

# Feb. Algebra I Unit 6: Exponential Functions & Sequences

Content Area: **Math**  
Course(s):  
Time Period: **February**  
Length: **4-5 Weeks**  
Status: **Published**

## Unit Overview

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Properties of Exponents

- Radicals & Rational Exponents
- Exponential Functions
- Exponential Growth & Decay
- Solving Exponential Equations
- Geometric Sequences
- Recursively Defined Sequences

## Enduring Understandings

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SWBAT:

- Identify and apply the general rules involving properties of exponents
  - Zero & Negative Exponents
  - Product of Powers Property
  - Quotient of Powers Property
  - Power of a Power Property
  - Power of a Product Property
  - Power of a Quotient Property
- Write and evaluate the  $n$ th root of a number
- Identify and evaluate exponential functions
- Graph exponential functions
- Identify the characteristics of exponential growth and decay functions
- Interpret and rewrite exponential growth and decay functions
- Solve an exponential equation graphically
- Solve exponential equations with the same base
- Solve exponential equations with the unlike bases
- Use a geometric sequence to describe a pattern
- Extend and graph geometric sequences
- Write geometric sequences as functions
- Define a sequence recursively
- Write terms of recursively defined sequences

- Write recursive rules for sequences
- Translate between recursive and explicit rules
- Write recursive rules for special sequences

## Essential Questions

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- How can we identify and apply the general rules involving properties of exponents?
- How can we write and evaluate the  $n$ th root of a number?
- How do we identify the characteristics of the graph of an exponential function?
- How do we identify the characteristics of exponential growth and decay functions?
- How can we solve an exponential equation graphically?
- How do we use a geometric sequence to describe a pattern?
- How can we define a sequence recursively?

## Instructional Strategies & Learning Activities

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- Guided Practice
- Do Now
- Extra Practice & Puzzle Time (Resources)
- Scavenger Hunts
- Coloring Activities
- Task Cards (Around the World)
- Maze Activities
- Quizizz Online Assignments
- Kahoot! Online Games

## Integration of Career Readiness, Life Literacies and Key Skills

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Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.

Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction.

WRK.9.2.8.CAP.15

Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.

An individual's strengths, lifestyle goals, choices, and interests affect employment and income.

TECH.9.4.8.IML.12

Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

WRK.9.2.8.CAP.10	Evaluate how careers have evolved regionally, nationally, and globally.
TECH.9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
TECH.9.4.8.GCA	Global and Cultural Awareness
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).  Multiple solutions often exist to solve a problem.
WRK.9.2.8.CAP.19	Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level.
WRK.9.2.8.CAP.16	Research different ways workers/employees improve their earning power through education and the acquisition of new knowledge and skills.
WRK.9.2.8.CAP.12	Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.
WRK.9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
TECH.9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
TECH.9.4.8.DC.5	Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure.
TECH.9.4.8.CT	Critical Thinking and Problem-solving
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).  Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
WRK.9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
TECH.9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
WRK.9.2.8.CAP.4	Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
WRK.9.2.8.CAP	Career Awareness and Planning
WRK.9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
TECH.9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.  An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.  Communication skills and responsible behavior in addition to education, experience, certifications, and skills are all factors that affect employment and income.

CS.6-8.DA	Data & Analysis
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.
CS.6-8.8.1.8.IC.1	Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options.  Computer models can be used to simulate events, examine theories and inferences, or make predictions.  Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.
CS.6-8.8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.  People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data.  Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings.
CS.6-8.8.1.8.CS.4	Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.
CS.6-8.8.1.8.DA.5	Test, analyze, and refine computational models.

## Interdisciplinary Connections

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LA.RI.6.10	By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

## Differentiation

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- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.
- **Definitions of Differentiation Components:**
  - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
  - Process – how the student will acquire the content information.
  - Product – how the student will demonstrate understanding of the content.

- Learning Environment – the environment where learning is taking place including physical location and/or student grouping

**Differentiation occurring in this unit:**

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- Challenges will be presented to students as the need arises.

Struggling students will get additional personalized instruction, and modifications as needed.

**Modifications & Accommodations**

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Refer to QSAC EXCEL SMALL SPED ACCOMMODATIONS spreadsheet in this discipline.

**Modifications and Accommodations used in this unit:**

Challenges will be presented to students as the need arises.

Struggling students will get additional personalized instruction, and modifications as needed.

IEP and 504 accommodations will be utilized.

**Benchmark Assessments**

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**Benchmark Assessments** are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

**Schoolwide Benchmark assessments:**

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

**Additional Benchmarks used in this unit:**

**End of semester testing**

## **Formative Assessments**

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Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

### **Formative Assessments used in this unit:**

- Kahoot! Games
- Quizizz Games
- Homework
- Q & A
- Scavenger Hunts
- Coloring Activities
- Task Cards
- Partner Activities

## **Summative Assessments**

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**Summative assessments** evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

### **Summative assessments for this unit:**

- Chapter Tests
- Quizzes































## **Instructional Materials**





















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1. Big Ideas Math: Modeling Real Life 6th Grade Book
2. Quizizz
3. Kahoot
4. Scavenger Hunts
5. Task Cards
6. Coloring Activities

## Standards

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- 0x CCSS.Math.Content.HSA-CEA.1 Create equations and inequalities in one variable and use them to solve problems.
- 0x CCSS.Math.Content.HSA-CEA.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- 0x CCSS.Math.Content.HSA-REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- 0x CCSS.Math.Content.HSA-REI.D.11 Explain why the  $x$ -coordinates of the points where the graphs of the equations  $y = m(x-h) + k$  and  $y = n(x-h) + k$  intersect are the solutions of the equation  $m(x-h) + k = n(x-h) + k$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where  $y = m(x-h) + k$  and/or  $y = n(x-h) + k$  are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- 0x CCSS.Math.Content.HSA-SSE.B.3.c Use the properties of exponents to transform expressions for exponential functions.
- 0x CCSS.Math.Content.HSF-BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.
- 0x CCSS.Math.Content.HSF-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.
- 0x CCSS.Math.Content.HSF-BF.B.3 Identify the effect on the graph of replacing  $y = f(x)$  by  $y = f(x) + k$ ,  $y = kf(x)$ ,  $y = f(kx)$ , and  $y = f(x + k)$  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.
- 0x CCSS.Math.Content.HSF-IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
- 0x CCSS.Math.Content.HSF-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

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  $0x$  CCSS.Math.Content.HSF-IF.C.7.e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
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  $0x$  CCSS.Math.Content.HSF-IF.C.8.b Use the properties of exponents to interpret expressions for exponential functions.
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  $0x$  CCSS.Math.Content.HSF-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
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  $0x$  CCSS.Math.Content.HSF-LE.A.1.c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
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  $0x$  CCSS.Math.Content.HSF-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).
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  $0x$  CCSS.Math.Content.HSN-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.
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  $0x$  CCSS.Math.Content.HSN-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.
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