MATH MCS MYP UNIT PLANNER

Teacher(s)	Schumacher	Subject group and discipline	Accelerated Algebra / Geometry B		
Unit title	DOE Unit 4 – Modelling and Analyzing Exponential Functions	MYP year	4	Unit duration (hrs)	12 Hours (3 weeks)

Inquiry: Establishing the purpose of the unit

Key concept	Related concept(s)	Global context
Relationships	Patterns Representation	Scientific and Technological Innovations Opportunity and Risk

Statement of inquiry

Patterns and representations create relationships that can be used to determine opportunity and risk.

Inquiry questions

Factual—

What is an exponential function?

What is exponential growth?

What is exponential decay?

What is a geometric sequence?

Conceptual—

How do I solve an exponential equation in one variable?

How do I use graphs to represent and solve real-world equations?

How do I interpret functions that arise in applications in terms of context?

Why are geometric sequences functions?

How do I use different representations to analyse exponential functions?

How do I build exponential functions that models a relationship between two quantities?

How do I build new functions from existing functions?

How can we use real –world situations to construct and compare exponential models and solve problems?

What are the effects on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative)? How do I find the value of k given the graphs?

Debatable—

What is the best model for you to use when solving an application problem?

MYP Objectives	**Assessments**
Objective C – Communication Objective D - Application	Common Quiz Common Test Formative Assessments - MYP Rubric C and D

Approaches to learning (ATL)

- Understand and use mathematical notation
- Take effective notes in class
- Structure information in summaries, essays, and reports
- Identify trends and forecast possibilities
- Make connections between various sources of Information
- Present information in a variety of formats and platforms

Action: Teaching and learning through inquiry

Content Standards

Create equations that describe numbers or relationships

MGSE9–12.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from ~~linear, quadratic, simple rational,~~ and exponential functions (integer inputs only).

MGSE9-12.A.CED.2 Create ~~linear, quadratic, and~~ exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)

Build a function that models a relationship between two quantities.

MGSE9–12.F.BF.1 Write a function that describes a relationship between two quantities.

MGSE9-12.F.BF.1a Determine an explicit expression and the recursive process (steps for calculation) from context. For example, if Jimmy starts out with $15 and earns $2 a day, the explicit expression "2x+15" can be described recursively (either in writing or verbally) as "to find out how much money Jimmy will have tomorrow, you add $2 to his total today." Jn = Jn – 1 + 2, J0 = 15

MGSE9-12.F.BF.2 Write a~~rithmetic and~~ geometric sequences recursively and explicitly, use them to model situations, and translate between the two forms. Connect ~~arithmetic sequences to linear functions~~ and geometric sequences to exponential functions.

Build new functions from existing functions.

MGSE9–12.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k(both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. ~~Include recognizing even and odd functions from their graphs and algebraic expressions for them.~~ (Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept.)

Understand the concept of a function and use function notation.

MGSE9–12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range, i.e. each input value maps to exactly one output value. If f is a function, x is the input (an element of the domain), and f(x) is the output (an element of the range). Graphically, the graph is y = f(x).

MGSE9–12.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

MGSE9-12.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (Generally, the scope of high school math defines this subset as the set of natural numbers 1,2,3,4...) By graphing or calculating terms, students should be able to show how the recursive sequence a1=7, an=an-1 +2; the sequence sn = 2(n-1) + 7; and the function f(x) = 2x + 5 (when x is a natural number) all define the same sequence.

Interpret functions that arise in applications in terms of the context.

MGSE9–12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and ~~periodicity.~~

MGSE9–12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person–hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

MGSE9–12.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations.

MGSE9–12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.

MGSE9-12.F.IF.7e Graph exponential ~~and logarithmic~~ functions, showing intercepts and end behavior, a~~nd trigonometric functions, showing period, midline, and amplitude.~~

MGSE9–12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one function and an algebraic expression for another, say which has the larger maximum.

Learning Activities and Experiences

Topic	Resource	Content Covered	Standards Addressed
Properties of Exponents & Introduction to Exponential Equations	**6-1 Rational Exponents and Properties of Exponents Pearson enVision pg. 217 - 223**	• Extend the properties of integer exponents to rational exponents to rewrite radical expressions using rational exponents. • Solve equations with rational exponents using the properties of exponents.	MGSE9-12.N.RN.1 MGSE9-12.N.RN.2
	Additional Resources: • 6-1 Solving Exponential Equations Lecture Outline • Paper Folding Task (DOE) • 3-Act Task Incredible Shrinking Dollar		

Graphing Exponential Functions	**6-2 Exponential Functions** **Pearson enVision pg. 224 - 230**	• Sketch the graphs showing key features of exponential functions. • Write exponential functions using tables and graphs. • Compare linear and exponential functions.	MGSE9-12.F.IF.4 MGSE9-12.F.IF.5 MGSE9-12.F.IF.6 MGSE9-12.F.BF.1 MGSE9-12.F.LE.1 MGSE9-12.F.LE.1a
	6-3 Exponential Growth and Decay **Pearson enVision pg. 231 - 238**	• Construct exponential growth and decay functions given a description of a relationship. • Recognize if a situation can be modelled with exponential growth or exponential decay, and interpret the parameters of the model in context.	MGSE9-12.N.Q.3 MGSE9-12.A.SSE.1b MGSE9-12.A.SSE.3c MGSE9-12.A.CED.2 MGSE9-12.F.LE.1c MGSE9-12.F.LE.2 MGSE9-12.F.LE.5
	Additional Resources: • 6-2 / 6-5 Graphing Exponential Functions Lecture Outline • 6-3 Applications of Exponential Functions Lecture Outline		
Geometric Sequences	**6-4 Geometric Sequences** **Pearson enVision pg. 239 - 245**	• Find explicit and recursive formulas for geometric sequences. • Translate between recursive and explicit formulas for geometric sequences. • Construct exponential functions to represent geometric sequences.	MGSE9-12.F.IF.3 MGSE9-12.F.BF.2 MGSE9-12.F.LE.2
	Additional Resources: • 6-4 Geometric Sequences Lecture Outline		
Comparing Functions	Comparing Exponential Functions Lecture Outline	• Compare and contrast exponential functions • Compare and contrast exponential and linear functions	MGSE9-12.A.CED.2 MGSE9-12.F.BF.1 MGSE9-12.F.BF.1a MGSE9-12.F.BF.2 MGSE9-12.F.IF.3 MGSE9-12.F.IF.5 MGSE9-12.F.IF.6 MGSE9-12.F.IF.9

Personalized Learning and Differentiation

Teachers differentiate by providing examples (work samples or task-specific clarifications of assessment criteria); structuring support (advance organizers, flexible grouping, peer relationships); establishing flexible deadlines, and adjusting the pace.

-SWD/504- Accommodations provided
-ELL- Five Principle ELL Curriculum Framework and Vocabulary Supports
-Intervention Support- Re-teaching Activities in Small Groups with Progress MonitoringIKII
-Extensions- Enrichment Tasks and Projects

Resources
Savvas Textbook DOE Frameworks