



College and Career Readiness Standards-in-Action

Foundational
Unit

1

WORKSHOP MATERIALS
MATHEMATICS

**FOCUSING ON THE
MAJOR WORK OF
THE LEVELS**

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TABLE OF CONTENTS

For Participants

Directions for Participants	1
Worksheet: Focusing on the Major Work of the Levels	2
Resource: CCR Standards for Adult Education (one copy per table)	
Resource: Major Work of the Levels	4

For Facilitators

Answer Key and Rationales: Focusing on the Major Work of the Levels	6
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Directions for Participants

1. On the worksheet, circle the topics for each level that are part of the major focus for that level.
2. Use the resource, Major Work of the Levels, to help you make your decisions. You also may use a copy of the CCR Standards, if needed.
3. Discuss your selections and rationales at your table. Here are some questions to guide your discussion:
 - What are some rationales for why you did or did not circle a particular topic as critical to the level?
 - Did anyone have a hard time deciding to which critical area a topic belongs? Tell us where and why.
 - Are any of the lesson objectives that you did not select for the given level critical to a different level?
 - Do you think that any of the topics you did not select are important to teach? If so, how might you relate them to one of the critical areas for the level?

Worksheet: Focusing on the Major Work of the Levels

CCR Level	Which of the following represent areas of major focus for the indicated level?		
A	A1. Compare numbers to 100.	A2. Write 2-digit whole numbers in expanded form.	A3. Understand meaning of subtraction as the inverse of addition.
	A4. Read a calendar, a thermometer, and a digital clock.	A5. Measure lengths by iterating units.	A6. Create and extend patterns and sequences.
B	B1. Use arrays to better understand multiplication.	B2. Count by 5s, 10s, and 100s.	B3. Identify line of symmetry in 2-dimensional figures.
	B4. Multiply and divide within 100.	B5. Solve problems involving time intervals to one-half hour.	B6. Develop understanding of fractions as numbers.
C	C1. Draw polygons in the coordinate plane.	C2. Understand place value to 1,000,000.	C3. Convert between units in a single measurement system.
	C4. Use a line plot to display measurements collected as data.	C5. Decompose 3-D shapes to find the volume of right rectangular prisms.	C6. Compute using all four operations with fractions and decimals.
	C7. Categorize quadrilaterals based on the side lengths and angle measures.	C8. Create and analyze numerical patterns and relationships.	C9. Determine if a 2-dimensional figure has a line of symmetry.
D	D1. Use ratio reasoning to solve problems.	D2. Locate ordered pairs in the coordinate plane.	D3. Model bivariate data using a linear equation.
	D4. Extend the number system to include complex numbers.	D5. Understand the concept of a function.	D6. Apply the Pythagorean theorem to problems involving right triangles.
	D7. Calculate with and compare integers.	D8. Describe situations using algebraic expressions.	D9. Generate the prime factorization of numbers to solve problems.

CCR Level	Which of the following represent areas of major focus for the indicated level?		
E	E1. Translate between forms of a linear equation.	E2. Rewrite radical expressions using rational exponents.	E3. Use polar coordinates.
	E4. Solve quadratic inequalities.	E5. Apply linear and quadratic functions to real-world applications.	E6. Create linear, quadratic, or exponential equations from a data set.
	E7. Apply logarithmic functions to real-world situations.	E8. Compare and order square roots, some of which are irrational.	E9. Use trigonometric functions to model real-world situations.

Resource: Major Work of the Levels¹

Color key: Black = Number, Red = Algebra, Blue = Geometry,
Green = Statistics and Probability

Level A (CCSS Grades K-1/Beginning ABE):

Number: Developing understanding of whole number place value for tens and ones

Number: Developing understanding of addition and subtraction and the properties of these operations

Geometry: Describing and reasoning about shapes and their attributes

Geometry: Developing understanding of linear measurement

Level B (CCSS Grades 2-3/ABE I):

Number: Extending understanding of base-10 notation

Number: Adding and subtracting to 1,000; fluency and application to 100

Number: Understanding multiplication and division of whole numbers to 100

Number: Understanding division as inverse of multiplication; single-digit divisors

Number: Developing understanding of fractions, especially unit fractions

Geometry: Using standard units of measure for length, time, liquid volume, and mass

Geometry: Developing understanding of area and its relationship to addition and multiplication

Geometry: Analyzing and partitioning 2-dimensional shapes

Level C (CCSS Grades 4-5 + 6/ABE II):

Number: Extending the number system to positive rational numbers

Number: Extending place value understanding for decimals to thousandths

Number: Attaining fluency with operations, using multi-digit whole numbers and decimals

Number: Understanding fraction equivalence and comparison

Number: Developing fluency with sums and differences of fractions

Number: Connecting ratio and rate to whole number multiplication and division

Algebra: Writing, evaluating, and interpreting expressions and equations

Geometry: Developing understanding of the coordinate plane

Geometry: Classifying geometric 2-dimensional figures based on properties

Geometry: Developing an understanding and solving problems involving volume and surface area

Statistics and Probability: Developing understanding of statistical variability

¹ This document is not meant to be a substitute for the CCR Standards for Adult Education; rather, it is meant to be used in conjunction with the CCR Standards for Adult Education, where full descriptions of the major work can be found in the introductions for each level.

Level D (CCSS Grades 6 + 7-8/ABE III):

Number: Extending number sense and fluency with operations to all rational numbers

Number: Understanding ratio and rate and using them to solve problems

Algebra: Applying proportional relationships

Algebra: Working with expressions and linear equations

Algebra: Solving linear equations and systems of linear equations

Algebra: Developing the concept of function

Algebra: Graphing functions in the coordinate plane and analyzing their graphs

Geometry: Solving problems involving scale drawings

Geometry: Solving problems involving 2- and 3-dimensional figures: area, surface area, and volume

Geometry: Analyzing 2- and 3-dimensional shapes using side length and angle measurements, similarity, and congruence

Geometry: Applying the Pythagorean theorem

Statistics and Probability: Understanding patterns of association for bivariate data and describing them with a linear equation, when appropriate

Statistics and Probability: Summarizing and interpreting data and data distributions

Statistics and Probability: Understanding and applying probability concepts

Statistics and Probability: Drawing inferences about populations based on random samples (probability distributions)

Level E (CCSS Grades 9-12/ASE I and II):

Number: Extending understanding of number systems to the set of real numbers

Number: Writing equivalent expressions involving radicals and rational exponents

Number: Reasoning quantitatively and the use of units and appropriate levels of precision

Algebra: Defining, evaluating, comparing, and modeling with linear, quadratic, and exponential functions and equations

Algebra: Building, interpreting, and analyzing functions using different representations

Algebra: Reasoning with and solving linear, quadratic, and exponential equations and linear inequalities

Algebra: Interpreting and using the structure of expressions to solve problems

Algebra: Operating with algebraic expressions, including polynomials and rational expressions

Geometry: Applying similarity and congruence concepts to geometric figures, including triangles

Geometry: Using geometric models and volume formulas to solve measurement problems

Statistics and Probability: Summarizing, representing, and interpreting one- and two-variable data, including using frequency tables

Answer Key and Rationales: Focusing on the Major Work of the Levels

(**Bold** = Addresses a major focus of the level. *Italics* = Not selected as a major focus of the level.)

CCR Level	Which of the following represent areas of major focus for the indicated level?		
A	A1. Compare numbers to 100.	A2. Write 2-digit whole numbers in expanded form.	A3. Understand meaning of subtraction as the inverse of addition.
	A4. <i>Read a calendar, a thermometer, and a digital clock.</i>	A5. Measure lengths by iterating units.	A6. <i>Create and extend patterns and sequences.</i>
B	B1. Use arrays to better understand multiplication.	B2. Count by 5s, 10s, and 100s.	B3. <i>Identify line of symmetry in 2-dimensional figures.</i>
	B4. Multiply and divide within 100.	B5. <i>Solve problems involving time intervals to one-half hour.</i>	B6. Develop understanding of fractions as numbers.
C	C1. Draw polygons in the coordinate plane.	C2. Understand place value to 1,000,000.	C3. <i>Convert between units in a single measurement system.</i>
	C4. Use a line plot to display measurements collected as data.	C5. Decompose 3-D shapes to find the volume of right rectangular prisms.	C6. Compute using all four operations with fractions and decimals.
	C7. Categorize quadrilaterals based on side lengths and angle measures.	C8. <i>Create and analyze numerical patterns and relationships.</i>	C9. <i>Determine if a 2-dimensional figure has a line of symmetry.</i>
D	D1. Use ratio reasoning to solve problems.	D2. Locate ordered pairs in the coordinate plane.	D3. Model bivariate data using a linear equation.
	D4. <i>Extend the number system to include complex numbers.</i>	D5. Understand the concept of a function.	D6. Apply the Pythagorean theorem to problems involving right triangles.
	D7. Calculate with and compare integers.	D8. Describe situations using algebraic expressions.	D9. <i>Generate prime factorizations of whole numbers.</i>
E	E1. <i>Translate between forms of a linear equation.</i>	E2. Rewrite radical expressions using rational exponents.	E3. <i>Use polar coordinates.</i>
	E4. <i>Solve quadratic inequalities.</i>	E5. Apply linear and quadratic functions to real-world applications.	E6. Create linear, quadratic, or exponential equations from a data set.

CCR Level	Which of the following represent areas of major focus for the indicated level?		
	<i>E7. Apply logarithmic functions to real-world situations.</i>	<i>E8. Compare and order square roots, some of which are irrational.</i>	<i>E9. Use trigonometric functions to model real-world situations.</i>

Rationales

Rationales provided for major work of Level A are bolded ; rationales that are not the major work of Level A are in <i>italics</i>	
A1. Compare numbers to 100.	This objective would likely be part of a lesson with emphasis on place value, a major focus of Level A. See 1.NBT.3 under CCR Level A, Number and Operations, Understand Place Value.
A2. Write 2-digit whole numbers in expanded form.	This objective would be a key part of understanding place value, a major focus of Level A. See 1.NBT.3 under CCR Level A. Also see 2.NBT.3 under CCR Level B for 3-Digit, Number and Operations, Understand Place Value. This implies a similar requirement for 2-digit numbers in Level A.
A3. Understand meaning of subtraction as the inverse of addition.	Understanding the relationship between addition and subtraction emphasizes a conceptual understanding of subtraction, a major focus of Level A. See 1.NBT.6 under CCR Level A, Number and Operations, Use Place Value Understanding.
<i>A4. Read a calendar, a thermometer, and a digital clock.</i>	While these measurements would be important to include in an early level curriculum, these are not part of the major work for mathematics. All work with these measurement readings would be connected with counting and number sense.
A5. Measure lengths by iterating units.	Using nonstandard units to measure length would support an understanding of linear measurement, a major focus of Level A. See 1.MD.4 under CCR Level A, Measurement and Data, Represent and Interpret Data.
<i>A6. Create and extend patterns and sequences.</i>	Patterns often play a big part in curriculum at this level, but this topic is not considered a major work or an end in itself. At this level, creating and extending patterns should be used to support and deepen understanding of number and counting. At a higher level, this is addressed in CCR Level C, 4.OA.5, Generate and Analyze Patterns.

<p>Rationales provided for major work of Level B are bolded; rationales that are not the major work of Level B are in <i>italics</i></p>	
<p>B1. Use arrays to better understand multiplication.</p>	<p>Conceptual understanding of multiplication is a major focus for Level B. See 3.OA.1 under CCR Level B, Operations and Algebraic Thinking, Represent and solve problems involving multiplication and division.</p>
<p>B2. Count by 5s, 10s, and 100s.</p>	<p>Skip counting is a way of connecting multiplication to addition and deepening understanding of multiplication, which is major work for Level B. See 2.NBT.2 under CCR Level B, the first standard in Number and Operations.</p>
<p><i>B3. Identify line of symmetry in 2-dimensional figures.</i></p>	<p>While one of the major emphases of this level is analysis of geometric shapes for which symmetry may be a part, this topic would play a supporting role and would not be considered a major work in itself. Note: The preamble to CCR Level B includes “<i>foundation for understanding area, volume, congruence, similarity, and symmetry.</i>” The preamble to CCR Level C includes “<i>analyzing geometric properties, such as parallelism, perpendicularity, and symmetry,</i>” but there are no CCR Standards specifically addressing symmetry at any level.</p>
<p>B4. Multiply and divide within 100.</p>	<p>This topic is a major focus for Level B. See 3.OA.7 under CCR Level B, Number and Operations, Algebraic Thinking.</p>
<p><i>B5. Solve problems involving time intervals to one-half hour.</i></p>	<p>Applications of time measurements would be an important skill but would be addressed as a support for understanding basic operations of whole numbers and simple fractions. This topic is not specifically addressed in the CCR.</p>
<p>B6. Develop understanding of fractions as numbers.</p>	<p>This topic is a major focus for Level B. See 3.NF.2 under CCR Level B, Number and Operations, Fractions.</p>

Rationales provided for major work of Level C are bolded ; rationales that are not the major work of Level C are in <i>italics</i>	
C1. Draw polygons in the coordinate plane.	Developing an understanding of the coordinate plane is a major focus of Level C. See 6.G.3 under CCR Level C, Geometry, Solve real-world and mathematical problems involving area, surface area, and volume.
C2. Understand place value to 1,000,000.	Extension of the number system beyond that of Level B would likely include larger numbers and thus is a major focus of Level C. See 5.NBT.1 under CCR Level C, Number and Operations, Base Ten, Understand the place value system.
<i>C3. Convert between units in a single measurement system.</i>	The critical geometric emphasis for this level is on using the coordinate plane and measurement. All concepts related to conversion of units would play a supporting role to basic measurements or to ratio and proportional reasoning.
C4. Use a line plot to display measurements collected as data.	At this level, students begin to use the coordinate plane. This would include creating line plots of data. See 5.MD.2 under CCR Level C, Measurement and Data, Represent and interpret data.
C5. Decompose 3-D shapes to find the volume of right rectangular prisms.	In the process of developing an understanding of volume, a critical concept for Level C, students likely would use decomposition of 3-D shapes to break down the process of finding volume. This constitutes a major focus of Level C. See 5.MD.5a under CCR Level C, Measurement and Data, Geometric measurement, Understand concepts of volume and relate volume to multiplication and to addition.
C6. Compute using all four operations with fractions and decimals.	Extending number operations to all positive rational numbers is a major focus of Level C. See the standards of 4.NF, 5.NBT, and 5.NF, and also note 4.MD.2 under CCR Level C, Measurement and Data, Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. Note that standard specifies <i>simple fractions or decimals</i> .
C7. Categorize quadrilaterals based on the side lengths and angle measures.	Quadrilaterals would be included in the classification of 2-D figures based on their properties, and thus is a major focus of Level C. See Geometry standard 5.G.3 under Geometry, Classify 2-D figures.
<i>C8. Create and analyze numerical patterns and relationships.</i>	Creation and analysis of numerical patterns, part of the progression to algebraic thinking, is not considered a major focus at this level but rather as support for writing and interpreting expressions and equations.
<i>C9. Determine if a 2-dimensional figure has a line of symmetry.</i>	Finding a line of symmetry may be addressed as part of analysis of 2-dimensional figures (see Level B), but this is not a major focus of this level.

<p>Rationales provided for major work of Level D are bolded; rationales that are not the major work of Level D are in <i>italics</i></p>	
<p>D1. Use ratio reasoning to solve problems.</p>	<p>This topic is a major focus of Level D. See 6.RP.3 under CCR Level D, The Number System, Understand ratio concepts and use ratio reasoning to solve problems.</p>
<p>D2. Locate ordered pairs in the coordinate plane.</p>	<p>The coordinate plane was introduced in Level B. Graphing functions and analyzing their graphs is a major focus of Level D. This topic would serve to support graphic analysis and would include rational number coordinates. See 6.NS.6c under CCR Level D, The Number System, Apply and extend previous understandings of numbers to the system of rational numbers.</p>
<p>D3. Model bivariate data using a linear equation.</p>	<p>This addresses part of 8.SP.2 and is a critical concept for CCR Level D.</p>
<p><i>D4. Extend the number system to include complex numbers.</i></p>	<p>At this level, students must recognize irrational numbers. However, an understanding of the complex number system is not considered a major work of the level and is not included in the CCR Standards.</p>
<p>D5. Understand the concept of a function.</p>	<p>At this level, students are first introduced to the critical concept of a function, and thus this is a major focus of the level. This topic is extended in Level E. See F.IF.1 under CCR Level E, Functions, Interpreting Functions. Understand the concept of a function and use function notation.</p>
<p>D6. Apply the Pythagorean theorem to problems involving right triangles.</p>	<p>Application of the Pythagorean theorem in solving right triangles is a major focus of Level D. See 8.G.6 in CCR Level D cluster under Geometry.</p>
<p>D7. Calculate with and compare integers.</p>	<p>As the number system is expanded in Level D to all rational numbers, it is critical to introduce negative numbers. See the CCR Level D preamble, “here the attention is on fluency with all four operations with rational numbers—both negative and positive.”</p>
<p>D8. Describe situations using algebraic expressions.</p>	<p>This is a major focus of Level D. See 6.EE.6 under CCR Level C, Expressions and Equations, Reason about and solve one-variable equations and inequalities.</p>
<p><i>D9. Generate the prime factorization of numbers to solve problems.</i></p>	<p>While factoring numbers is an important skill, it would play a supporting role to simplifying rational expressions. This topic is not specifically addressed in the CCR Standards.</p>

Rationales provided for major work of Level E are bolded ; rationales that are not the major work of Level E are in <i>italics</i>	
E1. <i>Translate between forms of a linear equation.</i>	The CCR Standards do not specifically require that students translate from one form of a linear equation to another. However, in Level D, students are required to rewrite expressions and formulas and to construct linear functions from different information, implying that different forms might be considered. In any case, this topic is not a major focus of Level E.
E2. Rewrite radical expressions using rational exponents.	This is a major focus of Level E. See N-RN.2 under Number and Quantity, Extend the properties of exponents to rational exponents.
E3. <i>Use polar coordinates.</i>	Standards addressing the use of polar coordinates are not included in the CCR Standards and are not a major work of the level.
E4. <i>Solve quadratic inequalities.</i>	Even though CCR Level E includes A-CED.1, which requires that students create and use quadratic inequalities to solve problems, this is not a critical area of study for any of the levels.
E5. Apply linear and quadratic functions to real-world applications.	This is a major focus of Level E. See A-CED.1 under CCR Level E, Algebra, Creating Equations, Create equations that describe numbers or relationships.
E6. Create linear, quadratic, or exponential equations from a data set.	In representing a two-variable data set (a critical concept for Level E), students would be required to find a line of best fit. Note: While this is addressed in Level E, this topic is also specifically addressed in 8.SP.2-3 under CCR Level D, Statistics and Probability, Investigate patterns of association in bivariate data. Participants might have not circled this for that reason.
E7. <i>Apply logarithmic functions to real-world situations.</i>	Level E students interested in STEM studies or careers must be able to use logarithms as a way of understanding and applying exponential functions. However, there is no requirement in the CCR Standards for students to apply or use logarithmic functions.
E8. <i>Compare and order square roots, some of which are irrational.</i>	This is part of 8.NS.2 under CCR Level D, The Number System, Know that there are numbers that are not rational, and approximate them by rational numbers. However, it is not major work for either level.
E9. <i>Use trigonometric functions to model real-world situations.</i>	While trigonometric functions are addressed in the CCR Standards, the functions that are considered a major focus for modeling in adult education are linear, quadratic, and exponential.