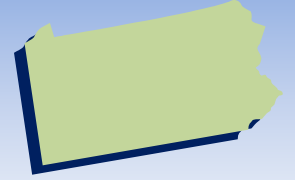


# **College and Career Readiness (CCR) Math Standards and Their Implications for Adult Education**

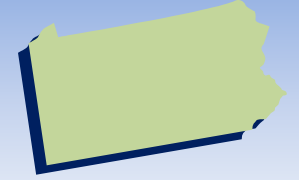
Lynda Ginsburg & Cynthia Zafft

# CCR Development Process



- Two review panels – ELA and Math
- Common Core State Standards served as the basis for discussions (CCSS)
- Using evidence, what CCSS content in the area of mathematics is *relevant* to preparing adult students for success in higher education and training programs?
- Using evidence, which standards in each content area are *most important* for adult students?

# Organization

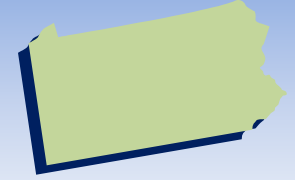


## ELA

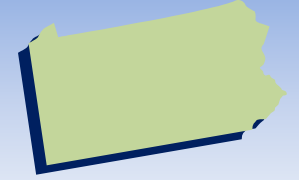
## Math

|   |      |   |        |
|---|------|---|--------|
| A | K–1  | A | K–1    |
| B | 2–3  | B | 2–3    |
| C | 4–5  | C | 4–5 +6 |
| D | 6–8  | D | 6+ 7-8 |
| E | 9–12 | E | 9-12   |

# What the CCR Standards are Not!



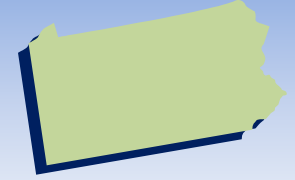
- They are ***not*** an order in which standards are to be taught.
- They are ***not*** directions about how instructors should teach.
- They are ***not*** a full spectrum of support and interventions for students.
- They are ***not*** a curriculum, so states and programs will need to complement them with high-quality curricula.
- They are ***not*** a national or federal set of mandates.



A model set of evidence-based CCR standards for use by state and local adult education programs!

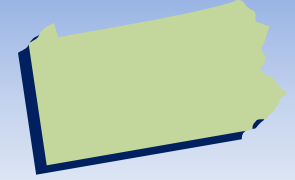
# Three Key Shifts

## Prompted by the CCR Standards



1. **Focus:** Focus strongly where the CCR standards focus.
2. **Coherence:** Design learning around coherent progressions level to level.
3. **Rigor:** Pursue conceptual understanding, procedural skill and fluency, and application—all with equal intensity.

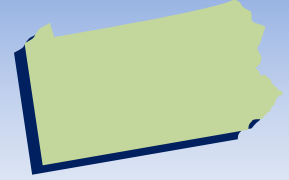
# Focus Strongly Where the CCR Standards Focus



## *Relevance and Importance Based on the Research*

- High-performing nations significantly narrow the scope of content so that students can focus their time and energy on the major work of the level.
- By focusing deeply on what is emphasized in the standards, students gain strong foundations.
- Identifying concepts that support the major concepts of the level creates a coherent flow of knowledge and skills within the level.

# Designing Learning Around Coherent Progressions Level to Level



## *Relevance and Importance Based on the Research*

- Based on how students' mathematical knowledge, skill, and understanding are known to develop over time:
  - Coherence allows students to demonstrate new understanding built on foundations from previous study.
  - Coherence prevents standards from being a list of isolated topics.
  - Coherence means that each standard is not a new event, but an extension of previous learning so less time needs to be spent on re-teaching.

# Pursuing Conceptual Understanding, Procedural Skill and Fluency, and Application

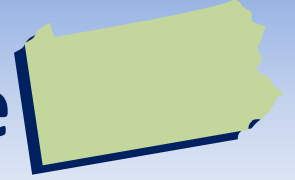


## — All with Equal Intensity

### *Relevance and Importance Based on the Research*

- Students with solid conceptual understanding know more than “how to get the answer”; they can generalize and apply concepts from several perspectives.
- When students can perform calculations with speed and accuracy (fluency), they are able to access more complex concepts and procedures.
- When students have the ability to use math flexibly, they are then able to apply their knowledge to a wide variety of types of problems.

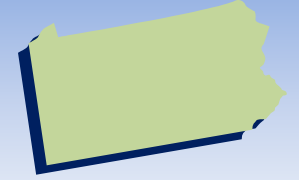
# Standards for Mathematical Practice



## *Relevance and Importance Based on the Research*

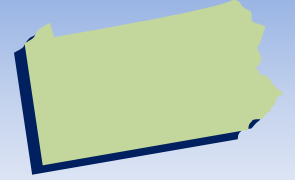
- The Standards for Mathematical Practice describe varieties of proficiency that students at all levels need to develop.
- When concepts and skills are connected to the Practices, deeper understanding can occur, which allows students to extend them to new situations.
- Emphasis on the Practices shifts the focus from just “how to get the answer” to also “learning how to learn.”

# Standards for Mathematical Practice



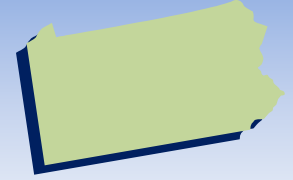
- MP.1** Make sense of problems and persevere in solving them.
- MP.2** Reason abstractly and quantitatively.
- MP.3** Construct viable arguments and critique the reasoning of others.
- MP.4** Model with mathematics.
- MP.5** Use appropriate tools strategically.
- MP.6** Attend to precision.
- MP.7** Look for and make use of structure.
- MP.8** Look for and express regularity in repeated reasoning.

# Examining the Standards for Mathematical Practice



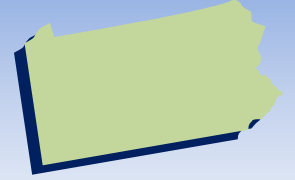
- Purpose of activity
- Materials
- Directions

# Standards for Mathematical Practice: Implications for Instruction



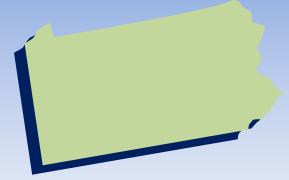
- The Standards for Mathematical Practice are meant to be **applied across all levels.**
- Not all Standards for Mathematical Practice are appropriate for every lesson—focus should be on developing those Practices that **fit well with particular content or activity.**
- Important to see to it that there are opportunities to **develop *all* the Standards for Mathematical Practice** over the unit or the level of study.
- **Teachers' questioning** supports development of the Mathematical Practices.

# Shift #1: Focus



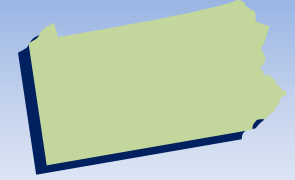
**“Focus:** Focus strongly where the CCR standards focus.”

# Implications for Instruction



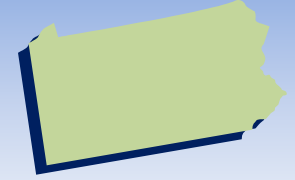
- Focus on the major work means that some content is more important than other content
  - Focusing narrows but deepens the scope of content.
  - Rather than “a mile wide and an inch deep,” focusing results in a “mile deep and an inch wide.”
  - Focusing opens the door to strengthening understanding—fewer topics on the list means more time to spend on each one.

# Major Areas of Focus in 5 Levels



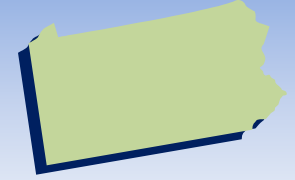
- *Level A:* Beginning ABE
- *Level B:* ABE I
- *Level C:* ABE II
- *Level D:* ABE III
- *Level E:* ASE I And II

# Level A (Beginning ABE)



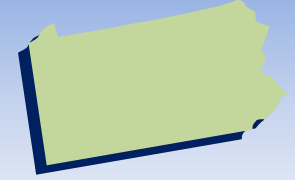
- Developing understanding of whole number place value for tens, and ones
- Developing understanding of addition and subtraction and the properties of these operations
- \*Developing initial understanding of equation, variable and the meaning of the equal sign
- Describing and reasoning about shapes and their attributes
- Developing understanding of linear measurement
- \*Organize, represent and interpret simple categorical data

# Level B (ABE I)



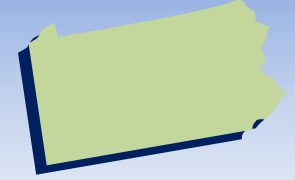
- Extending understanding of base-10 notation
- Adding and subtracting to 1,000; fluency to 100
- Understanding multiplication and division of whole numbers to 100
- Understanding division as inverse of multiplication; single-digit divisors
- Developing understanding of fractions, especially unit fractions
- \*Identify and explain patterns in arithmetic
- Using standard units for linear measure
- Developing understanding of area and its relationship to addition and multiplication
- Analyzing 2-dimensional shapes
- \*Beginning understanding of scaling picture and bar graphs

# Level C (ABE II)



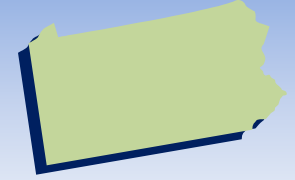
- Extending the number system to positive rational numbers
- Extending place value understanding to decimals
- Attaining fluency with multi-digit operations using whole numbers and decimals
- Understanding fraction equivalence and comparison
- Developing fluency with sums and differences of fractions
- Connecting ratio and rate to whole number multiplication and division
- Writing, evaluating, and interpreting expressions and equations
- Developing understanding of the coordinate plane
- Classifying 2-dimensional shapes based on sides and angles
- Developing an understanding of volume and surface area
- Developing understanding of statistical variability and measures of center and distribution

# Level D (ABE III)



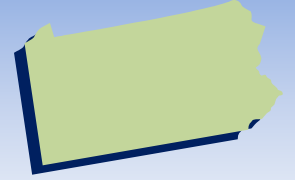
- Extending number sense and fluent operations to all rational numbers, including negatives
- Understanding ratio and rate and using them to solve problems
- Applying proportional relationships
- Working with expressions and linear equations
- Solving linear equations and systems of linear equations
- Developing the concept of function
- Graphing functions in the coordinate plane and analyzing their graphs
- Classifying geometric figures based on properties
- Solving problems involving scale drawings
- Measuring 2- and 3-dimensional figures: area, surface area, and volume
- Analyzing 2- and 3-dimensional shapes using distance and angle measurements, similarity, and congruence
- Applying the Pythagorean theorem
- Understanding patterns of association for bivariate data and describing them with a linear equation, when appropriate
- Summarizing data and data distributions
- Drawing inference about populations based on random samples (probability distributions)

# Level E (ASE I and II)



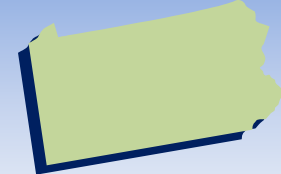
- Extending understanding of number systems to the set of real numbers
- Writing equivalent expressions involving radicals and integer exponents
- Reasoning quantitatively through the use of units and appropriate levels of precision
- Defining, evaluating, comparing, and modeling with linear, quadratic, and exponential functions and equations
- Building, interpreting, and analyzing functions using correct notation
- Reasoning with and solving linear, quadratic, and exponential equations and linear inequalities
- Interpreting and using the structure of expressions to solve problems
- Operating with algebraic expressions, including polynomials and rational expressions
- Applying similarity and congruence concepts to geometric figures, including right triangles
- Using geometric models to solve measurement problems involving volume
- Summarizing, describing, displaying, and interpreting data
- Understanding and applying probability concepts
- Summarizing, representing, and interpreting one- and two-variable data, including using frequency tables

# Focusing on the Major Work of Each Level



- Purpose of activity
- Materials
- Directions

# Which *are* major focus tasks?



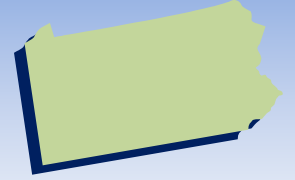
| CCR Level      | Which of the following represent areas of major focus for the indicated level? |                                                                      |                                                                               |
|----------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Level A</b> | Read a calendar, thermometer, and digital clock.                               | Measure lengths by iterating units.                                  | Create and extend patterns and sequences.                                     |
| <b>Level B</b> | Compare fractions with the same numerator.                                     | Add and subtract within 20 by decomposing numbers.                   | Recognize that equal shares of identical wholes need not have the same shape. |
| <b>Level C</b> | Use a line plot to display measurements collected as data.                     | Decompose 3-D shapes to find the volume of right rectangular prisms. | Compute using all four operations with fractions and decimals.                |
| <b>Level D</b> | Use ratio reasoning to solve problems.                                         | Locate ordered pairs in the coordinate plane.                        | Model bivariate data using a linear equation.                                 |
| <b>Level E</b> | Solve quadratic inequalities.                                                  | Apply linear and quadratic functions to real-world applications.     | Create a linear equation to represent a data set.                             |

# Not a major focus of the level



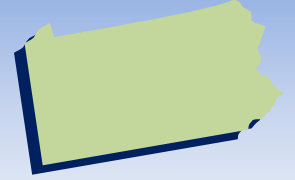
| CCR Level      | Which of the following represent areas of major focus for the indicated level?        |                                                                                  |                                                                               |
|----------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Level A</b> | Read a calendar, thermometer, and digital clock. <b><u>NO</u></b>                     | Measure lengths by iterating units.                                              | Create and extend patterns and sequences.                                     |
| <b>Level B</b> | Compare fractions with the same numerator.                                            | Add and subtract within 20 by decomposing numbers.<br><b><u>NO – LEVEL A</u></b> | Recognize that equal shares of identical wholes need not have the same shape. |
| <b>Level C</b> | Use a line plot to display measurements collected as data. <b><u>NO - LEVEL B</u></b> | Decompose 3-D shapes to find the volume of right rectangular prisms.             | Compute using all four operations with fractions and decimals.                |
| <b>Level D</b> | Use ratio reasoning to solve problems.                                                | Locate ordered pairs in the coordinate plane.<br><b><u>NO-LEVEL C</u></b>        | Model bivariate data using a linear equation.                                 |
| <b>Level E</b> | Solve quadratic inequalities.                                                         | Apply linear and quadratic functions to real-world applications.                 | Create a linear equation to represent a data set.<br><b><u>NO-LEVEL D</u></b> |

# Shift #2: Coherence



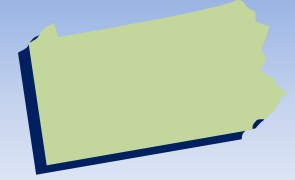
**“Coherence: Design Learning Around  
Coherent Progressions Level to Level”**

# Examining “Coherence” with Data



- Purpose of activity
- Materials
- Directions

# Data, Statistics & Probability Standards



**A. Develop understanding of statistical variability.**

**B. Summarize, represent, and interpret data on a single count or measurable variable.**

**C. Investigate patterns of association in bivariate data.**

**D. Represent and interpret data.**

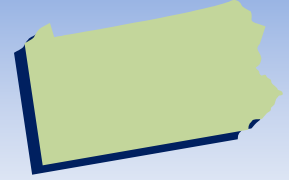
**E. Summarize and describe distributions.**

**F. Use random sampling to draw inferences about a population.**

**G. Interpret linear models.**

**H. Represent and interpret data.**

# Data, Statistics & Probability Standards



**Level A:** D. Represent and interpret data.

**Level B:** H. Represent and interpret data.

**Level C:** A. Develop understanding of statistical variability.

E. Summarize and describe distributions.

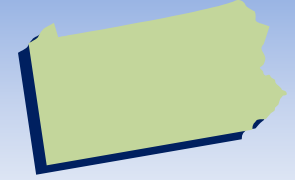
**Level D:** F. Use random sampling to draw inferences about a population.

C. Investigate patterns of association in bivariate data.

**Level E:** B. Summarize, represent, and interpret data on a single count or measurable variable.

G. Interpret linear models.

# Review of the Three Shifts



1. **Focus:** Focus strongly where the CCR standards focus.
2. **Coherence:** Design learning around coherent progressions level to level.
3. **Rigor:** Pursue conceptual understanding, procedural skill and fluency, and application—all with equal intensity.