Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Geometry	**Grade Level: 7th**

7.G.A Cluster: Draw, construct and describe geometrical figures & describe the relationship between them.

Students work to draw and construct geometric shapes, particularly triangles from given angle and side measurements. Students find relationships and connections between a 3D figure and slicing it into a plane figure. Students use scale drawings to find the actual lengths from scale drawing or redrawing a scale drawing to another scale.

****This is an ADDITIONAL cluster.** *Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate,* ***additional*** *work should be connected to and engage students in the major work of the grade.*

7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.2. Draw (freehand, with ruler and protractor/angle ruler, and/or with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application)

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand that scale factor is a number that multiplies some quantity. **(7.G.1)** Understand the ratio of the side lengths of two similar figures (including scale diagrams) is called the scale factor. The same is true for the ratio of their perimeters. **(7.G.1)** The ratio of the areas of two similar figures is the **square** of the scale factor. **(7.G.1)** For example, one square has side length 2 inches and another square has side length 3 inches. The scale factor of the smaller to the larger is 2:3. The ratio of the perimeters is	Calculate the scale factor given two similar figures.**(7.G.1)** Determine the dimensions of similar figures when given a scale. **(7.G.1)** Calculate perimeter (one dimension) and area (two dimensions) when given a scale factor. **(7.G.1)** Find actual lengths and areas from a scale drawing, using a scale factor. **(7.G.1)**	Using a given scale drawing, students reproduce the drawing at a different scale.(**7.G.1)**

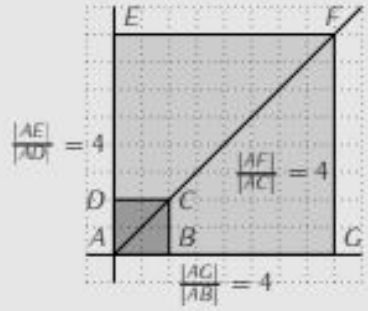
2:3, while the ratio of their areas is 4:9.		
Recall geometric shapes and properties. **(7.G.2)** Use of a protractor or ruler for measurement. **(7.G.2)** Students understand the characteristics of sides and angles that create triangles.**(7.G.2)** **Note:** For example, can a triangle have more than one obtuse angle? Will three sides of any length create a triangle? Students determine the sum of the angles in a triangle to be 180 degrees and recognize that the sum of the lengths of the two smaller sides must be larger than the third side.	Construct a triangle given three conditions. **(7.G.2)** For example, is it possible to draw a triangle with a 90 degree angle and one leg that is 4 inches long and one leg that is 3 inches long? Is there more than one such triangle? What if the angle is 80 degrees? Are there ever conditions that cannot be met? Measure side lengths and angle measures with given tools. **(7.G.2)** Draw a quadrilateral given certain conditions. **(7.G.2)**	Draw a geometric figure with given conditions. Explain why a set of given conditions does (or does not) produce the desired figure. **(7.G.2)**
	Identify the two-dimensional cross-sections that are formed by slicing three-dimensional figures. **(7.G.3)** Describe the resulting face shape from cuts made parallel and perpendicular to the bases of right rectangular prisms and pyramids. **(7.G.3)**	

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
   - Students solve problems using scale drawings.
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
   - Students can provide a justification for why a set of 3 values could (or could not) represent the lengths of the sides of a triangle.
   - Students can provide a justification for why a set of 3 angle measurements could (or could not) represent the angles of a single triangle.
   - Students can explain, and provide examples, why the ratio of the areas of similar figures is not the same as the scale factor.
4. **Model with mathematics.**
   - Students model geometric shapes and relationships using manipulatives and other materials.
5. **Use appropriate tools strategically.**
   - Students free hand or use tools (ruler, protractor, angle rulers, technology) to draw geometric shapes.
6. **Attend to precision.**
   - Students use precise mathematical language when presenting solutions to scale drawing problems.
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions		
Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In 5th grade, learners understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. In 5th grade, learners classify two-dimensional figures in a hierarchy based on properties. In 6th grade, learners understand and solve ratios and rates, generate equivalent ratios, and use ratios and rates to solve problems. In 6th grade, learners calculate perimeter & area of two-dimensional figures and find volume of 3D figures. In 6th grade, students explore the characteristics of a right rectangular prism and rectangular pyramid.	In 7th grade, learners can expand their work with expressions and equations as they write and solve equations related to similar figures, scale drawings, and the missing angle measures of triangles. In 7th grade, learners' work with similar figures supplements the concepts they have already learned (or will be learning) when studying direct variation and proportional reasoning.	In 8th grade, learners connect their previous understanding of similar figures with the properties of translations, rotations, reflections and dilations. In 8th grade, learners build on their experimentation with triangles and start to make informal arguments about their properties, such as angle sum, exterior angles of a triangle, and angles created when parallel lines are cut by a transversal line. In 8th grade, learners build on knowledge of triangle side lengths which leads to the investigation of the Pythagorean Theorem and its converse.
Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*		
• Scale • Scale factor • Scale drawing • Enlarge • Reduce • Angle ($\angle$) • Angle measure ($m\ \angle$) • Acute • Obtuse • Right	• Degrees (°) • Polygon • Vertex • Line segment (side AB of ΔABC) • Dimensions • Parallel • Perpendicular • Scalene triangle • Isosceles triangle • Acute triangle	• Obtuse triangle • Equilateral triangle • Right triangle • Cube • Right rectangular prism • Right rectangular pyramid • Cross-sections • Two-dimensional figure (2D) • Three-dimensional figure (3D) • Plane sections
Relevance, Explanations, and Examples:		
7.G.2		

How area changes under scaling

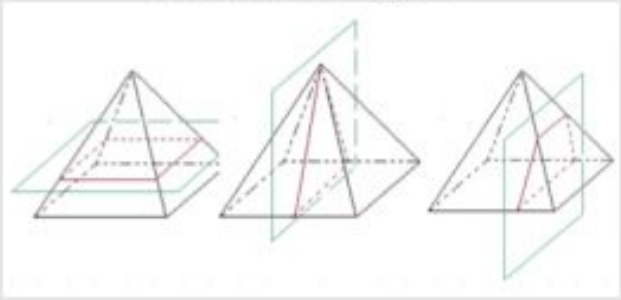


The quotient of corresponding lengths is 4, while the quotient of areas is $16 = 4^2$. See also the discussion of http://www.illustrativemathematics.org/illustrations/107

Taken from *Common Core Progression Document*

7.G.3

Cross-sections of a pyramid



Cross-section is another name for a plane section, but often that name is reserved for a section of a three-dimensional object that is parallel to one of its planes of symmetry or perpendicular to one of its lines of symmetry. So, for example, for a cube, one line of symmetry joins the centers of opposite faces. A cross-section perpendicular to that line is a square, as is the cross-section of the right rectangular pyramid shown above left.

Taken from *Common Core Progression Document*

Achievement Level Descriptors	
***Cluster:* Draw, construct and describe geometrical figures and describe the relationships between them.**	
Concepts and Procedures	***Level 1:*** students should be able to draw or construct geometric shapes with given conditions by freehand, with ruler and protractor, and by using technology.
	Level 2: students should be able to describe geometric shapes with given conditions and determine whether or not a set of any three given angle or side-length measures can result in a unique triangle, more than one triangle, or no triangle at all. They should be able to describe the relationship between a geometric figure and its scale drawing by finding the scale factor between them.
	Level 3: students should be able to compute actual lengths and areas from a scale drawing and reproduce a scale drawing using a different scale. They should be able to describe the two-dimensional figures that result from slicing

	prisms and pyramids by planes that are parallel to a face.
	Level 4: students should be able to describe the two-dimensional figures that result from slicing cones, spheres, cylinders, or other three-dimensional figures with rectangular or triangular faces by planes that are not parallel to a given face.