Unit #09: Sequences and Series

Content Area: **Mathematics**
Course(s): **Algebra II**
Time Period: **June**
Length: **2 weeks**
Status: **Published**

Unit Overview

This unit starts by introducing sequences in general, giving several examples of different sequences, and defining finite and infinite sequences. More specifically, arithmetic and geometric sequences are studied. Methods for finding terms of both arithmetic and geometric sequences are studied.

Enduring Understandings

Students will understand notation allows for a formula to be written in a condensed form.

Essential Questions

- How do you determine whether a sequence is arithmetic or geometric?
- What is the importance of studying geometric sequences/series?
- Where does the use of arithmetic sequences/series have application in the real world?

Standards/Indicators/Student Learning Objectives (SLOs)

Student Learning Objectives:

- SWBAT determine whether a sequence is arithmetic, geometric, or neither.
- SWBAT find a formula for the nth term of a geometric sequence.
- SWBAT find a formula for the nth term of an arithmetic sequence.
- SWBAT find specific terms of a geometric sequence.
- SWBAT find specific terms of arithmetic sequences.
- SWBAT find sums of finite arithmetic and geometric series.
- SWBAT find sums of infinite geometric series having ratios with absolute value less than one.
- SWBAT supply missing terms of a sequence.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.6	Attend to precision.

MA.A-SSE.B.4	Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.
MA.S-IC	Making Inferences and Justifying Conclusions

Indicators

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated

	explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MA.A-SSE.B.4	Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

Lesson Titles

- Arithmetic Sequences
- Find Sums of Finite Arithmetic and Geometric Series
- Find Sums of Infinite Geometric Series
- Geometric Sequences

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.2	Explain the importance of respecting digital content of others.
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LA.RST.9-10.9	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
LA.WHST.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
LA.WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.SL.11-12.1.B	Collaborate with peers to promote civil, democratic discussions and decision-making, set clear goals and assessments (e.g., student developed rubrics), and establish individual roles as needed.
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
LA.L.11-12.4.A	Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
12.9.3.ST-ET.3	Apply processes and concepts for the use of technological tools in STEM.
12.9.3.ST-SM.1	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
12.9.3.ST-SM.2	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
STEM.9-12.9.4.12.O.(2).1	Develop an understanding of how science and mathematics function to provide results, answers, and algorithms for engineering activities to solve problems and issues in the real world.
STEM.9-12.9.4.12.O.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
STEM.9-12.9.4.12.O.11	Apply active listening skills to obtain and clarify information.
STEM.9-12.9.4.12.O.32	Effectively use information technology to gather, store, and communicate data in appropriate formats.
STEM.9-12.9.4.12.O.48	Employ teamwork skills to achieve collective goals and use team members' talents effectively.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- Bloom's Analysis: Break the concept into parts to understand how each is related to one another
- Bloom's Application: Use knowledge gained in new ways
- Bloom's Comprehension: Make sense of what has been learned
- Bloom's Evaluation: Put new information together in an innovative way
- Bloom's Knowledge: Recall relevant knowledge from prior lessons and long-term memory
- Bloom's Synthesis: Make judgements based on a set of guidelines to create new meaning
- Define series and sigma notation
- intro lesson on arithmetic sequences
- intro lesson on geometric sequences
- Intro lesson on types of sequences
- Notes will be taken using Smart Notebook
- Review homework
- Review warm up
- Students will present solutions on the board
- Students will work independently on examples
- Students will work together on a worksheet
- Tutoring during Delsea One

Modifications

ELL Modifications

- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Offer resources for specific topics in primary language (Youtube web resources)
- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring
- Tutoring during Delsea One

IEP & 504 Modifications

- Allow student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Allow student to take notes in class for reinforcement but also provide a copy of completed/correct notes to study from
- Provide formulas on the test and/or sample problems
- Reduce homework length to just those most important for review
- Tutoring during Delsea One

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning
- Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment
- Provide additional rigorous challenge problems for advanced students
- Provide rationale for thinking
- Use effective questioning techniques (focus on what's important, provide processing time, require higher order thinking)

At Risk Modifications

- guided notes
- retesting
- speaking to students privately when redirecting behaviors
- study guides
- tutoring during Delsea One

Formative Assessment

- Exit Ticket
- Group Work
- Guided Practice
- Individual Practice
- Journal Entry
- Kahoot!
- Observation
- Oral Responses
- Poll class to self-analyze their comfort level of the lesson
- Socrative
- Teacher Observation
- Vocabulary Review

Alternate Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment

- Alternative Assessment
- Marking Period Assessment
- Quiz on Arithmetic Sequence
- Quiz on Geometric Sequence
- Unit Test on Sequences and Series

Resources & Materials

- Chromebook
- Graphing Calculator
- Promethean Board
- Smart Notebook
- Teacher generated worksheets
- Textbooks: Algebra and Trigonometry Structure and Method Book 2 (McDougal Littell), Algebra II Common Core (Pearson)

Technology

- google classroom
- http://kutasoftware.com/
- http://mathxlforschool.com/home_school.htm
- https://create.kahoot.it
- https://njctl.org/
- https://quizizz.com/
- https://socrative.com/
- https://www.desmos.com/
- https://www.resourceaholic.com/
- Student 1-1 Device (chromebook)
- TI Graphing Calculator

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS4	Process data and report results.