

Diagnosing Math Instruction



Mathematics Shift 1: Focus

What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">• Spend more time on fewer concepts.• Engage more deeply with content in a given class period (possibly many days)	<ul style="list-style-type: none">• Focus instructional time on priority concepts• Give students the gift of time

Principal's Role:

Work with groups of math teachers to determine what content to prioritize most deeply (reference PARCC MCFs)

Give teachers permission and hold teachers accountable for focusing on the priority standards immediately

Ensure that teachers have enough time, with a focused body of material, to build their own depth of knowledge

Major Areas of Work: P-2

Grade	Major Areas of Work
K	<p>Counting and Cardinality</p> <ul style="list-style-type: none"> • Know number names and count sequence • Count to tell the number of objects. • Compare numbers. <p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> • Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. <p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> • Work with numbers 11-19 to gain foundations for place value.
1	<p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> • Represent and solve problems involving addition and subtraction. • Understand and apply properties of operations and the relationship between addition and subtraction. • Add and subtract within 20. • Work with addition and subtraction equations. <p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> • Extend the counting sequence. • Understand place value. • Use place value understanding and properties of operations to add and subtract. <p>Measurement and Data</p> <ul style="list-style-type: none"> • Measure lengths indirectly by iterating length units.
2	<p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> • Represent and solve problems involving addition and subtraction. • Add and subtract within 20. • Work with equal groups of objects to gain foundations for multiplication. <p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> • Understand place value. • Use place value understanding and properties of operations to add and subtract. <p>Measurement and Data</p> <ul style="list-style-type: none"> • Measure and estimate lengths in standard units. • Relate addition and subtraction to length.

Major Areas of Work: 3-5

Grade	Major Areas of Work
3	<p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> •Represent and solve problems involving multiplication and division. •Understand the properties of multiplication and the relationship between multiplication and division. •Multiply and divide within 100. •Solve problems involving the four operations, and identify and explain patterns in arithmetic. <p>Number and Operations - Fractions</p> <ul style="list-style-type: none"> •Develop understanding of fractions as numbers. <p>Measurement and Data</p> <ul style="list-style-type: none"> •Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. •Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
4	<p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> •Use the four operations with whole numbers to solve problems. <p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> •Generalize place value understanding for multi-digit whole numbers. •Use place value understanding and properties of operations to perform multi-digit arithmetic. <p>Number and Operations - Fractions</p> <ul style="list-style-type: none"> •Extend understanding of fraction equivalence and ordering. •Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. •Understand decimal notation for fractions, and compare decimal fractions.
5	<p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> •Understand the place value system. •Perform operations with multi-digit whole numbers and with decimals to hundredths. <p>Number and Operations - Fractions</p> <ul style="list-style-type: none"> •Use equivalent fractions as a strategy to add and subtract fractions. •Apply and extend previous understandings of multiplication and division to multiply and divide fractions. <p>Measurement and Data</p> <ul style="list-style-type: none"> •Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Major Areas of Work: 6-8

Grade	Major Areas of Work
6	<p>Ratios and Proportional Relationships</p> <ul style="list-style-type: none">• Understand ratio concepts and use ratio reasoning to solve problems. <p>The Number System</p> <ul style="list-style-type: none">• Apply and extend previous understandings of numbers to the system of rational numbers.• Apply and extend previous understandings of multiplication and division to divide fractions by fractions. <p>Expressions and Equations</p> <ul style="list-style-type: none">• Apply and extend previous understandings of arithmetic to algebraic expressions.• Reason about and solve one variable equations and inequalities.• Represent and analyze quantitative relationships between dependent and independent variables.
7	<p>Ratios and Proportional Relationships</p> <ul style="list-style-type: none">• Analyze proportional relationships and use them to solve real-world and mathematical problems. <p>The Number System</p> <ul style="list-style-type: none">• Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. <p>Expressions and Equations</p> <ul style="list-style-type: none">• Use properties of operations to generate equivalent expressions.• Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
8	<p>Expressions and Equations</p> <ul style="list-style-type: none">• Work with radicals and integer exponents.• Understand the connections between proportional relationships, lines, and linear equations.• Analyze and solve linear equations and pairs of simultaneous linear equations. <p>Functions</p> <ul style="list-style-type: none">• Define, evaluate, and compare functions. <p>Geometry</p> <ul style="list-style-type: none">• Understand and apply the Pythagorean theorem.• Understand congruence and similarity using physical models, transparencies, or geometry software.

Sample Grade 5

Grade 5

Major	Supporting	Additional
<p>Number and Operations in Base Ten</p> <ul style="list-style-type: none"> ▪ Understand the place value system. ▪ Perform operations with multi-digit whole numbers and with decimals to hundredths. <p>Number and Operations – Fractions</p> <ul style="list-style-type: none"> ▪ Use equivalent fractions as a strategy to add and subtract fractions. ▪ Apply and extend previous understandings of multiplication and division to multiply and divide fractions. <p>Measurement and Data</p> <ul style="list-style-type: none"> ▪ Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. 	<p>Measurement and Data</p> <ul style="list-style-type: none"> □ Represent and interpret data. ⁵ □ Convert like measurement units within a given measurement system. ⁶ 	<p>Operations and Algebraic Thinking</p> <ul style="list-style-type: none"> ○ Write and interpret numerical expressions. ○ Analyze patterns and relationships. <p>Geometry</p> <ul style="list-style-type: none"> ○ Graph points on the coordinate plane to solve real-world and mathematical problems. ○ Classify two-dimensional figures into categories based on their properties.

Depth Opportunities:

NBT 1, 6; NF 2, 4; MD 5

Mathematics Shift 2: Coherence

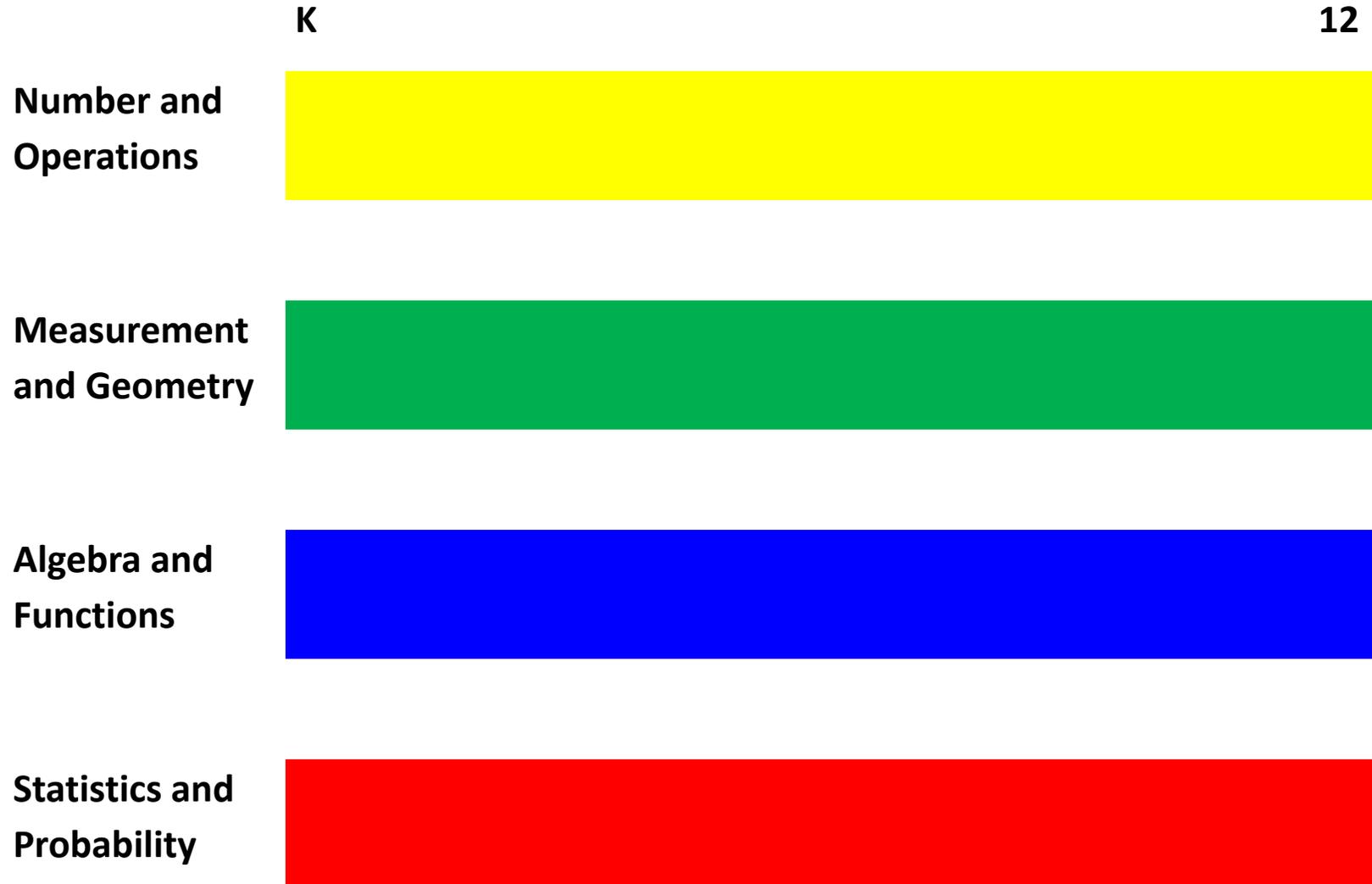
What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">• Build on knowledge from year to year, in a coherent learning progression	<ul style="list-style-type: none">• Connect the threads of math focus areas across grade levels• Connect to the way content was taught the year before and the years after• Progressions documents

Principal's Role:

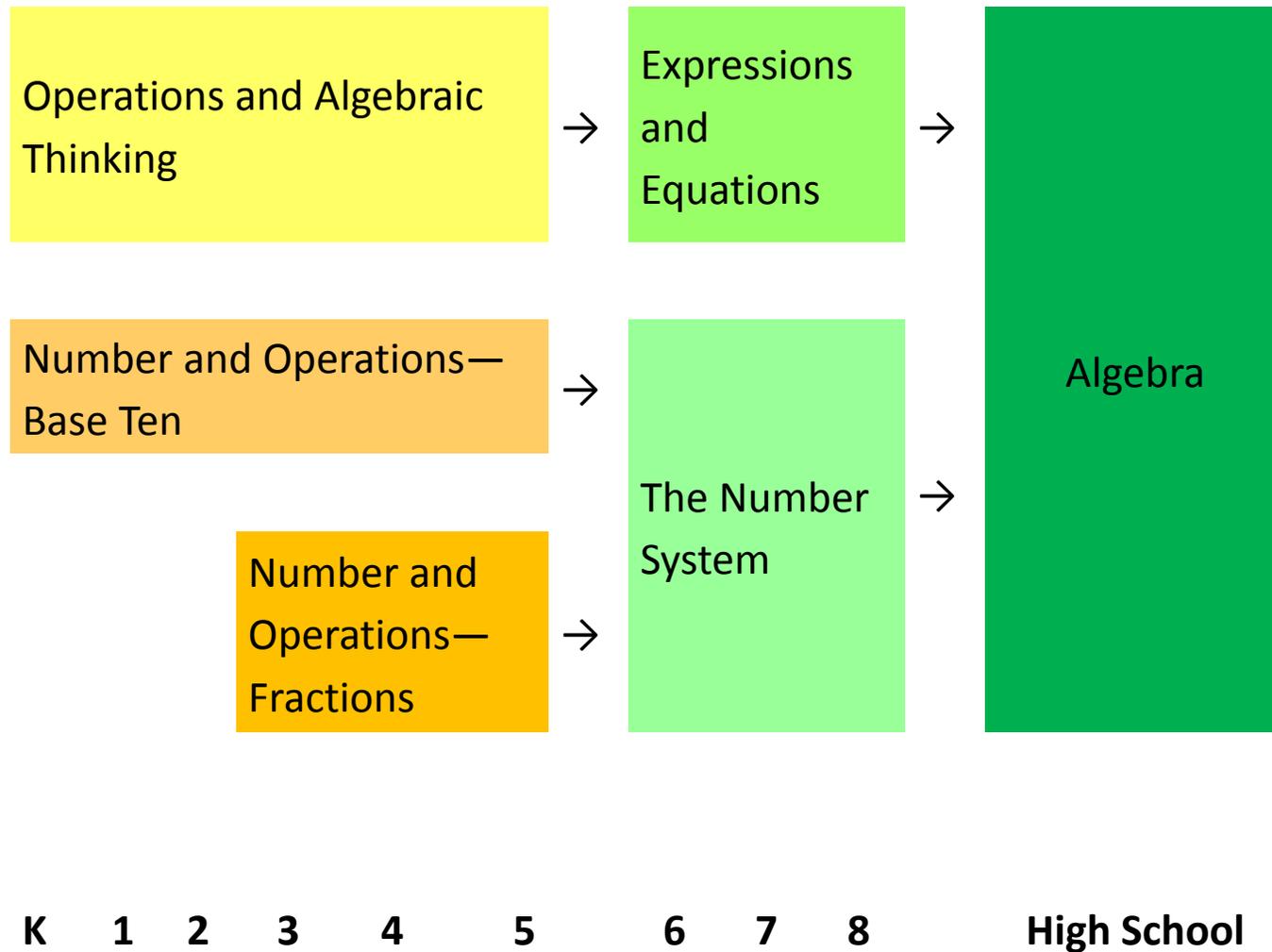
Ensure that teachers of the same content across grade levels allow for discussion and planning to ensure for coherence/threads of main ideas.

Provide professional development around the Progressions documents.

Traditional U.S. Approach



Focusing Attention Within Number and Operations



Certain cluster headings use language with a sense of motion from grade to grade. Some examples:

Grade 2

- Work with equal groups of objects to **gain foundations for** multiplication.

Grade 4

- **Generalize** place value understanding for multi-digit whole numbers.
- **Extend** understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by **applying and extending previous understandings** of operations on whole numbers.

Grade 5

- **Apply and extend previous understandings of** multiplication and division to multiply and divide fractions.

Grade 6

- **Apply and extend previous understandings of** multiplication and division to divide fractions by fractions.
- **Apply and extend previous understandings of** numbers to the system of rational numbers.
- **Apply and extend previous understandings of** arithmetic to algebraic expressions.
- **Apply and extend previous understandings of** operations with fractions to add, subtract, multiply, and divide rational numbers.

Mathematics Shift 3: Rigor - Fluency

What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">•Spend time practicing, with intensity, skills (in high volume)	<ul style="list-style-type: none">•Focus on the listed fluencies by grade level•Uses high quality problem sets, in high volume•Ensure fluency is always linked to conceptual understanding

Principal's Role:

Take on fluencies as a stand alone CCSS aligned activity and build school culture around them.

Key Fluencies

Grade	Required Fluency
K	Add/subtract within 5
1	Add/subtract within 10 Add/subtract within 20
2	Add/subtract within 100 (pencil and paper)
3	Multiply/divide within 100 Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2×2 systems by inspection

Mathematics Shift 4: Rigor - Deep Understanding

What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">• Show mastery of material at a deep level• Articulate mathematical reasoning• demonstrate deep conceptual understanding of priority concepts• “Know how, and also know why”	<ul style="list-style-type: none">• Create opportunities for students to understand the “answer” from a variety of access points• Ensure that EVERY student GETS IT before moving on• Base the lesson on mathematical truth

Principal's Role:

Allow teachers to spend time developing their own content knowledge

Provide meaningful professional development on what student mastery and proficiency really should look like at every grade level by analyzing exemplary student work

Classroom #1



What happens when I add the same thing to both sides of a scale?

$$2x - 3 = 9$$

Classroom #2

1. Is $3 + 2 = 5$ a true equation?
2. Describe what you notice when we do the following:
 1. Add 3 to both sides
 2. Add 3 to the left side, 4 to the right side
 3. Add 2 to the left side, 1 to the right side
 4. Add 2 to both sides
 5. Add 7 to both sides
3. Summarize what you noticed.

$$2x - 3 = 9$$

Mathematics Shift 5: Rigor- Application

What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">•Apply math in other content areas and situations, as relevant•Choose the right math concept to solve a problem when not necessarily prompted to do so	<ul style="list-style-type: none">•Provide students with real world experiences and opportunities to apply what they have learned•Build student independence and capacity for decision-making
<p><u>Principal's Role:</u></p> <p>Ensure that math has a place in science instruction</p> <p>Create a culture of math application across the school</p>	

Mathematics Shift 6: Rigor - Dual Intensity

What the Student Does...	What the Teacher Does...
<ul style="list-style-type: none">•Practice math skills with an intensity that results in fluency•Practice math concepts with an intensity that forces application in novel situations	<ul style="list-style-type: none">•Find the dual intensity between understanding and practice within different periods or different units•Be ambitious in demands for fluency and practice, as well as the range of application

Principal's Role:

Reduce the number of concepts taught and manipulate the schedule so that there is enough math class time for teachers to focus and spend time on both fluency and application of concepts/ideas

I. Alignment to the Depth of the CCSS	II. Key Shifts in the CCSS	III. Instructional Supports	IV. Assessment
<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. 	<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 understand concepts and skills at a high level of mathematical proficiency. 	<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 challenging questions, problems and tasks that require critical thinking. 	<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 assess student learning of standards-based content and skills.
<p>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>

Collaboratively built tools informed and approved by the authors of the CCSS, which evaluate the Common Core alignment of curricular materials Actualize the Publishers Criteria



The EQulP rubric is derived from the Tri-State Rubric and the collaborative development process led by Massachusetts, New York, and Rhode Island and facilitated by Achieve. This version of the EQulP rubric is current as of 06-15-13. View Creative Commons Attribution 3.0 Unported License at <http://creativecommons.org/licenses/by/3.0/>. Educators may use or adapt. If modified, please attribute EQulP and re-title.



EQIP Rubric for Lessons & Units: Mathematics

Directions: The Quality Review Rubric provides criteria to determine the quality and alignment of lessons and units to the Common Core State Standards (CCSS) in order to: (1) Identify exemplars/ models for teachers' use within and across states; (2) provide constructive criteria-based feedback to developers; and (3) review existing instructional materials to determine what revisions are needed.

Step 1 – Review Materials

- Record the grade and title of the lesson/unit on the recording form.
- Scan to see what the lesson/unit contains and how it is organized.
- Read key materials related to instruction, assessment and teacher guidance.
- Study and work the task that serves as the centerpiece for the lesson/unit, analyzing the content and mathematical practices the tasks require.

Step 2 – Apply Criteria in Dimension I: Alignment

- Identify the grade-level CCSS that the lesson/unit targets.
- Closely examine the materials through the “lens” of each criterion.
- Individually check each criterion for which clear and substantial evidence is found.
- Identify and record input on specific improvements that might be made to meet criteria or strengthen alignment.
- Enter your rating 0 – 3 for Dimension I: Alignment.

Note: Dimension I is non-negotiable. In order for the review to continue, a rating of 2 or 3 is required. If the review is discontinued, consider general feedback that might be given to developers/teachers regarding next steps.

Step 3 – Apply Criteria in Dimensions II – IV

- Closely examine the lesson/unit through the “lens” of each criterion.
- Record comments on criteria met, improvements needed and then rate 0 – 3.

When working in a group, individuals may choose to compare ratings after each dimension or delay conversation until each person has rated and recorded their input for the remaining Dimensions II – IV.

Step 4 – Apply an Overall Rating and Provide Summary Comments

- Review ratings for Dimensions I – IV adding/clarifying comments as needed.
- Write summary comments for your overall rating on your recording sheet.
- Total dimension ratings and record overall rating E, E/I, R, N – adjust as necessary.

If working in a group, individuals should record their overall rating prior to conversation.

Step 5 – Compare Overall Ratings and Determine Next Steps

- Note the evidence cited to arrive at final ratings, summary comments and similarities and differences among raters. Recommend next steps for the lesson/unit and provide recommendations for improvement and/or ratings to developers/teachers.

Additional Guidance on Dimension II: Shifts - When considering *Focus* it is important that lessons or units targeting additional and supporting clusters are sufficiently brief – this ensures that students will spend the strong majority of the year on major work of the grade. See the *K-8 Publishers Criteria for the Common Core State Standards in Mathematics*, particularly pages 8-9 for further information on the focus criterion with respect to major work of the grade at www.corestandards.org/assets/Math_Publishers_Criteria_K-8_Summer%202012_FINAL.pdf. With respect to *Coherence* it is important that the learning objectives are linked to CCSS cluster headings (see www.corestandards.org/Math).

Rating Scales

Rating for Dimension I: Alignment is non-negotiable and requires a rating of 2 or 3. If rating is 0 or 1 then the review does not continue.

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

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.

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)

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.

Grade: **Mathematics Lesson/Unit Title:**

Overall Rating:

I. Alignment to the Depth of the CCSS	II. Key Shifts in the CCSS	III. Instructional Supports	IV. Assessment
<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><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><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><i>A unit or longer lesson should:</i></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 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><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>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>	<p>Rating: 3 2 1 0</p>



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Dimension I

Alignment to The Depth of the CCSS

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.

Rating: 3 2 1 0

Dimension II

Key Shifts In the CCSS

II. Key Shifts in 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.

Rating: 3 2 1 0

Dimension III

Instructional Supports

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.

Rating: 3 2 1 0

Dimension IV

Assessment

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.

Rating: 3 2 1 0

Rating Procedures for Rubric

Rating for Dimension I: Alignment is non-negotiable and requires a rating of 2 or 3. If rating is 0 or 1 then the review does not continue.

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 Procedures for Rubric

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.
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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.

Curriculum: Top 3 Things To Look For

#1 Balance of Rigor (Procedural Fluency, Application, Conceptual Understanding):

- **Procedural Fluency:**
 - Repetition, Feedback, Connected to concepts
- **Conceptual Understanding:**
 - Students writing and speaking *why*, Visual models, Lessons that start with *tasks and questions* not teacher statements/talk
- **Application:**
 - Students doing problems set in the *real world*, Used to both demonstrate knowledge/skills *and introduce new knowledge/skills*

Curriculum: Top 3 Things To Look For

#2 Standards for Mathematical Practice:

- Named and evident in lessons and units
- Clear *connections to content*

#3 Assessments that include:

- Clear demonstration of targeted CCLS
- Rubrics/answer keys
- Unit-level assessments feature a balance of rigor (procedural fluency, conceptual understanding, application)

Curriculum: DON'T look for...

- Lessons and units devoid of context
- Lessons that feature excessive teacher modeling and “telling”
- Lessons without supports and extensions for all learners
- Activity-based lessons that lack a focus on content
- Lessons and units that are aligned to standards below grade-level

Let's rate some examples on the Tri-State Rubric

Instruction: What to Look For

- **The Shifts**

Focus

Coherence

 **Fluency**

 **Deep, Conceptual Understanding**

 **Application**

Dual Intensity

- **The Practices**

 **1 - 8**

Fluency

- **Teachers...**
 - **Assigning targeted, grade-level fluency work in the form of timed activities like sprints and whiteboard activities**
 - **Giving feedback on timing and accuracy**
 - **Maintaining connections to conceptual understanding**
 - **Tracking individual and class progress**
- **Students...**
 - **Practicing quickly, efficiently, and accurately**

Deep, Conceptual Understanding

- **Teachers...**

- **Beginning class with questions and tasks that drive toward understanding**
- **Employing visual models**
- **Asking students to generalize from repeated examples that illustrate a concept**
- **Using real-world problems to introduce concepts**
- **Asking questions like, “Why?” and “What do you notice?”**

- **Students...**

- **Speaking and writing carefully to explain and justify**

Application

- **Teachers...**
 - **Assigning problems that involve a real-world context and for which there is not an obvious procedural cue**
 - **Using real-world problems to introduce concepts**
 - **Using real-world problems as summative assessment tasks**
 - **Continuously increasing difficulty/complexity to build student perseverance**
- **Students...**
 - **Engaging fully in real-world problems for significant lengths of time**

The Practices – What do teachers do

1. **Make sense of problems and persevere in solving them.**

Teachers deliberately build up perseverance in their students by giving them time to struggle with problems.

2. **Reason abstractly and quantitatively.**

Teachers ask students to explain the connections between mathematical symbols or representations and the real-world problems they represent.

The Practices – What do teachers do

3. **Construct viable arguments and critique the reasoning of others.**

Teachers have a good “poker face” and insist that students justify their answers to each other.

4. **Model with mathematics**

Teachers ask students to use math to describe the real world.

The Practices – What do teachers do

5. Use appropriate tools strategically.

Teachers give students opportunities to use tools (not only technology, but also mathematical principles or rules) and evaluate their appropriateness for the task.

6. Attend to precision.

Teachers insist that students are precise not only in their calculations and solutions but also in their words, using mathematically correct language.

The Practices – What do teachers do

7. Look for and make use of structure.

Teachers ask students to notice components within a figure or expression and use these strategically to solve problems and answer questions.

8. Look for and express regularity in repeated reasoning.

Teachers ask students to generalize rules they notice after making repeated calculations, observations, or representations.

We no longer want to see...

- **Excessive teacher modeling/Too much teacher talk**
- **Students that are silent for extended periods of time**
- **Short or nonexistent periods of struggle**
- **Over-emphasis on procedural components of class**
- **Students following “steps” or using mnemonics instead of understanding**
- **Below grade-level work**
- **Teachers accepting and evaluating answers without insisting on justification**
- **Sloppy or nonexistent mathematical language**

- http://nysed.vpg.com/nysed_CC_videos/nysed_ball_cc_ma_ccdeu_g2_4_v7.mov
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