Marietta City Schools

2023–2024 District Unit Planner

Enhanced Algebra: Concepts & Connections (Grade 8)

Unit title	*Unit 3: Investigating Rational and Irrational Numbers*	**MYP year**	*3*	**Unit duration (hrs)**	*Enter Hours* *MSGA- (5 hours per week)* *MMS- (4.5 hours per week)* *MHS- (7.5 hours per 2 weeks)*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

8.NR.1 : Solve problems involving irrational numbers and rational approximations of irrational numbers to explain real-life applications.

8.NR.1.1: Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.

8.NR.1.2: Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.

8.NR.2 : Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real-life phenomena.

8.NR.2.1 Apply the properties of integer exponents to generate equivalent numerical expressions.

8.NR.2.2 Use square root and cube root symbols to represent solutions to equations. Recognize that x2 = p (where p is a positive rational number and |x| ≤ 25) has two solutions and x3 = p (where p is a negative or positive rational number and |x| ≤ 10) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.

8.NR.2.3 Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.NR.2.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools).

A.NR.5 : Investigate rational and irrational numbers and rewrite expressions involving square roots and cube roots.

A.NR.5.1: Rewrite algebraic and numeric expressions involving radicals.

A.NR.5.2: Using numerical reasoning, show and explain that the sum or product of rational numbers is rational, the sum of a rational number and an irrational number is irrational, and the product of a nonzero rational number and an irrational number is irrational.

A.MM.1 : Apply mathematics to real-life situations; model real-life phenomena using mathematics

A.MM.1.1 Explain applicable, mathematical problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics in the framework of real-life problems.
• Mathematically applicable problems are those presented in which the given framework makes sense, realistically and mathematically, and allows for students to make decisions about how to solve the problem (model with mathematics).

A.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities domains.

Fundamentals

• Students should be able to use the content learned in this course to create a mathematical model to explain real-life phenomena.

A.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

Strategies and Methods

• Students should be able to fluently navigate between mathematical representations that are presented numerically, algebraically, and graphically.
• For graphical representations, students should be given opportunities to analyze graphs using interactive graphing technologies.

A.MM.1.5 Define appropriate quantities for the purpose of descriptive modeling.

Fundamentals

• Given a situation, framework, or problem, students should be able to determine, identify, and use appropriate quantities for representing the situation.

A.MP.1-8 : Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.

Concepts/Skills to support mastery of standards

8.NR.1.1: Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.
8.NR.1.2: Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.
8.NR.2.1 Apply the properties of integer exponents to generate equivalent numerical expressions.
8.NR.2.2 Use square root and cube root symbols to represent solutions to equations. Recognize that x2 = p (where p is a positive rational number and $|x| \leq 25$) has two solutions and x3 = p (where p is a negative or positive rational number and $|x| \leq 10$) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.
8.NR.2.3 Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.
8.NR.2.4 Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools).
A.NR.5.1: Rewrite algebraic and numeric expressions involving radicals.
A.NR.5.2: Using numerical reasoning, show and explain that the sum or product of rational numbers is rational, the sum of a rational number and an irrational number is irrational, and the product of a nonzero rational number and an irrational number is irrational.
MSC.Gifted.S2B-Students will develop and utilize creative thinking through a variety of products and problem solving.
MSC.Gifted.S3B- Students will develop and utilize critical thinking, higher order thinking, logical thinking, and problem-solving skills in various situations.

Vocabulary

K-12 Mathematics Glossary

Addition Property of Equality	**Additive Inverse**	**Algebraic Expressions**	**Cube Roots**	**Square Roots**	**Equations**	**Evaluate an Algebraic Expression**
Exponents	**Inverse Operations**	**Irrational Numbers**	**Like Terms**	**Linear Equations in one variable**	**Multiplication Property of Equality**	**Multiplicative Inverse**
Radical	**Rational Numbers**	**Scientific Notation**	**Significant Digits**	**Operations**	**Perfect Square**	**Variable**
Product of nonzero rational number	**Decimal expansion**	**Perfect Cubes**	**Approximate/Estimate**	**Composite Numbers**	**Factors**	**Fractions**
Index	**Natural Numbers**	**Non-Repeating Decimals**	**Non-Terminating Decimals**	**Prime Numbers**	**Power**	**Radicand**
Ratio	**Real Numbers**	**Repeating Decimal**	**Terminating Decimal**	**Whole Number**	**Zero**	**Zero Exponent Rule**
Exponent Notation	**Negative Exponent Rule**	**Properties of Integer Exponents**	**Product Rule**	**Power Rule**	**Power of Product Rule**	**Quotient Rule**

Notation

Key concept	Related concept(s)	Global context
Form	Justification and Simplification	Scientific and Technical Innovation

Statement of inquiry

Exploring the relationships between rational and irrational numbers through models can enhance our understanding of their properties and applications in scientific and technical innovation.

Inquiry questions		
Factual— How can we simplify exponential expressions? **Conceptual— How are exponents and scientific notation related?** **Debatable- What is the best form of representing numbers and expressions?**		
MYP Objectives	**Assessment Tasks**	
*What specific MYP **objectives** will be addressed during this unit?*	***Relationship** between summative assessment task(s) and statement of inquiry:*	*List of common formative and summative assessments.*
Objective A: Knowing and Understanding Objective B: Investigating Patterns Objective C: Communicating Objective D: Applying Mathematics in Real-Life Contexts	Students will use various numeric forms to help them understand scientific principles.	**Formative Assessment(s):** **Unit 3 CFA** **Summative Assessment(s):** **Unit 3 Summative Assessment** **Unit 3 Summative Retest** **MYP Assessment - Evaluation Statements about Rational and Irrational Numbers**
Approaches to learning (ATL)		
Category: Self-Management Skills **Cluster:** Reflection **Skill Indicator:** Perseverance demonstrate persistence and performance		

Learning Experiences Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
A.NR.5: Investigate Rational and Irrational Numbers and rewrite expressions involving square roots and cube roots. **A.NR.5.1**: Rewrite algebraic and numeric expressions involving radicals. **A.NR.5.2**: Using numerical reasoning, show and explain that the sum or product of rational numbers is rational, the sum of a rational number and an irrational number is irrational, and the product of a nonzero rational number and an irrational number is irrational.	**Equivalent Radical Expressions: Length, Perimeter, and Area** https://lor2.gadoe.org/gadoe/file/533733ba-3fa6-4fc8-8e2f-e163cf69d6ff/1/Equivalent-Radical-Expressions-Length-Perimeter-Area-EA-Unit-3-Student-Reproducibles.pdf **(Student Document)** https://lor2.gadoe.org/gadoe/file/533733ba-3fa6-4fc8-8e2f-e163cf69d6ff/1/Equivalent-Radical-Expressions-Length-Perimeter-Area-EA-Unit-3-Learning-Plan.pdf **(Teacher Document)**	Learning Plan Description: In this learning plan, students will use their prior knowledge to identify and calculate equivalent radicals. Students will use radicals to solve problems involving length and perimeter of objects.
8.NR.1 : Solve problems involving irrational numbers and rational approximations of irrational numbers to explain real-life applications. **8.NR.1.1:** Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number. **8.NR.1.2**: Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.	**Translating Between Repeating Decimals and Fractions (FAL)** https://lor2.gadoe.org/gadoe/file/16b8e33d-7dcc-448c-9b65-569a76afd60d/1/Translating-Between-Student-8U5.pdf **(Student Document)** https://lor2.gadoe.org/gadoe/file/16b8e33d-7dcc-448c-9b65-569a76afd60d/1/Translating-Between-8U5.pdf **(Teacher Document)** https://lor2.gadoe.org/gadoe/file/16b8e33d-7dcc-448c-9b65-569a76afd60d/1/Translating-Between-Lesson-Guide-8U5.pdf **(Lesson Guide)** https://lor2.gadoe.org/gadoe/file/16b8e33d-7dcc-448c-9b65-569a76afd60d/1/Translating-Between-Blackline-8U5.pdf **(Blackline Master)**	Learning Plan Description: In this learning plan, students are asked to translate between decimal and fraction notation, particularly when the decimals are repeating, create and solve simple equations to find the fractional equivalent of a repeating decimal, and understand the effect of multiplying a decimal by a power of 10.

8.NR.2 : Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real-life phenomena. **8.NR.2.1** Apply the properties of integer exponents to generate equivalent numerical expressions.	**Generalizing Patterns of Exponent Properties** https://lor2.gadoe.org/gadoe/file/e7531553-72a7-4102-9486-f7c4ea153914/1/Generalizing-Patterns-of-Exponent-Properties-Student-Reproducible-8U5.pdf **(Student Document)** https://lor2.gadoe.org/gadoe/file/e7531553-72a7-4102-9486-f7c4ea153914/1/Generalizing-Patterns-of-Exponent-Properties-8U5.pdf **(Teacher Document)**	Learning Plan Description: In this learning plan, students generalize patterns of exponent properties. Students will use their generalizations to discover and name the Product, Power to a Power, Quotient, Zero Power, and Negative Exponent Rules.
Content Resources		
GADOE (Learning Plans) SaVVas: Envision Algebra 1 - **Lesson Topic 1-1, GA-5, 9-3, 9-4** SaVVas: Envision Grade 8 - **Lesson Topic 1-1 - 1-10**		