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| **Learning Target(s):**1. Extend and use properties of rational exponents.
* I can explain how the meaning of rational exponents extends from the properties of integer exponents.
 | **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:**This task has students experiment with the operations of addition and multiplication, as they relate to the notions of rationality and irrationality. As such, this task perhaps makes most sense after students learn the key terms (rational and irrational numbers), as well as examples of each (e.g., the irrationality of √2, π, etc.), but before formally proving any of the statements to be discovered in this task. Discussion of such proofs is taken up in other tasks.These conjectures are likely best discussed in small groups and/or with the whole class, and so is best used in instructional, rather than assessment-based, settings. The discussions generated by student conjectures will likely yield productive insights into the nature of sums and products of real numbers leading eventually to the explanations sought in content standard (CCSS) N.RN.3, preparing them for the formal statements of these results. Note that some of these decisions, e.g., the irrationality of π+√2, are well beyond the scope of high school mathematics, but this does not preclude students from being able to answer the always/sometimes/never questions being asked. Activity Link: <https://tasks.illustrativemathematics.org/content-standards/tasks/690>**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 Website:** <https://tasks.illustrativemathematics.org/content-standards/tasks/690>
* **Student Artifact:**

n/a | **Blooms:** Comprehend**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).  |