# Unit #09: Sequences and Series

Content Area: **Mathematics**
Course(s): **English I, Algebra II**
Time Period: **June**
Length: **3 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?

## Lesson Titles/Objectives

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

## Standards

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |

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| 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

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| | 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. |

## 21st Century Skills and Career Ready Practices

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| CRP.K-12.CRP2 | Apply appropriate academic and technical skills. |
| CRP.K-12.CRP4 | Communicate clearly and effectively and with reason. |
| CRP.K-12.CRP6 | Demonstrate creativity and innovation. |
| CRP.K-12.CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP.K-12.CRP9 | Model integrity, ethical leadership and effective management. |
| CRP.K-12.CRP11 | Use technology to enhance productivity. |
| CRP.K-12.CRP12 | Work productively in teams while using cultural global competence. |

## Inter-Disciplinary Connections

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| 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. |

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| STEM.9-12.9.4.12.O.48 | Employ teamwork skills to achieve collective goals and use team members' talents effectively. |

## Warm-Up

- Kahoot!
- Sample PARCC item
- Sample SAT question
- Socrative

## Anticipatory Set

- Use real life examples to demonstrate arithmetic and geometric series

## Instructional Strategies/Learning Activities

- 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 Power Point
- 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

## Closure

- Discussion on today's lesson
- Exit ticket
- Journal Entry
- Kahoot!
- Oral Questioning
- Poll the class to self-analyze their comfort level of the lesson
- Socrative
- Vocab Review
- What did you learn today?

## Modifications-G&T, LES, Special Education

- Collaborate with after-school programs or clubs to extend learning opportunities.
- Engage students with a variety of Mathematical Practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Provide ELL students with multiple literacy strategies.
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Structure the learning around explaining or solving a social or community-based issue.
- Use project-based math learning to connect math with observable phenomena.

## Formative Assessment

- Arithmetic Sequence Quiz
- Geometric Sequence Quiz
- Group Work
- Guided Practice
- Individual Practice
- Kahoot!
- Observation
- Oral Responses
- Smart Response
- Socrative
- Teacher Observation

## Summative Assessment

- Unit Test on Sequences and Series

## Resources & Technology

- chromebook

- Desmos online graphing calculator
- Graphing Calculator
- Kahoot!
- mathxlforschool.com
- PowerPoint
- Smart Board
- Socrative.com
- Teacher generated worksheets
- Textbook: Algebra and Trigonometry Structure and Method Book 2 (McDougal Littell)
- Video to introduce or demonstrate concepts