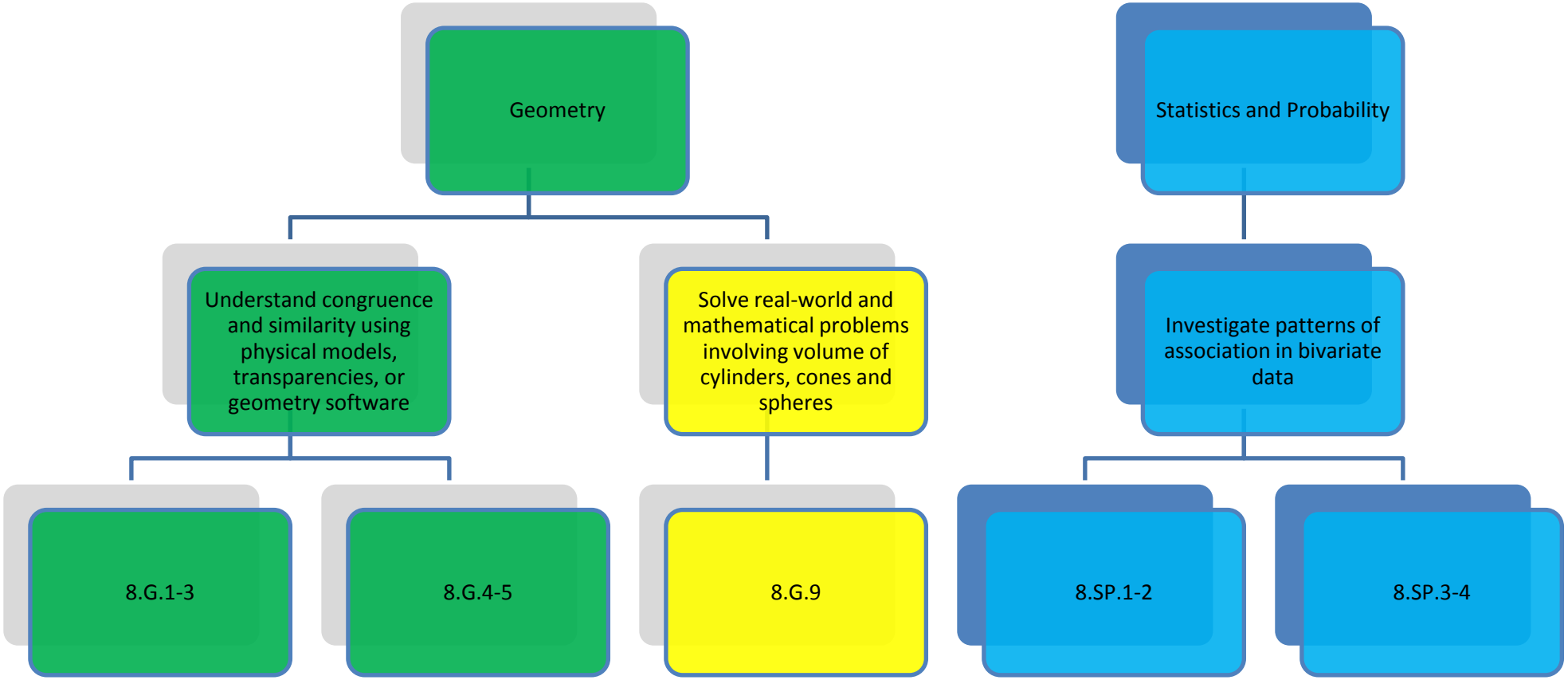
Common Core Math 8

Unit 4

Pythagorean Theorem, Congruence and Similarity, Problem Solving Involving 3-D Geometry



COMMON CORE MATH 8 – UNIT 4
Pythagorean Theorem and its Converse, Congruence and Similarity
Problem Solving Involving Volume of Cylinders, Cones and Spheres

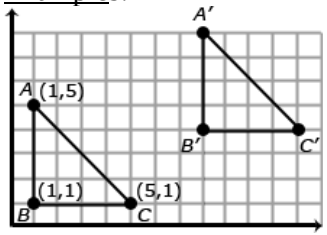
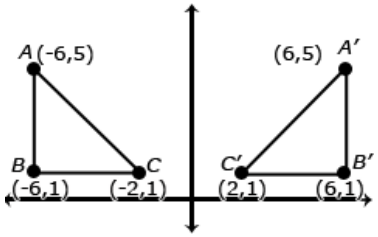
Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

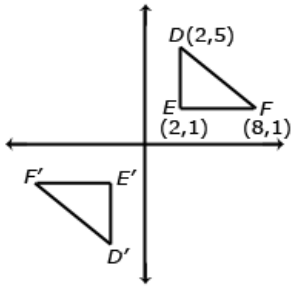
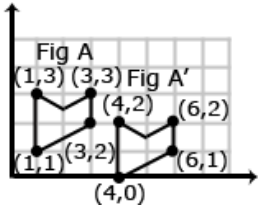
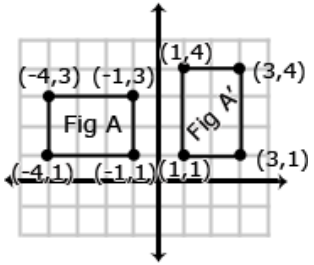
CLUSTER	COMMON CORE STATE STANDARDS
Understand congruence and similarity using physical models, transparencies, or geometry software.	**8.G.1** Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. **8.G.2** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. **8.G.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **8.G.4** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. **8.G.5** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*
Solve real-world and mathematical problems involving volume of cylinders,	**8.G.9** Know the formulas for the volumes of cones, cylinders, and spheres and

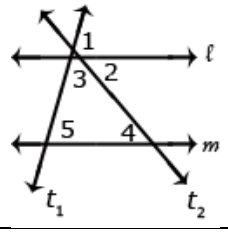
CLUSTER	COMMON CORE STATE STANDARDS
cones and spheres.	use them to solve real-world and mathematical problems.
MATHEMATICAL PRACTICES	**LEARNING PROGRESSIONS**
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. **Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. 5. **Use appropriate tools strategically.** 6. Attend to precision. 7. Look for and make use of structure. 8. **Look for and express regularity in repeated reasoning.**	http://ime.math.arizona.edu/progressions/#committee. CDE Progress to Algebra K-8 www.cde.ca.gov/be/cc/cd/documents/updateditem12catt3.doc

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	KEY VOCABULARY
• Students apply their understanding of the effect of geometric transformation(s) on a figure or shape. • Students describe how two figures or shapes are congruent or similar. • Students create or identify a sequence of transformations that lead to congruent or similar figures. • Students analyze the relationship between angles measures (triangle sum; parallel lines cut by a transversal; impact of a geometric transformation). • Students prove the Pythagorean Theorem, use to determine the distance between two coordinate points, and apply to real world situations.	How are the (angles), (lengths), or (figures) changing? How are they staying the same? How is _____ related to ____? What happens when an object is dilated? How could an object be transformed to enlarge or reduce its size? How can you determine the distance between two points in a coordinate plane?	Angle, Angle sum Argument Cone Congruent Coordinate Cylinder Dilation Exterior angle Line Line segment Parallel Proof Reflection Rotation Sequence Similar/similarity Sphere Translation Transversal Two-dimensional (2-D)

LANGUAGE GOALS for **low achieving, high achieving, students with disabilities and English Language Learners**
Students will understand prime notation to describe an image after a translation, reflection, or rotation. I will describe an image of translation, reflection, or rotation by_____. Students will use physical models, transparencies, or geometry software to verify the properties of rotations, reflections, and translations. Students will explain a proof of the Pythagorean Theorem and its converse. Students will apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. The unknown side lengths of a right_____ can be determined by using _____.
PERFORMANCE TASKS
Mathematics Assessment Project • 8.G.9: Modeling Making Matchsticks • 8.G.1: Representing and Combining Transformations • 8.G.4: Photographs

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
LAUSD Concept Lesson 8.G.9: The Chocolate Factory 8.G.6: Squaring Triangles **Mathematics Assessment Project** 8.G.1: Representing and Combining Transformations 8.G.1: Aaron's Designs 8.G.5: Finding Shortest Routes: The Schoolyard Problem 8.G.5: Identifying Similar Triangles **Engage NY**: 8.G.1: The Concept of Congruence. 8.G.4: Similarity. **NCTM Illuminations** 8.G.1: Cyclic Figures 8.G.1: Dihedral Figures 8.G.4: In Your Shadow 8.G.4: Inversions	Provide explanations with examples of Reflection, Rotation, Translation, and Dilation. Examples:  ΔABC has been translated 7 units to the right and 3 units up. To get from A (1,5) to A′ (8,8), move A 7 units to the right (from x = 1 to x = 8) and 3 units up (from y = 5 to y = 8). Points B + C also move in the same direction (7 units to the right and 3 units up).  When an object is reflected across the y axis, the reflected x coordinate is the opposite of the pre-image x coordinate.	SBAC Sample Items: 8.G.2 MAT.08.SR.1.0000G.G.141 MAT.08.TE.1.0000G.G.146 8.G.3 MAT.08.SR.1.0000G.G.142 8.G.5 MAT.08.CR.1.0000G.G.129 8.G.6: MAP Center, Summative Assessment: "Proofs of the Pythagorean Theorem?" http://map.mathshell.org/materials/tasks.php 8.G: MAP Center, Summative Assessment, "Circles and Squares," http://map.mathshell.org/materials/tasks.php?taskid=287#task287

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
8.G.5: Angle Sums 8.G.9 Popcorn, Anyone? 8.G.9: Popcorn Cylinders Anyone? 8.G.9: Cubed Cans. **Inside Mathematics**: Cut It Out" activity **Illustrative Mathematics** 8.G.2: Congruent Segments. 8.G.2: Congruent Rectangles 8.G.2: Congruent Triangles 8.G.3: Reflecting Reflections 8.G.3: Triangle Congruence with Coordinates 8.G.5: Are They Similar? **LAUSD Adopted Textbooks and Programs** • Houghton Mifflin Harcourt, 2013 Go Math! • McGraw-Hill, 2013, California Math, Courses 3 • College Preparatory Mathematics, 2013, Core Connections, Courses 3 • Pearson, 2013, Common Core System of Courses	 Consider when is rotated 180˚ clockwise about the origin. The coordinates of are D(2,5), E(2,1), and F(8,1). When rotated 180˚, has new coordinates D'(-2,-5), E'(-2,-1) and F'(-8,-1). Each coordinate is the opposite of its pre-image. Examples: • Is Figure A congruent to Figure A'? Explain how you know.  • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'.  • Examples: Students can informally prove relationships with transversals. Show that m $\angle 3$ + $m\angle 4$ + $m\angle 5$ = 180˚ if ℓ and m are parallel lines and t_1 & t_2 are transversals. $\angle 1 + \angle 2 + \angle 3 = 180^\circ$. Angle 1 and Angle 5 are congruent because they are corresponding angles ($\angle 5 \cong \angle 1$). $\angle 1$ can be substituted for $\angle 5$.	

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
	$\angle 4 \cong \angle 2$: because alternate interior angles are congruent. $\angle 4$ can be substituted for $\angle 2$ Therefore m$\angle 3$ + m$\angle 4$ + m$\angle 5$ = 180° 	

DIFFERENTIATION 🕮		
UDL/ FRONT LOADING	ACCELERATION	INTERVENTION
• Students build on their understanding of what it means for two objects to be similar and/or congruent • Students expand their knowledge of finding distances between two points in a coordinate system. (8.G.8: Unit 1) • Students are able to draw, construct and describe geometrical figures and describe the relationships between them. (7.G.2) • Students 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. (7.G.5) • Students build on knowledge of radicals, integer exponents, square roots, and cube roots. (8.EE.2: Unit 1)	Acceleration for high achieving students: • Students can compare the volume of different objects and can describe optimization • Given a complex polygon in a coordinate plane, students can describe the boundaries of the figure	Intervention for low achieving students and students with disabilities: • Students use "nets" and other hands on manipulatives to visualize 3 dimensions • Teacher uses "transparency" sheets or computer applets to show transformations • Provide sentence starters for students to be able to describe the effects of transformations. • Provide sentence frames to support students using informal arguments to establish facts. • Choral response especially for two parallel lines cut by a transversal theorems.

References:

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