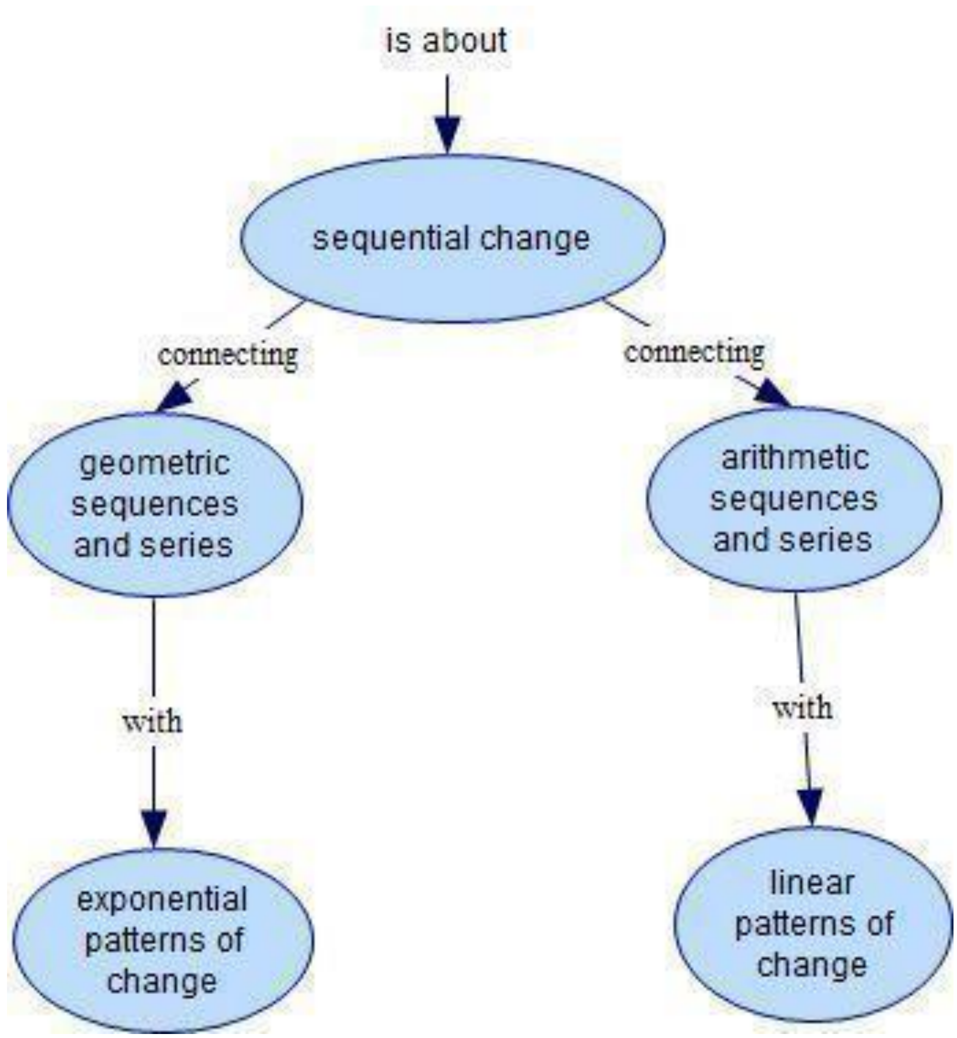
Common Core Initiative

Overarching Questions and Enduring Understandings

What connection exists between arithmetic and geometric sequences and linear and exponential functions?

Graphic Organizer



Unit Abstract

Students have already had experience with arithmetic and geometric sequences. As they studied linear and exponential functions these sequences appeared in tabular representations; this unit will allow students to formalize this knowledge. Students will take NOW-NEXT recursive equations and write them using subscripted notation. Students will learn to model problems involving sequential change, represent them using sigma notation, and analyze their model to solve problems. Understanding the differences and characteristics of arithmetic and geometric sequences will help students develop strategies to find sums of arithmetic and geometric series and develop formulas for these sums. Technology in the form of sequential mode of graphing calculators, CAS systems, and computer spreadsheets will provide additional resources for students to explore these topics.

Unit Overview (Word)

Unit Overview (PDF)

Content Expectations/Standards

High School: Algebra

Seeing Structure in Expressions

HSA-SSE.B. Write expressions in equivalent forms to solve problems.

- HSA-SSE.B.4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

For example, calculate mortgage payments.

High School: Functions

Interpreting Functions

HSF-IF.A. Understand the concept of a function and use function notation.

- HSF-IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.

Building Functions

HSF-BF.A. Build a function that models a relationship between two quantities.

- 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.

Linear, Quadratic, and Exponential Models

HSF-LE.A. Construct and compare linear and exponential models and solve problems.

- 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).

Unit Level Standards

There are standards listed in this section for two reasons.

1. ***The standards have been modified to be appropriate for this unit. Text in gray font is part of the Michigan K-12 standard but does not apply to this unit. Text in brackets denotes a modification that has been made to the standard.***
2. ***The standards contain content that is developed and/or utilized across multiple units.***

Modified For this Unit

n/a

Developed and/or Utilized Across Multiple Units

Linear, Quadratic, and Exponential Models

HSF-LE.A. Construct and compare linear and exponential models and solve problems.

- HSF-LE.A.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- HSF-LE.A.1c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Essential/Focus Questions	Key Concepts
1. Given a sequence of numbers, how can you determine if it is arithmetic, geometric, or neither? 2. Find the recursive and explicit formulas for a given arithmetic or geometric sequence. 3. Translate between sigma notation and expanded form. 4. What are the strategies for finding an arithmetic or geometric series? 5. Given an arithmetic or geometric sequence, what information is needed to find the nth term?	arithmetic sequence arithmetic series convergence divergence explicit formulas finite series geometric sequence geometric series infinite series nth term recursive formulas subscripted notation sum of a series summation/sigma notation
Assessment Tasks	**Intellectual Processes**
Assessment Overview Assessment Task Independent Practice	**Standards for Mathematical Practice** *Students will have opportunities to:* • **look for and make use of structure:** understand how mathematical ideas interconnect and build on one another to produce a coherent whole; • **model with mathematics**: use representations to model and interpret physical, social, and mathematical phenomena; and • **reason abstractly and quantitatively**: build new mathematical knowledge of sequential change through problem solving.
Lesson Sequence	**Resources**
Lesson Overview Student Handout Lesson Task teacher page	Unit Resources