Kentucky Core Academic Standards

Mathematics

Questions you need answered…

- **How are these Standards different?**

- **What should teachers be doing with these standards right now?**

- **How should I support teachers in this process?**

How are these standards different?

- **Mathematical Practices**

Mathematical Practices

- **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.**

How are these standards different?

- **Mathematical Practices**
- **Grade level standards now exist for K-8**
- **Overview Pages**
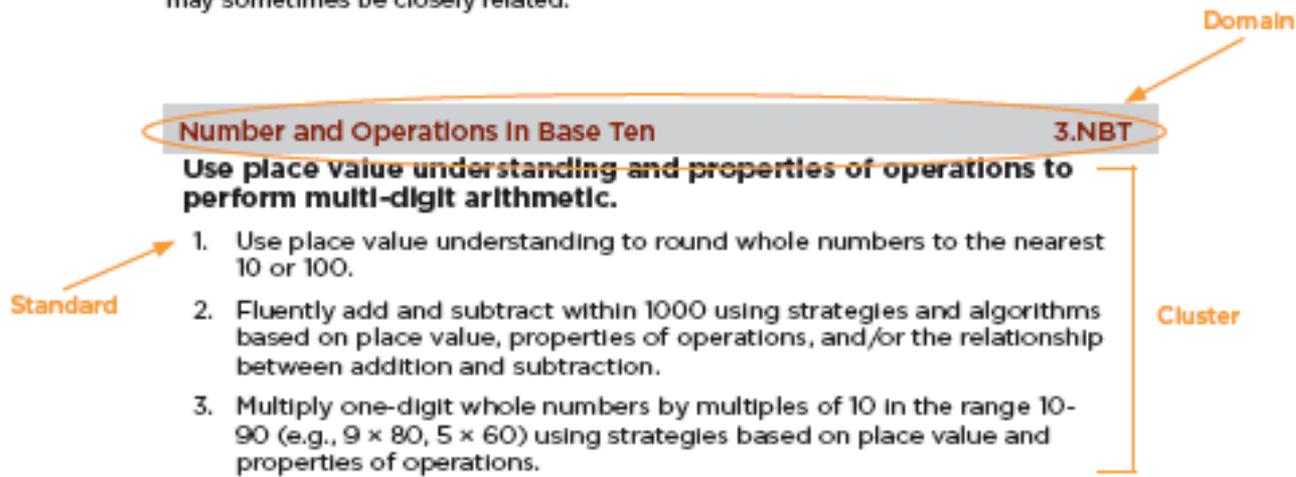
Organization of the Standards

Page 5

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.

Domain

Number and Operations in Base Ten	3.NBT

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

Standard

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.

Cluster

3. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

Overview Pages K-8

Mathematics | Grade 1

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

(1) Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

(2) Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

(3) Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

(4) Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

[1]Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.

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.

Domain

Clusters

*standards not listed

Overview Pages: High School

Conceptual Category:
Algebra

Domain

Clusters

Standards

Seeing Structure in Expressions   A-SSE

Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.*

    a. Interpret parts of an expression, such as terms, factors, and coefficients.

    b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*

2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*

Write expressions in equivalent forms to solve problems

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

    a. Factor a quadratic expression to reveal the zeros of the function it defines.

    b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

    c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*

Identifying Specific Standards

- **1.OA.2 is…**
  - **1st grade**
  - **Operations and Algebraic Thinking**
  - **Standard 2**

- **A-SSE.3a is…**
  - **Algebra**
  - **Seeing Structure in Expressions**
  - **Standard 3 (substandard a)**

Standards Scavenger Hunt

- **Starting on Page 14 (Grade 1 Overview) in your standards, find the following:**
  - **List one Domain:**
  - **List one Cluster heading:**
  - **List one Standard:**
  - **Find 1.NBT.2b**

How are these standards different?

- **Mathematical Practices**
- **Grade level standards now exist for K-8**
- **Overview Pages**
- **Reorganization of High School Standards**

Reorganization of HS Standards

Old Document

- Number Properties and Operations
- Measurement
- Geometry
- Data Analysis and Probability
- Algebraic Thinking

New Document

- Number and Quantity
- Algebra
- Functions
- Modeling *
- Geometry
- Statistics and Probability

- These are referred to as "Conceptual Categories"

How are these standards different?

- **Mathematical Practices**
- **Grade level standards now exist for K-8**
- **Overview Pages**
- **Reorganization of High School Standards**
- **High School Math Standards include standards for students pursuing STEM programs. (+)**
- **There is no repetition in the standards.**

What should teachers be doing now?

- **Comparing the old and new**
  - **Use the crosswalk for guidance**
    - **www.education.ky.gov/KDE**
  - **Identify gaps and make plans to bridge them**

Crosswalk for Math Standards

Mathematics Crosswalk
All Grades

G	Common Core Std	MG	GD	POS Standard(s)	DM	Notes
1	CC.1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: -- a. 10 can be thought of as a bundle of ten ones — called a "ten." -- b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. -- c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	K-3	1 to -2	KY.K-3.N.EU.1 Students will understand that numbers, ways of representing numbers, relationships between numbers and number systems are means of representing real-world quantities.	2 = Good match, with minor aspects of the CCSS not addressed	
		K-3	1 to -2	KY.K-3.N.SC.1 Number Sense: Students will read, write, count and model whole numbers 0-10,000, developing an understanding of place value for ones, tens, hundreds, thousands and ten thousands		
		K-3	1 to -2	KY.K-3.A.EU.2 Students will understand that numerical patterns can be written as rules that generate the pattern.		
1	CC.1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.	K-3	1 to -2	KY.K-3.N.EU.1 Students will understand that numbers, ways of representing numbers, relationships between numbers and number systems are means of representing real-world quantities.	3 = Excellent match between the two documents	
		K-3	1 to -2	KY.K-3.N.SC.4 Number Sense: Students will order, compare and understand the relative magnitude of numbers from 0-10,000, using the symbols <, >, =, including the use of physical and visual models for smaller numbers		

G	Common Core Std	MG	GD	POS Standard(s)	DM	Notes
7	CC.7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	7	0	KY.7.M.SC.1 Measuring Physical Attributes: Students will read and use measurement tools (e.g., rulers, scales, protractors, angle rulers)	2 = Good match, with minor aspects of the CCSS not addressed	
		7	0	KY.7.G.EU.4 Students will understand that shape and area are conserved during mathematical transformations (flips, slides and turns). Scale conserves shape, but changes size.		
		7	0	KY.7.M.SC.5 Measuring Physical Attributes: Students will determine the length of sides (to the nearest eighth of an inch or nearest centimeter), area and perimeter of triangles, quadrilaterals (rectangles, squares, trapezoids) and other polygons. (Using the Pythagorean theorem will not be required as a strategy)		
		8	-1	KY.8.G.SC.9 Transformations of Shapes: Students will transform figures in a coordinate plane (translations, reflections and dilations [magnifications and contractions] with the center of dilation at the origin); determine the new coordinates of the image after the transformation		
		8	-1	KY.8.G.SC.6 Transformations of Shapes: Students will investigate the congruence, proportionality and/or similarity of pre-images and images of dilations (e.g., enlargements, reductions) in a coordinate plane		
7	CC.7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	9-12	-2 to -5	KY.9-12.G.SC.1 Shapes and Relationships: Students will identify and apply the definitions, properties and theorems about line segments, rays and angles and use them to prove theorems in Euclidean geometry, solve problems and perform basic geometric constructions using a straight edge and a	3 = Excellent match between the two documents	
		9-12	-2 to -5	KY.9-12.G.SC.11 Shapes and Relationships: Students will draw and construct representations of two-dimensional figures and three-dimensional objects using a variety of tools		
		6	1	KY.6.M.SC.2 Measuring Physical Attributes: Students will read and use measurement tools (e.g., rulers, scales, protractors, angle rulers)		

What should teachers be doing now?

- **Comparing the old and new**
  - **Use the crosswalk for guidance**
  - **Identify gaps and make plans to bridge them**

- **Making meaning of the standards**
  - **What does success look like for this Standard?**
  - **How do the Practices look at each level?**

I think/We think…

- **In your standards documents, find your Grade 7 standards.**

- **Find 7.G.4**

- **Complete the "I think" side of the Handout.**

- **Share thoughts at your table.**

- **Complete the "We think" side of the Handout.**

How should I support teachers?

- **Build in time for:**
  - **Vertical/Horizontal Review of the Standards**
    - **Analyze the progression of standards**
    - **Make plans to bridge the gaps**
    - **Discuss and agree upon the meaning of the standards**

How can I help you?

- **Planning and facilitation of PLC meetings**
- **Content Specialist**
- **Modeling and Observing Lessons**
- **Etc, etc, etc**

- **Contact me:**

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