MAKING SENSE OF THE CT MATHEMATICS STANDARDS (COMMON CORE STATE STATE STANDARDS)

Grades 6 - 8

ATOMIC Conference

November 29, 2011
Your Presenters

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Goals

• Provide a brief tour of the Standards
  • Format
  • Content
  • Focus

• Explain the unit template development process

• Review the units

• Q & A
Mathematics Common Core Layout

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STANDARDS FOR MATHEMATICAL PRACTICES

Making Sense of the CT Mathematics Standards
Standards for Mathematical Practice

- The standards for mathematical practices are located in the front of the mathematics standards and within the “nature of mathematics” section at each grade level.

- The standards for mathematical practice illustrate the connection between 21\textsuperscript{st} century skills and mathematical content and instruction.

- The standards for mathematical practices should be considered when creating curricula, assessments, and professional development for teachers, and administrators.
Standards for Mathematical Practice

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning
SMP 1: Make sense of problems and persevere in solving them.

Mathematically Proficient Students:
- Explain the meaning of the problem to themselves
- Look for entry points
- Analyze givens, constraints, relationships, goals
- Make conjectures about the solution
- Plan a solution pathway
- Consider analogous problems
- Try special cases and similar forms
- Monitor and evaluate progress, and change course if necessary
- Check their answer to problems using a different method
- Continually ask themselves “Does this make sense?”
SMP 2: Reason abstractly and quantitatively

**Decontextualize**
Represent as symbols, abstract the situation

**Contextualize**
Pause as needed to refer back to situation

Mathematical Problem

![Diagram](https://via.placeholder.com/150)
SMP 3: Construct viable arguments and critique the reasoning of others

- Use assumptions, definitions, and previous results
- Make a conjecture
- Build a logical progression of statements to explore the conjecture
- Analyze situations by breaking them into cases
- Recognize and use counterexamples
- Justify conclusions
- Respond to arguments
- Communicate conclusions
- Explain flaws
- Ask clarifying questions
- Distinguish correct logic
- Justify conclusions
- Respond to arguments
SMP 4: Model with mathematics

Problems in everyday life...

...reasoned using mathematical methods

Mathematically proficient students
• make assumptions and approximations to simplify a situation, realizing these may need revision later

• interpret mathematical results in the context of the situation and reflect on whether they make sense

SMP 5: Use appropriate tools strategically

Proficient students

- are sufficiently familiar with appropriate tools to decide when each tool is helpful, knowing both the benefit and limitations
- detect possible errors
- identify relevant external mathematical resources, and use them to pose or solve problems
SMP 6: Attend to precision

Mathematically proficient students
• communicate precisely to others
• use clear definitions
• state the meaning of the symbols they use
• specify units of measurement
• label the axes to clarify correspondence with problem
• calculate accurately and efficiently
• express numerical answers with an appropriate degree of precision

SMP 7: Look for and make use of structure

Mathematically proficient students

• look closely to discern a pattern or structure to model and solve problems.
• step back for an overview and shift perspective
• see complicated things as single objects, or as composed of several objects
  • Ex. Handshake problem, Locker problem
SMP 8: Look for and express regularity in repeated reasoning

Mathematically proficient students

- notice if calculations are repeated and look both for general methods and for shortcuts
- use repeated reasoning to
  - understand algorithms
  - make generalizations about patterns
  - derive formulas
- maintain oversight of the process while attending to the details, as they work to solve a problem
- continually evaluate the reasonableness of their intermediate results
SMARTER Balance Assessment Consortium
Claims

- Four major claims for the Mathematics Assessment that directly tie to the Mathematical Practices
  - **Claim 1**: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.
  - **Claim 2**: Students can frame and solve a range of complex problems in pure and applied mathematics
  - **Claim 3**: Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others
  - **Claim 4**: Students can analyze complex, real-world scenarios and can use mathematical models to interpret and solve problems
MATHEMATICS CONTENT STANDARDS

Making Sense of the CT Mathematics Standards
How to read the grade level standards

**Standards** define what students should understand and be able to do.

**Clusters** are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.

**Domains** are larger groups of related standards. Standards from different domains may sometimes be closely related.

**Number and Operations in Base Ten**

**3.NBT**

**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 10-90 (e.g., $9 \times 80$, $5 \times 60$) using strategies based on place value and properties of operations.
How to read the grade level standards

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Mathematics Common Core Layout

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Counting and Cardinality

Know number names and the count sequence.
1. Count to 100 by ones and by tens.
2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

Count to tell the number of objects.
4. Understand the relationship between numbers and quantities; connect counting to cardinality.
   a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
   b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
   c. Understand that each successive number name refers to a quantity that is one larger.
5. Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects.

Compare numbers.
6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.
7. Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
## Common Core State Standards
### K-12 Mathematics Learning Progressions

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counting and Cardinality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number and Quantity</td>
</tr>
<tr>
<td>Number and Operations in Base Ten</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The Number System</td>
</tr>
<tr>
<td>Number and Operations: Fractions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ratios and Proportional Relationships (6 and 7)</td>
</tr>
<tr>
<td>Operations and Algebraic Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expressions and Equations</td>
</tr>
<tr>
<td>Geometry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Functions</td>
</tr>
<tr>
<td>Measurement and Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Statistics and Probability</td>
</tr>
</tbody>
</table>

[http://education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1704&ContentID=83475&Content=102764](http://education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1704&ContentID=83475&Content=102764)
Critical Areas of Focus

Each grade level section of the Common Core contains Critical Areas of Focus:

**Mathematics | Grade 6**

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.
Critical Areas of Focus

A detailed description of each of the key areas where instruction & learning time should be focused.

(2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.
### Priorities in Mathematics

<table>
<thead>
<tr>
<th>Grade</th>
<th>Priorities in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>K–2</td>
<td>Addition and subtraction, measurement using whole number quantities</td>
</tr>
<tr>
<td>3–5</td>
<td>Multiplication and division of whole numbers and fractions</td>
</tr>
<tr>
<td>6</td>
<td>Ratios and proportional reasoning; early expressions and equations</td>
</tr>
<tr>
<td>7</td>
<td>Ratios and proportional reasoning; arithmetic of rational numbers</td>
</tr>
<tr>
<td>8</td>
<td>Linear algebra</td>
</tr>
</tbody>
</table>

http://commoncoretools.wordpress.com/
## Key Fluencies

<table>
<thead>
<tr>
<th>Grade</th>
<th>Required Fluency</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Add/subtract within 5</td>
</tr>
<tr>
<td>1</td>
<td>Add/subtract within 10</td>
</tr>
<tr>
<td>2</td>
<td>Add/subtract within 20</td>
</tr>
<tr>
<td></td>
<td>Add/subtract within 100 (pencil and paper)</td>
</tr>
<tr>
<td>3</td>
<td>Multiply/divide within 100</td>
</tr>
<tr>
<td></td>
<td>Add/subtract within 1000</td>
</tr>
<tr>
<td>4</td>
<td>Add/subtract within 1,000,000</td>
</tr>
<tr>
<td>5</td>
<td>Multi-digit multiplication</td>
</tr>
<tr>
<td>6</td>
<td>Multi-digit division</td>
</tr>
<tr>
<td></td>
<td>Multi-digit decimal operations</td>
</tr>
<tr>
<td>7</td>
<td>Solve $px + q = r$, $p(x + q) = r$</td>
</tr>
<tr>
<td>8</td>
<td>Solve simple $2\times2$ systems by inspection</td>
</tr>
</tbody>
</table>

http://commoncoretools.wordpress.com/
Considerations for Acceleration in Middle School

• Appendix A (pages 80 – 146) outlines suggestions for acceleration in middle school.

• Students who may be taking Algebra I and/or high school Geometry in Grades 7 or 8 must receive instruction that is closely aligned with CCSS.

• These students will be assessed on the full range of the CCSS in high school.
THE DESIGN PROCESS

Making Sense of the CT Mathematics Standards
Team Structure

- Grade bands
  - K-2
  - 3-5
  - 6-8
  - HS
Rigorous Curriculum Design Model

Providing a frame for district curriculum work

- Prioritized standards

- Curriculum Units of study
  - With prioritized and supporting standards

- Pacing Calendar

- Unit Planning Organizer
Process

- Identified grade band standards as *Priority* or *Supporting*
  - Based on critical areas of focus and overall continuum of learning
    - Considered grade band progression of conceptual understanding and skill acquisition
  - ALL standards are important
## Example: Priority vs. Supporting

<table>
<thead>
<tr>
<th>Priority CCSS Standard</th>
<th>Supporting Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.G.7.</strong> Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.</td>
<td><strong>8.G.8.</strong> Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</td>
</tr>
<tr>
<td><strong>8.EE.2</strong>. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.</td>
<td></td>
</tr>
</tbody>
</table>
Collaborative Process

• Aligned K-12 Standards
  • All teams joined for the continuum gallery walk
  • Consensus reached on status of standards (priority or supporting)
Process: Units of Study

7th Grade Units:

1. Operating with Rational Numbers (Addition and Subtraction)
2. Operating with Rational Numbers (Multiplication and Division)
3. Two- and Three-Dimensional Geometry
4. Proportional Reasoning
5. Algebraic Reasoning II
6. Inferences About Populations
7. Probability
## Grade 7 Mathematics Units

<table>
<thead>
<tr>
<th>Unit Title</th>
<th>Pacing</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operating with Rational Numbers (Addition and Subtraction)</td>
<td>4 weeks</td>
<td>7.NS.1 7.NS.3</td>
</tr>
<tr>
<td>2. Operating with Rational Numbers (Multiplication and Division)</td>
<td>3 weeks</td>
<td>7.NS.2 7.NS.3 7.EE.3 7.EE.2</td>
</tr>
<tr>
<td>4. Proportional Reasoning</td>
<td>5 weeks</td>
<td>7.RP.1 7.RP.2 7.RP.3 7.G.1</td>
</tr>
</tbody>
</table>
Process: Unit Planning Organizer

- Mathematical Practices
- Domain and Standards Overview
- Priority Standards and Supporting Standards
- Concepts and Skills
- Essential Questions
- Corresponding Big Ideas
- Standardized Assessment Correlation
- Unit Assessments

- **SDE: Mathematics CCSS Curriculum Design**
The purpose of this document is to provide guidance for schools and districts to move toward full implementation of the math standards prior to the administration of the new assessments. The transition in mathematics must be done in a thoughtful manner to address the challenges of instructional gaps.
# Process: 6th Grade Transition Guide

<table>
<thead>
<tr>
<th>Grade 6 Domains</th>
<th>Grade 6 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2011-2012</strong></td>
<td><strong>Unit 2: Operating with Positive Rational Numbers</strong>&lt;br&gt;<strong>Unit 3: Understanding Positive and Negative Numbers</strong>&lt;br&gt;<strong>Unit 4: Applications of Geometry</strong></td>
</tr>
<tr>
<td>The Number System</td>
<td></td>
</tr>
<tr>
<td>Geometry</td>
<td></td>
</tr>
</tbody>
</table>

| **2012-2013**                                        | **Unit 1: Using Expressions and Equations**<br>**Unit 2: Operating with Positive Rational Numbers**<br>**Unit 3: Understanding Positive and Negative Numbers**<br>**Unit 4: Applications of Geometry**<br>**Unit 6: Algebraic Reasoning I**<br>**Unit 7: Statistics and Distributions** |
| The Number System                                    |                                                    |
| Geometry                                             |                                                    |
| Expressions and Equations                            |                                                    |

| **2013-2014**                                        | **Unit 1: Using Expressions and Equations**<br>**Unit 2: Operating with Positive Rational Numbers**<br>**Unit 3: Understanding Positive and Negative Numbers**<br>**Unit 4: Applications of Geometry**<br>**Unit 5: Ratios and Rates**<br>**Unit 6: Algebraic Reasoning I**<br>**Unit 7: Statistics and Distributions** |
| The Number System                                    |                                                    |
| Geometry                                             |                                                    |
| Expressions and Equations                            |                                                    |
| Statistics and Probability                           |                                                    |

| **2014-2015**                                        | **Unit 1: Using Expressions and Equations**<br>**Unit 2: Operating with Positive Rational Numbers**<br>**Unit 3: Understanding Positive and Negative Numbers**<br>**Unit 4: Applications of Geometry**<br>**Unit 5: Ratios and Rates**<br>**Unit 6: Algebraic Reasoning I**<br>**Unit 7: Statistics and Distributions** |
| The Number System                                    |                                                    |
| Geometry                                             |                                                    |
| Expressions and Equations                            |                                                    |
| Statistics and Probability                           |                                                    |
| Ratios and Proportional Relationships                |                                                    |

**Displaced Grade-Level Concepts (Former CT Grade 6 content that is no longer in Grade 6 under the CCSS)**

- Place value, including expanded form notation (students understanding of place value should come to closure in Grade 5)
- Fraction, decimal, percent equivalence (Introduction to percents in Grade 6 takes a different approach)
- Addition and subtraction of fractions (Most fractional operations have come to closure – focus on dividing fractions by fractions)
- Estimation
- Symmetry
- Geometric translations
- Radius, diameter, circumference
- Scale models and similar figures
- Probability

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7 The unit titles refer to shells that have been developed to organize the content and practice standards into coherent clusters for curriculum development. These will be available on the Connecticut State Department of Education website. Please use the unit titles to guide the implementation as the unit numbers are subject to change.
Process: Assessment

**ITEM DESCRIPTION**

Grade: 8  
Content area: MATH  
Item Type: CR-3  
Difficulty: (B, P, A) P  
DOK: (Webb 1-4) 2

Unit of Study: Unit 4 – Linear Relationships

Standard: 8.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph, (e.g. where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

**ITEM DETAILS**

**Item Stem:**
The graph below shows your trip from your locker to your class.

[Graph showing distance from locker over time]

Describe the story the graph tells about your trip.

**Item Specific Rubric:**

Score Point 3:
Students' response includes reasoning as to why the graph goes down and the constant rate represented. This may include:
- I was walking to class and then realized I forgot something and went back to my locker.
- I then walked at a constant pace to class

Score Point 2:
Student has an incomplete description or may include an error.

Score Point 1:
Student response is incorrect or missing
Process: Resources

- Ohio Department of Education: [http://education.ohio.gov](http://education.ohio.gov)
- Mathematics Assessment Project: [http://map.mathshell.org/materials](http://map.mathshell.org/materials)
QUESTIONS