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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 an algebraic 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 an algebraic problem.
* Communicate their reasoning clearly.
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| **Suggested Activity:**In this lesson, the equation: *f*(x) = ax2 + bx + c has three constants a, b, c which can take any real number value. This gives three degrees of freedom in specifying a quadratic function. Requiring the graph of function *f* to pass through a point P1 puts one condition on a, b, c while requiring the graph of function *f* to pass through P2 puts a second condition on a, b, c. Assuming the P1 and P2 have distinct x-coordinates, this leaves one degree of freedom for the coefficients a, b, c of a quadratic whose graph goes through P1 and P2. This extra degree of freedom is revealed as a "scaling factor'' in part (a) while part (b) is more subtle as the graphs do not share the same vertex.The second solution to part (b) is quite sophisticated. While students should be able to follow the logic its primary use should be to challenge them to think creatively about the problem. The first solution to (b) is more grounded in classroom practice and should likely be the one emphasized for the majority of students. Activity Link: <https://tasks.illustrativemathematics.org/content-standards/HSF/LE/A/2/tasks/379>**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
 | **Aligned Resources:*** **Lesson Website:** <https://tasks.illustrativemathematics.org/content-standards/HSF/LE/A/2/tasks/379>
* **Student Slide Set:**

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).  |