/http://education.illinoisstate.edu/casei/ccm

Location of the Shift Kit

WELCOME TO "READY, SET, SHIFT"

Please:

1. Sign in
2. Pick up handouts
3. Find your grade level table

Thank you

Annemarie Garcia
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"GOALS"

- Create "Shift experts" so that you will be able to go back to your district and share information.
- Provide additional resources to help understand the shifts of Common Core Mathematics.
- Engage in grade level discussion and tasks.

"Getting to know your group"

On the paper please answer the following questions.

Pick a reporter for your group.

1. How many years of teaching experience does your group have?
2. How many students does your group teach each day?
3. How many different school districts does your group represent?

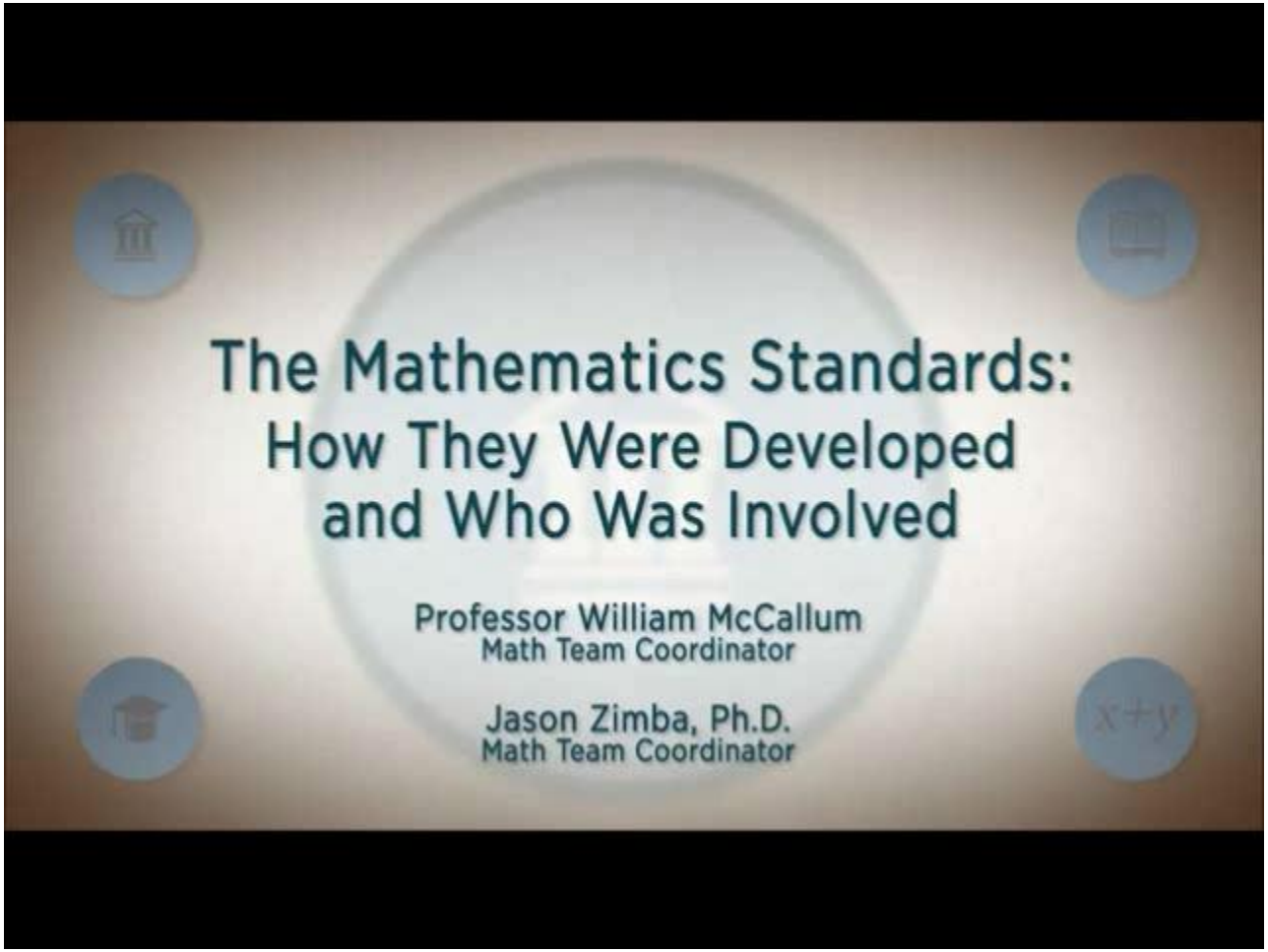
No calculators allowed

Use math practice #7 Look for and make use of structure to find your answers.

ACHIEVE THE CORE

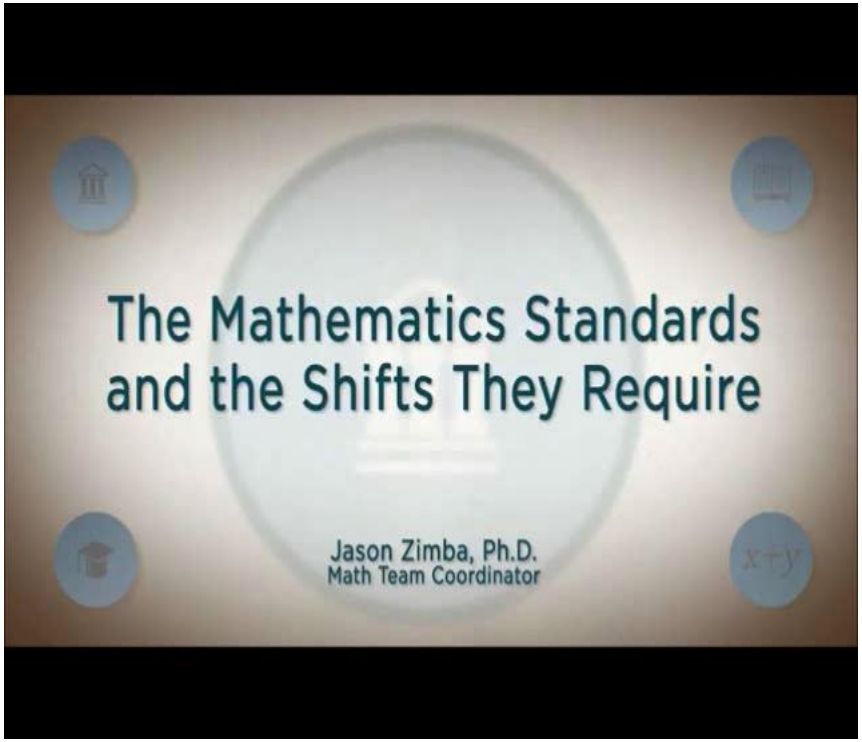
Deep Dive into the Math Shifts

Understanding Focus, Coherence, and Rigor in the Common Core State Standards for Mathematics


The Mathematics Standards:
How They Were Developed
and Who Was Involved
Professor William McCallum
Math Team Coordinator
Jason Zimba, Ph.D.
Math Team Coordinator

The CCSS Requires Three Shifts in Mathematics

1. **Focus:** Focus strongly where the Standards focus.
2. **Coherence**: *Think* across grades, and *link* to major topics within grades.
3. **Rigor:** In major topics, pursue *conceptual* **understanding,** procedural skill and *fluency*, and *application.*



Focus on the Major Work of the Grade

Two levels of focus:

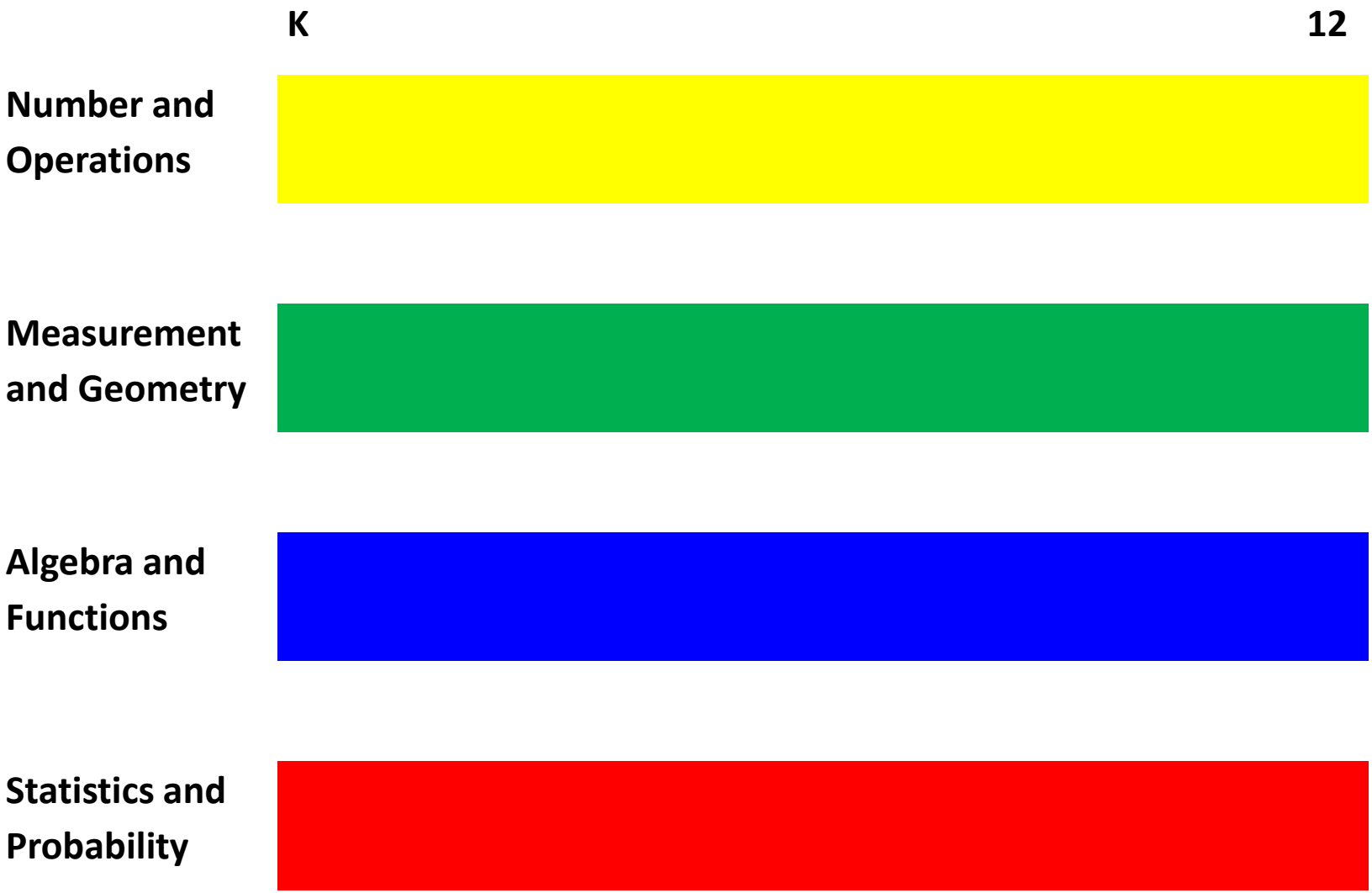
- What's in/What's out
- The shape of the content that is in

Shift #1: Focus Strongly where the Standards Focus

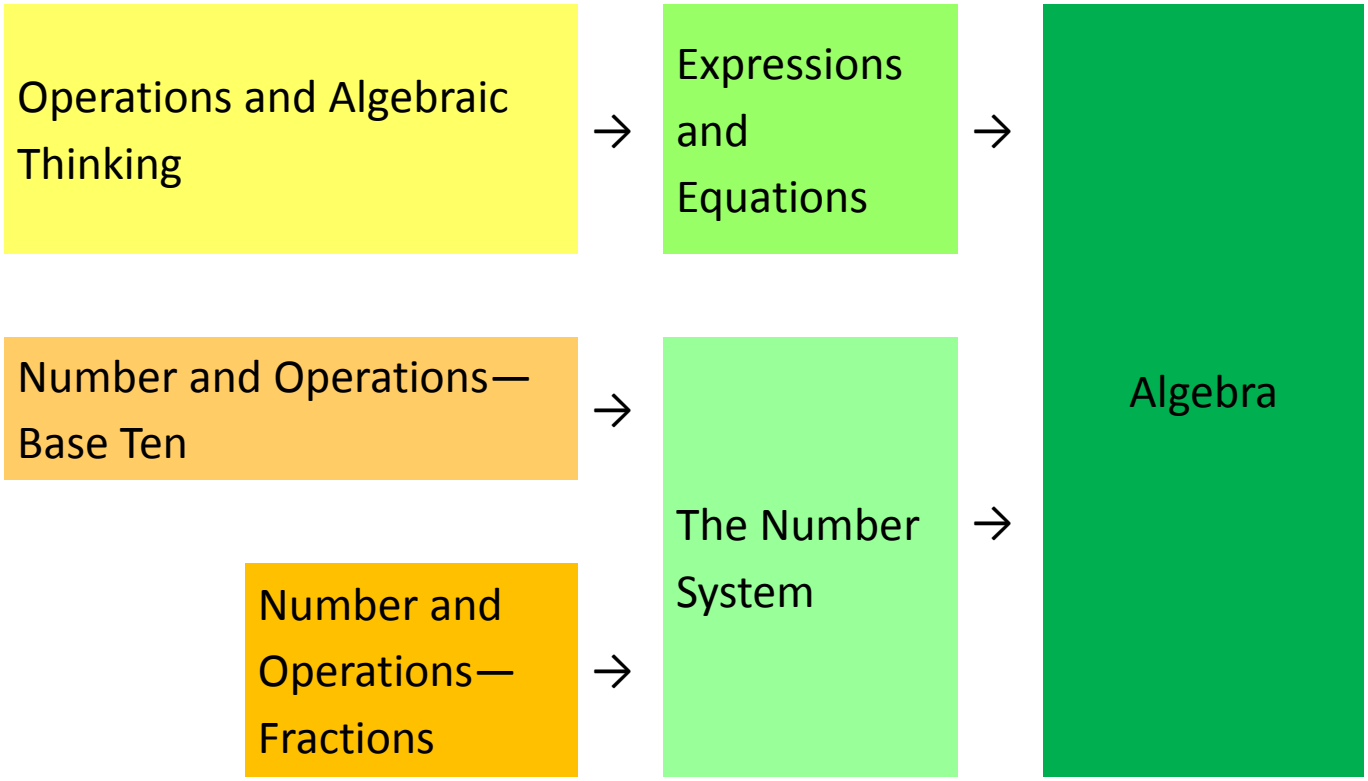
- Significantly narrow the scope of content and deepen how time and energy is spent in the math classroom.
- Focus deeply on what is emphasized in the standards, so that students gain strong foundations.


What *is* Focus?
Council of the Great City Schools

Traditional U.S. Approach



Focusing Attention Within Number and Operations




Our Students. Their Moment.
engage ny
Their Moment.

Grade K Overview

Counting and Cardinality

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- Work with numbers 11–19 to gain foundations for place value.

Measurement and Data

- Describe and compare measurable attributes.
- Classify objects and count the number of objects in categories.

Geometry

- Identify and describe shapes.
- Analyze, compare, create, and compose shapes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Kindergarten*

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

Counting and Cardinality

- ■ Know number names and the count sequence.
- ■ Count to tell the number of objects.
- ■ Compare numbers.

Operations and Algebraic Thinking

- ■ Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- ■ Work with numbers 11-19 to gain foundations for place value.

Measurement and Data

- ○ Describe and compare measureable attributes.
- ◘ Classify objects and count the number of objects in categories.

Geometry

- ○ Identify and describe shapes.
- ○ Analyze, compare, create, and compose shapes.

Grade 1 Overview

Operations and Algebraic Thinking

- 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.

Number and Operations in Base Ten

- Extend the counting sequence.
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Tell and write time.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Grade 1*

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

Operations and Algebraic Thinking

- ■ **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.**

Number and Operations in Base Ten

- ■ **Extending the counting sequence.**
- ■ **Understand place value.**
- ■ **Use place value understanding and properties of operations to add and subtract.**

Measurement and Data

- ■ **Measure lengths indirectly and by iterating length units.**
- ○ **Tell and write time.**
- ▣ **Represent and interpret data.**

Geometry

- ○ **Reason with shapes and their attributes.**

Grade 2 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Grade 2*

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

Operations and Algebraic Thinking

- ■ **Represent and solve problems involving addition and subtraction.**
- ■ **Add and subtract within 20.**
- ■ **Work with equal groups of objects to gain foundations for multiplication.**

Number and Operations in Base Ten

- ■ **Understand place value.**
- ■ **Use place value understanding and properties of operations to add and subtract.**

Measurement and Data

- ■ **Measure and estimate lengths in standard units.**
- ■ **Relate addition and subtraction to length.**
- ▣ **Work with time and money.**
- ▣ **Represent and interpret data.**

Geometry

- ○ **Reason with shapes and their attributes.**

Engaging with the K-2 Content

How would you summarize the major work of K-2?

What would you have expected to be a part of the major work that is not?

Give an example of how you would approach something differently in your teaching if you thought of it as supporting the major work, instead of being a separate, discrete topic.

Key Areas of Focus in Mathematics

Grade	Focus Areas in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding
K–2	Addition and subtraction - concepts, skills, and problem solving and place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional reasoning; early expressions and equations
7	Ratios and proportional reasoning; arithmetic of rational numbers
8	Linear algebra and linear functions

Grade 3 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving multiplication and division.
- Understand 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.

Number and Operations in Base Ten

- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- Develop understanding of fractions as numbers.

Measurement and Data

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Grade 3*

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

Operations and Algebraic Thinking

- ■ Represent and solve problems involving multiplication and division.
- ■ Understand 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.

Number and Operations in Base Ten

- ○ Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- ■ Develop understanding of fractions as numbers.

Measurement and Data

- ■ Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- ◻ Represent and interpret data.
- ■ Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- ○ Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

- ◻ Reason with shapes and their attributes.

Grade 4 Overview

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.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Grade 4*

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.

Grade 5 Overview

Operations and Algebraic Thinking

- Write and interpret numerical expressions.
- Analyze patterns and relationships.

Number and Operations in Base Ten

- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions

- 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.

Measurement and Data

- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry

- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning 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 and express regularity in repeated reasoning.

Content Emphases by Cluster--Grade 5*

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

Operations and Algebraic Thinking
○ Write and interpret numerical expressions.
○ Analyze patterns and relationships.
Number and Operations in Base Ten
■ Understand the place value system.
■ Perform operations with multi-digit whole numbers and with decimals to hundredths.
Number and Operations—Fractions
■ 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.
Measurement and Data
◘ Convert like measurement units within a given measurement system.
◘ Represent and interpret data.
■ Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.
Geometry
○ Graph points on the coordinate plane to solve real-world and mathematical problems.
○ Classify two-dimensional figures into categories based on their properties.

Engaging with the 3-5 Content

How would you summarize the major work of 3-5?

What would you have expected to be a part of the major work that is not?

Give an example of how you would approach something differently in your teaching if you thought of it as supporting the major work, instead of being a separate discrete topic.

Key Areas of Focus in Mathematics

Grade	Focus Areas in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding
K–2	Addition and subtraction - concepts, skills, and problem solving and place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional reasoning; early expressions and equations
7	Ratios and proportional reasoning; arithmetic of rational numbers
8	Linear algebra and linear functions

Coherence Across and Within Grades

Progression Documents
http://ime.math.arizona.edu/progressions/

It's about math making sense.

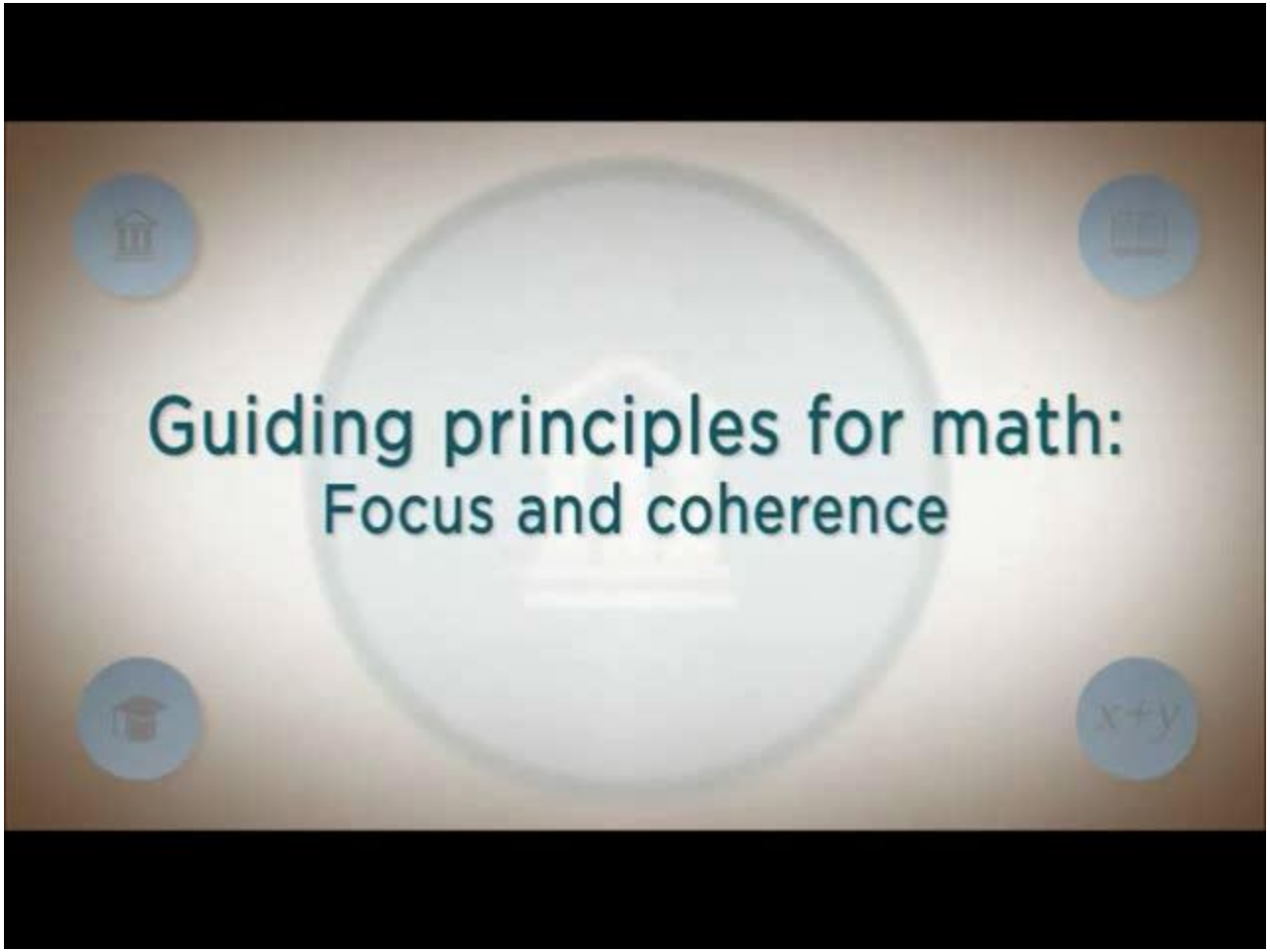
The power and elegance of math comes out through carefully laid progressions and connections within grades.

Helps connect new learning to past and present!

Shift #2: Coherence: Think Across Grades, and Link to Major Topics Within Grades

- Carefully connect the learning within and across grades so that students can build new understanding on foundations built in previous years.
- Begin to count on solid conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

Math does not consist of a list of isolated topics…math should build on major concepts within a given school year as well as from previous school years.


Guiding principles for math:
Focus and coherence

Looking For Coherence Within Grades

Examples:

- 1st grade – 5th grade: Represent and Interpret Data (supports major work of the grade)
- 3rd grade & 5th grade: "Relate area (volume) to multiplication and to addition."
- 6th grade: Solve problems by graphing in all 4 quadrants. (1st year of rational numbers)
- 8th grade: "Understand the connections between proportional relationships, lines and linear equations."

Alignment in Context: Neighboring Grades and Progressions

One of several staircases to algebra designed in the OA domain.

Expressions and Equations 6.EE

3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*

Operations and Algebraic Thinking 5.OA

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Operations and Algebraic Thinking 3.OA

5. Apply properties of operations as strategies to multiply and divide.[2] *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

Operations and Algebraic Thinking 1.OA

3. Apply properties of operations as strategies to add and subtract.[3] *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add and subtract.

Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.)

To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12.
(Associative property of addition.)

Understand properties of multiplication and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide.

Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.)

3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.)

Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)

Write and interpret numerical expressions.

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

For example, express the calculation “add 8 and 7, then multiply by 2” as 2 × (8 + 7).

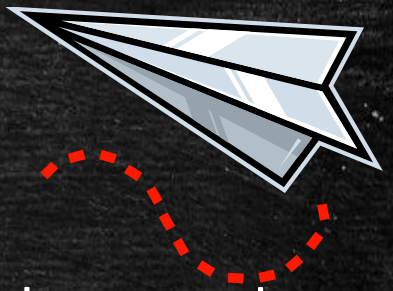
Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

Coherence Within A Grade

Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

2.MD.5

Paper Airplanes 2.MD.5



Mrs. Smith's second grade students made paper airplanes and measured their flights.
Each student flew the plane 3 times.
Below is the table of one group of students' measurements:

Jose: 12 feet ,7 feet, 18 feet

Alex: 44 feet, 26 feet, 29 feet

Simon: 21 feet ,38 feet, 36 feet

---

1. Represent each student's total distance flown on the number line .
2. Which student's plane flew the greatest total distance?
3. Which student's plane had the greatest difference in distance between its shortest and longest flight?

Coherence: *Link* to Major Topics Within Grades

Example: Data Representation

Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

Standard
3.MD.3

Your teacher was just awarded $1,000 to spend on materials for your classroom. She asked all 20 of her students in the class to help her decide how to spend the money. Think about which supplies will benefit the class the most.

Supplies	Cost
A box of 20 markers	$5
A box of 100 crayons	$8
A box of 60 pencils	$5
A box of 5,000 pieces of printer paper	$40
A package of 10 pads of lined paper	$15
A box of 50 pieces of construction paper	$32
Books and maps	
A set of 20 books about science	$250
A set of books about the 50 states	$400
A story book (there are 80 to choose from)	$8
A map: there is one of your city, one for every state, one of the country, and one of the world to choose from	$45
Puzzles and games	
Puzzles (there are 30 to choose from)	$12
Board games (there are 40 to choose from)	$15
Interactive computer games (math and reading)	$75
Special Items	
A bean bag chair for the reading corner	$65
A class pet	$150
Three month's supply of food for a class pet	$55
A field trip to the zoo	$350

Classroom Supplies 3.OA, MD, NBT

1. Write down the different items and how many of each you would choose. Find the total for each category.
    1. Supplies
    2. Books and maps
    3. Puzzles and games
    4. Special items

2. Create a bar graph to represent how you would spend the money. Scale the vertical axis by $100. Write all of the labels.

3. What was the total cost of all your choices? Did you have any money left over? If so, how much?

4. Compare your choices with a partner. How much more or less did you choose to spend on each category than your partner? How much more or less did you choose to spend in total than your partner?

Coherence Within A Grade

Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

4.MD.4

Button Diameters 4.MD.4

Button Diameters 4.MD.4

1. With a partner or group, gather a handful of round buttons from a diverse collection, and use a ruler to measure the diameter of each button to the nearest eighth-inch.

2. Make a line plot of button diameters, marking your scale in eighth-inch increments.

3. What is the most common diameter in your collection? How does that compare with the collection from another group?

4. Now measure the diameters of these same buttons to the nearest quarter-inch.

5. Make a line plot of button diameters, marking your scale in quarter-inch increments.

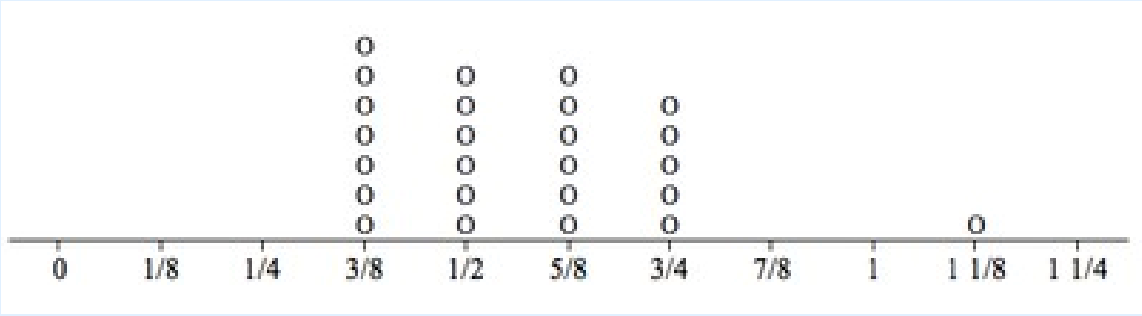
6. Describe the differences between the two line plots you created. Which one gives you more information? Which one is easier to read?

Solution: Possible Solution

a. Here are the measurements from a sample of 25 buttons that I collected:

Diameter to nearest eighth-inch	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$1\frac{1}{8}$
Count	7	6	6	5	1

b. Below is a line plot based on the data collected in part a.

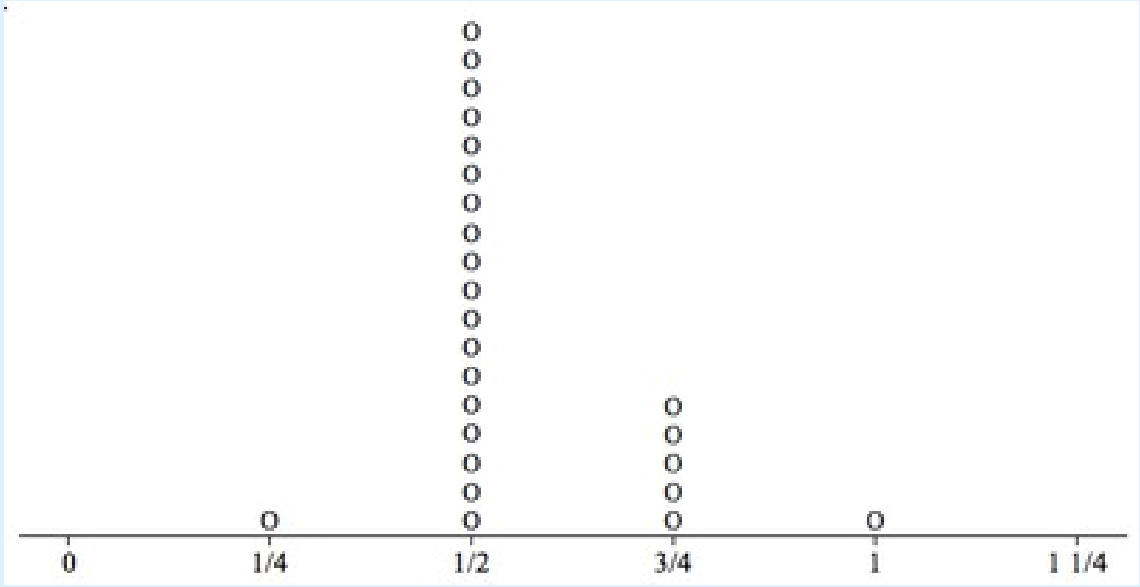


c. In this collection, the most common diameter is $\frac{3}{8}$ of an inch. That may vary some from other groups.

d. Here are the measurements from the same sample of 25 buttons from part a.

Diameter to nearest quarter-inch	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
Count	1	18	5	1

e. Below is a line plot based on the data in part d.



f. From the line plots shown above, the second shows less variation among the diameters, and clearly shows that the most common diameter, to the nearest quarter-inch, is $\frac{1}{2}$ inch. The first line plot gives more information about the diameters, and shows a cluster of buttons with diameters that round to $\frac{3}{8}$ inch to $\frac{3}{4}$ inch.

Coherence: *Link* to Major Topics Within Grades

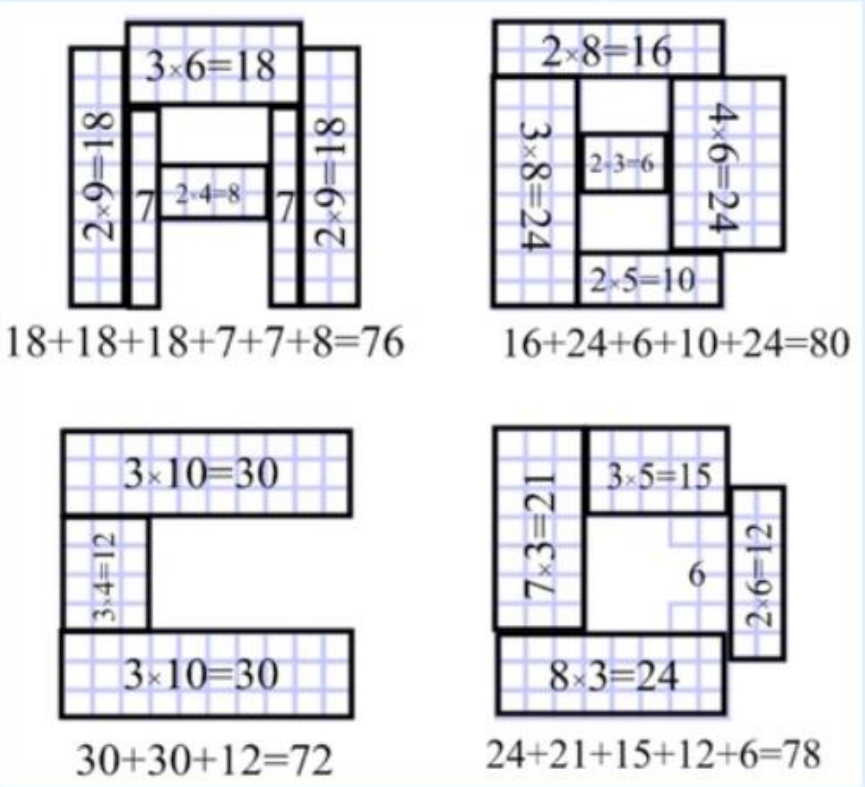
Example: Geometric Measurement

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD, third cluster

The Square Counting Shortcut 3.MD

(There are many ways to subdivide the letters into rectangles, this is one solution of many.)



The letter "A" has an area of 76 square cm.

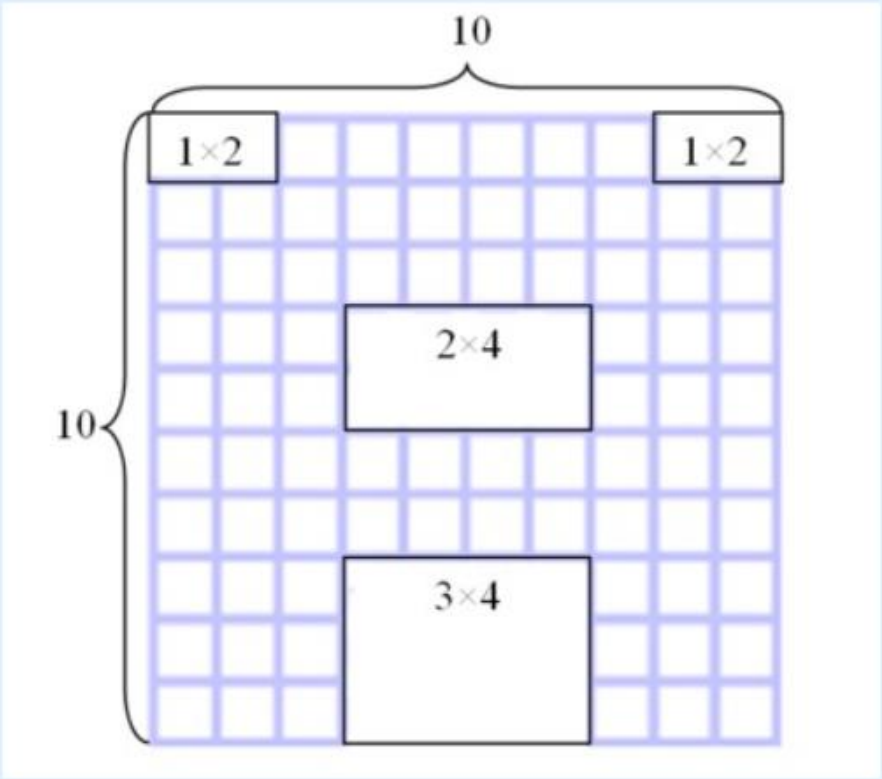
The letter "B" has an area of 80 square cm.

The letter "C" has an area of 72 square cm.

The letter "D" has an area of 78 square cm.

The Square Counting Shortcut 3.MD

Another way students might do this is to figure out the number of squares that have been "removed" from a square that is 10 cm on each side.



A square that is 10 cm on each side has an area of 100 square cm.

$$\begin{aligned} 100 - (1 \times 2 + 1 \times 2 + 2 \times 4 + 3 \times 4) &= 100 - (2 + 2 + 8 + 12) \\ &= 100 - 24 \\ &= 76 \end{aligned}$$

So the area of the letter A is 76 square centimeters. These others can be done in a similar manner.

Looking for Coherence Across Grades

Coherence is an important design element of the standards.

"The Standards are not so much built from topics as they are woven out of progressions."

Structure is the Standards, Publishers' Criteria for Mathematics, Appendix

Progression Documents

http://ime.math.arizona.edu/progressions

Group Discussion

Shift #2: Coherence: Think across grades, link to major topics within grades

In your groups, discuss what coherence in the math curriculum means to you. Be sure to address both elements—coherence within the grade and coherence across grades. Cite specific examples.

Coherence Card Activity

Activity: Place the standards of each color under the appropriate grade (K-8).

- Determine a “theme” for each color.
- No grade has two of the same color card.
- Some “themes” that have only a few cards might represent consecutive grades and some may not.
- Read each card in it’s entirety to help determine placement.
- Do not check your Standards until you and your colleagues agree on the final product.
- Discuss horizontal and vertical observations with your partners.

http://achievethecore.org/page/655/math-coherence-activity-list-pg

Coherence Card Activity

Activity: Place the standards of each color under the appropriate grade (K-8).

- Remember No grade has two of the same color card.

The theme are as follows:

Application Teal Green

Decomposition Yellow

Equations White

Fluency Red

Place Value Pink

Number Lines Blue

Operations Lime Green

This activity can be found at:

http://achievethecore.org/page/655/math-coherence-activity-list-pg

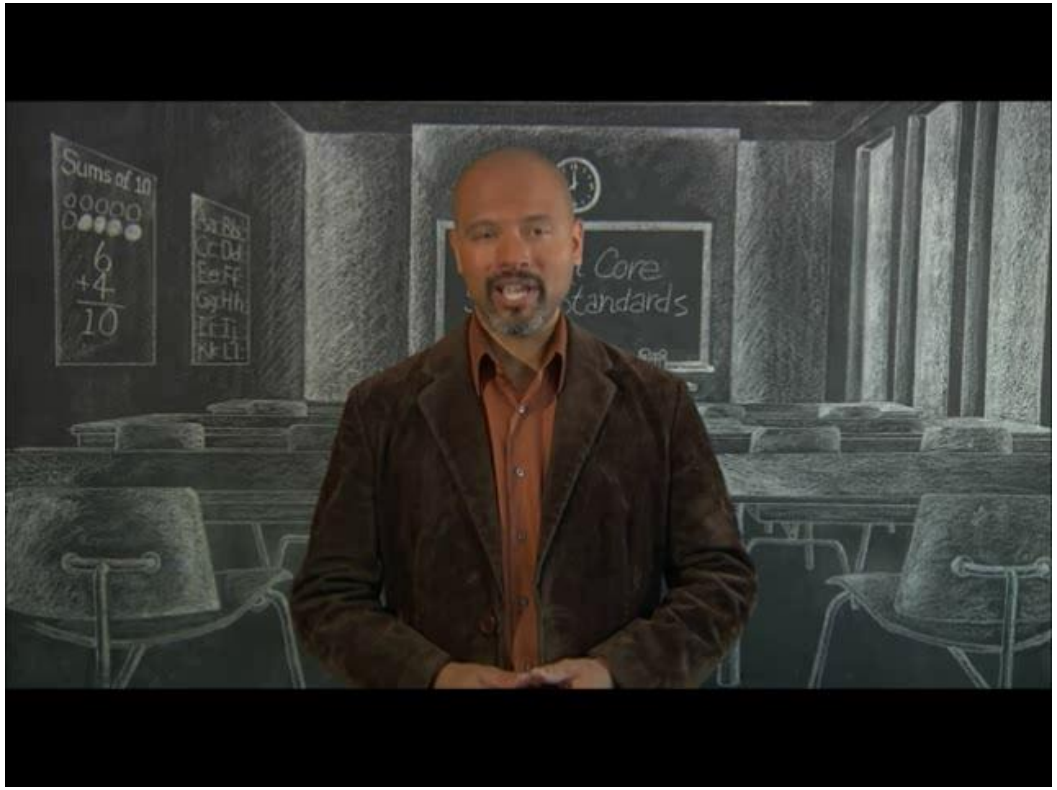
Rigor: Illustrations of Conceptual Understanding, Fluency, and Application

Here rigor does not mean “hard problems.”

It’s a balance of three fundamental components that result in deep mathematical understanding.

There must be variety in what students are asked to produce.

Shift #3: Rigor: In Major Topics, Pursue Conceptual Understanding, Procedural Skill and Fluency, and Application



Rigor

Conceptual Understanding:

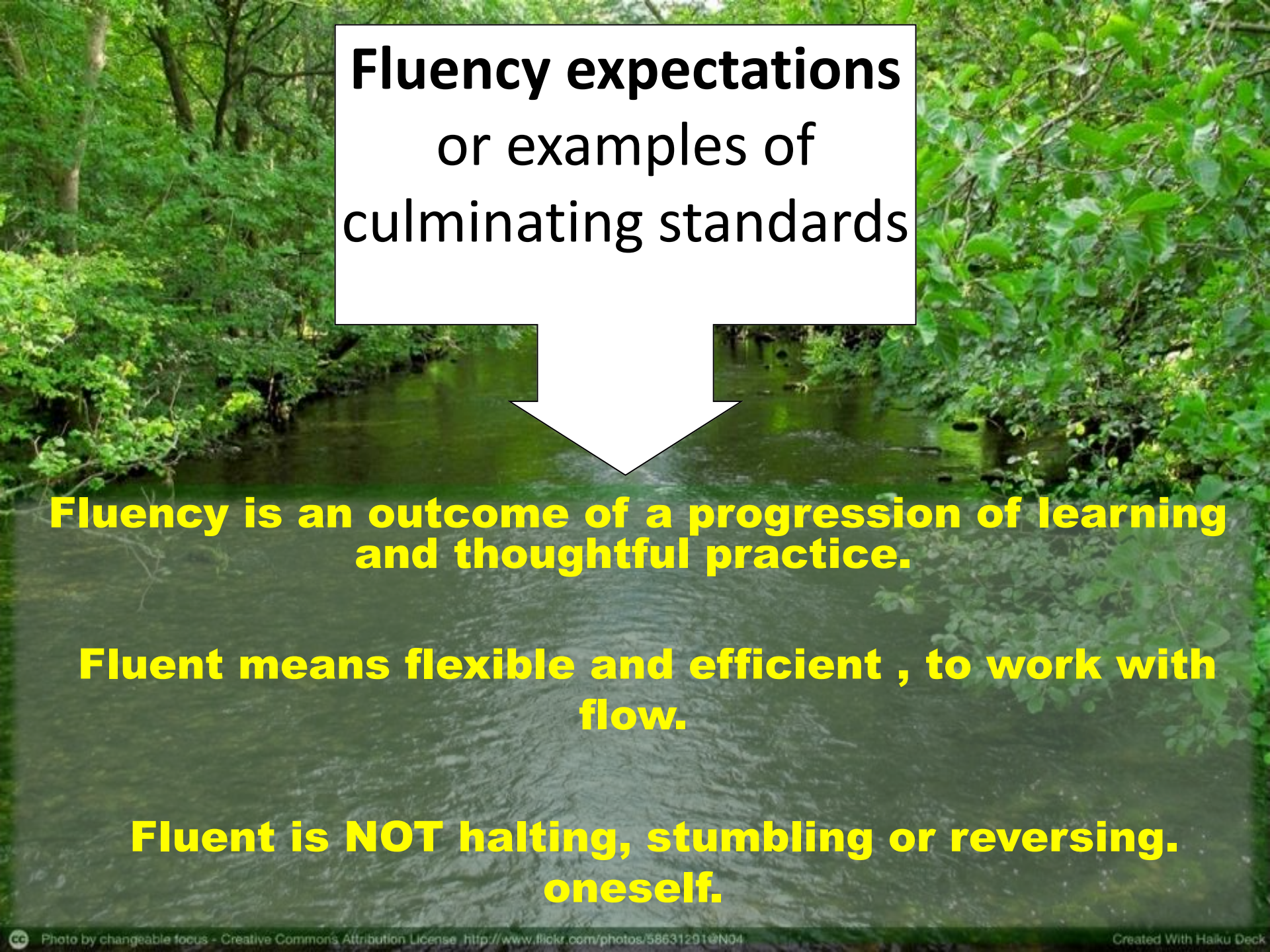
3.NF.1 **Understand** a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction *a/b* as the quantity formed by *a* parts of size 1/*b*.

Procedural Skill and Fluency:

5.NBT.5 **Fluently** multiply multi-digit whole numbers using the standard algorithm.

Application:

7.NS.3 **Solve real-world and mathematical problems** involving the four operations with rational numbers.



5.NBT.5 **Fluently** multiply multi-digit whole numbers using the standard algorithm.

Fluency means flexible and efficient….

	700	40	3
20	14,000	800	60
5	3,500	200	15

17,500 + 1,000 + 75 = 18,575

This diagram is called an area model. It's an organized way to show all the partial products. This method allows us to multiply multiples of 10s, 100s, and so on, which is easier than multiplying digits.

My friend said that all of these methods can be used to find 7 X 3.

Problem 7 X 3

1. 3 X 3 = 9

   10 X 3 = 30

   7 X 3 = 21

2. 5 X 3 = 15

   2 X 3 = 6

   7 X 3 = 21

3. 7 X 3 = 1 + 2 + 3 + 4 + 5 + 6

4. 3 X 7 = 1 + 2 + 3 + 4 + 5 + 6

What do you think?

Frequently Asked Questions

- How can we assess fluency other than giving a timed test?
- Is it really possible to assess conceptual understanding? What does it look like?
- Aren't the Common Core State Standards for Math all about application and meaningful tasks?

Let's Review


Instructional Shifts
• Focus
• Coherence
• Rigor
Application
Deep Conceptual Understanding
Fluency

Playground time

KINDERGARTEN TASKS

FOCUS

- DOT FLASH
- LETTERS IN YOUR NAME
- ROLLING A NUMBER CUBE
- SNAP IT

COHERENCE

- LEARNING NAMES OF POLYGONS

RIGOR

- BIGGEST NUMBER WINS

MATERIALS NEEDED:

- Subtizing cards
- *Ten Black Dots* by Donald Crews
- *Ten Frames*
- *Ten in the Bed* by Penny Dale
- *Chrysanthemum* by Kevin Henke
- Unifix cubes
- Number cube
- *The Greedy Triangle* by Marilyn Burns
- *Geoboards*
- *Variety of polygons*
- *Toothpicks or anglegs*

FIRST GRADE TASKS

FOCUS

- CROSSING THE DECADES
- NUMBERS, NUMBERS

COHERENCE

- ROLL AND BUILD

RIGOR

- SHAPE SORT

MATERIALS NEEDED:

- Set of cards 19 & 20, 29 & 30, 39& 40,…99 & 100
- Set of cards 1-9
- 10 sided dice, (0-9) spinner
- Variety of polygons
- *Shape Up!* By David A. Adler

SECOND GRADE TASKS

FOCUS

- ALL ROADS LEAD TO 100
- BE THE MATHEMATICS AUTHOR
- TOLL BRIDGE PUZZLE
- TRUE OR FALSE?

COHERENCE

- SAVING MONEY

RIGOR

- HOW CAN YOU MAKE $.25
- JAMIR'S PENNY JAR
- PENNY A DAY

Materials needed:

- Money
- Place value disks
- Place value tools (popsicle sticks)
- *A Quarter from the Tooth Fairy* by Caren Holtzman

THIRD GRADE TASKS

FOCUS

- TERRIFIC TILES

COHERENCE

- THE LONG AND THE SHORT
- THE STICKER COLLECTION

RIGOR

- COMPARING FRACTIONS
- QUADRILATERAL QUESTIONS
- PUPPY PROBLEM?

Materials needed:

- Color tiles
- Ten items that are less than ten inches in length
- Inch rulers
- Geoboards
- Fraction pieces
- *Step-by-Step Model Drawing* by Char Forsten

FOURTH GRADE TASKS

FOCUS

- EQUIVALENT FRACTIONS

COHERENCE

- THE LOCKER GAME

RIGOR

- SUGAR IN SIX CANS OF SODA

Material Needed:

- Fraction pieces
- Unifix cubes
- Colored tiles

FIFTH GRADE TASKS

FOCUS

- CANDY BOXES
- SWEET TOOTH ICE CREAM FACTORY

COHERENCE

- SIXES ARE WILD
- WHAT IS A TRAPEZOID?

RIGOR

- DECIMAL CLUE CONUNDRUM
- SPIN AND RACE

Material needed:

- 36 inch cubes
- Fraction pieces
- Decimal clue conundrum cards
- Spin and race fraction spinners, recording sheets, pencil and paper clip
- Quadrilateral shapes
- Cards (1-9)

Playground time

Work a few problems from each shift.

- Be prepared to discuss something you observed concerning the shifts from one of the problems you tried.
- How can we assess all three aspects of rigor?
- What does it look like when we ask students to work on all three aspects of rigor?

Other important resources

Publisher's Criteria

http://www.isbe.net/common_core/pls/level1/html/math-pub-criteria.htm

Equip Rubric

http://www.achieve.org/EQuIP "look at the exemplar units"

Online Resources

Located in the last section of the shift kit

Link for the math shift kit

http://education.illinoisstate.edu/casei/ccm/