**Lesson/Unit Name:** Relationships Between Quantities and Reasoning with Equations and Their Graphs  
**Content Area:** Mathematics  
**Grade Level:** 9

### Dimension I – Alignment to the Depth of the CCSS

<table>
<thead>
<tr>
<th>The lesson/unit aligns with the letter and spirit of the CCSS:</th>
<th>Targets:</th>
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<tbody>
<tr>
<td>✓ Targets a set of grade-level CCSS mathematics standard(s) to the full depth of the standards for teaching and learning.</td>
<td>In the Overview, focus standards are identified for all lessons. In Topic A, an introduction to functions is given through the use of real world context. The depth increases and we move into Topic B to develop the arithmetic properties. A game is used to introduce them and then the actual property is developed by students with connections to the &quot;why&quot; these properties work. Reasoning with equations and inequalities was the strength of the unit. A possible suggestion for improvement would be to identify where the major and minor work of the standard is within the lesson to drive / focus the instructional time. It also may have been helpful if a standard (s) is identified for each lesson at the beginning of the lesson.</td>
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<tr>
<td>✓ Standards for Mathematical Practice that are central to the lesson are identified, handled in a grade-appropriate way, and well connected to the content being addressed.</td>
<td>SMPs: Many SMPS are identified throughout the lessons and are directly connected to the content. Certain SMP’s are used more frequently than the lessons permit. When SMP 1 was identified, many times the work did not allow the full depth of the standard to be experienced by students. For example on page 253, &quot;guide them through the problem as needed&quot; removes the opportunity for students to make sense and persevere. Another enhancement could be to make the connection more transparent between the SMP and the actions of the students. For example, on page 44 with SMP 3, state that students need to debate the work of their partner and justify their reasoning. This could be built into the partner work or could just be the directions from the teacher. On page 211, there is an example where the directions to the teacher &quot;walk students through the solution to this problem&quot; does not allow students to experience SMP 3. On page 170, there is an opportunity for students to experience SMP 3 but it is not noted.</td>
</tr>
<tr>
<td>✓ Presents a balance of mathematical procedures and deeper conceptual understanding inherent in the CCSS.</td>
<td>Balance: There is a definitely balance between conceptual and procedural knowledge throughout this unit. This is dictated by the standard itself. Examples of appropriate balance are as follows: Lesson 6 uses the area model to develop polynomial multiplication and then students are given many opportunities to discuss and practice. Lesson 7 develops the communicative and associative properties and again affords students the opportunities to practice this in multiple ways. The standard for these lessons requires students to &quot;use the structure ...&quot; and to &quot;understand that ... &quot; which indicates conceptual depth and is evident in these lessons.</td>
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</table>

**Rating:** 2 – Meets many of the criteria in the dimension

### Dimension II – Key Shifts the CCSS
The lesson/unit reflects evidence of key shifts that are reflected in the CCSS:

- **Focus:** Lessons and units targeting the major work of the grade provide an especially in-depth treatment, with especially high expectations. Lessons and units targeting supporting work of the grade have visible connection to the major work of the grade and are sufficiently brief. Lessons and units do not hold students responsible for material from later grades.

- **Coherence:** The content develops through reasoning about the new concepts on the basis of previous understandings. Where appropriate, provides opportunities for students to connect knowledge and skills within or across clusters, domains and learning progressions.

- **Rigor:** Requires students to engage with and demonstrate challenging mathematics with appropriate balance among the following:
  - **Application:** Provides opportunities for students to independently apply mathematical concepts in real-world situations and solve challenging problems with persistence, choosing and applying an appropriate model or strategy to new situations.
  - **Conceptual Understanding:** Develops students’ conceptual understanding through tasks, brief problems, questions, multiple representations and opportunities for students to write and speak about their understanding.
  - **Procedural Skill and Fluency:** Expects, supports and provides guidelines for procedural skill and fluency with core calculations and mathematical procedures (when called for in the standards for the grade) to be performed quickly and accurately.

Focus: In the module overview all of the standards covered are listed. There are 8 clusters and all but 2 are the major work of Algebra I. The first five lessons are used to support the major work of Algebra I. The appropriate amount of time is spent with the major work.

Coherence: The attention to prior standards within the lesson and in the overview, allows for teachers and students to connect to previously learned topics. The focus of Topic B on algebraic expressions and properties coherently connects to the concrete representations presented in Topic A.

Rigor: Lessons are developed in a thoughtful way that demonstrate an appropriate balance between application, procedural skills and conceptual understanding. Students have the opportunity to experience a variety of problems (pg. 96, 99), questions (pg. 181), multiple representations (pg. 82, 95, 180), and are frequently asked to speak and write about what they are learning (pg. 182, 230). The last lesson exemplifies this strongly.

Rating: 3 – Meets most to all of the criteria in the dimension

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### Dimension III – Instructional Supports

The lesson/unit is responsive to varied student learning needs:

- Includes clear and sufficient guidance to support teaching and learning of the targeted standards, including, when appropriate, the use of technology and media.

- Uses and encourages precise and accurate mathematics, academic language, terminology and concrete or abstract representations (e.g., pictures, symbols, expressions, equations, graphics, models) in the discipline.

For most educators, this material is clear and sufficient in guidance. It will require competence in Algebra I content and pedagogy to successfully implement. Learning targets are provided for educators. These learning targets could be included in the student materials to better define what students are learning. At the beginning of the module, several videos are suggested. Later a lesson suggest a link to Wolfram Alpha, but frequently technology is not included in the module. Thus, there is little guidance regarding technology. There are wonderful and thoughtful questions included in both teacher and student materials. These will provide extensive opportunities for students to engage in productive struggle. In addition, there are multiple opportunities for students to participate in a variety of different group configurations.
Engages students in productive struggle through relevant, thought-provoking questions, problems and tasks that stimulate interest and elicit mathematical thinking.

Addresses instructional expectations and is easy to understand and use.

- Provides appropriate level and type of scaffolding, differentiation, intervention and support for a broad range of learners.
  - Supports diverse cultural and linguistic backgrounds, interests and styles.
  - Provides extra supports for students working below grade level.
  - Provides extensions for students with high interest or working above grade level.

A unit or longer lesson should:

- Recommend and facilitate a mix of instructional approaches for a variety of learners such as using multiple representations (e.g., including models, using a range of questions, checking for understanding, flexible grouping, pair-share).
- Gradually remove supports, requiring students to demonstrate their mathematical understanding independently.
- Demonstrate an effective sequence and a progression of learning where the concepts or skills advance and deepen over time.
- Expect, support and provide guidelines for procedural skill and fluency with core calculations and mathematical procedures (when called for in the standards for the grade) to be performed quickly and accurately.

The two major strengths of this module include attention to precise and accurate mathematical language and the use of various models and representations to illustrate mathematics. However, on the lesson 2 notes, although precise, the language explaining the algebraic difference between \( h(x) \) and \( h(t) \) complicates and confuses the focus of the lesson. Furthermore, the teacher language throughout the module is inconsistent. In lesson 10, specific language examples are given but are not followed in subsequent exercises within the lesson, making the overall focus of lesson 10 confusing.

Another challenge with consistency is how the scaffolds and extensions are placed within the lesson. For clarity, either all extension activities/comments should occur within the teacher notes or should occur within the scaffolded boxes. There is an occasional reference to a scaffold (pg. 61, 64) or an extension (pg. 85, 88). There is no consistency nor depth to these opportunities. For example, the scaffold on page 64, gives teachers the option of providing an easier problem or "let students ponder and struggle for a bit". Perhaps an option for improving this scaffold would be to include specific strategies or probing questions for teachers to use to help students clarify their own thinking. The use of various methods and models allows for natural differentiation because students can access mathematical problems with a variety of approaches. However, specific suggestions targeting struggling learners do not exist. The removal of supports occurs occasionally and with little structure.

The included problems sets are aligned to the goals of the lesson but it is unclear as to how they should be used. Clarification of the lesson design would be helpful to the reader. Note: We understand that this information may be available but it was not submitted as part of the review process.

Rating: 2 – Meets many of the criteria in the dimension

### Dimension IV – Assessment

The lesson/unit regularly assesses whether students are mastering standards-based content and skills:

- Is designed to elicit direct, observable evidence of the degree to which a student can independently demonstrate the targeted CCSS.
- Assesses student proficiency using methods that are accessible and unbiased, including the use of grade-level language in student prompts.
- Includes aligned rubrics, answer keys and scoring guidelines that provide sufficient guidance for interpreting student performance.

A unit or longer lesson should:

- Use varied modes of curriculum-embedded assessments that may include pre-, formative, summative and self-assessment measures.

The unit contains a mid-module and end of module assessment that allows students to independently demonstrate their level of understanding for the standards aligned to this module. These assessments include the materials that are covered in the module. The scoring rubrics are precise, aligned to each question and allow the teacher to accurately interpret student performance. There are no pre-, formative or self-assessments made explicit. Although, there are opportunities for teachers to use the materials in a manner that will elicit evidence in a formative way.

Rating: 3 – Meets most to all of the criteria in the dimension
Overall, this is a very strong unit that meets the content standards and the shifts of the CCSS. Most of the suggestions for improvement of this module are minor in nature. However, we highly encourage the authors to revisit the alignment of the Standards for Mathematical Practice. In the alignment process, careful attention should be paid to who is doing the math, teachers or students.

**Rating Scales**

**Rating Scale for Dimensions I, II, III, IV:**

3:  Meets most to all of the criteria in the dimension
2:  Meets many of the criteria in the dimension
1:  Meets some of the criteria in the dimension
0:  Does not meet the criteria in the dimension

**Overall Rating for the Lesson/Unit:**

E:  Exemplar – Aligned and meets most to all of the criteria in dimensions II, III, IV  *(total 11 – 12)*
E/I: Exemplar if Improved – Aligned and needs some improvement in one or more dimensions *(total 8 – 10)*
R:  Revision Needed – Aligned partially and needs significant revision in one or more dimensions *(total 3 – 7)*
N:  Not Ready to Review – Not aligned and does not meet criteria *(total 0 – 2)*

**Rating Descriptors**

**Descriptors for Dimensions I, II, III, IV:**

3:  **Exemplifies CCSS Quality** - meets the standard described by criteria in the dimension, as explained in criterion-based observations.
2:  **Approaching CCSS Quality** - meets many criteria but will benefit from revision in others, as suggested in criterion-based observations.
1:  **Developing toward CCSS Quality** - needs significant revision, as suggested in criterion-based observations.
0:  **Not representing CCSS Quality** - does not address the criteria in the dimension.

**Descriptor for Overall Ratings:**

E:  **Exemplifies CCSS Quality** – Aligned and exemplifies the quality standard and exemplifies most of the criteria across Dimensions II, III, IV of the rubric.
E/I: **Approaching CCSS Quality** – Aligned and exemplifies the quality standard in some dimensions but will benefit from some revision in others.
R:  **Developing toward CCSS Quality** – Aligned partially and approaches the quality standard in some dimensions and needs significant revision in others.
N:  **Not representing CCSS Quality** – Not aligned and does not address criteria.