YES Prep North Central
2009-2010

Unit 1: Foundations of Geometry & Geometric Reasoning

To what extent does language limit your access to your environment?
6 weeks

This unit is an introduction to what geometry is and to the level of reasoning we will be developing over the course of the year. We will discuss how mathematics helps us to identify and represent patterns found in nature through the use of numbers. By identifying patterns we can predict future outcomes. Much of what we do in geometry is study basic figures that are found in the real-world much of the applications of the figures will come into play later in high school in calculus, however, there will still be numerous situations where will use both Algebra and Geometry to analyze patterns and predict future outcomes. To be successful in Geometry and beyond students will need to become excellent communicators. In this unit we will examine the importance of vocabulary, reasoning and communication.

State/District/National Standards		Daily Objectives (SWBAT…)
G.1B	Recognize the historical development of geometric systems and know mathematics is developed for a variety of purposes	SWBAT explain some of the cultural differences in how people approach problem-solving and mathematics. SWBAT identify mathematicians who have made contributions to the mathematics that we study today.
A.3A	Use symbols to represent unknowns and variables	**Use algebra to interpret real-world situations** *SWBAT manipulate literal equations.(1.1)* *SWBAT write expressions and equations to represent a situation/ relationship. (1.2)* *SWBAT solve linear equations. (1.3)*
A.7B	Investigate methods for solving linear equations and inequalities using concrete models, graphs, and the properties of equality, select a method, and solve the equations and inequalities	
8.8C	Estimate measurements and use formulas to solve application problems involving lateral and total surface area and volume.	**Use formulas to solve for an unknown.** *SWBAT calculate the area of a rectangle, triangle, trapezoid and circle given the formulas and dimensions.(1.4)* *SWBAT calculate volume and surface area of 3-dimensional figures given the formulas and dimensions.(1.5)*
G.1A	Develop an awareness of the structure of a mathematical system, connecting definitions, postulates, logical reasoning, and theorems.	**Solve for unknowns using foundational terms with a focus on point, line and angle.** SWBAT define foundational geometry terms including prerequisite terminology. *SWBAT name and label various geometric figures. (1.6)* *SWBAT solve for unknowns using foundational geometry terms with a focus on points, lines, and angles.(1.7)* *SWBAT investigate angle pairs and form conjectures about their properties and/or relationships. (1.7)*
G.1.2.1	Describes the structure of and relationships within an axiomatic system (undefined terms, defined terms, axioms/postulates, methods of reasoning, theorems).	
G.2A	Use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships	

G.3D	Use inductive reasoning to formulate a conjecture.	**Use inductive reasoning to identify a pattern, create a conjecture or "rule" and use the rule to identify the nth term.** SWBAT define inductive reasoning and explain its role in geometric reasoning. SWBAT use inductive reasoning to identify a pattern, create a conjecture or "rule" and use the rule to identify the nth term. (This does not yet include finding the equation) *SWBAT use common patterns to solve for the next term, including following rules that use symbols. (1.8)*
G.1.2.2	Forms conjectures based on exploring geometric situations with or without technology.	
G.3A	Determine the validity of a conditional statement, its converse, inverse and contrapositive.	**Determine the truth-value of a conditional statement in addition to its converse, inverse, and contrapositive by identifying counterexamples for statements with false truth-values.** *SWBAT write conditionals and their converse, inverse and contrapositive. (1.9)* *SWBAT determine the truth-value of a conditional statement in addition to its converse, inverse, and contrapositive by identifying counterexamples for statements with false truth values. (1.10)* SWBAT use biconditional statements to write and test definitions.
G.1.2.5	Formulates and investigates the validity of the converse of a conditional statement.	
G.3C	Use logical reasoning to ~~prove statements are true and~~ find counter examples to disprove statements that are false.	
G.1.2.3	Proves, directly or indirectly, that a valid mathematical statement is true. Develops a counterexample to refute an invalid statement.	
G.3E	Use deductive reasoning to prove a statement.	**Use the law of syllogism and the law of detachment to determine a statement's validity.** SWBAT define deductive reasoning and explain its role in geometric reasoning. *SWBAT identify the law of syllogism and law of detachment and use the laws to determine if a statement is valid.(1.11)*

MYP Objectives

- Select and use appropriate mathematical knowledge when investigating problems.
- Select and apply appropriate mathematical skills and techniques when investigating problems.
- Recognize patterns and structures and describe them as relationships or general rules when investigating problems.
- Justify mathematical relationships when investigating problems.

Area of Interaction	Enduring Understandings
Human Ingenuity Students will be given various excerpts from Is God a Mathematician? to begin examining the essential question for the semester. They will be working to form an opinion on whether mathematics is something the existed already (and that humans created systems to explain) or if mathematics was completely invented by humans. They will also read information about _____ and his contributions to mathematics.	• Before beginning Geometry, we need to touch up on the prerequisites – algebra and 8th grade geometry. It will seem easy – and that's okay but students need to remember that we will continue to build on this knowledge throughout the year so they cannot put it on the backburner and forget about it. Once it's taught they are expected to be able to call on it at any time. • Geometry is a way of thinking about and seeing the world. • Points, lines, and planes form the foundation of geometry. The three terms taken explicitly as undefined. Vocabulary or definitions are essential to communicating ideas and reasoning. • Geometry is a mathematical system. Together definitions, postulates, logical reasoning, and theorems work together to help us explain and prove mathematical patterns and relationships • Inductive reasoning is used to identify a pattern and make a conjecture or rule. • Deductive reasoning helps to prove a conjecture or rule (then it becomes a theorem). • If a conditional is true, then its contrapositive is also true. • Things you can assume ▪ Lines are straight ▪ If two lines intersect, they intesect at on point. ▪ Points on a line are collinear ▪ Points shown in a diagram are coplanar unless the planes are drawn to show that they are noncoplanar. • Things you canNOT assume: ▪ That just because two lines or segments *look* parallel that they *are* parallel ▪ That two lines *are* perpendicular just because they *look* perpendicular ▪ That pairs of angles, segments, or polygons are congruent – they MUST be marked!
Approaches to Learning In the first unit students will be introduced to note-taking skills and strategies for problem-solving and memorization. Students will read an excerpt from Malcolm Gladwell's Outliers that addresses the issue of hardwork/persistence when it comes to success in mathematics.	

Unit Essential Question

Was mathematics invented or discovered?

Summative Assessment

Type of Assessment	Objectives Tested	MYP Assessment Criteria
■ Traditional Assessment	• **Tracking Skills/ Automaticity – Weekly Skills Mastery Quizzes** **1.1** Manipulate literal equations to solve for one variable — AP **1.2** Write expressions and equations to represent a situation/ relationship — AP **1.3** Solve linear equations — AP **1.4** Calculate area of rectangles, triangles, trapezoids and circles (given area) — AP **1.5** Calculate volume and surface area (given formula) — AP **1.6** Labeling point, line, plane, segment, ray, etc. — AP **1.7** Solve for unknowns using segment and angle relationships. — A **1.8** Solve problems using symbolic deductive reasoning **1.9** Write conditional statements (converse, inverse, contrapositive) — A **1.10** Determine truth values and provide counterexamples — A **1.11** **Identify?** Law of Syllogism and Law of Detachment — A • **End-of-unit Exam** (More rigorous – requires students to combine skills to solve problems)	**Criterion A**
■ Project	• LTF – Working with Formulas and Function Notation or Literal Equations (Geometric Formulas) • LTF – Logical Reasoning (If-then Statements)	**Criterion B**

Unit Vocabulary

1. Geometry
2. Point
3. Line
4. Plane
5. Compass
6. Straightedge
7. **Collinear**
8. **Coplanar**
9. **Line segment**
10. **Endpoints**
11. **Congruent segments**
12. **Midpoint**
13. **Bisects**
14. **Ray**
15. **Vertex**
16. Sides
17. **Angle**
18. Measure of an angle
19. Degrees
20. Protractor
21. Right angle
22. Acute angle
23. Obtuse angle
24. Vertical angle
25. **Complementary angle**
26. **Supplementary angle**
27. **Linear angle**
28. **Angle bisector**
29. **Polygon**
30. **Diagonal**
31. **Convex**
32. **Concave**
33. **Equilateral Polygon**
34. **Equiangular Polygon**
35. **Regular Polygon**
36. **Triangle**
37. Quadrilateral
38. Pentagon
39. Hexagon
40. Heptagon
41. Octagon
42. Nonagon
43. Decagon
44. Trapezoid
45. Kite
46. **Parallelogram**
47. **Rhombus**
48. **Rectangle**
49. **Square**
50. Circle
51. Radius
52. Diameter
53. Arc of a circle
54. Semicircle
55. Minor arc
56. Major arc
57. Central angle
58. Chord
59. Diameter
60. Tangent
61. Point of Tangency
62. Space
63. Pyramid
64. Cylinder
65. Prism
66. Cone
67. Sphere
68. Hemisphere
69. Inductive Reasoning
70. Conjecture
71. **Counterexample**
72. **Conditional Statement**
73. Hypothesis
74. Conclusion
75. Truth Value
76. Negation
77. Converse
78. Inverse
79. Contrapositive
80. Logically equivalent statements
81. Deductive Reasoning
82. **Biconditional Statement**
83. Definition
84. Proof
85. Postulate
86. Axiom
87. Theorem
88. Two-column proof
89. Flowchart proof
90. Paragraph proof

Daily (tentative) Schedule

Friday, August 14, 2009 – Friday, September 18, 2009

Date	Day	Objectives	Lesson	Homework
10-Aug	Monday	PD	PD	
11-Aug	Tuesday	PD	PD	
12-Aug	Wednesday	Culture	Culture/ Diagnostic	Outliers reading – Due Tues. 8/18
13-Aug	Thursday	Culture	Culture	Outliers reading – Due Tues 8/18
14-Aug	Friday	Culture	Culture	Outliers reading – Due Tues. 8/18 Supplies for class due Mon. 8/17
17-Aug	Monday	SWBAT articulate the expectations for the course.	Intro to course – review syllabus (focus on grading and portfolios) and room set up	Outliers reading – Due Tues 8/18
18-Aug	Tuesday	SWBAT explain some of the cultural differences in how people approach problem-solving and mathematics.	Discussion about hard work/persistence/how to approach a problem Discuss hw expectations, grading, tracking, and "toolkit"	Get syllabus signed.
19-Aug	Wednesday	*SWBAT manipulate literal equations.(1.1)*	Mini lesson – then GP and IP (this week will be very traditional teaching – trying to help students understand why INDEPENDENT practice is so important and that when I say "no talking to others" they need to comply	$H = (0.24)I^2Rt$ Easy: Solve for R Challenge: Solve for I
20-Aug	Thursday	*SWBAT write expressions and equations to represent a situation/ relationship. (1.2)* *SWBAT solve linear equations. (1.3)*		Easy: The ages of two brothers can be represented as consecutive even integers. If the younger brother's age is x +3, represent the age of the older brother. Challenge: Bryan and Nate are dirt bike racers and are brothers. Bryan gives his younger brother, Nate, a 60 meter head start during a practice run. After *t* seconds, Nate is a distance $6t + 60$ from the starting line and Bryan is a distance of $7t$ from the starting line. a. How far ahead of Bryan is Nate after *t* seconds? b. Evaluate the answer for part a when: i. t = 15 ii. t = 30 ii. t = 45 c. Does Bryan ever catch up with

				Nate? If so, after how many seconds?
21-Aug	Friday	*SWBAT calculate the area of a rectangle, triangle, trapezoid and circle given the formulas and dimensions.(1.4)*		
24-Aug	Monday	*SWBAT calculate volume and surface area of 3-dimensional figures given the formulas and dimensions.(1.5)*		
25-Aug	Tuesday	*SWBAT calculate volume and surface area of 3-dimensional figures given the formulas and dimensions.(1.5)*		
26-Aug	Wednesday	SWBAT demonstrate current mastery level of automaticity skills. *Half Day/shortened class	Quiz day: 1.1 – literal equations, 1.2 – expressions, 1.3 linear equations, 1.4 area,	
27-Aug	Thursday	SWBAT combine automaticity skills (in their toolkit) to solve complex problems.	LTF – Working with Formulas and Function Notation or Literal Equations (Geometric Formulas)	
28-Aug	Friday	SWBAT combine automaticity skills (in their toolkit) to solve complex problems.	LTF – Working with Formulas and Function Notation or Literal Equations (Geometric Formulas)	
31-Aug	Monday	SWBAT define foundational geometry terms including prerequisite terminology. *SWBAT name and label various geometric figures. (1.6)*		
1-Sep	Tuesday	*SWBAT name and label various geometric figures. (1.6)* *SWBAT solve for unknowns using foundational geometry terms with a focus on points, lines, and angles.(1.7)* *SWBAT investigate angle pairs and form conjectures about their properties and/or relationships. (1.7)*		
2-Sep	Wednesday	SWBAT demonstrate current mastery level of automaticity skills.	Quiz day – 1.4 area, 1.5 volume, 1.6 labeling/naming	
3-Sep	Thursday	*SWBAT solve for unknowns using foundational geometry terms with a focus on points, lines, and angles.(1.7)* *SWBAT investigate angle pairs and form conjectures about their properties and/or relationships. (1.7)*		

4-Sep	Friday	SWBAT define inductive reasoning and explain its role in geometric reasoning. SWBAT use inductive reasoning to identify a pattern, create a conjecture or "rule" and use the rule to identify the nth term. (This does not yet include finding the equation) *SWBAT use common patterns to solve for the next term, including following rules that use symbols. (1.8)*		
7-Sep	Monday	No School		
8-Sep	Tuesday	*SWBAT write conditionals and their converse, inverse and contrapositive. (1.9)*		
9-Sep	Wednesday		Quiz day – 1.7 solving, 1.8 symbolic reasoning, 1.9 conditional statements	
10-Sep	Thursday	*SWBAT determine the truth-value of a conditional statement in addition to its converse, inverse, and contrapositive by identifying counterexamples for statements with false truth values. (1.10)* SWBAT use biconditional statements to write and test definitions.		
11-Sep	Friday	*SWBAT determine the truth-value of a conditional statement in addition to its converse, inverse, and contrapositive by identifying counterexamples for statements with false truth values. (1.10)* SWBAT use biconditional statements to write and test definitions. (maybe)	True values, counterexamples: LTF – Logical Reasoning (If-then Statements)	
14-Sep	Monday	SWBAT define deductive reasoning and explain its role in geometric reasoning. *SWBAT identify the law of syllogism and law of detachment and use the laws to determine if a statement is valid.(1.11)*		
15-Sep	Tuesday	SWBAT define deductive reasoning and explain its role in geometric reasoning. *SWBAT identify the law of syllogism and law of detachment and use the laws to determine if a statement is valid.(1.11)*		
16-Sep	Wednesday		Quiz day –1.10 TV/counterexamples, 1.11 laws	

17-Sep	Thursday	SWBAT	Review	
18-Sep	Friday	SWBAT demonstrate their ability to apply Unit 1 objectives in new ways.	Unit 1 exam	
21-Sep	Monday	PD – Planning for next 6 weeks		

Resources

How will the classroom environment, local environment, and/or the community be used to facilitate students experiences?
How will I incorporate international mindedness throughout the unit?
What resources do I need to teach this unit in terms of differentiation, equipment, and materials?

- Malcolm Gladwell's Outliers
- Mario Livio's Is God a Mathematician?
- Discovering Geometry Book, Key Curriculum Press, Chapters 1 and 2
- Holt Geometry Text Book, Chapters 1 - 3
- Dana Center Assessment Book
- Laying the Foundations lessons
- Patty Paper Geometry by Michael Serra, Key Curriculum Press

- **You've done a great job of planning how to incorporate Approaches to Learning and Human Ingenuity.**
- **Do you think it would be helpful o narrow down to fewer enduring understandings? If I have too many, I end up not really being deliberate about using them at all… I like to have five or fewer.**
- **What do AP and A mean, in the assessment section?**
- **I REALLY like the way you did the calendar!**
- **I'm curious how you decided to order the objectives for 8/19 and 8/20. I usually teach them to solve equations in one variable first.**
- **I LOVE your plan to test and track mastery of automaticity skills. I think it will really help to make sure kids don't slip through the crack.**
- **Since the unit tests are more rigorous than the quizzes, how will students know if they are ready for the test? What if a kid does really well on quizzes, assumes he's ready for the test, and then does poorly? How should they study/prepare?**