Marietta City Schools

2024–2025 District Unit Planner

Algebra: Concepts & Connections

Unit title	Unit 5: Modeling and Analyzing Exponential Expressions and Equations	**MYP year**	4	**Unit duration (hrs)**	*12 hours*

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

GA DoE Standards

Standards

A.PAR.8: Create and analyze exponential expressions and equations to represent and model real-life phenomena; solve exponential equations in mathematically applicable situations.

A.PAR.8.1 Interpret exponential expressions and parts of an exponential expression that represent a quantity in terms of its framework.

Fundamentals

• Students should be able to interpret parts of an expression, such as terms, factors, leading coefficient, coefficients, constant and degree in context.

• Given mathematically applicable situations which utilize formulas or expressions with multiple terms and/or factors, students should be able to interpret the meaning in context of individual terms or factors

A.PAR.8.2 Create exponential equations in one variable and use them to solve problems, including mathematically applicable situations.

Relevance and Application

• Exponential equations are limited to those containing like bases, or exponential equations that could easily be transferred to like bases with linear operations.

A.PAR.8.3 Create exponential equations in two variables to represent relationships between quantities, including in mathematically applicable situations; graph equations on coordinate axes with labels and scales.

Example

• Exponential growth and decay situations are an expectation for this learning objective.

A.PAR.8.4 Represent constraints by exponential equations and interpret data points as possible or not possible in a modeling environment.

Terminology

• Possible data points are solutions to the equation(s); data points that are not possible are non-solutions to the equation(s).

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.

Concepts/Skills to support mastery of standards

Students should be able to continue to draw on previous knowledge of expressions to help determine all parts of exponential equations.
Students should use applicable in - context situations to model growth and decay.

Vocabulary

Asymptotic Behavior	Average Rate of Change	Coefficient	Constraint	Continuous	Decay
Decreasing	Domain	End Behavior	Exponential Expression	Exponential Model	Exponential Relationship
Geometric Sequence	Growth	Increasing	Interval Notation	Parameter	Range
Term	x-intercept	y-intercept			

Notation

Function Notation - $f(t)$ Interval Notation - [.] , (,) Set Notation - D: $\{x|x \in R\}$ (Set of all real numbers) , R: $\{y \mid y \in R\}$, $\{x|5 \leq x \leq 7\}$

Key concept	Related concept(s)	Global context
Logic A method of reasoning and a system of principles used to build arguments and reach conclusions.	Generalization, Pattern, Representation	Globalization and Sustainability: Consumption, conservation, natural resources and public goods

Statement of inquiry

The application of logical reasoning principles, including validity and quantity, within mathematical models can enhance our understanding of the relationship between globalization and sustainability, particularly in the context of consumption, conservation of natural resources, and the provision of public goods.

Inquiry questions
Factual— ● What is the formula for growth and decay exponential equations? ● How do I graph an exponential function? ● What does half-life mean? ● What does a growth and a decay function look like on a graph? **Conceptual—** ● How can you interpret an exponential function? ● What is the difference between a growth and a decay within an exponential function? **Debatable-** ● Is it easier to interpret a graph of an exponential function or the equation?

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.*
MYP A - Unit Assessment	Summative assessment will have questions that ask students to use multiplying cells learning activity to make predictions about sustainability.	**Formative Assessment(s):** Common Formative **Summative Assessment(s):** MYP A

Approaches to learning (ATL)	
Category: Thinking Skills **Cluster:** Critical-thinking **Skill Indicator:** Practice visible thinking strategies and techniques **Learning Experience: Paper Folding Task**	**Category:** Self-Management Skills **Cluster:** Organization **Skill Indicator:** Use appropriate strategies for organizing complex information

Learning Experiences		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
A.PAR.8.1 - Interpret exponential expressions and parts of an exponential expression that represent a quantity in terms of its framework **A.PAR.8.2** - Create exponential equations in one variable and use them to solve problems, including mathematically applicable situations. **A.PAR.8.3** - Create exponential equations in two variables to represent relationships between quantities, including in mathematically applicable situations; graph equations on coordinate axes with labels and scales. **A.PAR.8.4** - Represent constraints by exponential equations and interpret data points as possible or not possible in a modeling environment.	**Paper Folding Task (Explore (Desmos), Apply, and Reflect)** **(Honors same)** **Description:** In this learning plan, students will use paper folding to model exponential functions. Students will collect data and determine algebraic models that represent their functions. **Learning Goals:** ● I can write an equation to represent an exponential relationship. ● I can model a data set using an equation. ● I can choose the best form of an equation to model exponential functions	Supporting the Learning: Make explicit connections between current and prior lessons by reminding students that they've already learned 2 types of functions (linear and Quadratic). This task will introduce students to using exponential functions to model real-world situations. Extending the Learning: Once students have completed the task, allow time to discuss the findings. Focus on questioning that verifies and deepens students' understanding such as: o How does the initial value change the function? o How do we use exponential functions to represent real-life situations? o What is happening to the function as it approaches the x-intercept? o How can we tell if we have exponential growth or decay based on the equation?
Content Resources		
Textbook Correlation: enVision A|G|A - Algebra 1 **A.PAR.8.1** - Lesson 6-2, 6-3 **A.PAR.8.2** - Lessons 6-1 **A.PAR.8.3** - Lesson 6-3, Topic 6 - Mathematical Modeling in 3 Acts **A.PAR.8.4** - Lessons 6-3		