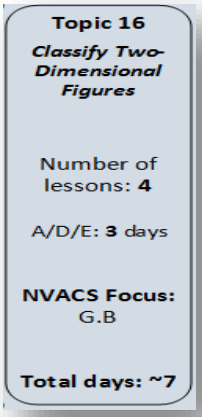
Grade 5 Topic 16: Geometric Measurement: Classify Two-Dimensional Figures



5th grade Curriculum Pacing Framework: Balanced Calendar

Big Conceptual Idea: K-6 Geometry, (pp. 17-18)

Prior to instruction, view the Topic 16 Professional Development Video located in Pearson Realize online. Read the Teacher's Edition (TE): Cluster Overview/Math Background (pp. 845A-845F), the Topic Planner (pp.845I-845J), all 4 lessons, and the Topic Assessments (pp. 881-882A).

Mathematical Background: Read Topics 15 Cluster Overview/Math Background (TE, pp. 845A-845F)	Topic Essential Question: How can triangles and quadrilaterals be described, classified, and named? *Reference Answering the Topic Essential Questions (TE, pp. 879-880) for key elements of answers to the Essential Question.*

The lesson map for this topic is as follows:

16-1	16-2	16-3	16-4	Assessment

3 A/D/E days used strategically throughout the topic

Instructional Note:

Instruction for Topic 16 focuses on Nevada Academic Content Standards (NVACS) cluster 5.G.B, "Classify two-dimensional figures into categories based on their properties" (2010). The cluster contains two standards:

- 5.G.B.3- Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

- 5.G.B.4- Classify two-dimensional figures in a hierarchy based on properties.

The WCSD Pacing Frameworks moves Topic 16 between Topics 9 and Topic 10. The 2017-2018 WCSD pacing committee, composed of Washoe County teachers, made the decision to move this topic. The reasoning is stated on page 2 of the pacing framework as "because two-dimensional figures lead into the understanding of three-dimensional figures and volume. Students will need to have a strong understanding of the attributes of polygons to decompose solid figures when volume is additive."

Instructional use of mathematical language and vocabulary is important to consider during Topic 16. Students will learn to identify, draw and classify two-dimensional shapes based on their attributes. All students benefit from an increased focus on language in mathematics, especially when the language support is connected to the mathematics (Van de Walle, Karp, Lovin, & Bay-Williams, 2014). The use of mathematical language plays a crucial role as students build understandings necessary to analyze and relate categories of triangles and quadrilaterals based on their attributes.

The Frayer Model, a vocabulary graphic organizer, is provided in the enVisionmath2.0 instructional materials as Teaching Tool 24. It is beneficial for English Language Learners to support the connection of ideas and relationships. For the development of conceptual understanding, knowing which properties that an object does not include is just as important as knowing which properties are included (Dunston and Tyminski, 2013).

The Progression Documents provide an example of how a Venn diagram can be used to model quadrilaterals existing in several classes at once (Common Core Standards Writing Team (CCSWT), 2013, p. 18). Use of the Venn diagram supports student observation of how properties defining a shape in one category extend to all subclasses. For example, students placing a square into the diagram will find that a square possesses all the properties of a rectangle in addition to the special attributes that define it as a square. Visuals can enhance students' abilities to use multiple attributes to classify a single shape. Students are learning that shapes exist in a hierarchy and the properties of a given category extend to its subsets as well. Students may need clarification about the meaning of hierarchy. Referencing real world contexts that use a hierarchy may help students to build understanding of how hierarchies are used for classification.

Students should explore these hierarchies using the two definitions for trapezoids. See figures below:

• Note that in the U.S., that the term "trapezoid" may have two different meanings. In their study *The Classification of Quadrilaterals* (Information Age Publishing, 2008), Usiskin et al. call these the exclusive and inclusive definitions:

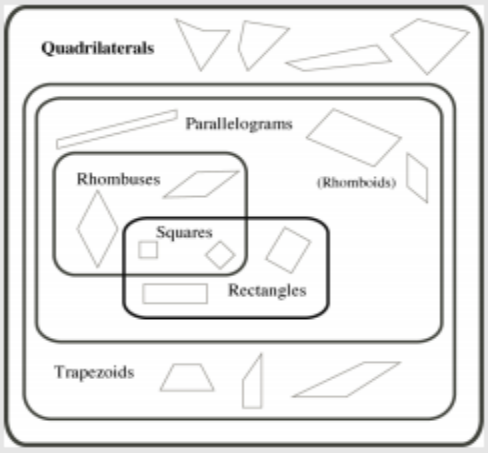
T(E): a trapezoid is a quadrilateral with exactly one pair of parallel sides

T(I): a trapezoid is a quadrilateral with at least one pair of parallel sides.

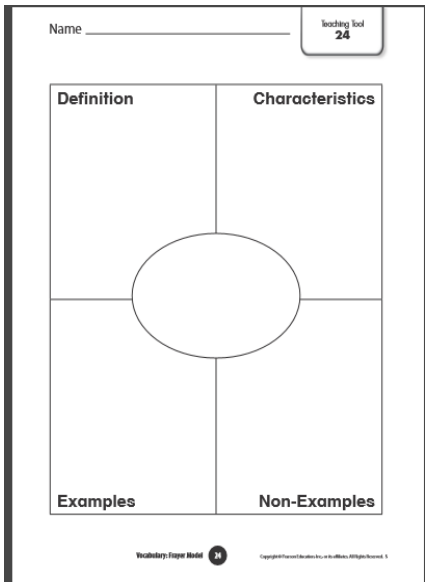
These different meanings result in different classifications at the analytic level. According to T(E), a parallelogram is not a trapezoid; according to T(I), a parallelogram is a trapezoid.

Both definitions are legitimate. However, Usiskin et al. conclude, "The preponderance of advantages to the inclusive definition of trapezoid has caused all the articles we could find on the subject, and most college-bound geometry books, to favor the inclusive definition."

Venn diagram showing classification of quadrilaterals



Note that rhomboids are parallelograms that are not rhombuses or rectangles. This example uses the inclusive definition of trapezoid (see p. [pageref "T(E)"]).



Math Practice 3: Construct viable arguments and critique the reasoning of others
Focus on opportunities for students to develop *Mathematical Practice 3* behaviors as this is the focus of the Math Practices and Problem Solving, lesson 16-4. Reference the Teacher's Edition (TE, pp. F23-F23A) and the NVACS (2010, p. 6).

This topic has 4 lessons with 2 additional days for assessment, differentiation and enrichment (A/D/E). Consider using the provided enrichment time to focus on geometric vocabulary used during Topic 16. Teaching Tool 27 (word map) and vocabulary cards (TE, pp. 847-850) are provided to support vocabulary acquisition.

Essential Academic Vocabulary Use these words consistently during instruction.	
New Academic Vocabulary: (First time explicitly taught)	Review Academic Vocabulary: (Vocabulary explicitly taught in prior grades or topics)
	equilateral triangle *isosceles triangle* *scalene triangle* *right triangle* *acute triangle* *obtuse triangle* *trapezoid* *parallelogram* *rectangle* *rhombus* *square*

Additional terminology that students may need support with:

Collaborative Team Conversations (CTC)

Consider using *one* of the following as part of the formative assessment process at the lesson level to **collect student work** to analyze for evidence of mathematical understanding:

Guiding questions: "Are students able to name and classify two-dimensional shapes as a hierarchy?"
"Do students recognize that a shape retains all of the attributes of subcategories in a hierarchy?"

Lesson	Evidence	Look for
16-3	*Solve and Share* (student work samples)	Focus CTC around the big idea: • are students understanding that a shape can belong to more than one category? • are students able to identify the two-dimensional shapes?
16-3	*Convince Me!* (student work samples)	Focus CTC around the big idea: • can students give specific examples of how a two-dimensional? • shape can belong to more than one category in a hierarchy?
16-3	*Quick Check* (digital platform)	• Focus CTC around data analysis and collection of student workspace (scratch paper). Printable version available under "Teacher Resources".

Learning Cycle Assessments (summative)	*Topic Performance Assessments* SE pp. 879-882	Use *Scoring Guide* TE pp. 879-882A

Standards listed in **bold** indicate a focus of the lesson.

NVACS (Content and Practices)	Mathematical Development of the Big Idea	Instructional Clarifications & Considerations
Lesson 16-1: Classify Triangles		
5.G.B.3 5.G.B.4 MP.1 MP.2 MP.3 MP.4	Access Prior Learning: In 4th grade, students learned about geometric measurement of angles and classified shapes based on properties (4.MD.C) (4.G.A). Developing the Big Idea: Students use properties to analyze and classify triangles to build conceptual understanding.	Solve and Share: Students work to draw and classify several triangles based on their properties. Consider asking students to share their ideas and justify their solutions (MP.3). What properties are used to classify triangles? How are these attributes described using mathematical language? Consider discussing the image of the musical instrument triangle, why would this shape not be classified as a triangle? Visual Learning: Mathematical terms for the properties of triangles are given. Can any descriptions shared during the *Solve and Share* be connected to mathematical terminology? Students are more likely to remember vocabulary if they can make connections. Consider exploring concepts and labeling rather than front loading vocabulary. Use the *Convince Me!* to assist students in thinking about what combinations of attributes are possible for a single triangle. For example, is it possible for a triangle to be isosceles and have a right angle? Why or why not? Assess and Differentiate: A breakdown of attributes similar to what was shown in the *Visual Learning Bridge* is given on the *Reteach* page.
Lesson 16-2: Classify Quadrilaterals		
5.G.B.3 5.G.B.4 MP.1 MP.2 MP.3 MP.6 MP.8	Access Prior Learning: In 4th grade, students learned about geometric measurement of angles and classified shapes based on properties (4.MD.C) (4.G.A). Developing the Big Idea: Students use properties to analyze and classify quadrilaterals to build conceptual understanding.	Solve and Share: Students may need to review the meaning of parallel lines to begin this task. Are students able to use geometric vocabulary to classify their created shapes? Consider using student ideas to facilitate a discussion gathering students' ideas about attributes of quadrilaterals. Visual Learning: We use geometric vocabulary to classify quadrilaterals. Can students connect these terms to descriptions shared during the *Solve and Share*? The *Convince Me!* asks students to use knowledge of attributes to distinguish between a parallelogram and a rhombus. The *Guided Practice* reiterates that shapes retain the properties of subclasses. Multiple attributes are listed for single shapes. During the *Independent Practice*, support students that stop after naming a single attribute of the shapes (SE, p. 859). Prompt students to analyze the shapes for additional attributes. *-continues on next page-*

		Assess and Differentiate: The *Homework and Practice* page contains a classification hierarchy beginning with a trapezoid and ending with a square. Do students understand that each shape after the trapezoid has all of the attributes of the classes before it, as well as the attributes that make it unique?
Lesson 16-3: Continue to Classify Quadrilaterals		
5.G.B.3 5.G.B.4 MP.2 MP.3 MP.4 MP.5 MP.7	Access Prior Learning: In 4th grade, students learned about geometric measurement of angles and classified shapes based on properties (4.MD.C) (4.G.A). Students analyzed properties to classify quadrilaterals in the previous lesson. Developing the Big Idea: Students continue to build conceptual understanding of quadrilaterals through analyzing properties to determine that the properties of a two-dimensional shape belong to all subcategories of that shape.	Solve and Share: Students use knowledge of the properties of quadrilaterals to classify. Do students understand that quadrilaterals can have many attributes? How are the quadrilaterals related? What properties define some quadrilaterals as unique? Visual Learning: Notice the visual hierarchy for classifying quadrilaterals. This diagram might remind students of a family tree. How does this organizer help to classify quadrilaterals? Students must decide if statements about quadrilaterals are true or false on the *Guided Practice* and *Independent Practice* pages. Can students use geometric vocabulary to justify their thinking? Assess and Differentiate: See the classification hierarchy on the *Reteach* page and the *Homework and Practice* page. *CTC: ***Solve and Share*** (student work samples) *CTC: ***Convince Me!*** (student work samples) *CTC: ***Quick Check*** (digital platform)
Lesson 16-4: Math Practices and Problem Solving- Construct Arguments		
5.G.B.3 5.G.B.4 MP.1 MP.2 MP.3 MP.6 MP.7	Access Prior Learning: Students analyzed properties to classify triangles and quadrilaterals in previous lessons. Students worked with MP.3 in previous lessons. Securing the Big Idea: Students apply knowledge of properties of shapes to solve a problem and work to model the thinking habits of MP.3.	Solve and Share: Students work to construct an argument to justify a solution. Consider providing concrete tools such as paper and scissors that will allow students to test their ideas. A class discussion focused on the thinking habits of MP.3 can be used to share strategies and explain thinking. Visual Learning: The thinking used to solve a similar problem is modeled. How do the thinking habits shown connect to student ideas shared during the *Solve and Share*? The *Convince Me!* offers an opportunity for students to form a counter example. How can counter examples be helpful for classifying and constructing arguments? Assess and Differentiate: Students use the thinking habits of MP.3 to construct an argument to justify a statement about the measure of angles in a triangle using the task given on *Another Look!*.

References

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Council of Chief State School Officers. (2010). The Nevada Academic Content Standards. Retrieved from http://www.doe.nv.gov/uploadedFiles/nde.doe.nv.gov/content/Standards_Instructional_Support/Nevada_Academic_Standards/Math_Documents/mathstandards.pdf.

Dunston, P. J., & Tyminkski, A. M. (2013). What's the big deal about vocabulary? *Mathematics Teaching in the Middle School*, *19*(1), 38-45.

Van de Walle, J., Karp, K., Lovin, L., & Bay-Williams, J. (2014). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades 3-5.* (2nd ed.). New York, NY: Pearson.