Math Curriculum Review

Committee Update
March 18, 2013

Committee Members

Lynne Bugai -K
Patti Malartsik -K/1
Erin Breen -1
Julie Chalberg -1
Jenny DeLuca -1
Melanie Moon -2
Nancy Sweeney -2
Carolyn Borta -3
Dawn O'Connor -4
Sandy Blethen -4
Matt Bozeday -4/5
Lindsey Hejza -5
Josh Hammond - 6
Tricia Warneke - 6

Erica Dieden -7/8
Mark Pancini -7/8
Michele Vondruska -7/8
Linda Damianides -C of C
Shirlee Pater - C of C
Kelly McCall - IR
Carrie Bellen - ITC
Amanda Walsh - ITC
Mary McCabe - IR
Kitty McGrath - IR
Tina DeCicco - PC
Kelly Tess -AP
Camille Derwin - IR Fac./C of C Curr. Spec.
Martha Rode - IR Facilitator

Committee Goals

Support the delivery of high quality math instruction aligned with the Common Core State Standards to all District 64 students

- *Identify curriculum materials for potential adoption and plan professional development*
- *Approve recommendations for small refinements to the District 64 Math Priority Standards*
- *Review and recommend math assessments and progress-monitoring tools*

CCSSM Problem-Solving- HS

Consider the table of data about the cellular regeneration experiment.

a. If the number of cells continues to grow according to the pattern shown in the table, at what week number will the number of cells exceed one billion?

b. Explain how the process you used to find the week number relates to either the recursive model or the explicit model you constructed in the previous questions.

Week	Number of cells in medium
1	15
2	30
3	60
4	120
5	240
6	480

Source: http://ccsstoolbox.com

CCSSM Problem-Solving- 7th

A restaurant makes a special seasoning for all its grilled vegetables. Here is how the ingredients are mixed:

- $\frac{1}{2}$ of the mixture is salt
- $\frac{1}{4}$ of the mixture is pepper
- $\frac{1}{8}$ of the mixture is garlic powder
- $\frac{1}{8}$ of the mixture is onion powder

When the ingredients are mixed in the same ratio as shown above, every batch of seasoning tastes the same.

Study the measurements for each batch in the table. Fill in the blanks so that every batch will taste the same.

	Batch 1	Batch 2	Batch 3
Salt (cups)	1		
Pepper (cups)		1	
Garlic powder (cups)	$\frac{1}{4}$		1
Onion powder (cups)			1

Source: http://ccsstoolbox.com

CCSSM Problem-Solving- 4th

San Francisco Giants' stadium: 41,915 seats	Washington Nationals' stadium: 41,888 seats	San Diego Padres' stadium: 42,445 seats

Compare these statements from two students.

> Jeff said, "I get the same number when I round all three numbers of seats in these stadiums."
>
> Sara said, "When I round them, I get the same number for two of the stadiums but a *different* number for the other stadium."

Can Jeff and Sara both be correct? Explain how you know.

Source: http://ccsstoolbox.com

Standards

K-5	6-8
• Counting & Cardinality (K) • Operations & Algebraic Thinking • Number & Operations in Base Ten- Fractions (3-5) • Measurement & Data	• Ratios & Proportional Relationships (6-7) • The Number System • Expressions & Equations • Functions (8) • Geometry • Statistics & Probability

8 Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasons of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for an express regularity in repeated reasoning.

The Three Shifts in Mathematics

Focus strongly where the standards focus

Key: ■ Major Clusters; ▣ Supporting Clusters; ○ Additional Clusters

Operations and Algebraic Thinking

- ■ Use the four operations with whole numbers to solve problems.
- ▣ Gain familiarity with factors and multiples.
- ○ Generate and analyze patterns.

Number and Operations in Base Ten

- ■ Generalize place value understanding for multi-digit whole numbers.
- ■ Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations — Fractions

- ■ 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.

Measurement and Data

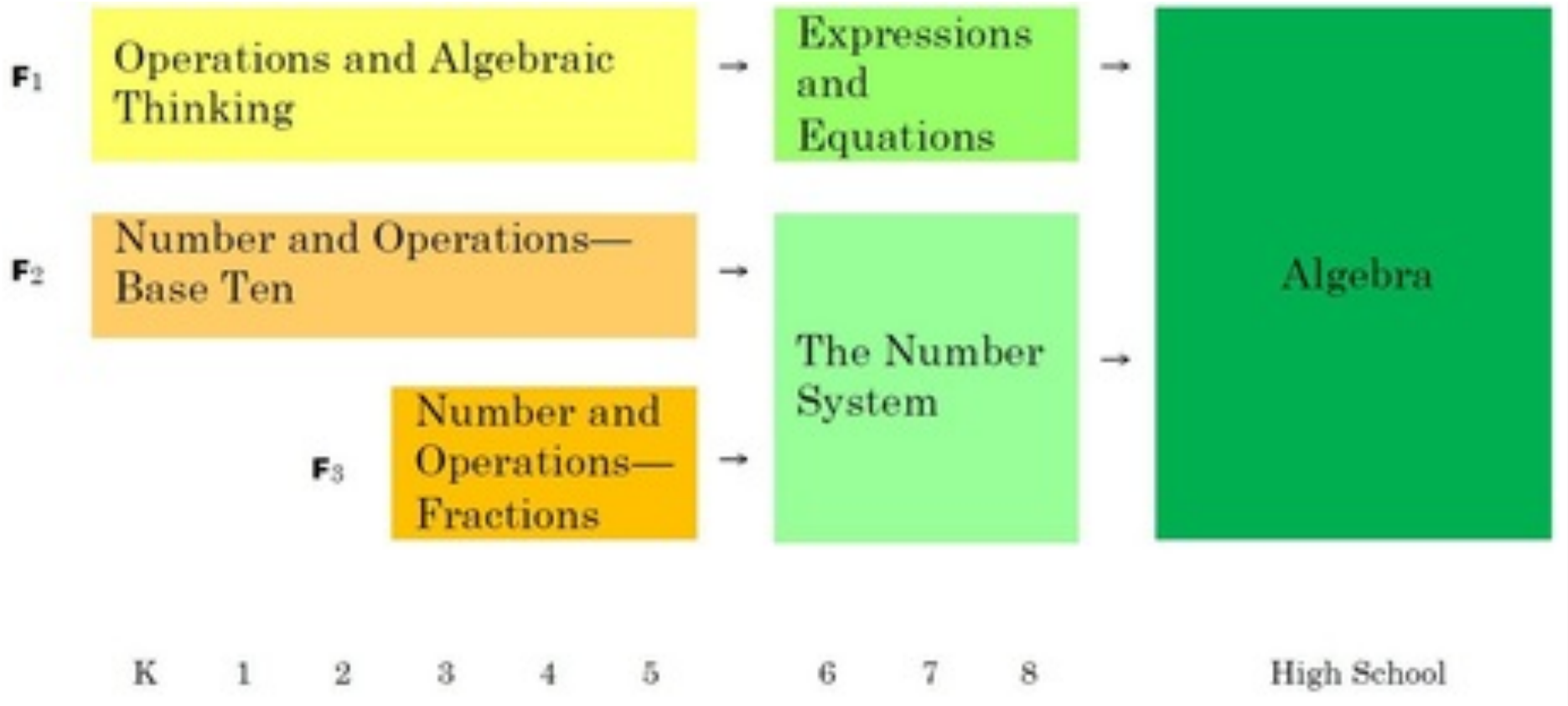
- ▣ Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- ▣ Represent and interpret data.
- ○ Geometric measurement: understand concepts of angle and measure angles.

Geometry

- ○ Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

The Three Shifts in Mathematics

Coherence: Think across grades, link to major topics



Source: http://jmforadori.weebly.com/shift-2-coherence.html

The Three Shifts in Mathematics

Rigor: Pursue with equal intensity:

- conceptual understanding
- procedural skill and fluency
- application

Committee Activities

Kristen Clegg, Dynamic Math Institute

Professional Development for Committee Members

- Content Standards & Mathematical Practices
- PARCC Assessment
- Curriculum Analysis Tools

Professional Development for All Staff

- Content Standards & Mathematical Practices
- Math Grade-Level Professional Development Team; MS Math Department Activities

The Curriculum Analysis Tools

CCSS Mathematics Curriculum Analysis Project

- national team of educators and mathematicians
- *objective measures* to assist with materials selection
- Tool 1, Tool 2, Tool 3

CCSSM Curriculum Analysis Tool 1—Number and Operations in Base Ten for Grades K-2

Name of Reviewer _____ **School/District** _____ **Date** _____

Name of Curriculum Materials _____ **Publication Date** _____ **Grade Level(s)** _____

Content Coverage Rubric (Cont)
Not Found (N) - The mathematics content was not found.
Low (L) - Major gaps in the mathematics content were found.
Marginal (M) - Gaps in the content, as described in the Standards, were found and these gaps may not be easily filled.
Acceptable (A) - Few gaps in the content, as described in the Standards, were found and these gaps may be easily filled.
High (H) - The content was fully formed as described in the Standards.

Balance of Mathematical Understanding and Procedural Skills Rubric (Bal):
Not Found (N) - The content was not found.
Low (L) - The content was not developed or developed superficially.
Marginal (M) - The content was found and focused primarily on procedural skills and minimally on mathematical understanding, or ignored procedural skills.
Acceptable (A) -The content was developed with a balance of mathematical understanding and procedural skills consistent with the Standards, but the connections between the two were not developed.
High (H) - The content was developed with a balance of mathematical understanding and procedural skills consistent with the Standards, and the connections between the two were developed.

CCSSM Grade K				CCSSM Grade 1				CCSSM Grade 2			
K.NBT/CC Counting and Cardinality/ Number and Operations in Base Ten	**Chap. Pages**	**Cont N-L-M-A-H**	**Bal N-L-M-A-H**	**1.NBT Number and Operations in Base Ten**	**Chap. Pages**	**Cont N-L-M-A-H**	**Bal N-L-M-A-H**	**2.NBT Number and Operations in Base Ten**	**Chap. Pages**	**Cont N-L-M-A-H**	**Bal N-L-M-A-H**
Work with numbers 11-19 to gain foundations for place value				**Understand place value**				**Understand place value.**			
1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.				2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: a. 10 can be thought of as a bundle of ten ones — called a "ten." b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).				1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases: a. 100 can be thought of as a bundle of ten tens — called a "hundred." b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).			
Counting and Cardinality				**Extend the counting sequence**				**Understand place value**			
1. Count to 100 by ones and tens 2. Count forward beginning from a given number within the known sequence. 3. Write number from 0 to 20. Represent a number of objects with a written numeral 0-20.				1.Count to 120, starting at any number less than 120. In this range read and write numerals and represent a number of objects with a written numeral.				2. Count within 1000; skip count by 5s, 10s,100s. 3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.			

Tool 2

CCSSM Mathematical Practices Analysis Tool 2	Page 1

Name of Reviewer _____ School/District _____ Date _____

Name of Curriculum Materials _____ Publication Date _____ Grade Level(s) _____

Tool 1 Domain Considered _____

Opportunities to Engage in the Standards for Mathematical Practices Found Across the Content Standards

Overarching Habits of Mind	**1. Make sense of problems and persevere in solving them.**	**6. Attend to precision.**
Evidence of how the Standards for Mathematics Practice were addressed (with page numbers)		
Reasoning and Explaining	**2. Reason abstractly and quantitatively.**	**3. Construct viable arguments and critique the reasoning of others.**
Evidence of how the Standards for Mathematics Practice were addressed (with page numbers)		

Example of Content Shifts

New to 5th Grade:

- Patterns in zeros when multiplying
- Extend understandings of multiplication and division of fractions
- Conversions of measurements within the same system
- Volume
- Coordinate System
- Two-dimensional figures
- Line plot to display measurements

Example of Content Shifts

Moved from 5th Grade:

- Estimate measure of objects from one system to another system
- Measure of angles
- Describe triangles and quadrilaterals
- Angles, diagonals, parallelism and perpendicularity
- Symmetry - line and rotational
- Data - Stem-and-leaf plots, different representations, median, range and mode.
- Constant and carrying rates of change

The Next Step.....

Elementary presentations:

1. *My Math by McGraw-Hill*
2. *Go Math by Houghton Mifflin*
3. *Envision Math by Pearson*
4. *Everyday Math by McGraw-Hill*
5. *Math in Focus (Singapore Math) by Houghton Mifflin*
6. *Investigations by Pearson*

The Next Step.....

Middle school presentations:

1. *Glencoe Math by McGraw-Hill*
2. *Big Ideas by Houghton Mifflin*
3. *Digits by Pearson*
4. *Prentice Hall 3 by Pearson*
5. *Math in Focus (Singapore Math) by Houghton Mifflin*

Tool 1 and Tool 2 Results

Elementary

- Envision Math by Pearson
- Investigations by Pearson
- Everyday Math by McGraw Hill
- Math in Focus (Singapore Math) by Houghton Mifflin

Middle School

- Prentice Hall 3 by Pearson
- Math in Focus (Singapore Math) by Houghton Mifflin
- Digits by Pearson

Tool 3 - Overarching Considerations

Questions about Overarching Considerations (Page 1)	See Rubric	Comments/Examples
Equity	**N-L-M-H**	
To what extent do the materials:		
1. Provide teachers with strategies for meeting the needs of a range of learners?		
2. Provide instructional support to help teachers sequence or scaffold lessons so that students move from what they know to what they do not know?		
3. Provide opportunities for teachers to use a variety of grouping strategies?		
4. Embed tasks with multiple entry-points that can be solved using a variety of solution strategies or representations?		
5. Suggest accommodations and modifications for English language learners that will support their regular and active participation in learning mathematics?		

To what extent do the materials:	**N-L-M-H**	
6. Provide opportunities to use reading, writing, and speaking in mathematics lessons.		
7. Encourage teachers to draw upon home language and culture to facilitate learning?		
8. Encourage teachers to draw on multiple resources such as objects, drawings, and graphs to facilitate learning?		
9. Draw upon students' personal experiences to facilitate learning?		
10. Provide opportunities for teacher and students to connect mathematics to other subject areas?		
11. Provide both individual and collective opportunities for students to learn using mathematical tasks with a range of challenge?		
12. Provide opportunities for advanced students to investigate mathematics content at greater depth?		
13. Provide a balanced portrayal of various demographic and personal characteristics?		
Assessment		
14. Provide strategies for gathering information about students' prior knowledge and background?		
15. Provide strategies for teachers to identify common student errors and misconceptions?		
16. Assess students at a variety of knowledge levels (e.g., memorization, understanding, reasoning, problem solving)?		
17. Encourage students to monitor their own progress?		
18. Provide opportunities for ongoing review and practice with feedback related to learning concepts, and skills.		
19. Provide support for a varied system of on-going formative and summative assessment (formal or informal observations, interviews, surveys, performance assessments, target problems)?		

Additional Steps

- McGraw-Hill vs. Houghton Mifflin
- Lesson/Unit Sampling
- Site Visits (Middle School)

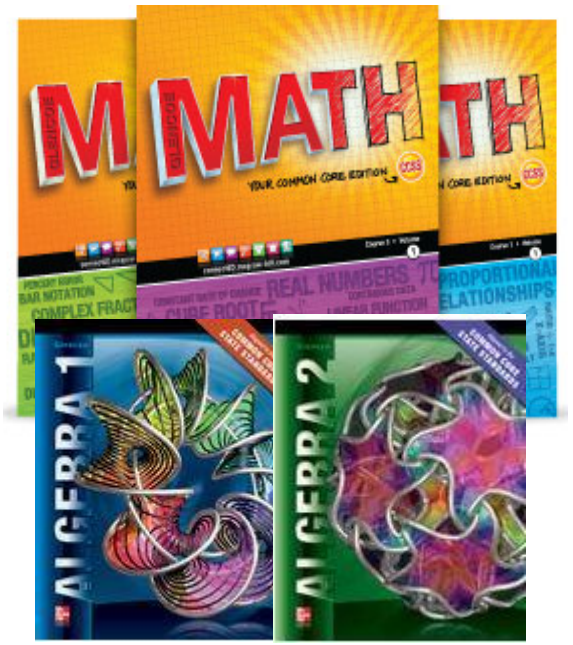
Our Recommendations

K-5

My Math
by
McGraw-Hill

6-8

Glencoe Math & Glencoe
Algebra I, Algebra II
by McGraw-Hill



Source: https://www.mheonline.com/mhmymath/

Key Strengths of My Math & Glencoe Math

- CCSSM Aligned
- Mathematical Practices
- RtI Components
- 21st Century Technology
- Innovative Assessment Tools
- Consumable Guides

CCSSM Aligned

Content Standards

- Organized around Essential Questions for focused content
- Sequenced instruction to ensure student success
- Every lesson explicitly addresses the new CCSS

Mathematical Practices

- Multiple experiences to build conceptual understanding
- Modeling, reasoning, and reflection activities
- Real-world problem solving activities

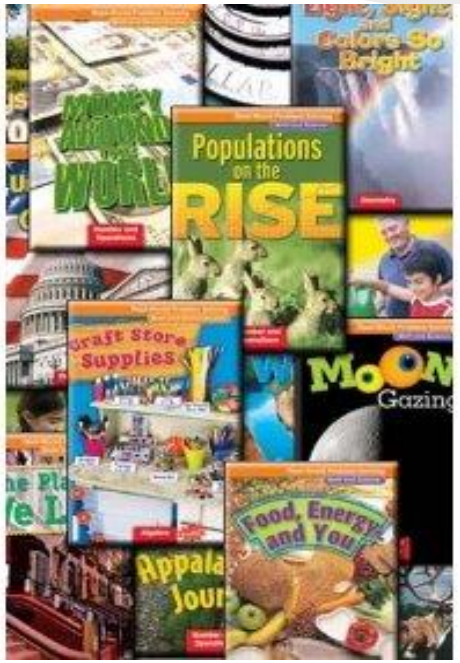
Differentiated Instruction

- Differentiated instruction
- Meet individual learning needs

AL APPROACHING LEVEL

OL ON LEVEL

BL BEYOND LEVEL



MyMath: Leveled nonfiction, real world problem solving readers

Source: https://www.mheonline.com/mhmymath/

21st Century Technology

- Online eEdition
- Homework help for parents
- Engaging instructional videos
- Virtual manipulatives
- Virtual tutors for students
- Interactive whiteboard lessons
- Lesson planning tools for teachers

Source: https://www.mheonline.com/mhmymath/

Innovative Assessment Tools

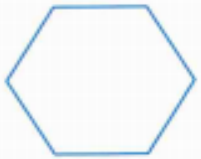
- Assessments that can drive instruction - before, during, and after teaching
  - create
  - edit
  - administer
  - store
  - share

- Varied options for formative & summative assessment

Consumable Books K-8

Apply It

9. Mathematical PRACTICE 2 **Use Number Sense** Rebecca used a centimeter ruler to measure the perimeter of the figure below. Which estimate is closest to the actual perimeter, 6 centimeters or 12 centimeters?



My Work!

10. Antoine built a picture frame out of wood. He used an inch ruler to measure the perimeter of the frame. If the length of the sides of the frame are 8 inches, 6 inches, 8 inches, and 6 inches, what is the perimeter of the frame?

11. Mathematical PRACTICE 3 **Justify Conclusions** The perimeter of an object is 10 inches. Will the perimeter of the object to the nearest centimeter be less than, greater than, or equal to 10? Explain.

Write About It

12. How is perimeter related to the operation of addition?

Name

Measurement and Data
3.MD.5, 3.MD.5a, 3.MD.5b, 3.MD.6, 3.MD.8
CCSS

Hands On
Understand Area

Lesson 3

ESSENTIAL QUESTION
How are perimeter and area related and how are they different?

A square with a side length of one unit is called a **unit square**.

A unit square has one **square unit** of area and can be used to measure area. **Area** is the number of square units needed to cover a figure without overlapping.

Shading or covering a unit square results in one square unit.

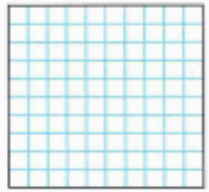
Draw It

Tools

Draw and shade two different rectangles that each have an area of 20 square units.

Use the 10-by-10 grid.

To shade a rectangle with 20 square units, you need to shade a rectangle made up of 20 unit squares.



1. Shade 20 unit squares so that they form a rectangle.

   What is the perimeter of your rectangle?

2. Shade another 20 unit squares so that they form a different rectangle.

   What is the perimeter of your rectangle?

Bundle	Duration	Components	Price Per Student
K-5 My Math	5 years	5-year online resource subscription 5-year consumable guide subscription	$78.99
6-8 Course 1, 2, & 3	5 years/ 7 years	7-year online resource subscription 5-year consumable guide subscription	$74.97
Acc. Pre-Alg.	5 years/ 7 years	7-year online resource subscription 5-year consumable guide subscription Print edition of student text	$74.97
Algebra 1	6 years	6-year online resource subscription Print edition of student text	$83.94
Algebra 2	6 years	6-year online resource subscription Print edition of student text	$87.93

Cost Analysis: K-8 Program

Total Value of Program	$718, 337
Value of Free Materials	$313,515.17 All Teacher Materials K-8, All Real World Problem-Solving Libraries, Portion of the manipulative Kits
Cost to District	$404,821.83 + estimated 5% shipping

Cost Analysis - Historical

Elementary

2004 Initial K-5 Adoption	$149, 523.40
K-2 Consumable Workbooks	+ $42,259/yr
Total	$318,559.40
Savings	**$38,246**

Middle School

- 2013 Adoption - estimated $29-$31 more per student due to increase in text prices
- 2003 Adoption did not include comprehensive eEdition online resource

Additional Recommendations

Recommendation 2: Professional Development

- Teachers and principals
- Support the three shifts in instruction
- Rich performance tasks
  - National Council of Teachers of Mathematics
  - InsideMathematics.org
  - PARCC Model Content Framework
  - illustrativemathematics.org
  - Center for Innovation and Education
  - The Van de Walle Professional Mathematics Series
  - Exemplars

Additional Recommendations

Recommendation 3: Finalize Priority Standards

- Review audit of K-8 Learning Progression
- Refine the D64 Priority Standards as needed

Alignment of Recommendations to D64 Strategic Plan

- CCSS Aligned
- 21st Century Learning
- Compatible with D64 Technology

- Ongoing
- Aligned with D64 PD Structure
- Rich Performance Tasks