

Pocatello/Chubbuck School District #25
MATHEMATICS
Unit 5: Modeling with Geometry

Course: Honors Integrated Math III

Pacing: 3 Weeks

Unit Overview: In this unit, learners will build on their knowledge of three-dimensional shapes and right triangle trigonometry. **Learners will be introduced to the idea of solids of revolution. Learners will recognize the three dimensional shape created by rotating a two dimensional shape about an axis. Students will gain an understanding of the term “cross section”, and be able to visualize the two-dimensional shape created when a solid is sliced at a given place. Learners will identify special right triangles and the relationship of their sides. Learners will also derive the Laws of Sine and Cosine and be able to solve any triangle. Learners will identify how to find the area of any triangle.**

FOCUS MATHEMATICS STANDARD PROGRESSION
(Key: Bold = New learning for grade level)

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Integrated Math II	Honors Integrated Math III	Higher Level Math
F.TF.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, and the quadrant of the angle. G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles. G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	G.MG.A. 1 Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects . ★ G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G.SRT.9 (+) Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems. G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	In Calculus, learners will find the volume of a solid revolved around a line using cross sections.

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MATHEMATICS FOCUS AND ACCOMPANYING STANDARDS <i>(Key: Bold = New learning for grade level)</i> The FOCUS (critical area) and accompanying standards are clustered with Learning Intentions and Success Criteria (LI/SC) identified to provide coherence in teaching and learning. It is from these standards, LI/SC, identified Tools for Learning, and Assessments that PLCs create weekly learning intentions, success criteria and lesson plans.	Learning Intentions
G.MG.A. 1 Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects . ★ G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G.SRT.9 (+) Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems. G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	In this unit, learners will apply appropriate mathematical practices to strengthen their math learning. In this unit, learners will visualize how two-dimensional objects rotate around an axis to create three-dimensional objects. In this unit, learners will apply geometric principles to find the area and volume of complex shapes. In this unit, learners will recognize special right triangles and the relationship between the sides. In this unit, learners will derive the Laws of Sine and Cosine. In this unit, learners will solve a triangle using the Laws of Sine and Cosine In this unit, learners will find the area of a triangle using newly acquired

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UNIT LEARNING INTENTIONS
• In this unit, learners will visualize how two-dimensional objects rotate around an axis to create three-dimensional objects. • In this unit, learners will apply geometric principles to find the area and volume of complex shapes. • In this unit, learners will recognize special right triangles and the relationship between the sides. • In this unit, learners will derive the Laws of Sine and Cosine. • In this unit, learners will solve a triangle using the Laws of Sine and Cosine. • In this unit, learners will find the area of a triangle using newly acquired knowledge.

SUCCESS CRITERIA ALIGNED TO UNIT LEARNING INTENTIONS WITH <u>VETTED</u> TOOLS FOR LEARNING		
SURFACE I can demonstrate conceptual understanding of new ideas and connect these ideas to the related procedures, <u>vocabulary</u> and symbolic representations. Hattie, Fisher, et al, <i>Visible Learning for Mathematics</i> . Corwin. 2017 p. 29	DEEP I can plan, investigate, and elaborate on my conceptual understandings and begin to make generalizations, using accountable talk. Hattie, Fisher, et al, <i>Visible Learning for Mathematics</i> . Corwin. 2017 p. 31	TRANSFER I can apply my thinking to new contexts and situations through self-questioning and reflection. Hattie, Fisher, et al, <i>Visible Learning for Mathematics</i> . Corwin. 2017 p. 32
• I can visualize two-dimensional cross sections of three dimensional objects ○ Tools for learning: ■ Task 5.1 ○ Vocabulary: ■ cross section • I can visualize solids of revolution by rotating two-dimensional objects about an axis. ○ Tools for learning:	• I can analyze a cross section perpendicular to the axis of revolution and know it will always be circular. ○ Tools for learning: ■ Task 5.3 ○ Vocabulary: • I can use my knowledge of right triangle trig to derive the Laws of Sine and Cosine ○ Tools for learning: ■ Task 5.7	• I can use knowledge of three-dimensional figures to find volumes of complex objects ○ Tools for learning: ■ Task 5.4 ○ Vocabulary: ■ Density ■ solid of revolution • I can formulate a method to find the area of any triangle given

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■ Task 5.2 ○ Vocabulary: ● I can use right triangle trig to identify special right triangles ○ Tools for learning: ■ Task 5.5 ○ Vocabulary: ● I can recognize special right triangles and identify the relationship of the sides of these triangles. ○ Tools for learning: ■ Task 5.6 ○ Vocabulary: ● I can use right triangle trig to solve a right triangle ○ Tools for learning: ■ Task 5.6 ○ Vocabulary:	○ Vocabulary: ● I can use the Laws of Sine and Cosine to solve any triangle ○ Tools for learning: ■ Task 5.7 ○ Vocabulary:	various measurements ○ Tools for learning: ■ Task 5.8 ○ Vocabulary:
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REQUIRED SUMMATIVE ASSESSMENT (Administered 'On Demand')	
Learning Intention	Learners will extend their geometry skills in order to model real life situations.
Success Criteria	Link to rubric (if applicable):
Resources	District Shared Assessment Folder

KEY ACADEMIC VOCABULARY

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- cross section
- solid of revolution
- density

CONTEXT: *VETTED* MATERIALS/RESOURCES

- District Shard Drive Integrated Math III