



Common Core State Standards

it's about the math...

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Remember

K-4

- 1. Mathematics as Problem Solving**
- 2. Mathematics as Communication**
- 3. Mathematics as Reasoning**
- 4. Mathematical Connections**
5. Estimation
6. Number Sense and Numeration
7. Concepts of Whole Number Operations
8. Whole Number Computation
9. Geometry and Spatial Sense
10. Measurement
11. Statistics and Probability
12. Fractions and Decimals
13. Patterns and Relationships

5-8

- 1. Mathematics as Problem Solving**
- 2. Mathematics as Communication**
- 3. Mathematics as Reasoning**
- 4. Mathematical Connections**
5. Number and Number Relationships
6. Number Systems and Number Theory
7. Computation and Estimation
8. Patterns and Functions
9. Algebra
10. Statistics
11. Probability
12. Geometry
13. Measurement

NCTM, 1989



Remember

9-12

1. ***Mathematics as Problem Solving***
2. ***Mathematics as Communication***
3. ***Mathematics as Reasoning***
4. ***Mathematical Connections***
5. Algebra
6. Functions
7. Geometry from a Synthetic Perspective
8. Geometry from an Algebraic Perspective
9. Trigonometry
10. Statistics
11. Probability
12. Discrete Mathematics
13. Conceptual Understanding of Calculus
14. Mathematical Structure

NCTM, 1989

The trilogy



1989



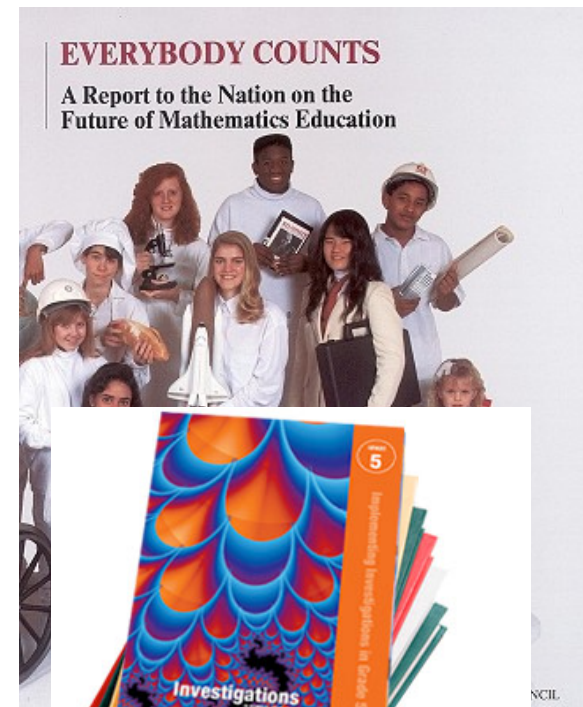
1991

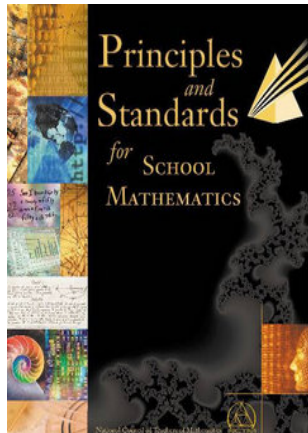


1995

Then what...

- Universal acceptance
- Everybody Counts – companion document
- NSF supported curriculum projects
 - Middle
 - Elementary
 - High School
- Curriculum Center Projects
 - Elementary
 - Middle
 - High
 - K-12
- **Mid to Late 1990's**
 - **Honeymoon Over – Math Wars...**





Next Step...

Pre-K-2; 3-5; 6-8; 9-12

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability
- *Problem Solving*
- *Reasoning and Proof*
- *Communication*
- *Connections*
- *Representation*

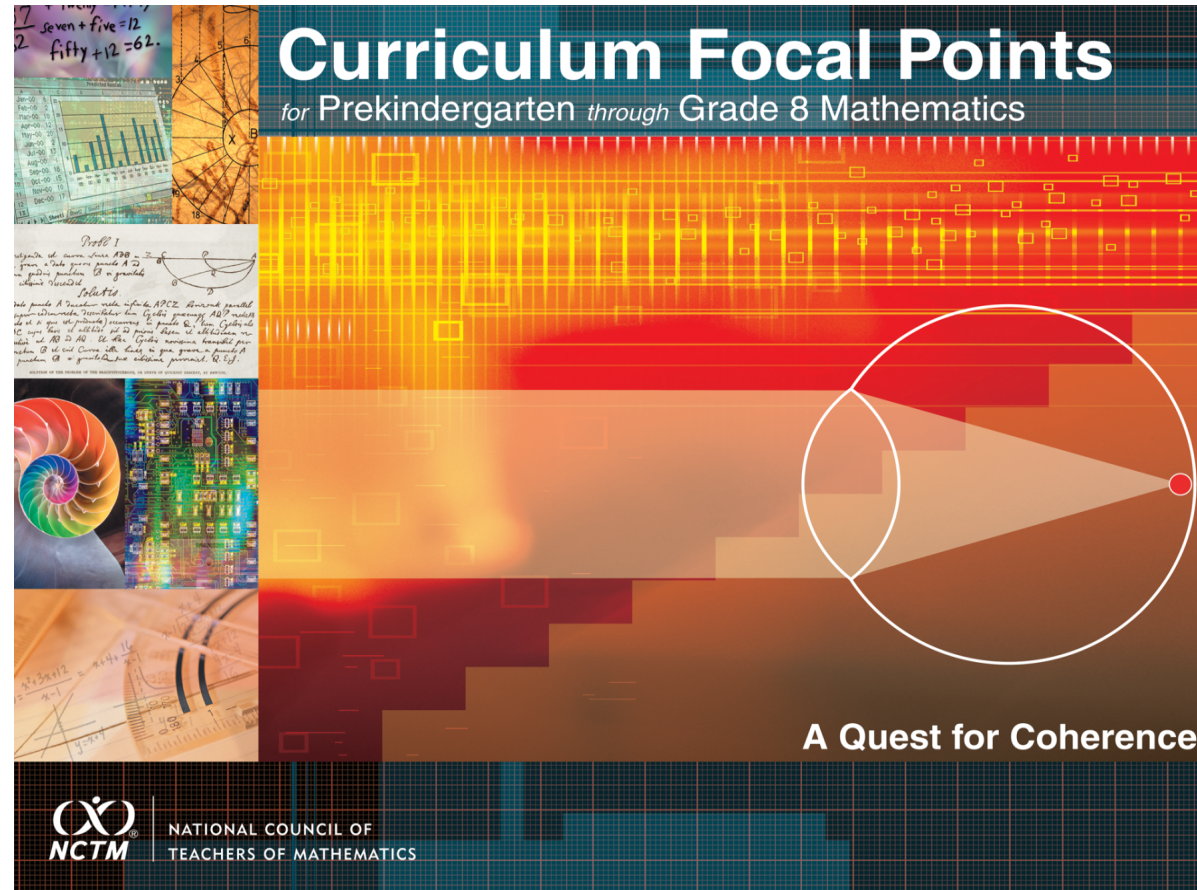


NCTM, 2000

Then what...

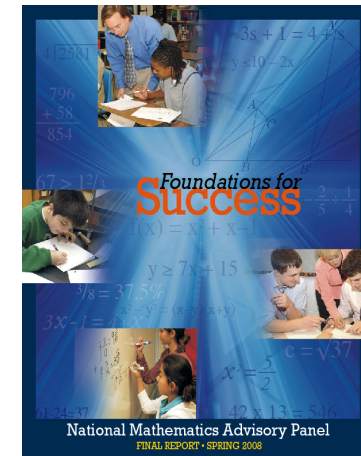
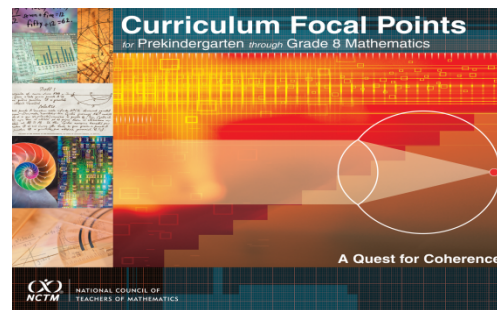
- Widely accepted
- Navigations...
- International stuff...
 - TIMSS
 - PISA
- General Ferment

and then...

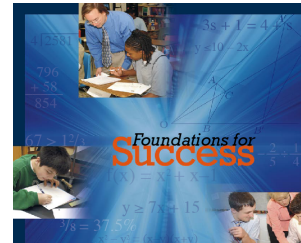
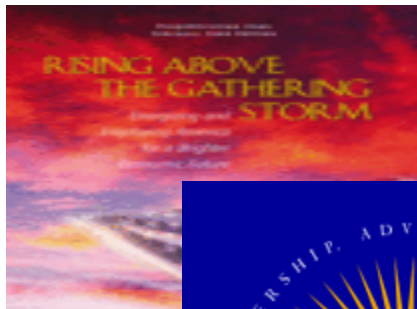


Why Focus and Coherence?

- Long lists of state learning expectations
- “Mile wide, inch deep”
- Mobility
- **International Comparisons**
- **Common Curriculum Clamoring – both sides of the aisle**
- **National Math Advisory Panel Recommendations**



Driving the CCSS





One year ago...

*“This will change your life and
what you do as a mathematics
specialist...”*

Let's take a look...

Yesterday...

NCTM Processes	CCSS – Standards for Mathematical Practice	Adding it Up – Strands of Mathematical Proficiency
Problem Solving	<i>Make sense of problems and persevere in solving them.</i>	Strategic competence
Reasoning and Proof	<i>Reason abstractly and quantitatively.</i>	Adaptive reasoning
Reasoning and Proof	<i>Construct viable arguments and critique the reasoning of others.</i>	Adaptive reasoning
Connections	<i>Model with mathematics.</i>	Strategic competence
Representation	<i>Use appropriate tools strategically.</i>	Strategic competence
		Conceptual understanding
Communication	<i>Attend to precision.</i>	Procedural fluency.
Connections	<i>Look for and make use of structure.</i>	Strategic competence
Reasoning and Proof	<i>Look for and express regularity in repeated reasoning.</i>	Adaptive reasoning
		*Productive disposition

Content - now...

Grades K-2

- **Counting and Cardinality (K only)**
- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- Measurement and Data
- Geometry

Grades 3-5

- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- **Number and Operations – Fractions**
- Measurement and Data
- Geometry

and...

Grades 6, 7

- **Ratios and Proportional Relationships**
- The Number System
- Expressions and Equations
- Geometry
- Statistics and Probability

Grades 8

- The Number System
- Expressions and Equations
- **Functions**
- Geometry
- Statistics and Probability

and...

High School Conceptual Categories

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability
- **Note on courses and transitions:** course sequence, K-7 standards prepare students for Algebra I in grade 8, etc.

High School Pathways

1. Course-based; algebra and geometry (typical)
2. Integrated curriculum (less likely)
3. Early start – calculus in the junior or senior year
4. Early start integrated – calculus in the junior or senior year

Challenges here...

A glimpse...probably not fair


Cluster Expectations

K	24
1	23
2	27
3	30
4	34
5	34
6	43
7	44
8	33

- Don't let the number of understandings and skills be the whole story...
- **Issues:** Focus, Understandings and Skills (and impact on assessment)
Algebra, **Language*** of the Content Domains and Standards and throughout, other?

Common Core State Standards Adoptions

45 states

 State adopted standards in only one subject

FEBRUARY

10 Kentucky

MAY

12 West Virginia

20 Hawaii

25 Maryland

JUNE

2 Wisconsin

3 North Carolina

4 Utah

7 Ohio

15 Michigan

15 Missouri

16 New Jersey

16 Wyoming

18 Nevada

24 Illinois

14 Oklahoma

JULY

1 Louisiana

1 Pennsylvania

1 Rhode Island

7 Connecticut

8 Georgia

8 New Hampshire

12 Arkansas

14 South Carolina

19 New York

19 Washington

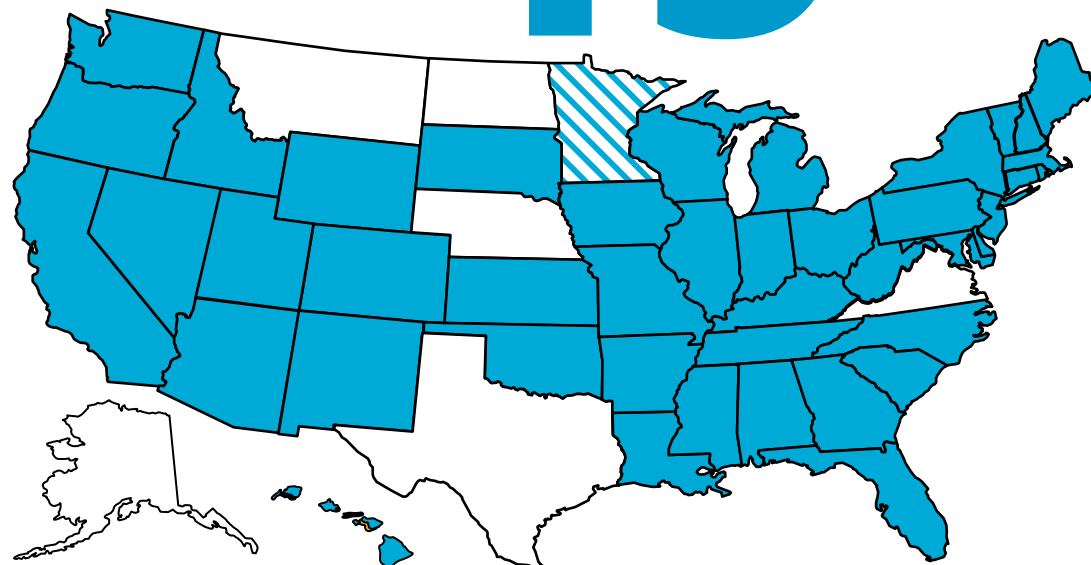
21 Massachusetts

21 Washington, D.C.

27 Florida

29 Iowa

30 Tennessee



AUGUST

2 Colorado

2 California

3 Indiana

17 Vermont

19 Delaware

SEPTEMBER

27 Minnesota

OCTOBER

12 Kansas

19 New Mexico

28 Oregon

NOVEMBER

17 Idaho

18 Alabama

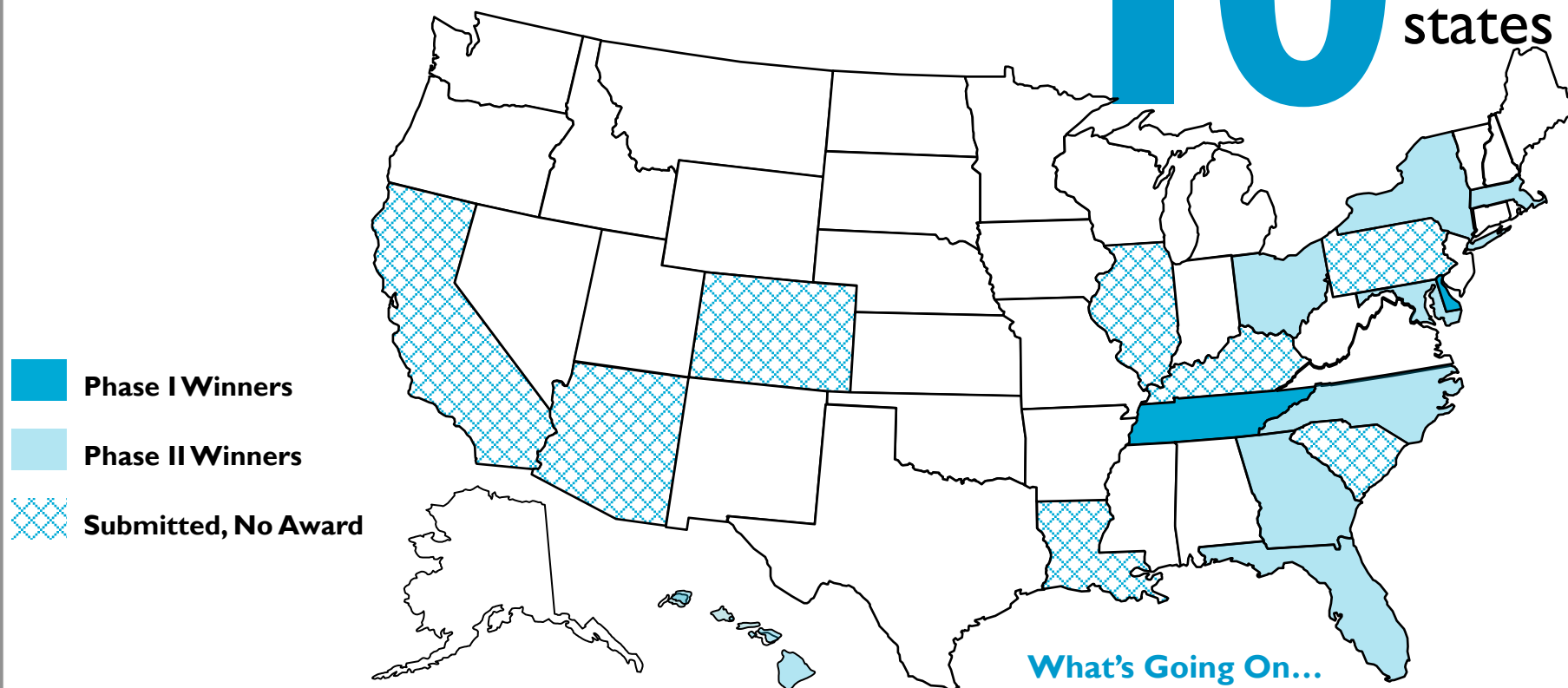
29 South Dakota

APRIL 2011

1 Maine

Race to the Top Competition Results

10 states



What's Going On...

New Race to the Top:
\$500M for Early Education
\$200M for Round 2 Runners-Up



Math Groups Support Common Standards

TO THE EDITOR:

The final set of common academic standards released June 2 by the Common Core State Standards initiative are a welcome milestone in the standards movement that began more than 20 years ago when the National Council of Teachers of Mathematics published its “Curriculum and Evaluation Standards for School Mathematics.” The new common standards provide the foundation for more-focused and coherent instructional materials and assessments that measure students’ understanding of mathematical concepts and acquisition of fundamental reasoning habits, in addition to fluency with math skills. ...

Letter co-signed by NCTM, NCSM, AMTE, ASSM; June 14, 2010
Additional efforts forthcoming by NCTM and NCSM – stay tuned

- What's comfortable? What's new?
- Interesting...
- Really important: “A lack of ***understanding*** effectively prevents a student from engaging in the mathematical practices.” (p. 8)

Moving Forward

- *Transition to adoption*
- *What's important?*
 - *three considerations...*

Grade 7 Critical Areas

1. Developing understanding of and applying proportional relationships;
2. Developing understanding of operations with rational numbers and working with expressions and linear equations;
3. Solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume;
4. Drawing inferences about populations based on samples.

Curriculum Focal Points and Connections for Grade 7

The set of three curriculum focal points and related connections for mathematics in grade 7 follow. These topics are the recommended content emphases for this grade level. It is essential that these focal points be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations.

Grade 7 Curriculum Focal Points	Connections to the Focal Points
<p>Number and Operations and Algebra and Geometry: Developing an understanding of and applying proportionality, including similarity</p> <p>Students extend their work with ratios to develop an understanding of proportionality that they apply to solve single and multistep problems in numerous contexts. They use ratio and proportionality to solve a wide variety of percent problems, including problems involving discounts, interest, taxes, tips, and percent increase or decrease. They also solve problems about similar objects (including figures) by using scale factors that relate corresponding lengths of the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and identify the unit rate as the slope of the related line. They distinguish proportional relationships ($y/x = k$, or $y = kx$) from other relationships, including inverse proportionality ($xy = k$, or $y = k/x$).</p>	<p>Measurement and Geometry: Students connect their work on proportionality with their work on area and volume by investigating similar objects. They understand that if a scale factor describes how corresponding lengths in two similar objects are related, then the square of the scale</p> <div><p>Data Analysis: Students use proportions to make estimates relating to a population on the basis of a sample. They apply percentages to make and interpret histograms and circle graphs.</p></div>
<p>Measurement and Geometry and Algebra: Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes</p> <p>By decomposing two- and three-dimensional shapes into smaller, component shapes, students find surface areas and develop and justify formulas for the surface areas and volumes of prisms and cylinders. As students decompose prisms and cylinders by slicing them, they develop and understand formulas for their volumes ($Volume = Area\ of\ base \times Height$). They apply these formulas in problem solving to determine volumes of prisms and cylinders. Students see that the formula for the area of a circle is plausible by decomposing a circle into a number of wedges and rearranging them into a shape that approximates a parallelogram. They select appropriate two- and three-dimensional shapes to model real-world situations and solve a variety of problems (including multistep problems) involving surface areas, areas and circumferences of circles, and volumes of prisms and cylinders.</p>	<p>Students continue to develop their understanding of multiplication and division and the structure of numbers by determining if a counting number greater than 1 is a prime, and if it is not, by factoring it into a product of primes.</p> <p>Data Analysis: Students use proportions to make estimates relating to a population on the basis of a sample. They apply percentages to make and interpret histograms and circle graphs.</p> <p>Probability: Students understand that when all outcomes of an experiment are equally likely, the theoretical probability of an event is the fraction of outcomes in which the event occurs. Students use theoretical probability and proportions to make approximate predictions.</p>
<p>Number and Operations and Algebra: Developing an understanding of operations on all rational numbers and solving linear equations</p> <p>Students extend understandings of addition, subtraction, multiplication, and division, together with their properties, to all rational numbers, including negative integers. By applying properties of arithmetic and considering negative numbers in everyday contexts (e.g., situations of owing money or measuring elevations above and below sea level), students explain why the rules for adding, subtracting, multiplying, and dividing with negative numbers make sense. They use the arithmetic of rational numbers as they formulate and solve linear equations in one variable and use these equations to solve problems. Students make strategic choices of procedures to solve linear equations in one variable and implement them efficiently, understanding that when they use the properties of equality to express an equation in a new way, solutions that they obtain for the new equation also solve the original equation.</p>	

Understanding

4.NBT

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

4.NF

- 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.

4.MD

- Geometric measurement: ***understand*** concepts of angle and measure angles.

Understanding

6.RP

- ***Understand*** ratio concepts and use ratio reasoning to solve problems.

6.NS

- 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.

6.EE

- Apply and extend previous ***understandings*** of arithmetic to algebraic expressions.

6.SP

- Develop ***understanding*** of statistical variability.

Representation

- 1.OA.2 – Solve word problems...,e.g., by ***using objects, drawings, and equations...***
- 2.MD.1 – Measure the length of an object...and ***using appropriate tools, such as rulers, yardsticks, meter sticks, and measuring tapes.***
- 3.NF.2 – Understand a fraction as a number on the number line; ***represent fractions on a number line diagram.***
- 4.NBT.5 – Multiply a whole number...Illustrate and explain...by ***using equations, rectangular arrays, and/or area models.***
- 5.MD.4 – Measure volumes by counting unit cubes, ***using cubic cm, cubic in, cubic ft, and improvised units.***

Representation - more

- 6.RP.3 – Use ratio and rate reasoning...by reasoning about ***tables of equivalent ratios, tape diagrams, double line diagrams or equations.***
- 7.EE.3 – Solve multi-step real-life and mathematical ***problems...using tools strategically.***
- 8.FF.2 – Compare properties of two ***functions...represented in a different way (algebraically graphically, numerically in tables or by verbal descriptions).***

Major Point

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method...(2.NBT.7)
- Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* (4.NF.4c)

**Conceptual *understanding* is not an option,
it's an expectation!**

Teacher needs?

A. Do they know this is going on?

B. Do they care?

C. Beyond A and B...

- Professional Development

- Language

- Unpacking the content – scope and sequence

- Curriculum Materials

- Assessments

Language...

- Grade 1
 - Students should apply the principle of *transitivity of measurement* to make indirect comparisons, but they need not use this technical term.
 - *Right rectangular prisms*
 - *Right circular cones*
 - *Right circular cylinders*
- Grade 3
 - 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 $1/b$.
- Grade 5
 - Make a line plot to display...
- Grade 6
 - Display numerical data in plots on a number line, including dot plots, histograms, and box plots

Unpacking Grade 4

- **4.OA Operations and Algebraic Thinking**
 - Use the four operations with whole numbers to solve problems
 - Gain familiarity with factors and multiples
 - Generate and analyze patterns
- **4.NBT 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 using the standard algorithm for addition and subtraction

Unpacking Grade 4 (cont.)

- **4.NF 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.

Unpacking Grade 4 (cont.)

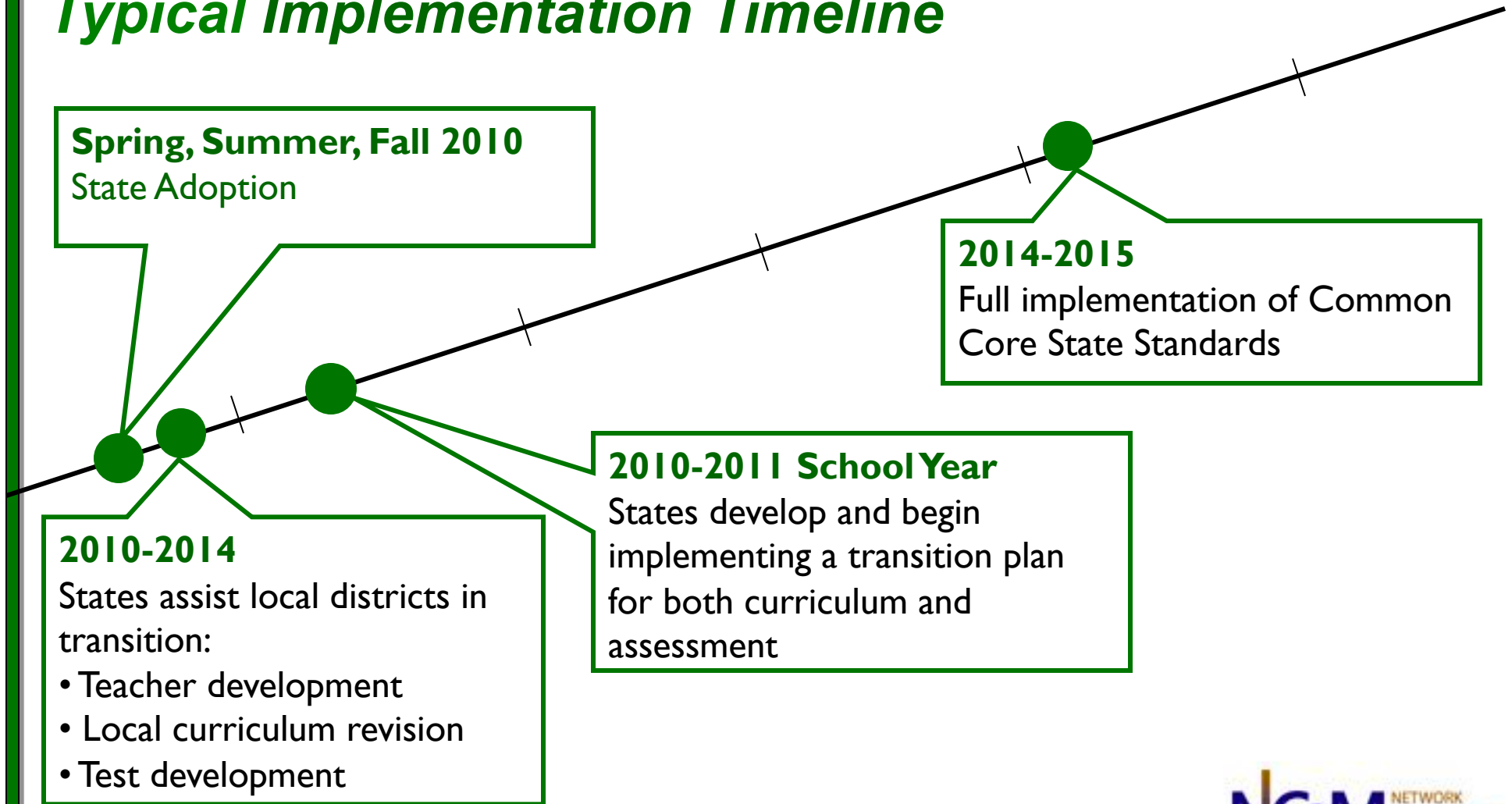
- **4.MD Measurement and Data**
 - Solve problems involving measurement and conversion of measurement from a larger unit to a smaller unit.
 - Represent and interpret data
 - Geometric measurement: understand concepts of angle and measure angles.
- **4.G Geometry**
 - Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Unpacking Standards

- Number and Operations in Base Ten **3.NBT**
 - **Standard** - Use place value understanding and properties of operations to perform multi-digit arithmetic
 1. Use place value understanding to round whole numbers to the nearest 10 or 100.
 2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction).
 3. Multiply one-digit whole numbers by multiples of 10 in the range of 10-90 (e.g. 9×80 , 5×60) using strategies based on place value and properties of operations.

Common Core State Standards

Typical Implementation Timeline



What's going on...more

- Most states transitioning K-2...
- Promise of the *Mathematical Practices...*
- 2011-2012 – Grades K, 1, 2 (or portions)
- 2012-2013 – Grades 3-5
- 2013-2014 – Grades 6-8; Interim PARCC Assessments
- 2014-2015 – PARCC Assessments...

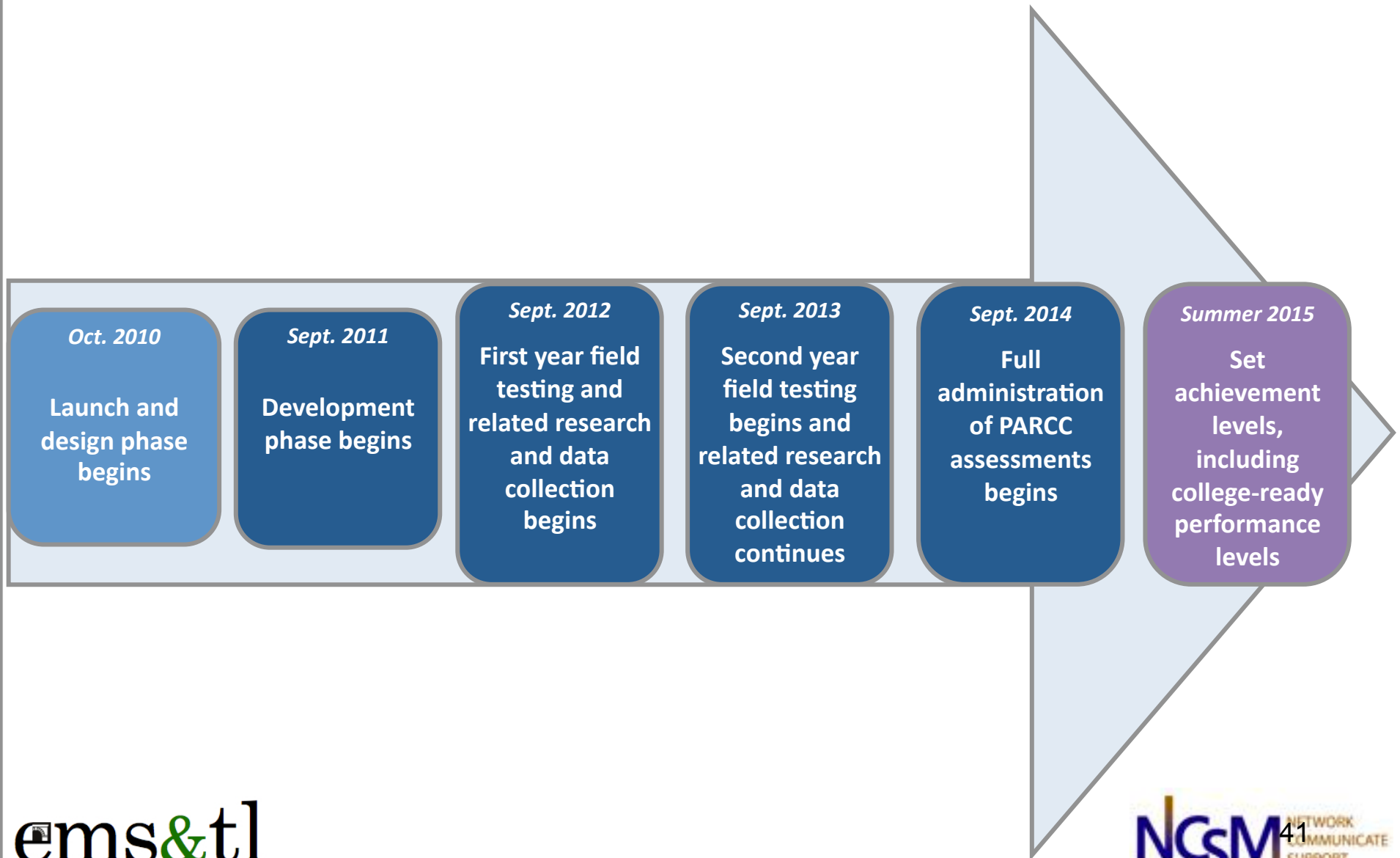
Race to the Top Assessment Program Competition

- \$350 million of Race to the Top Fund set aside for awards to consortia of states to design and develop common K-12 assessment systems aligned to common, college- and career-ready standards
- The competition asked consortia to design assessment systems that meet the dual needs of *accountability* and *instructional improvement*
- In September 2010, the U.S. Department of Education awarded grants to:
 - ***Partnership for Assessment of Readiness for College and Careers (PARCC)***
 - ***Smarter Balanced Assessment Consortium (SBAC)***
- The winning consortia have four years to develop assessments systems, and states participating in either consortium will administer new assessments statewide by 2014-2015

PARCC Assessments

- A mix of item types – short answer, longer open response and performance-based – in addition to richer multiple choice items that:
 - Better reflect the sophisticated knowledge and skills found in the English and math Common Core State Standards and
 - Will encourage teachers to focus on helping each student develop a deep understanding of the subject matter, rather than just narrowing their instruction in order to “teach to the test”
- Testing at key points throughout the year to give teachers, parents and students better information about whether students are “on track” or need some additional support in particular areas

PARCC Timeline



Taking your CCSS Pulse

- District level awareness AND plan
- Building level awareness and PLAN
- Teachers
 - Standards
 - Content; related language
- Materials
- Professional Development
- PARCC or SMARTER
 - awareness of plan

How is your CCSS pulse?

Defining Adoption - Really

- 100% of the common core K-12 standards in mathematics to be adopted within 3 years
- Adoption of the common core either in its entirety or in its entirety with up to an additional 15% added (“85% rule”).
- A state will have adopted when the **standards authorizing body within the state** has taken formal action to adopt and implement the common core.
- **States are responsible** for demonstrating that they have adhered to this definition of adoption.

Address Immediately

- What does it mean to adopt?
 - State level; YOUR county; YOUR school district
- What has your state decided to add?
- What about clarification and prerequisite expectations?
- Steps toward implementation – who is leading this?
- What is compliance?

Implementation Resources...

- Progressions
- Illustrative Mathematics Project
- *Institute for Mathematics and Education*
– *University of Arizona; Bill McCallum*

Resources - Coming

- Articulating Research Ideas that Support the Implementation of the Professional Development Needed for Making the CCSS Reality – Karen Marrongelle, Peg Smith, Paola Sztajn – forthcoming report.
- COMAP – Curriculum and Assessment and the CCSS – on COMAP site.
- Development of a Research Agenda for Understanding the Influence of the Common Core State Standards in Mathematics – Horizon Research forthcoming, check Horizon site.
- Mathematics Curricular Analysis Tool – Bill Bush, University of Louisville, to be posted CCSS site.
- Math Forum – October 2-4, 2011 – CCSS and Teacher Education and Professional Development – Reston, VA
- *NCTM, NCSM, AMTE, ASSM, CCSO, PARC, SBAC – CCSS Coalition – look for*

Don't Forget

- Rtl – defining tier needs with a CCSS curriculum
- Advanced students? Acceleration – particularly between elementary and middle school.

Thanks for asking...

- Mathematical Practices
- K-2
 - What about PreK – Wisconsin, Ohio, NY
- What's Important
 - Focal Points and Critical Areas
- Beginning PD
 - Understanding and Representation
 - Scope and Unpacking
- Deciding Material (all of it) Needs

Closing the Door on Innovation

Why One National Curriculum is Bad for America

A Critical Response to the Shanker Institute Manifesto and the U.S. Department of Education's Initiative to Develop a National Curriculum and National Assessments Based on National Standards

First, there is no constitutional or statutory basis for national standards, national assessments, or national curricula.

Be wary...Google conservative manifesto

What are your steps toward transition
and implementation?

What is your common core pulse?

Reality...



- No set of standards has much meaning without equitable resources to ensure that teachers are trained well enough to reach kids who live in widely different circumstances.
- ...it is important to remember that neither these standards nor any other single effort will be the silver bullet some mistakenly believe is out there...

Your turn...

Questions?