

Lesson/Unit Name: Transformations of Functions

Content Area: Mathematics

Grade Level: Algebra I

Reviewer 1

Overall Rating:

E

Exemplar

Dimension I – Alignment to the Depth of the CCSS

The lesson/unit aligns with the letter and spirit of the CCSS:

- ✓ Targets a set of grade-level CCSS mathematics standard(s) to the full depth of the standards for teaching and learning.
- ✓ 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.
- ✓ Presents a balance of mathematical procedures and deeper conceptual understanding inherent in the CCSS.

This sequence of lessons clearly target three course-appropriate standards with depth by fully investigating each aspect of transformations (F.BF.B.3) by examining several function types (general piecewise-defined functions, absolute value functions, greatest integer, least integer, and fractional-part functions; F-IF.C.7b), and eliciting specific details about the relationships between graphical representations of functions and graphs of equations A-REI.D.11

F-BF.B.3 and A-REI.D.11 are addressed thoroughly to the limits defined for Algebra 1 for the assessment consortium for this state. These limits are clearly listed for these standards in footnote in the unit overview. Consideration should be given to reiterating these limits at the beginning of topic C to ensure teacher clarity on the extent to which each of these standards should be treated in instruction.

Standards for Mathematical Practice that are relevant to the content in this unit are identified at the beginning of the unit with specific notation as to how they connect to the content. Making this aspect stronger is that specific opportunities to engage in an appropriate Standard for Mathematical Practice are referenced at appropriate places within the lesson descriptions (for example, page 199 explicitly calls out an opportunity for students to engage in MP.6 in that students must use precise language to communicate their findings, and on page 220, MP.3 and MP.8 are both referenced in connection to the work students will be doing while exploring the effects of k). Consider providing teachers suggestions for making these opportunities a focus of instructional activities and clear to students. Suggestions for student behaviors may also guide teachers in assessing student proficiency in the indicated mathematical practices.

The lessons contain explorations that develop new concepts graphically, numerically, and symbolically (for example, the step-function exploration on page 203) and guide students to making generalizations about the concept. Some questions that support the development of conceptual understanding (On page 207 question e calls for comparison and analysis of the functions using understanding of the concepts. And, on page 267 item d elicits conceptual understanding of transformations of piecewise functions by having students compare and summarize verbally patterns they have observed). Development of conceptual understanding is balanced with many opportunities for students do develop procedural fluency in graphing, analyzing key features of those graphs, and manipulating symbolic representations. Attention is also drawn to maintaining procedural skills from prior courses.

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

Dimension II – Key Shifts the CCSS

<p><i>The lesson/unit reflects evidence of key shifts that are reflected in the CCSS:</i></p> <ul style="list-style-type: none"> ✓ 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: <ul style="list-style-type: none"> – 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. 	<p>These lessons provide in-depth treatment of graphing functions and their transformations, as well as forming understanding about the relationship between graphs of functions and solutions to equations. In general, throughout this sequence of lessons, expectations are appropriately high for students to think deeply about this content that is a focus of the course ("explain the meaning of the function in your own words." p.197; "do you agree or disagree with __? Explain your reasoning." page 218).</p> <p>The sequence of lessons is coherent, making appropriate connections among standards within the course, as well as connections across domains and levels to middle school and towards a geometry course. The narrative expertly makes these connections for teachers, and one lesson explicitly points out these connections for students.</p> <p>Students are often presented with real-world situations that prompt the exploration of content (cell phone plans is a context that appears in lesson 16 and recurs later in the sequence of lessons). As mentioned in the previous domain, these lessons present an appropriate balance of conceptual development using tasks that explore multiple representations that reveal patterns in the functions, and procedural fluency by providing ample opportunities for students to practice graphing and solving equations.</p> <p>To increase the level of rigor, consideration should be given to provide less scaffolding (directed questioning that walk through each step) on some of the explorations and/or provide more opportunities for open-ended problems and discovery.</p>
<p>Rating: 3 – Meets most to all of the criteria in the dimension</p>	

Dimension III – Instructional Supports

<p><i>The lesson/unit is responsive to varied student learning needs:</i></p> <ul style="list-style-type: none"> ✓ 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. 	<p>This module contains clear discussion of learning events that are easy to understand and follow and ample guidance to support teaching and learning. Sample student responses are provided for each exercise, providing additional information to aid instruction. The use of graphing technology is appropriate and clear, though some consideration could be given to additional forms of technology that might enhance the learning experiences.</p> <p>A strength of this module is the expertly communicated, precise mathematical language that is apparent throughout the lesson descriptions, and is also elicited from students in the way questions are asked.</p>
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<ul style="list-style-type: none"> <input type="checkbox"/> 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. <ul style="list-style-type: none"> – 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. <p><u>A unit or longer lesson should:</u></p> <ul style="list-style-type: none"> ✓ 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). <input type="checkbox"/> 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. 	<p>Many student tasks are accompanied by alternative instructions, labeled "scaffolding," that meet the needs of students who may be struggling with the content ("use a simpler example..."), may need different approaches to the process ("provide graphing calculators..."), and those who may need extensions ("as an extension task, ask students if..." - all examples from page 213). These notes clearly support universal design for learning by providing options to students. To further strengthen these supports, consideration could be given to additional options for diverse cultural backgrounds and English Language Learners.</p> <p>As mentioned in Dimension II, thought-provoking questions are evident, though more opportunities for students to engage in productive struggle would lead to deeper conceptual understanding and proficiency in Standards for Mathematical Practice. Similarly, consider purposefully and gradually removing supports over the lesson sequence would allow students opportunities to gain deeper understanding.</p> <p>The sequence of lessons is an effective progression, and appropriately supports the development of procedural skills.</p>
<p>Rating: 2 – Meets many of the criteria in the dimension</p>	

Dimension IV – Assessment

<p><i>The lesson/unit regularly assesses whether students are mastering standards-based content and skills:</i></p> <ul style="list-style-type: none"> ✓ 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. <p><u>A unit or longer lesson should:</u></p> <ul style="list-style-type: none"> ✓ Use varied modes of curriculum-embedded assessments that may include pre-, formative, summative and self-assessment measures. 	<p>The module elicits observable, unbiased evidence of student skill and understanding through daily exit tickets and an end of sequence assessment. Extensive rubrics are provided for each task on the final assessment, and sample student responses are provided for the exit tickets. In addition, many other opportunities exist for teachers to informally assess student understanding through classroom activities and answers to questions on explorations ("Be sure to review...; use this as an opportunity to informally assess..." page 214). Explicit reference to these options with suggestions for how performance could be used to adjust instruction might make these formative assessment opportunities more effective. Also consider modeling the use of all types of assessments (observation, products, performance tasks, self-assessment) by explicitly embedding assessments within each lesson, rather than waiting until the end of each lesson, and purposefully demonstrating different assessment methods over the course of the lesson sequence.</p>
<p>Rating: 3 – Meets most to all of the criteria in the dimension</p>	

Summary Comments

This is a high-quality set of lessons with alignment to the CCSS and clear connections to Standards for Mathematical Practice. This set of lessons also attends well to precise mathematical language and procedural skill while balancing the need for conceptual understanding. This combined with some applications leads to an appropriate level of rigor. Providing more opportunities for productive struggle would increase the level of rigor, further enhance students' depth of understanding, and allow students additional opportunities to become proficient in the Standards for Mathematical Practice. This lesson sequence provides clear and thorough guidance for teachers including alternatives that support Universal Design for Learning and the needs of diverse learners, and many opportunities for assessment exist throughout the module to guide teachers towards responsive teaching.

Reviewer 2

Dimension I – Alignment to the Depth of the CCSS

The lesson/unit aligns with the letter and spirit of the CCSS:

- ✓ Targets a set of grade-level CCSS mathematics standard(s) to the full depth of the standards for teaching and learning.
- ✓ 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.
- ✓ Presents a balance of mathematical procedures and deeper conceptual understanding inherent in the CCSS.

This module presents a logical progression of lessons, each with a narrow scope. Throughout the course of each lesson there are specific tasks that elicit evidence from the students which indicate the depth of standards are being addressed. Of particular interest is the mathematical practices which are central to the unit are identified in the front matter. Then the practices are again highlighted at the beginning of the lesson. It is commendable that examples of how students might engage in the practices are also provided. This unit does a good job balancing procedures and then moving students toward the conceptual understanding necessary for success not only on the end-of-unit module, but also in the future. One suggestion might be to include more real-world/conceptual elements prior to the end-of-unit module.

Rating: **3 – Meets most to all 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

This particular unit of study was focused and there were progressions evident. In the front matter of the unit, previous knowledge was not only defined but limited. The increase in the rigor of the tasks and assessments was indicative of the great deal of demand was placed on the students to show evidence of skill mastery as well as engagement of the mathematical practices but more so at the end of the unit.

Although there were a wide range of item types, this unit might be strengthened by adding more real world applications and while minimizing the procedure driven tasks. Although this could be reflective of how the actual standards are written, it would make for a much richer student experience if more rigor is evident through real-world application during all portions of the module, not just the end-of-unit modules.

<p>situations.</p> <ul style="list-style-type: none"> - 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. 	
<p>Rating: 2 – Meets many of the criteria in the dimension</p>	

Dimension III – Instructional Supports

<p><i>The lesson/unit is responsive to varied student learning needs:</i></p> <ul style="list-style-type: none"> ✓ 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. ☐ 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. <ul style="list-style-type: none"> - 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. <p><u><i>A unit or longer lesson should:</i></u></p> <ul style="list-style-type: none"> ✓ 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 	<p>This section was also well done. There was little or no evidence of consideration of diverse culture and backgrounds although the standards don't necessarily lend themselves to this. If the real world applications were beefed up, it would be an opportunity to introduce more cultural diversity into the tasks.</p> <p>Although fluency is not called for in these particular standards, there is evidence of procedural skill and mathematical procedures with the expectation of accuracy.</p>
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<p>skills advance and deepen over time.</p> <ul style="list-style-type: none"> ✓ 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. 	
<p>Rating: 3 – Meets most to all of the criteria in the dimension</p>	

Dimension IV – Assessment

<p><i>The lesson/unit regularly assesses whether students are mastering standards-based content and skills:</i></p> <ul style="list-style-type: none"> ✓ 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. <p><i>A unit or longer lesson should:</i></p> <ul style="list-style-type: none"> ✓ Use varied modes of curriculum-embedded assessments that may include pre-, formative, summative and self-assessment measures. 	<p>This section is very thorough and well done. The only thing that might improve this section is to vary the types of assessment. If there are tools or resources that teachers could use to vary the way the students are assessed, it would seem to be less "worksheet driven." Another suggestion would be how to treat the exploratory challenges (pre-assessment/formative).</p>
<p>Rating: 3 – Meets most to all of the criteria in the dimension</p>	

Summary Comments

<p>I am concerned about the absence of rigor. If the standards addressed do not require a high level of rigor, then please note that. Overall, the lesson was well done.</p>
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Reviewer 3

Dimension I – Alignment to the Depth of the CCSS

<p><i>The lesson/unit aligns with the letter and spirit of the CCSS:</i></p> <ul style="list-style-type: none"> ✓ Targets a set of grade-level CCSS mathematics standard(s) to the full depth of the standards for teaching and learning. ✓ 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. ✓ Presents a balance of mathematical procedures and deeper conceptual understanding inherent in the CCSS. 	<p>The unit clearly articulates 3 content standards (A.REI.11, F.IF.7b, F.BF.3) at the beginning. Appropriate standards are also specifically mentioned in the opening "lesson notes". Although this unit doesn't fully address A.REI.11, it is clear that the remaining functions will be addressed in another unit or course. Lesson 19 addresses F.BF.3, however it makes no mention of odd functions, which the authors clearly address in several locations. Odd functions will be assessed in Algebra 2, and therefore is not part of this unit.</p> <p>A clear overview of Mathematical Practice Standards for this module is provided in the beginning. Mathematical Practice Standards are suggested, with some narrative/commentary, within each lesson when and where appropriate. Clear direction is provided in each lesson in regards to the Mathematical Practice Standards. Appropriate use of MP.3, construct viable arguments and critique the reasoning of others, and frequent opportunity for students to engage with MP.3 is available. This is important as MP.3 is specifically called out in PARCC assessments (which the authors indicate in</p>
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the beginning is the assessment this module is built with in mind). Also, this unit is a wonderful example of appropriate use of MP. 8, look for and express regularity in repeated reasoning (lessons 17, 18 and 19).

This unit provides a solid balance between procedure and understanding. The teacher is directed to provide clear procedure to students at times, but also given quality questions that help drive conceptual understanding. Students work tasks that require either or both procedural skill and conceptual understanding. Students need to be competent at graphing, creating tables, and writing functions. Students also need to be able to explain transformations (of graphs and of functions) and work with table, graphs, and equations interchangeably.

Rating: 3 – Meets most to all 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.

A.REI.11 is part of the major work in Algebra 1/Math 1. F.IF.7b is closely connected to A.REI.11 providing opportunities to support the understanding of A.REI.11. F.BF.3 is not part of the major work and is slightly less supportive of the major work.

This unit does a lovely job of including short statements regarding the coherence between lessons, previous grades/content, conceptual categories (Algebra and Functions), and "interplay between graphs, equations and functions" (Lesson 15). Lesson 16 mentions tying work from Module 1 on solving systems of two-variable equations to work with functions and leads students to the understanding of what the solution set to a one-variable equation can be. The commentary for the teacher in Example 1 of Lesson 16 even says "This exercise should reinforce the previous discussion", reminding teachers to constantly make connections. Throughout the unit references are made to 8th grade standards (especially in Lesson 17). Lesson 18 and 20 refer to previous lessons within the unit.

As previously mentioned in Dimension I, there is a nice balance of procedural skill and conceptual understanding. This unit does a good job of providing appropriate, meaningful real-world application problems. The unit does not force situations or applications, but instead finds quality application tasks that support the procedural skills and conceptual understanding that drives this unit. It is important to provide students plenty of time with the procedural skills and constructive concrete manipulation of graphs and equations. This is what helps solidify deep understanding.

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

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.
- ✓ 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.

This unit is easy-to-read, easy-to-follow, and laid out in an informative and progression-based approach. Teachers who may not be comfortable with the new standards could pick this unit up and successfully teach these lessons because of the detailed information provided for teachers in each lesson. Each lesson follows the same layout structure, which adds to the ease-of-use. Lessons include Student Outcomes, which articulate the goals for the students, and Lesson Notes, a short narrative that provides an overview of the lesson. With the increase in precise mathematical terminology and concept of rigid motion, some teachers may wish more support and guidance was provided. Some further attention to possible misconceptions students may have would add additional support to the teacher. This unit does a wonderful job of using and providing definitions of mathematical terminology (ex: relevant vocabulary on page 201). Not only are definitions provided, but the vocabulary is frequently and accurately used throughout the unit (ex: Discussion on page 244). This frequent use of appropriate vocabulary helps students become more comfortable with the language and use the vocabulary appropriately in their own work. Teachers are encouraged to have students use appropriate language and questions are included that lead students to use their new vocabulary (ex: Example 2 on Lesson 19). Students are asked to demonstrate their understanding using graphs, tables, equations, and verbal and/or written explanations, providing a good balance of concrete and abstract representations. Lessons also include example responses and sample solutions. This is a critical element to help teachers understand the student expectation. A variety of responses would help novice teachers determine if their students are reaching their full potential.

Quality questions that push students to think, explain, and demonstrate their command of transformations of functions is woven throughout the entire unit. Lesson 15 starts off with students comparing and contrasting between solution sets and their graphs. Lesson 16 has students reflect on the limitations of solving an equation graphically with an opportunity to share and compare their reasoning.

There are excellent suggestions for scaffolding or differentiation in this unit. These recommendations are easy to see, as they are pulled out in separate boxes. This makes scaffolding or differentiating easy for the teacher. Also, the suggestions include options for students working below grade level and those working above grade level.

A good mix of instructional approaches occur in this unit. Students work alone, in pairs, in small groups, and as a whole class. Students graph, solve equations, explain their reasoning using precise language, and use technology.

There is a clear removal of supports or movement toward independent work. It is explicitly written in the directions for Exit Slips and Lesson Problem Set.

The lessons are in a clear progression of learning, providing students the opportunity to build on previous knowledge to help deepen their concepts and skills. Lesson 15 mentions continuing the work from Lessons 11-13. Lesson 18 extends the concept of shifts by teaching horizontal shifts (vertical shifts taught in Lesson 17). Lesson 20 reviews the information covered in Lessons 17-19 by applying transformations to piecewise functions.

This unit provides support and guidance for teachers on procedural skills expectations for students. Example 2 in Lesson 16 guides teachers and students through graphing using technology. Students are also asked to complete tables and manipulate equations. There are no fluency standards for High School. More conversation around the relationship of equations, functions, graphs, tables, and appropriate terminology may be beneficial for many teachers.

Rating: **3 – Meets most to all 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.

A variety of assessments (Exit Tickets, Problem Sets, and end-of-module assessment) are included in this unit. Depending on how these are used by the teacher, they each could provide direct, observable evidence of the degree to which a student can independently demonstrate the standards. Clear directions on how to use these assessments are included throughout the lessons. However, this unit still provides a sense of freedom for the teacher to use all the assessment pieces as they see best. Although vocabulary is an important aspect of this unit, it is used frequently throughout and therefore should not limit accessibility on any assessment. All other language is grade-level and unbiased. Answer keys are provided for all questions, tasks, and assessments in the unit. A comprehensive rubric is included for the end-of-module assessment.

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

Summary Comments

This unit is an excellent example of clear, concise formatting that supports teachers and students. The quality of the questions, mix of examples and tasks, precise terminology, balance of procedural skill, application and conceptual understanding, and variety of possible assessments with answer keys provide ample opportunity for all students to be successful. Specific scaffolding and differentiation is included, providing an additional layer of support for teachers and students. A good collection of tasks guide students in a logical progression through the content standards of the unit using quality questions that address both students' procedural skill and their conceptual understanding. Clear and comprehensive commentary on the Mathematical Practice Standards ensures the proper use of the Mathematical Practice Standards.

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.

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- 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.
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- 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.