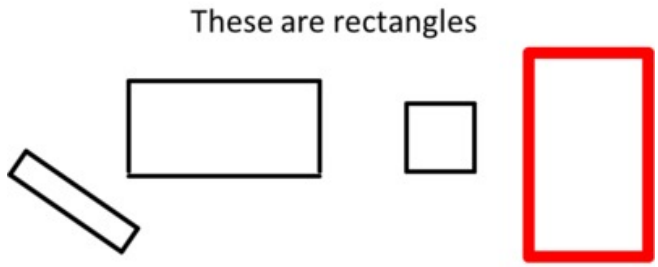
Here are four triangles. What do all these triangles have in common? What makes them different from the figures that are not triangles? What is true for some but not all these triangles?

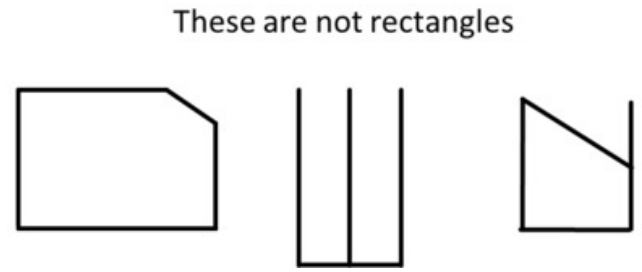


If students come up with a statement that is true about all the triangles that they see but not true of all triangles in general, the teacher should ask students if they can imagine a triangle without that attribute. For example, if a student says, "All of the triangles are white on the inside," the teacher can ask, "Would it be possible for a triangle to have a different color on the inside?" When the class comes up with an attribute that is truly shared by all triangles, then the class can complete the sentence frame: All triangles _____, but only some triangles _____. When the students have written (or composed) their sentences based on the sentence frames, the class can write the definition of a triangle together:

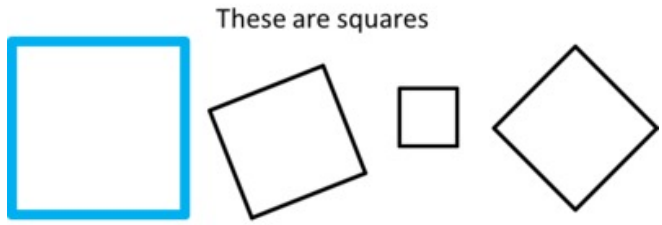
A triangle is a closed shape with three straight sides that meet at three corners.

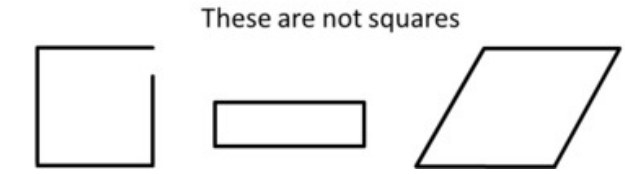
The teacher will repeat the process for rectangles and then squares. Each time, the class should complete the appropriate sentence frame once they have settled on a universal attribute. Then the teacher can help them compose a definition for the shape.



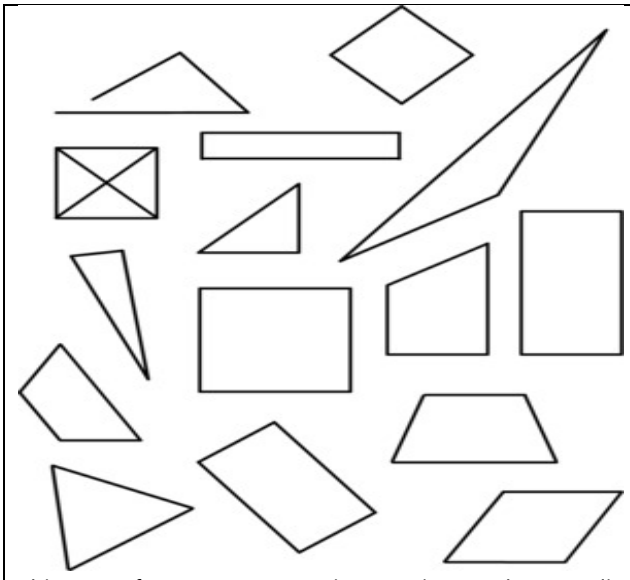


A rectangle is a closed shape with four straight sides and four-square corners.





A square is a closed shape with four straight sides and four-square corners. The four sides are the same length. Once the class has working definitions in grade appropriate language for these shapes, students can identify the triangles, rectangles, and squares below. * Color all the triangles blue. * Color all the squares red. * Color all the rectangles green.



This type of assessment question requires students to discuss and come to understand what constitute defining attributes for triangles, squares, and rectangles. Students start by looking for attributes shared by all the instances of a shape. Some, but not, all these attributes will be defining attributes. For example, all rectangles have opposite sides parallel, but this isn't a defining attribute--it is something you can show starting only with the defining attributes that a rectangle is a quadrilateral with four right angles. The Standards for Mathematical Practice focus on the nature of the learning experiences by attending to the thinking processes and habits of mind that students need to develop in order to attain a deep and flexible understanding of mathematics.

Relevance to families and communities:

During a unit focused on reasoning about 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, Identify 2D and 3D shapes found at home, in the community, and in nature. Identify the shapes of culturally significant places or even items in the world, what shapes make up that structure/item or that you can derive from the structure. Ex. The Pentagon: what shape is it, and what shapes can you make from it? Pyramids: what shapes are they; what shapes make up the pyramids? How are these different from the Temples in South America? Making connections between the world outside of school and the math classroom. Traffic signs such as a stop sign. Shapes in nature, including a turtle shell and honeycomb.

Cross-Curricular Connections:

Social Studies: In first grade the New Mexico Social Studies Standards state students should "identify and compare celebrations and events from the United States, Mexico, and Canada". Consider providing a connection for students to create images to represent different celebrations and events using only shapes that combine to form the larger image.

Language Arts: Literature can offer connections to help students begin to understand part-whole relationships such as: *Give Me Half* by Stuart J. Murphy and *Picture Pie* by Ed Emberley.