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| **Learning Target(s):**1. Build new functions from existing functions (limited to linear, quadratic and exponential).
* I can analyze the effect of translations and scale changes on functions.
 | **Pacing:*** 2 Days
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| **In previous grades, students have:*** In 7th Grade students develop an understanding of rational numbers and work with expressions and linear equations.
* In 6th Grade students write interpret and use expressions and equations.
* In 4th Grade students develop an understanding of fluency with multi-digit multiplication and dividing to find quotients with multi-digit dividends.
* In 2nd Grade students build fluency with addition and subtraction.
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| **Success Criteria** (to be able to do this, students must learn and understand…):* Understand how to represent the constraints and variables mathematically.
* Understand how to select appropriate mathematical methods to use.
* Understand how to make sensible estimates and assumptions.
* Understand how to investigate a sequential problem.
* Understand how to communicate their reasoning clearly.
 | **Performance Task** (students will show they can do this by):* Interpret a situation and represent the constraints and variables mathematically.
* Select appropriate mathematical methods to use.
* Make sensible estimates and assumptions.
* Investigate a sequential problem.
* Communicate their reasoning clearly.
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| **Suggested Activity:**In this problem, *Tri-Triangles*, students use algebraic thinking to solve problems involving patterns, sequences, and generalizations, linear and non-linear functions. The mathematical topics that underlie this problem are finding and extending patterns, creating generalizations, finding functions, developing inverse processes, exploring non-linear functions, and justifying solutions.In the first level of the problem, students view a pattern of triangles composed of toothpicks. Their task is to determine the number of toothpicks that make up each pattern. The function is proportional. In level B, students examine a linear pattern that involves a constant. The task involves a set of triangular tables that are arranged adjacently in a row. The task asks students to determine the relationship between the number of tables and the number of people who can sit around the tables. Students need to extend the pattern. They also find the inverse relationship, i.e., find the pattern number when given the total number of people seated. Level C requires students to determine how a pattern grows. Students need to see that the pattern grows by square numbers. They identify the relationship and then explain a valid process for finding these values. In level D, students are asked to generalize a rule for finding a value in the triangular number sequence. They are also asked to explain the process for finding an inverse value for the triangular number sequence by finding the term given the total. In the final level E, students generate a closed expression for a sequence that grows as the sum of two exponential functions. In addition, the students must justify their findings. Activity Link: <https://svmimac.org/wp-content/uploads/2018/07/0c36d8f3775c4bec.pdf>**Re-teaching:**Student Focus Questions and Thinking Guide:* What is known and what is unknown?
* What are you asked to find out?
* What kind of representation will help you tackle this problem?

*Try not to make suggestions that move students towards a particular approach to this task. Instead, ask questions that help students to clarify their thinking and encourage checking:* * Can you set out your work using a table or diagram?
* What would be a good way?
* What assumptions have you made?
* How can you check your solution?
* Do you think there is just one solution?

**Extension:*** What was your strategy for solving this problem?
* What do you know now that you did not know before?
* Would you continue to use this strategy on similar problem types?
* Are there any other approaches you could try?

Peer Reflection/Assessment:* If you are visiting another group, read through their work. If their work makes sense, explain it in your own words. If the work does not make sense to you, ask for clarification.
* If you are staying at your desk, either carefully listen to the explanation and check it matches your own thinking or answer the visiting students’ questions.
* You may then want to consider improving your artifact.
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| **EL Accommodations:*** Provide written instructions.
* Provide a vocabulary list.
* Peer support.
* Discourse strategies.
* Reading and writing prompts.
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| **Vocabulary:*** Linear
* Quadratic
* Function
* Modeling
* Data Table
* Sequence
* nth Term
 | **Aligned Resources:*** **Lesson PDF:** <https://svmimac.org/wp-content/uploads/2018/07/0c36d8f3775c4bec.pdf>
* **Student Slide Set:**

n/a* **DTMC Exploration Supplement:**

<https://docs.google.com/presentation/d/1BCJYgdMql15X58HEjH7SrFbhWUG3q0Q2d68j3dnNPsU/edit#slide=id.p> | **Blooms:** Analyze**DOK:** 2**21st Century Skills:**Learning and Innovation Skills:* Creativity and Innovation
* Critical Thinking and Problem Solving
* Communication
* Collaboration

Information, Media and Technology Skills:* Information Literacy
* Media Literacy
* Technology Skills
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| **Test Item Exemplars:**Open Exploration Activity (Ongoing Formative Assessment).  |