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| **Learning Target(s):**1. Construct and compare linear, quadratic and exponential models and solve problems.
* I can construct linear, quadratic and exponential equations given graphs, verbal descriptions or tables.
 | **Pacing:*** 1 Day
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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 real world 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 real world problem.
* Communicate their reasoning clearly.
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| **Suggested Activity:**The purpose of this problem is to have students compose functions using tables of values only. Students are asked to consider the meaning of the composition of functions to solidify the concept that the domain of *g* contains the range of *f*. Part c requires two non-trivial pieces of reasoning: First, in (ii), students are asked to reason out an approximate value for *g*(*f*(18)), even though this number cannot be directly evaluated from the given data. The solution provides a reasonable but fairly inexact procedure for doing this -- a more precise approach would be to attempt to interpolate the functions with precise formulas, but most attempts to do this are too simplistic (e.g., a linear model) or beyond the scope of the task (e.g., a logistic model). Second, in (iii), students are presented with the expression *f*(*g*(9)), which can be evaluated when *f* and *g* are considered as abstract functions, but which is meaningless when considered in the context of the problem. The distinction between these two points of view is subtle, but important -- the "jumping" in and out of the real-world context is an important aspect of mathematical modeling. Regardless, students should certainly come away with the message that it may be possible to compose a pair of functions in one direction but not the other. Activity Link: <https://tasks.illustrativemathematics.org/content-standards/tasks/671>**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
* Functional Notation
* Systems of Equations
* Sum
* Product
* Rational
* Irrational
 | **Aligned Resources:*** **Lesson PDF:** <https://tasks.illustrativemathematics.org/content-standards/tasks/671>
* **Student Artifact:**

n/a | **Blooms:** Analyze**DOK:** 3**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).  |