Marietta City Schools

2024–2025 District Unit Planner

Algebra: Concepts & Connections

Unit title	Unit 1: Modeling Linear Functions	**MYP year**	4	**Unit duration (hrs)**	*15 hrs*

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

GA DoE Standards

Standards

A.FGR.2: Construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena. Use formal notation to represent linear functions and the key characteristics of graphs of linear functions, and informally compare linear and nonlinear functions using parent graphs.

A.FGR.2.1 Use mathematically applicable situations algebraically and graphically to build and interpret arithmetic sequences as functions whose domain is a subset of the integers

Fundamentals - Students should be able to:

- make connections between linear functions and arithmetic sequences presented in mathematically applicable situations.
- build and interpret arithmetic sequences as functions presented graphically and algebraically.
- convert arithmetic sequences from explicit to recursive form and vice versa.
- define sequences recursively and explicitly.

Example • By graphing or calculating terms, students should be able to show how the arithmetic sequence in recursive form $a_1=7$, $a_n=a_n$-1 +2; the arithmetic sequence in explicit form $a_n = 2(n-1) + 7$; and the function $f(x) = 2x + 5$ (when x is a natural number) all define the same sequence.

A.FGR.2.2 Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation.

Strategies and Methods

- Students should be able to use graphs created by hand and with technology, verbal descriptions, tables, and function notation when analyzing linear functions that represent real-life phenomena.
- Students should be given opportunities to use interactive graphing technologies to explore and analyze key characteristics of linear functions, including domain, range, intercepts, intervals where the function is increasing or decreasing, positive or negative, maximums and minimums over a specified interval, and end behavior.

Fundamentals

- Students should be able to express characteristics in interval and set notation with linear functions.
- Students should be able to interpret the key characteristics of the graph in a situation.

A.FGR.2.3 Relate the domain and range of a linear function to its graph and, where applicable, to the quantitative relationship it describes. Use formal interval and set notation to describe the domain and range of linear functions.

Examples

- If the function h(n) gives the number of hours it takes a person to assemble n engines in a factory, then the set of positive integers would be an appropriate domain for the function. • Use symbolic notation to represent the domain and range of a linear function, considering the specific context.

(-∞,∞) [3, ∞) D: {x| xϵℝ} D: {x| x > 0} D: {x| x = 1,2,3,4,5,…} R: {y| y = 10,20,30,…}

A.FGR.2.4 Use function notation to build and evaluate linear functions for inputs in their domains and interpret statements that use function notation in terms of a mathematical framework.

Fundamentals

- Students should develop a deep understanding of function notation to build, evaluate, and interpret linear functions; this understanding will be applied to other functions studied hereafter.

A.FGR.2.5 Analyze the difference between linear functions and nonlinear functions by informally analyzing the graphs of various parent functions (linear, quadratic, exponential, absolute value, square root, and cube root parent curves).

Fundamentals

- Students should explore the parent function graphs to compare linear and nonlinear relationships (including a visual analysis of end behavior, increasing and decreasing, domain and range, intercepts, and general curvature).
- Learning all the characteristics of these nonlinear functions is not an expectation for this learning objective.
- Students should be able to identify parent functions by name (i.e., linear, quadratic, etc.).
- Students should have opportunities to explore the various graphs using technology.

Strategies and Methods

- Students should be able to informally analyze the curvature of several parent functions to highlight the characteristics of linear functions in comparison to several nonlinear functions.
- This is an introduction to functions they will explore in future units and courses.
- Students should be provided opportunities to utilize graphing calculators and interactive graphing technologies to explore this concept.

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 will construct and interpret arithmetic sequences as functions, both algebraically and graphically.

Students will need to maintain their ability to interpret linear functions, including key characteristics using proper notation.

Students should be able to compare linear and nonlinear functions informally.

Vocabulary

Arithmetic Sequence	Continuous	Dependant Variable	Discrete	Domain	Function Notation
Independent Variable	Interval Notation	Linear Function	Non-linear Functions	Parent Functions	Range
Relation	Set Notation	Evaluate	Time Graph	Coefficient	Intercepts
Rate of Change / Slope	Constant				

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
Form - The shape and underlying structure of an entity or piece of work, including its organization, essential in nature and external appearance.	Change, Model, Pattern	Identities and Relationships - Physical, psychological and social development; transitional; health and well-being; lifestyle choices

Statement of inquiry

Forms of identities and relationships model psychological and social development using patterns and changes throughout health and well being activities.

Inquiry questions

Factual—

- What is the common difference in a sequence?
- What is the domain and range of a linear function?
- What are the intercepts of a linear function?
- What is the slope of a linear function?

Conceptual—

- How do we use arithmetic sequences as functions to model and explain real-life phenomena?
- How do we identify characteristics of linear functions in context?

Debatable-

- Is it more effective to represent linear functions using formal notation or informally compare them to non-linear functions using parent graphs?

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 B - DOE Identifying and Predicting Patterns Modified Art Designs	Summative assessment will have questions that ask students to use patterns in data to make predictions about health and wellness.	**Formative Assessment(s):** MYP B - Identifying and Predicting Patterns Quiz **Summative Assessment(s):** Cumulative Unit 1 Test

Approaches to learning (ATL)	
Category: Communication Skills **Cluster:** Communication **Skill Indicator:** Understand and use mathematical notation Learning Activity: Exploring Growth Rates (Baby Denise)	**Category:** Thinking Skills **Cluster:** Critical-thinking **Skill Indicator:** Gather and organize relevant information to formulate an argument. Learning Activity: Detention Hall BuyOut (Which option is best?)

Learning Experiences

Add additional rows below as needed.

Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
● **A.FGR.2.1** Use mathematically applicable situations algebraically and graphically to build and interpret arithmetic sequences as functions whose domain is a subset of the integers. ● **A.FGR.2.2** Construct and interpret the graph of a linear function that models real-life	**Exploring Patterns (Art Designs)** (Honors & On-level) **Description:** In this learning plan, students will explore visual and numerical patterns to understand arithmetic sequences. Students will make connections between arithmetic sequences and linear functions by examining explicit equations. Students will make connections, in context, and apply their knowledge to create their own patterns and critique the patterns of their peers. **Learning Goals:**	Remedial support can provide counters and other manipulatives to represent patterns. Language Supports could include vocabulary such as common difference, arithmetic, sequence, and formula. Enrichment opportunities could include more contextual examples.

phenomena and represent key characteristics of the graph using formal notation.	1. I can use arithmetic sequences to describe patterns. 2. I can identify arithmetic sequences in linear functions to describe real world phenomena. 3. I can construct and interpret graphs of linear functions.	
● **A.FGR.2.2** Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation. ● **A.FGR.2.4** Use function notation to build and evaluate linear functions for inputs in their domains and interpret statements that use function notation in terms of a mathematical framework.	**Exploring Growth Rates - Baby Denise** (Honors Only) **Description:** In this learning plan, students will have multiple opportunities to explore the growth rate of a baby girl named Denise. The students will develop a linear model to predict the length of Denise at different ages. The model is then tested by finding the predicted length of Denise at ages ranging from 1 year to 5 years of age. The students will then create mathematical arguments as to the validity of the domain and range for different functions. **Learning Goals:** 1. I can read and interpret function notation in real-world applications. 2. I can analyze the validity of a mathematical model in a real-world application.	Remedial support could utilize peg boards and technology to look at lines in a coordinate plane. Language Supports could include preview of vocabulary and intentional conversation of context and how that relates to their home language and culture. Enrichment opportunities can have students complete the targeted questions throughout the task. Encourage critical thinking and deeper connections.
● **A.FGR.2.5** Analyze the difference between linear functions and nonlinear functions by informally analyzing the graphs of various parent functions (linear, quadratic, exponential, absolute value, square root, and cube root parent curves).	**Learning Task - Parent Functions** - Desmos Portion (On-level) Description: students will discover the patterns that nonlinear functions create. Students will formally and informally describe the patterns that are created. Students will be given an opportunity to use technology to explore the patterns that these functions create compared to the patterns that linear functions create. Students will explore quadratic, exponential, absolute value, square root, and cube root parent functions. Learning Goals: I can analyze the difference between linear and nonlinear functions. **Learning Goals:** 1. I can analyze the difference between linear and nonlinear functions.	Remedial Support: Peg boards, technology and explicit connections drawn to characteristics prior. Language: Provide multiple opportunities for structured peer interactions or conversations (pairs or triads) to negotiate meaning using charts, graphic organizers, a word bank and/or sentence frames. There should also be a focus on precise vocabulary.
● **A.FGR.2.1** Use mathematically applicable situations algebraically and graphically to build and interpret arithmetic sequences as functions whose domain is a subset of the integers.	**Detention Hall Buyout** (On-level Only) **Description:** In this learning plan, students practice the creation of arithmetic sequences, and the creation of equations using function notation to recognize the relationship between the two.	Include accommodations and scaffold as necessary.

• **A.FGR.2.2** Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation. • **A.FGR.2.4** Use function notation to build and evaluate linear functions for inputs in their domains and interpret statements that use function notation in terms of a mathematical framework.	**Learning Goals:** 1. I can interpret linear functions in context 2. I can make conjectures about the relationship between arithmetic sequences and function notation.	

Content Resources

Textbook Correlation: enVision A|G|A - Algebra 1

A.FGR.2.1 - Lesson 3-4
A.FGR.2.2 - Lessons 3-2, 3-3
A.FGR.2.3 - Lesson 3-1
A.FGR.2.4 - Lessons 3-2, 3-3
A.FGR.2.5 - Lesson 5-1