THE OHIO STATE UNIVERSITY

Ohio's Mathematics Standards: a history

Math 1165

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Brief History of Standards

- 1989: Standards released by the National Council of Teachers of Mathematics
- Early 1990s: States developed standards in various subjects
- 2001: No Child Left Behind Act required state standards and assessments in English language arts (ELA), mathematics, and (later) science
- 2000s: Growing recognition:
  - State standards were shallow and repetitive (“mile wide, inch deep”)
  - State standards varied widely in quality, rigor, and topics
  - State standards were not preparing students for college and careers
  - Most careers will require some post-secondary training
  - Not enough progress compared to international peers

History of Common Core State Standards

- 2007: Governors and state superintendents began discussing shared standards across interested states
- 2009: Common Core State Standards Initiative launched
  - 48 states participated in the development of standards in ELA and mathematics
  - Broad, bipartisan effort, written by committees of content experts
- 2010: Common Core State Standards (CCSS) released
  - Ohio adopted the Common Core in June 2010 without modification
  - By late 2011, Common Core adopted by 45.5 states and the District of Columbia
- *Note: In June 2010, Ohio also adopted state-developed standards in science and in social studies*

CCSS History Since 2011

- A few states have replaced the CCSS
- Many states have “customized” the CCSS
- For 2014-2015, Ohio administered new CCSS assessments designed by a consortium of states
  - Partnership for Assessment of Readiness for College and Careers (PARCC)
- For 2015-2016, Ohio replaced the PARCC assessments with assessments designed by the American Institutes for Research (AIR) for Ohio
- In 2016, Ohio revised the standards in response to feedback from teachers, administrators, higher education faculty, and the general public
  - Most of the proposed changes improve the clarity of individual standards

Ohio's Standards Revision Infrastructure, 2016

- Public comment
  - Organized by standard
  - Called for claims, resolutions, and research/rationale
- Advisory Committee
  - Representatives of stakeholder organizations
  - Findell represented the Ohio Department of Higher Education
  - Reviewed public comments, provided directives for working groups
- Working Groups
  - Grade bands: K-5, 5-9, High School
- Ohio Department of Education staff

Ohio's Standards Revision Timeline, 2016

- March: Standards posted for public comment
- April and May: Advisory Committee
- May and June: Working Groups
- July: Proposed revisions posted for public comment
- August and September: Working Groups and Advisory Committee
- October to December: Presentation to Legislature and State Board of Education
- February, 2017: Approval by the State Board of Education

Revision Process, by the Numbers

- 385 mathematics standards reviewed online
- 242 standards received 647 public comments
- 100 standards and 10 additional directives forwarded to Working Groups
- 155 changes to standards
  - Most changes were about clarity, embedding footnotes, or “clarity by HS course”
  - 13 standards with proposed revisions reverted to original
  - 41 standards with substantive changes, deleted, moved, or new
- 23 changes to cluster headings
  - 14 changes for clarity, including 7 embedded footnotes
  - 9 changes for vertical alignment, including 3 new clusters

Current Work

- Ohio's "Model Curriculum" and assessments are under revision during 2017-2018.
- Students (and teachers) will be responsible for revised standards in 2018-2019 through assessments in spring 2019.

- For more information, see the ODE Mathematics site:
  - http://education.ohio.gov/Topics/Learning-in-Ohio/Mathematics

Examples of Changes for Clarity

Clarifying Learning Targets

Original Standards	Revised Standards
Know number names and the count sequence. **K.CC.2** Count forward beginning from a given number within the known sequence (instead of having to begin at 1).	**Know number names and the count sequence.** **K.CC.2** Count forward within 100 beginning from any given number other than 1.
Know number names and the count sequence. **K.CC.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).	**Know number names and the count sequence.** **K.CC.3** Write numerals from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).
K.CC.6 Compare numbers. 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.	**Compare numbers.** **K.CC.6** Orally identify (without using inequality symbols) whether the number of objects in one group is greater/more than, less/fewer than, or the same as the number of objects in another group, not to exceed 10 objects in each group.

Providing Helpful Detail

Original Standards	Revised Standards
Understand place value. **2.NBT.2** Count within 1000; skip-count by 5s, 10s, and 100s.	**Understand place value.** **2.NBT.2** Count forward and backward within 1000 by ones, tens, and hundreds starting at any number; skip-count by 5s starting at any multiple of 5.
Understand place value. **2.NBT.3** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.	**Understand place value.** **2.NBT.3** Read and write numbers to 1000 using base-ten numerals, number names, expanded form, and equivalent representations, e.g., 716 is 700 + 10 + 6, or 6 + 700 + 10, or 6 ones and 71 tens, etc.

Providing Cautionary Detail

Original Standards	Revised Standards
Develop understanding of fractions as numbers. **3.NF.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram. **a.** Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. **b.** Represent a fraction *a*/*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line.	**Develop understanding of fractions as numbers. Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.** **3.NF.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram. **a.** Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. **b.** Represent a fraction *a/b* (which may be greater than 1) on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line.

Fending off Misinterpretation

Original Standards	Revised Standards
Represent and solve problems involving multiplication and division. **3.OA.1** Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*	**Represent and solve problems involving multiplication and division.** **3.OA.1** Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. (Note: These standards are written with the convention that *a* x *b* means *a* groups of *b* objects each; however, because of the commutative property, students may also interpret 5 x 7 as the total number of objects in 7 groups of 5 objects each).

Conforming to Convention

Original Standards	Revised Standards
Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. **5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. **a.** Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. **b.** Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. **c.** Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** **5.MD.5** Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. **a.** Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the Associative Property of Multiplication. **b.** Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems. **c.** Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.

Examples of Substantive Changes

New Progression on Money

Original Standards	Revised Standards
Count to tell the number of objects. **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality. [a,b,c]	**Count to tell the number of objects.** **K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality using a variety of objects including pennies. [a,b,c]
Tell and write time. **1.MD.3** Tell and write time in hours and half-hours using analog and digital clocks.	**Work with time and money.** **1.MD.3** Work with time and money. **a.** Tell and write time in hours and half-hours using analog and digital clocks. **b.** Identify pennies and dimes by name and value.
Work with time and money. **2.MD.8** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*	**Work with time and money.** **2.MD.8** Solve problems with money. **a.** Identify nickels and quarters by name and value. **b.** Find the value of a collection of quarters, dimes, nickels, and pennies. **c.** Solve word problems by adding and subtracting within 100, dollars with dollars and cents with cents (not using dollars and cents simultaneously) using the $ and ₵ symbols appropriately (not including decimal notation).

New Progression on Money (cont.)

Original Standards	Revised Standards
Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. **3.MD.1** Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.	**Solve problems involving money, measurement, and estimation of intervals of time, liquid volumes, and masses of objects.** **3.MD.1** Work with time and money. **a.** Tell and write time to the nearest minute. Measure time intervals in minutes (within 90 minutes). Solve real-world problems involving addition and subtraction of time intervals (elapsed time) in minutes, e.g., by representing the problem on a number line diagram or clock. **b.** Solve word problems by adding and subtracting within 100, dollars with dollars and cents with cents (not using dollars and cents simultaneously) using the $ and ¢ symbol appropriately (not including decimal notation).
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. **4.MD.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	**Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** **4.MD.2** Solve real-world problems involving money, time, and metric measurement. **a.** Using models, add and subtract money and express the answer in decimal notation. **b.** Using number line diagrams, clocks, or other models, add and subtract intervals of time in hours and minutes. **c.** Add, subtract, and multiply whole numbers to solve metric

What Do You Know About the CCSS?

- I know they were the standards I had while in High School.
- They are standards that have been accepted by many states, to provide a common set of knowledge that each student should have.
- A good portion of the responses mentioned the picture on the internet of a student's work that was marked incorrect because for 5x3, the student put 5+5+5, but it was marked incorrect, and the teacher said the correct answer was 3+3+3+3+3.
- A few responses mentioned how the standards want to focus more on critical thinking instead of memorization.

Your Questions

- Why does it seem like the standards change every few years?
- Why did Ohio adopt the current Common Core Standards?
- Are the standards changing for 2017? And if so, what is changing about them?
- What improvements have you seen from these current standards, from previous standards and in the classroom?
- Does Common Core limit what control teachers have in the classroom?
- Why does there seem to be a negative connotation with the words Common Core?