Unit 6: Exponential Functions

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

UNIT RATIONALE

In this unit, students are introduced to exponential functions. Students learn that exponential relationships are characterized by a constant quotient over equal intervals, and compare them to linear relationships which are characterized by a constant difference over equal intervals. Students will look at exponential functions in a table, graph and word problems. They will construct exponential equations and use them to does situations and solve problems. Students will look at the real world examples of exponential function in detail and how it relates to everyday life.

ESSENTIAL QUESTIONS

What characterizes exponential growth and decay?

What are real world models of exponential growth and decay?

How can one differentiate an exponential model from a linear model given a real world set of data?

STANDARDS

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

New Jersey (NJSLS) - High School - Mathematics (2020)

MA.S-ID.B.6a	Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data.
MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
MA.F-IF.C.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and

	trigonometric functions, showing period, midline, and amplitude.
MA.F-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
MA.F-BF.A.1b	Combine standard function types using arithmetic operations.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.F-LE	Linear and Exponential Models
MA.F-LE.A	Construct and compare linear and exponential models and solve problems
MA.F-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
MA.F-LE.A.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
MA.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
MA.F-LE.A.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
MA.F-LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.

NEW JERSEY STUDENT LEARNING STANDARDS: CAREER READINESS, LIFE LITERACIES AND KEY SKILLS

PFL.9.1.12.CFR.2	Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions.
PFL.9.1.12.CFR.4	Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
PFL.9.1.12.CDM.1	Identify the purposes, advantages, and disadvantages of debt.
PFL.9.1.12.CDM.3	Determine ways to leverage debt beneficially.
PFL.9.1.12.CDM.4	Identify issues associated with student loan debt, requirements for repayment, and consequences of failure to repay student loan debt.
PFL.9.1.12.CDM.5	Identify the types of characteristics of predatory lending practices and the importance of collateral (e.g., payday loans, car title loans, high-risk mortgages).
PFL.9.1.12.CDM.6	Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit. (e.g., student loans, credit cards, auto loans, mortgages, etc.).
PFL.9.1.12.CDM.7	Calculate a mortgage payment based on type of loan, down payment, credit score, and loan interest rate.
PFL.9.1.12.CDM.8	Compare and compute interest and compound interest and develop an amortization table using business tools.
PFL.9.1.12.PB.1	Explain the difference between saving and investing.
PFL.9.1.12.PB.2	Prioritize financial decisions by considering alternatives and possible consequences.
PFL.9.1.12.PB.3	Design a personal budget that will help you reach your long-term and short-term financial goals.
PFL.9.1.12.PB.4	Explain how you would revise your budget to accommodate changing circumstances.
PFL.9.1.12.PB.5	Analyze how changes in taxes, inflation, and personal circumstances can affect a personal budget.

PFL.9.1.12.PB.6	Describe and calculate interest and fees that are applied to various forms of spending, debt and saving.
PFL.9.1.12.RM.2	Identify types of investments appropriate for different objectives such as liquidity, income, and growth.

NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

CS.9-12.8.1.12.AP.2	Create generalized computational solutions using collections instead of repeatedly using simple variables.
CS.9-12.8.1.12.AP.8	Evaluate and refine computational artifacts to make them more usable and accessible.
CS.9-12.8.1.12.AP.9	Collaboratively document and present design decisions in the development of complex programs.
CS.9-12.8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.

PRE-ASSESSMENTS

Non-curricular tasks to identify students' readiness levels with problem solving.

Rubric Based Reassessments and Algebra 1 assignments.

INSTRUCTIONAL PLAN

MODULE 1

Student Learning Intentions (SLI) WALT: (We are learning to…)	Students will be introduced to exponential functic by recreating the growth and decay of cancerous cells during treatments using skittles.
Student Learning Strategies	Using M&Ms to recreate cancerous cells growing and decaying through treatment.
Success Criteria	I can create an exponential function from the data given in a exponential growth and decay problem I can graph the points presented from the skittles make an exponential graph.
Formative Assessment (drives instructional decisions)	complete the packet and hand in.

Activities and Resources	listed below
Suggested Modifications	make sure to pair them in groups of 3 or 4. Use skittles, they are cheaper.

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MODULE 2

Student Learning Intentions (SLI) WALT: (We are learning to…)	Students will fill out interactive notebook pages help them in their algebra 1 class.
Student Learning Strategies	Interactive notebook pages common mistakes resources and flip books.
Success Criteria	Students can fill out the pages of their interacti notebook so they have a resource for their classroom
Formative Assessment (drives instructional decisions)	There is no formative assessment for this introduction to each topic.
Activities and Resources	interactive notebook pages listed
Suggested Modifications	fill out pages for absent students.

ExpLineQuadInt.docx

Exponential_FunctionsINT.docx
ExpLineQuadInt.pdf
Exponential_FunctionsINT.pdf

MODULE 3

Student Learning Intentions (SLI) WALT: (We are learning to…)	Students will discover the cost of buying a new o used car using the exponential functions. Studen will calculate a loan payment and how many yea it'll take to pay off the loan.

Student Learning Strategies	Car payments How the car exponential loses value over time Loan payments and how much the interest rate makes payments more.
Success Criteria	I can determine the cost to buy a car. I can determine the value of my loan and how lor it'll take to pay it back. I can determine if it's smarter to buy a more expensive car or a reasonable car.
Formative Assessment (drives instructional decisions)	Students will answer questions
Activities and Resources	Car prices website. Google slide assignment
Suggested Modifications	I would adjust the activity as you see fit for stude I had to end the project early do to students struggling with working at their own pace.

Exponential_Functions_Project.pdf

Stem Lab Buying a Car Project
Edited- Stem Lab Buying a Car Project
Buying a Car Project

REFLECTIONS

The car project could be better. It's a great idea for stem lab, but a bunch of my students struggled. I think this class was just extremely immature so it was hard monitoring and keeping up with each students and the prices.

INTERDISCIPLINARY CONNECTIONS: NEW JERSEY STUDENT LEARNING STANDARDS FOR ELA, SOCIAL STUDIES, SCIENCE AND/OR MATHEMATICS

LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.K-12.NJSLSA.R9	Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

LA.K-12.NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.K-12.NJSLSA.W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
TECH.9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
TECH.9.4.12.IML.6	Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
TECH.9.4.12.IML.8	Evaluate media sources for point of view, bias, and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6).