Grade Level	Content Area	Course Title *(9-12 Samples Only)*	Unit Title
9th -12th Grade	Mathematics	Geometry	Nets and Solid Figures

Length of Unit	Time of Year Taught	Expected Prior Knowledge
Five days	Suggested - Beginning of 10th grade	The following standard(s) and PO(s) must be mastered: MHS-S4C4-05. Course credit in Algebra 1-2. Geometric concepts: Areas of Polygons, Areas Revisited Solids 1, Solids 2

Unit Description

Geometry is delivered as an independent, self-paced, computer-based course. Students use ANYWHERE LEARNING SYSTEM (A+LS™) and Adobe Flash for lesson instruction and activities. Although this course and unit are intended to be taken as an independent, self-paced program, teacher involvement is built into the unit sequence. This allows the math instructor to check student understanding and perform formative assessments to ensure the student is able to master the standards on the summative assessment at the end of the unit.

<u>The following topics are covered in this unit:</u>

The focus of this unit is transforming 3- dimensional objects into 2-dimensional representations and vice versa. The 3-dimensional objects are called solids and the 2-dimensional representations are called nets, this language was chosen based on common language used in high school textbooks. Two different naming systems are used for 3-dimensional objects. 3-dimensional objects, solids, are turned into 2-dimensional representations, nets. Nets are then represented by solids. The unit and entire course is enhanced by using this information to determine the surface area of a variety of solids. As the final lesson of the unit, value or purpose is given for the naming of solids, visualizing 3-D objects as 2-D and vice versa. This unit also introduces real world applications of Geometry for any person, not just specialized uses.

After completing this unit, the student will be able to:

- name any type of 3-dimensional object they encounter using one of two systems
- identify three basic kinds of shapes, platonic, prism and pyramid
- relate a particular solid to its category
- correctly match a given net to its solid (or vice versa)
- calculate the surface area of solids.

In the lab component, the student will connect 3-dimensional objects to 2-dimension representations and vice versa.

Strand(s), Concept(s), and PO(s) *List and define the required Strand(s), Concepts(s), and PO(s) for each lesson included in this sample.*	MHS-S4C1-02 Strand 4: Geometry and Measurement Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional figures and develop mathematical arguments about their relationships. PO 2: Visualize solids and surfaces in 3-dimensional space when given 2-dimensional representations and create 2-dimensional representations for the surfaces of 3-dimensional objects.

Summative Assessment *Describe a cumulative and comprehensive activity that allows students to demonstrate mastery of stated POs. A copy of the summative assessment must be included in the application package.*	The summative assessment is at the end of the unit. This assessment is multiple choice and fill in the blank. It measures the mastery of MHS-S4C1-02. The student will need to demonstrate an understanding of the two naming systems, number of sides, type of shape, transforming a solid into a net and net into a solid, and use of the correct formulas to calculate surface area.
Assessment Scoring *Explain how each assessment is scored, to include points per question, total points possible, criteria, and grading scale. Describe rubric, if applicable, to include components being evaluated and the scoring criteria for each. A copy of the answer key and/or scoring rubric must be included in the application package.*	The unit test is 12 questions. Each question is worth 10 points. A passing score of 70% or 84 points must be achieved on the unit test to be considered "successfully completed." A score of less than 70% or 84 points on the unit test will result in the student having to retake the test. Grade Breakdown: Percent / Points 90 – 100% = A / 108 – 120 = A 80 – 89% = B / 96 –107 = B 70 – 79% = C / 84 – 95 = C < 70% = no credit / <84 = no credit
Materials/Resources Needed *(Include all items for the entire unit.)*	Computer with access to ANYWHERE LEARNING SYSTEM (A+LS™)– Lesson 30 - Geometry Nets and Solid Figures Flash software Lab Activity Worksheet Activity Worksheet- Transforming Solids into Nets, Nets into Solids Pencil/Paper/Scissors/Tape Math Instructor for lesson activity clarification, further explanations, demonstration of problems, test proctoring.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5

Lesson Instruction
 	
Is provided through the study portion of the unit lesson In the A+LS course. A math teacher is readily available whenever the student needs further help.
	Intro/Review (pg. 1-13)
	(10 min)
	• Describe mastery and course expectations.
	• Provide an overview of Nets and Solid Figures.
	• Review solids vocabulary from Solids 1 and 2 Lessons.
	• Describe how solids will be examined at a deeper level, instead of just a name and picture; how they relate to other shapes; what systems can be used to understand a shape we have never met.
	• Describe the two naming systems; number of sides, and type of shape
	
	Guided Practice
	(40 min)
	• Provide practice of naming systems by listing rules, asking questions, providing examples, reviewing vocabulary, and demonstrating patterns of all shape types.
	
	Independent Practice
	(10 min)
	• A lab activity with a variety of nets shapes is provided; the student uses the two systems to name the solid figures.
		Intro/Review (pg.13 -17)
		(20 min)
		• Review the naming systems, how they are used, strengths and limitations of each.
		• Review the procedure of naming a solid by viewing it as a 3-D figure and breaking it down into a 2-D figure.
		• Explain how this process introduces the net, or the surface area, of a shape.
		• Provide a variety of shapes and corresponding nets and show the appearance of the shape flattened.
		• Provide everyday examples of nets for the student to make connections.
		
		Guided Practice
		(20 min)
		• Solids/ Nets Lab – Using the lab program identify corresponding solids and nets
		
		Independent Practice
		(20 min)
		• A worksheet with a variety of nets shapes is provided; the student will use scissors and tape to create the correct solid.
			Intro/Review (pg. 18-22)
			(20 min)
			• Introduce the practical value of flattening out any solid shape.
			• Questions guide the student to make the inference that using a net is the most efficient method to calculate surface areas.
			• Review the procedure for naming the shape to locate the appropriate formula to determine surface area.
			• Examine the notion that not all shapes have formulas or are a combination of several shapes.
			
			Check toward Mastery
			(20 min)
			• The student takes a practice test which provides feedback for each answer.
			
			Guided Practice
			(20 min)
			• Student uses the solids created in the previous section.
			• Transform solid into a net, calculate the surface area of the solid.
				Review (pg. 23)
				(15 min)
				• Review
				  • the two naming systems
				  • creating 3-D representations of 2-D surfaces and creating 3-D objects from 2-D representations
				  • calculating area of the 2-D figure to determine the surface area of the 3-D object.
				
				Independent Practice
				(15 min)
				• Using the making connections portion of the lesson, practice the use of the AIMS reference sheet and a variety of solids to calculate surface area.
				
				Check toward Mastery
				(30 min)
				• The student takes a practice test which provides feedback for each chosen answer.
				• The student is then provided the challenge of determining the surface area of an icosahedrons.
					Review (Lesson 30)
					(15 min)
					• Review concepts from A+LS, Lesson 30, Nets and Solids.
					
					Check Mastery (45 min)
					• Teacher provides test and proctors testing.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5

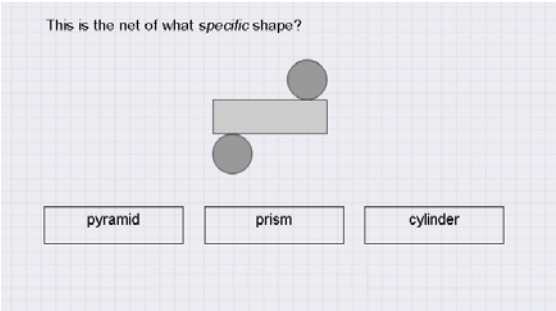
Student Activities	Intro/Review
	(10 min)
	• Students take notes on course expectations, nets and solid figures vocabulary.
	(4 min)
	• Review solids vocabulary from solids lessons 1 and 2.
	(3 min)
	• Examining solids at a deeper level by relationships to other shapes, and systems.
	(3 min)
	
	Guided Practice
	(40 min)
	• Student practices naming solids by
	  • using naming systems
	  • following naming rules
	  • answering questions
	  • using provided examples
	  • reviewing vocabulary
	  • practices determining pattern being demonstrated
	(40 min)
	
	Independent Practice
	(10 min) (Lab Assignment)
	• Student completes the Lab - Naming Solid Figures (10 min)
	• Student requests teacher support as needed.
		Intro/Review
		(20 min)
		• Student reviews notes on the naming systems, the procedure of naming a solid when viewed as a 3-D figure. (5 min)
		• Student reviews transforming a 3-D object into its 2-D representation. (5 min)
		• Student takes notes on nets, shapes, and the value for each. (5 min)
		• Student makes connections to everyday objects. (5 min)
		
		Guided Practice
		(20 min)
		• Solids/ Nets Lab – Using the lab program identify corresponding solids and nets.
		
		Independent Practice
		(20 min)
		• Student will use scissors and tape to create 3-D representations with 2-D surfaces.
		• Student requests teacher support as needed.
			Intro/Review
			((20 min)
			• Student takes notes on the practical value of using the 2-D representation as the most efficient method for calculating surface area. (10 min)
			• Student reviews the procedure for naming the shape, locating the appropriate formula, and determining the surface area of a solid.
			(10 min)
			• Student meets with teacher for clarification of understanding.
			
			Check toward Mastery
			(20 min)
			• Student takes a practice test that provides instant feedback for each answer.
			
			Guided Practice
			(20 min)
			• Student uses the solids created in the previous section.
			• Student transforms the solid into a net then uses the AIMS formula sheet to calculate the surface area of the solid. (20 min)
			• Student requests teacher support as needed.
				Review
				(15 min)
				• Student reviews notes for
				  • the two naming systems
				  • creating 3-D representations of 2-D surfaces and creating 3-D objects from 2-D representations.
				  • calculating area of the 2-D figure to determine the surface area of the 3-D object.
				
				Independent Practice
				(15 min)
				• In *Making Connections* student practices using the AIMS reference sheet and a variety of solids to calculate surface area.
				
				Check toward Mastery
				(30 min)
				• Student takes a practice test that provides instant feedback for each answer (15 min)
				• The student is then provided the challenge of determining the surface area of an icosahedrons. (15 min)
				• Student requests teacher support as needed.
					Review
					(15 min)
					• Student reviews notes for Lesson 30.
					• Student meets with teacher for clarification of understanding.
					
					Check Mastery
					(45 min)
					• Meet with teacher to access final lesson test.

Geometry Nets and Solid Figures: Summative Assessment

Strand(s), Concept(s), and PO(s) for Mastery
MHS-S4C1-02
Strand 4 Geometry and Measurement
Concept 1: Geometric Properties Analyze the attributes and properties of 2- and 3- dimensional figures and develop mathematical arguments about their relationships.
PO 2: Visualize solids and surfaces in 3-dimensional space when given 2-dimensional representations and create 2-dimensional representations for the surfaces of 3-dimensional objects.

Unit Summative Assessment- All 10 questions in this unit summative assessment demonstrate mastery of MHS-S4C1-02.

Question #1



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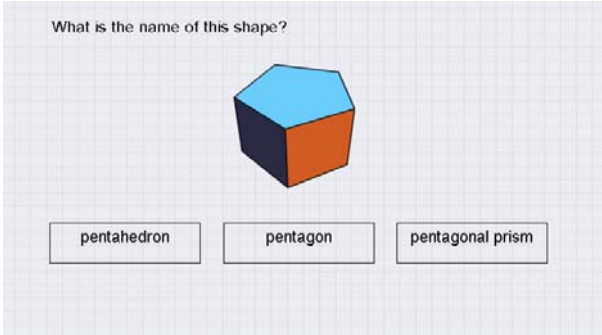

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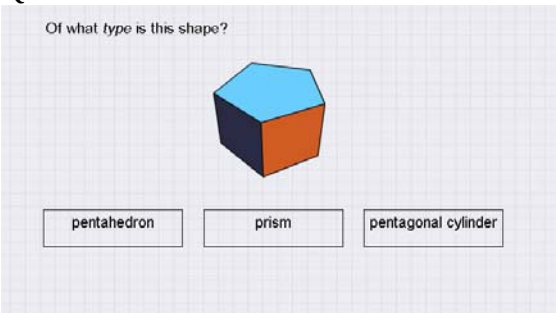

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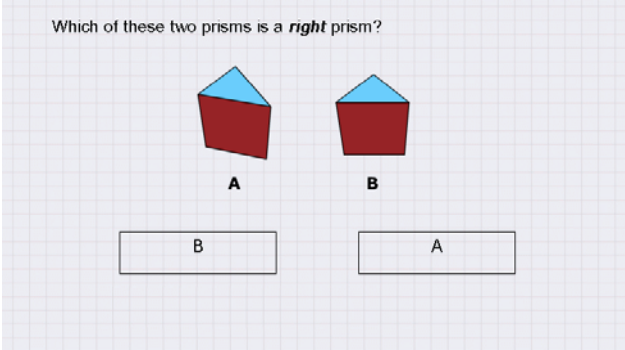

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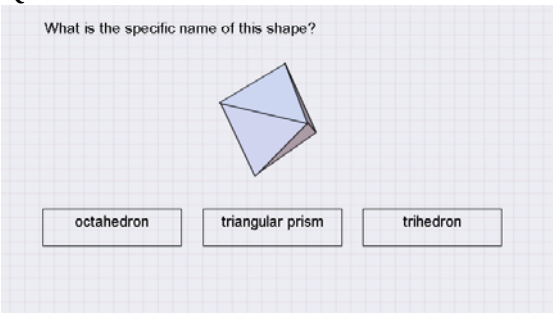

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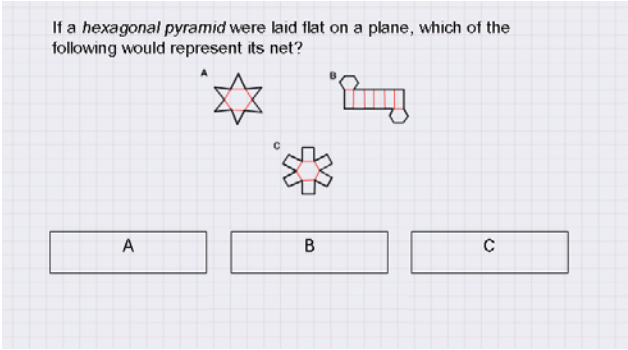

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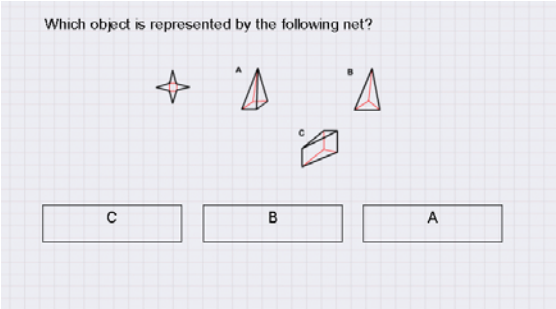
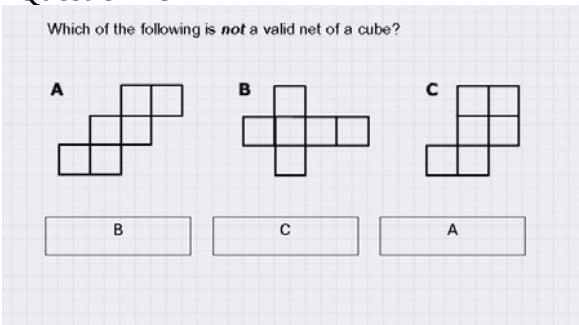


Question #8



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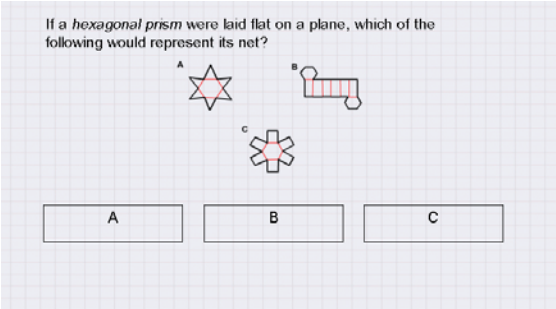

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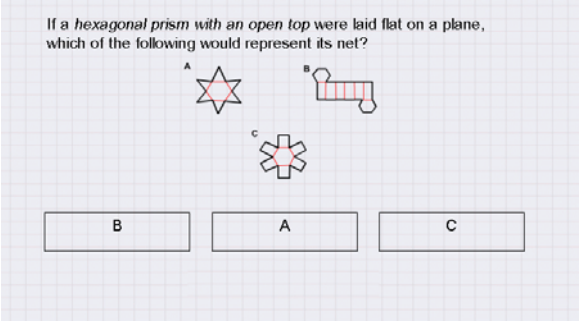

Hint: Solve the problems 11 and 12 using the solid and net representations of the object.

Question #11
Given the area formula for a square, determine the total surface area of a cube with a side measurement of 5 inches.

Area of a square = length x width

Question #12
Given the area formula for a triangle and a square, determine the total surface area of a square pyramid which the height of one of the faces is 6 inches and the base of one of the faces is 10 inches.

Area of a square = length x width
Area of a triangle = ½ x length x width

Nets and Solid Figures, Answer Key

1. cylinder		2. pentagonal prism	3. prism	4. B	5. octahedron	
6. A	7. A	8. C	9. B	10. C	11. 150 inches^2	12. 220 inches^2

Grade Breakdown:	Percent	Points
	90 – 100% = A	108 – 120 = A
	80 – 89% = B	96 –107 = B
	70 – 79% = C	84 – 95 = C
	< 70% = no credit	<84 = no credit