Unit 9: Exponential Functions

Content Area: **Mathematics**
Course(s): **Algebra 8**
Time Period: **April**
Length: **3 weeks**
Status: **Published**

Transfer

Big Idea: Exponential Functions

Essential Questions

How do the characteristics of exponential functions affect the graph?

How do you use exponential growth and decay to model real-life situations?

Enduring Understandings

A single quantity may be represented by many different expressions

All of the facts of arithmetic and algebra follow from certain properties

Many real-world mathematical problems can be represented algebraically. These representations can lead to algebraic solutions

Critical Knowledge and Skills

Vocabulary

Vocabulary:

Compound Interest, Decay Factor, Exponential Decay, Exponential Function, Exponential Growth, Geometric

Sequence, Growth Factor, Index

Learning Objectives

Simplify expressions involving zero and negative exponents (N.RN.1)

Multiply powers with the same base (N.RN.1)

Raise a power to a power (N.RN.1)

Raise a product to a power (N.RN.1)

Divide powers with the same base (N.RN.1)

Raise a quotient to a power (N.RN.1)

To rewrite expressions involving radicals and rational exponents (N.RN.2)

Evaluate and graph exponential functions (F.LE.1.a,b,c)

Model exponential growth and decay (F.IF.7.e, F.IF.8.b, F.LE.1.c)

Write and use recursive formulas for geometric sequences (F.BF.1,2, F.LE.2)

Observe using graphs and tables that exponential growth functions will eventually exceed a quantity increasing linearly or quadratically (F.LE.A.3)

Interpret the parameters in an exponential function in terms of context (F.LE.5)

Use properties of exponents to transform expressions for exponential functions (A.SSE.3.c)

Resources

Desmos Exponential Bundle

3 Act Math: Domino Skyscraper

Desmos: Domino Skyscraper

Khan Academy: Exponential growth & decay

Standards

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as

they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP11. Use technology to enhance productivity.

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).

9.1.8.D.3 Differentiate among various investment options.

9.1.8.E.6 Compare the value of goods or services from different sellers when purchasing large quantities and small quantities.

9.2.8.B.7 Evaluate the impact of online activities and social media on employer decisions.

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

MA.N-RN.A	Extend the properties of exponents to rational exponents.
MA.N-RN.A.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
MA.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
MA.K-12.5	Use appropriate tools strategically.
MA.A-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
MA.F-IF.C	Analyze functions using different representations
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	Build a function that models a relationship between two quantities
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.
MA.F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

MA.F-LE.A	Construct and compare linear and exponential models and solve problems
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.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
MA.F-LE.A.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
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.