#### ABGS MIDDLE SCHOOL Unit Planner

# ALGEBRA 1

### UNIT 1 – REAL NUMBER SYSTEMS

Teacher(s)	N. Davis D. Topping T. Moran	Subject Group and Discipline	Advanced 8 Algebra 1		
Unit Title	Unit 1 Real Number System	MYP Year	4	Unit Duration	2 – 3 WEEKS

## INQUIRY? Establishing the purpose of the unit

Key Concept	Related Concept(s)	Global Context
Relationships	Simplification and Equivalence	Identities and Relationships

Statement of Inquiry
Conceptual Understanding: Relationships can be modeled and identified through simplification and equivalence.
Statement of Inquiry: Establishing patterns in the natural world can help in understanding the simplification of relationships,
identities and their equivalence.
Inquiry Questions
Factual – How can one differentiate between rational and irrational?
Conceptual – How can we use properties to simplify and evaluate relationships?
Debatable – How can one arrive at the same answer using different processes?

MYP OBJECTIVES			
NYS Next Generation Standards	IB Objectives		
<b><u>NY-8.EE.1</u></b> : Know and apply the properties of integer exponents	Mathematics Year 4		
to generate equivalent numerical expressions. e.g., $3^2  imes$			
$3^{(-5)} = 3^{-3} = \frac{1}{(3^3)} = \frac{1}{27}$	<b>Objective A</b> : Knowing and Understanding		
<b>NY-8.EE.2</b> : Use square root and cube root symbols to represent	i. Students select appropriate mathematics when solving simple		
solutions to equations of the form $x^2 = p$ and $x^3 = p$ , where p is a positive rational number. Know square roots of perfect	problems in familiar and unfamiliar situations.		
squares up to 225 and cube roots of perfect cubes up to 125.			
Know that the square root of a non-perfect square is irrational.	II. Students apply the selected mathematics successfully when		
e.g., The v2 is irrational.	solving problems.		
<b>NY-8.EE.3:</b> Use numbers expressed in the form of a single digit	iii. Students solve these problems correctly.		
small quantities and to express how many times as much one is			
than the other. e.g., Estimate the population of the United	Objective B: Investigating Patterns		
States as $3 \times 108$ and the population of the world as $7 \times 109$ ,	. Chudonte coloct and each methometical mehlow coluing		
and determine that the world population is more than 20 times	1. Students select and apply mathematical problem-solving techniques to discover complex patterns		
larger			
<b><u>NY-8.EE.4</u></b> : Perform multiplication and division with numbers	ii. Students describe patterns as relationships and/or general		
expressed in scientific notation, including problems where both	rules consistent with correct findings.		
scientific notation and choose units of appropriate size for			
measurements of very large or very small quantities. Interpret	iii. Students verify and justify relationships and/or general rules.		
scientific notation that has been generated by technology			
<u>NY-8.NS.1</u> : Understand informally that every number has a	Objective C: Communicating		
decimal expansion; for rational numbers show that the decimal	i Students use appropriate mathematical language (notation		
expansion eventually repeats. Know that other numbers that	symbols and terminology) in both oral and written		
are not rational are called irrational.	explanations.		

<b><u>NY-8.NS.2</u></b> : Use rational approximations of irrational numbers	
to compare the size of irrational numbers, locate them	ii. Students use appropriate forms of mathematical
approximately on a number line, and estimate the value of	representation to present information.
expressions.	iii. Students move between different forms of mathematical
AI-N.RN.3: different forms of rational and irrational numbers.	representation.
a.) Perform all four arithmetic operations and apply properties	
to generate equivalent forms of rational numbers and square	<b>Objective D</b> : Applying mathematics in real-life context.
roots.	
Note: Tasks include rationalizing numerical denominators of the	i. Students identify elements of authentic real-life situations.
form $aa \lor bb$ where a is an integer and b is a natural number.	
b.) Categorize the sum or product of rational or irrational	ii. Students select appropriate mathematical strategies when
numbers.	solving real-life situations.
• The sum and product of two rational numbers is rational. •	
The sum of a rational number and an irrational number is	iv. Students explain the degree of accuracy of a solution.
irrational. • The product of a nonzero rational number and an	
irrational number is irrational. • The sum and product of two	v. Students explain whether a solution makes sense in the
irrational numbers could be either rational or irrational.	context of the authentic real-life situation.
• The sum and product of two rational numbers is rational. •	
The sum of a rational number and an irrational number is	
irrational. • The product of a nonzero rational number and an	
irrational number is irrational. • The sum and product of two	
irrational numbers could be either rational or irrational.	
AI-A.SSE.3c: Use the properties of exponents to rewrite	
exponential expressions. (Shared standard with Algebra II) e.g.,	
• $3^{2x} = (3^2)^x = 9^x \cdot 3^{2x+3} = 3^{2x} \cdot 3^3 = 9^x \cdot 27$ Note: Exponential	
expressions will include those with integer exponents, as well as	
those whose exponents are linear expressions. Any linear term	
in those expressions will have an integer coefficient.	

Summative Assessment	Relationship Between Summative Assessment Task
	and Statement of Inquiry
Outline of summative assessment task(s) including assessment criteria:   Goal: Establishing patterns in the real world can help in understanding relationships between rational and irrational numbers.   Role: You own an in-ground pool company, Lagoon Pools.   Audience: Potential Customers   Situation: Your job is to create a marketing campaign which could include a brochure, poster board or webpage to advertise to potential customers about the type of pools your company is able to design.   This campaign must contain pools in the shape of circles, squares and rectangles. The campaign should include costs per features such as walkways and fencing around the pool, type of stone, and lighting.   Equipment such as pool heater, energy efficiency, water sanitizer and additional features such as hot tubs or requests made by the customer should be included. You want to ensure that this strategy displays models of pools with their shape and dimension to appeal to all potential customers. Customers include residential, homeowners and commercial; camps, resorts, hotels, ocean liners, etc.   For Example:   Rectangle pool with dimensions 23 feet by 14 feet.   Circle pool with dimensions 20 feet by 20 feet.   Marketing campaign should include:   Models of the three shapes. You may include shapes other than the three given. However, one of the shapes must be a circle.   Cost of additional features.	Establishing patterns in the natural world can help in understanding the simplification of relationships, identities and their equivalences.

1. Students will be able to calculate the square feet of the dimension	
of their designed pool.	
<ol><li>Students will be able to calculate the total cost to build the</li></ol>	
designed pool with or without additional features.	
3. Students will be able to determine which pool has rational or	
irrational dimensions.	
4. Students will be able to explain why these dimensions of the pools	
are rational or irrational.	

Approaches to Learning (ATL)
Thinking: Draw justifiable conclusion and generalizations from investigating patterns.
Communication: Keep a regular journal during the investigation to maintain a record of reflections.

# ACTION: Teaching and learning through inquiry

Content	Learning Process
Real Number System	LEARNING EXPERIENCES AND TEACHING STRATEGIES
Properties of Real Numbers	
Operations with Real Numbers	Direct Instruction
Evaluating Expressions	Group Activities
Modeling Expressions	Independent Practice
Exponents	Math Jeopardy
Scientific Notation	
Real-Life Context with Rational Numbers	

	VOCABULARY	FORMATIVE ASSESSMENT
Real Numbers	Associative Property	Quizzes
Counting Numbers	Commutative Property	Tests
Integers	Identity Property	Homework
Whole Numbers	Inverse Property	Classwork
Rational Numbers	Distributive Property	Benchmark
Irrational Numbers	Perfect Squares Square Root	Algebra Common Core 1 Regent
Principal Square Root	Prime Numbers Composite Numbers	DIFFERENTIATION
Fractions	Decimals Algebraic Expressions	TI-84 Graphing Calculator
Order of Operations	Term Variable Coefficient	TI-30 Scientific Calculator
Base Factors	Exponents Constant	Students' IEPs
Leading Coefficient	Verbal Expressions	Real-Life Situations
Standard Notation	Scientific Notation Powers	Student Options
Numerical Expressions	Translation	With Additional Teacher Support (AIS)

Resources		
Teacher Created Worksheets	Computer Based Worksheets & Activities	Algebra Teachers' Activity Book
Math Textbook	Delta Math	IXL
Brain-Pop	www.jmap.org	Problem-Attic
Teachers Pay Teachers	Kahn Academy	Kendrick Krause (YouTube)

Prior to Teaching the Unit	During Teaching	After Teaching the Unit
Why do we think that the unit or the	What difficulties did we encounter while	What were the learning outcomes of this
selection of topics will be interesting?	completing the unit or the summative	unit?
What do students already know, and	assessment task(s)?	How well did the summative assessment
what can they do?	What resources are proving useful, and	task serve to distinguish levels of
What have students encountered in this	what other resources do we need?	achievement? Was the task sufficiently
discipline before?	What student inquiries are emerging?	complex to allow students to reach the
What does my experience tell me about	What can we adjust or change?	highest levels?
what to expect in this unit?	What skills need more practice?	What evidence of learning can we
What attributes of the learning profile	What is the level of student engagement?	identify? What artefacts of learning
does this unit offer students	How can we scaffold learning for students	should we document?
opportunities to develop?	who need more guidance?	Which teaching strategies were effective?
What potential interdisciplinary	What is happening in the world right now	Why?
connections can we identify?	with which we could connect teaching	What was surprising?
What do we know about my students'	and learning in this unit?	What student-initiated action did we
preferences and patterns of interaction?	How well are the learning experiences	notice?
Are there any possible opportunities for	aligned with the unit's objectives?	What will we do differently next time?
meaningful service learning?	What opportunities am I hearing to help	How will we build on our experience to
What in the unit might be inspiring for	students explore the interpretative	plan the next unit?
community or personal projects?	nature of knowledge, including personal	How effectively did we differentiate
Could we develop authentic	biases that might be retained, revised or	learning in this unit?
opportunities for service learning?	rejected? (DP Theory of knowledge skills	What can students carry forward from
How can we use my students'	development)	this unit to the unit? to the next year/
multilingualism as a resource for		level of study?
learning?		Which subject groups could we work with
		next time?
		What did we learn from standardizing the
		assessment?

# REFLECTION: Considering the planning, process and impact of the inquiry