

## Unit A - “Cracking Codes” Patterns and Repetition in our World

### Overview

Student will be engaged in learning mathematical skills within the context of interesting problems that connect to real world issues. Students will be expected to use the 21st Century Skill: Analyzing to independently use their learning in new situations. They will learn to interpret patterns in the real world and use mathematics to evaluate complex situations, apply properties of patterns to inform decisions by analyzing information, and design and create representations of data.

Students coming from Pre-Algebra should be proficient in combining like terms, order of operations, the rules of integer operations, graphing on a coordinate plane, finding rate of change and the meaning of the intercepts.

The students begin with hands-on activities building concrete models which helps them generalize to tables, graphs and equations. They will recognize and extend addition, multiplication and other patterns including fractions and decimals. They are asked to write explicit and recursive rules for the patterns. Later students will explore rules for arithmetic and geometric sequences that will help them find values and terms that extend the usefulness of patterns. They will explore the rules that will reach a higher understanding of the patterns to explain real world phenomenon. Students will develop strategies to select the most efficient method to solve problems involving arithmetic or geometric sequences.

Challenges for students can be: 1) distinguishing between arithmetic and geometric sequences, 2) accurately representing data on a graph, 3) independently transferring skills to new situations.

In the next unit students will extend pattern rules to function relationships. The students will use technology to generate and display patterns.

**21<sup>st</sup> Century Capacities:** Analyzing

### Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS	<b>Transfer:</b>
<b>MP2</b> Reason abstractly and quantitatively <b>MP4</b> Model with Mathematics <b>MP5</b> Use appropriate tools strategically	<i>Students will be able to independently use their learning in new situations to...</i> <ol style="list-style-type: none"> <li>1. Interpret patterns in the real world and use mathematics to evaluate complex situations. (Analyzing)</li> <li>2. Apply properties of patterns to inform decisions by analyzing information. (Analyzing)</li> </ol>

# Algebra I Level 2 Curriculum

<p><b>MP7</b> Look for and make use of structure</p> <p><b>MP8</b> Look for and express regularity in repeated reasoning</p> <p>F-IF 3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p> <p>F-BF 1. Write a function that describes a relationship between two quantities.* a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</p> <p>F-BF 2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.</p>	<b>Meaning:</b>	
	<p><b>UNDERSTANDINGS:</b> <i>Students will understand that:</i></p> <ol style="list-style-type: none"> <li>1. A pattern can be described using a variety of mathematical means.</li> <li>2. Representations of patterns can be used and extended to draw conclusions and/or find solutions.</li> <li>3. Patterns can be used to explain real world phenomena.</li> </ol>	<p><b>ESSENTIAL QUESTIONS:</b> <i>Students will explore &amp; address these recurring questions:</i></p> <ol style="list-style-type: none"> <li>A. How can we mathematically model the world?</li> <li>B. Which tools can I use to solve this problem and which are best?</li> <li>C. What is the most efficient way to solve this problem?</li> <li>D. How do you express and describe a pattern and use it to make predictions or solve problems?</li> </ol>
	<b>Acquisition:</b>	
	<p><i>Students will know...</i></p> <ol style="list-style-type: none"> <li>1. Format for explicit rules <ul style="list-style-type: none"> <li>• <math>a + d(x)</math> where the first input is 0</li> <li>• <math>a + d(x - c)</math> where the first input is c</li> <li>• <math>ar^{(x)}</math> where the first input is 0</li> <li>• <math>ar^{(x-1)}</math> where the first input is 1</li> </ul> </li> <li>2. The format for recursive rules as sentences: Starting with (<u>first output</u>), each term increases/decreases by _____ or Where the first input ____ is multiplied by _____.</li> <li>3. How to use tables, graphs, and/or lists to display patterns</li> <li>4. What a fractal is</li> <li>5. That sequences are functions</li> <li>6. Vocabulary: explicit, recursive, geometric, arithmetic, fractal</li> </ol>	<p><i>Students will be skilled at...</i></p> <ol style="list-style-type: none"> <li>1. Writing the recursive rule for a set of data</li> <li>2. Writing the explicit rule for a set of data</li> <li>3. Determine if a pattern is arithmetic or geometric</li> <li>4. Finding the explicit and/ or recursive rule for a word problem or visual pattern</li> <li>5. Identifying patterns from real world context</li> <li>6. Representing patterns using tables, graphs and equations</li> <li>7. Creating an appropriate scale to represent data within a pattern on x and y axes</li> <li>8. Labeling x and y axes</li> <li>9. Creating and extending fractals</li> </ol>