

# Teaching with the Common Core State Standards

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## Math Talk and the Common Core State Standards

For more than two decades, the National Council of Teachers of Mathematics has been urging teachers to emphasize communication—talk and writing—as part of mathematics teaching and learning. Their arguments make sense: The mathematical thinking of many students is aided by hearing what their peers are thinking. Putting thoughts into words pushes students to clarify their thinking. Teachers can spot student misunderstandings much more easily when they are revealed by a discussion instead of remaining unspoken.

Recently, the ante has been upped by the introduction of the Common Core State Standards. Now there are even more reasons to use classroom talk and discussion to support math learning. Let's look at these reasons through both the standards for mathematical practice and the standards for mathematical content.

### The Standards for Mathematical Practice

Consider just a few of the Mathematical Practices from the CCSS.

#### ***Mathematical Practice Standard 3: Construct viable arguments and critique the reasoning of others.***

Any teacher knows that this is not a simple goal. How can we help students learn to make claims, support them with evidence, and engage in discussion of counterarguments with others? We believe that the use of *discussion* in a variety of formats is really the ideal (and perhaps only) way to bring this about.

#### ***Mathematical Practice Standard 6: Attend to precision.***

As the CCSS writers argue, “Mathematically proficient students try to communicate precisely with others.” In our experience, the desire and ability to communicate clearly and precisely grows best *in the context of talking with others*. As students engage in productive talk, they learn that it takes effort to get their ideas across. They learn to pay attention to what they don't understand,

and ask questions of others to repair their own understanding. In this environment, they naturally learn to attend to precision.

## The Standards for Mathematical Content

It is not just the Mathematical *Practices* that call for discussion. The Content Standards call for it too. As the CCSS writers state:

Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily . . . they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, . . . explain the mathematics accurately to other students, step back for an overview. (2010, 8)

In our experiences in many classrooms where academically productive discussion is common, deeper understanding emerges from the many opportunities students have throughout the year to hear about and talk about the mathematical concepts, procedures, tools, and representations in their lessons.

## Lesson Correlations in this Resource

Throughout this resource, we rely on classroom examples to portray the practices and principles of whole-class mathematics discussions. All the mathematics problems that are described in our classroom vignettes and the lessons featured in the video clips are connected to the Common Core State Standards. The connections are listed with grade (K, 1, 2, 3, 4, 5, 6) first, followed by the abbreviated domain, followed by a description of the relevant strand and/or cluster.

# Teaching with the Common Core State Standard: Lesson Correlations

Chapter	Discussion Examples: Vignettes and Video Clips	Counting and Cardinality (CC)	Operations and Algebraic Thinking (OA)	Number and Operations in Base Ten (NBT)	Number and Operations – Fractions (NF)	Ratios and Proportional Relationships (RP)	Expressions and Equations (EE)	Measurement and Data (MD)	The Number System (NS)	Geometry (G)
1	Academically Productive Talk in Mrs. Schuster's Third-Grade Class		3.OA Understand properties of multiplication and the relationship between multiplication and division. 3.OA Apply properties of operations as strategies to multiply and divide.							
1	Ms. D's Third-Grade Class		3.OA Represent and solve problems involving multiplication and division.							

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1	Mrs. Sigler's First-Grade Class									1.G Reason with shapes and their attributes. 1.G Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
1	Mrs. Stangle's Fifth-Grade Class				5.NF Apply and extend previous understandings of multiplication and division to multiply and divide fractions. 5.NF Interpret division of a whole number by a unit fraction, and compute such quotients.					

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3	Working with Place Value, Grade 2			2.NBT Understand place value. 2.NBT Use place value understanding and properties of operations to add and subtract.						
3	Counting and Place Value, Grade 1			1.NBT Extend the counting sequence. 1.NBT Understand place value.						
3	Area of a Parallelogram, $A = bh$ , Grade 6									6.G. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes.

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3	Perimeters of Rectangles with a Fixed Area, Grade 4							3.MD Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. 3.MD Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.		

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3	Operations with Decimals, Grade 5							4.MD Apply the area and perimeter formulas for rectangles in real world and mathematical problems.		
4	Teaching Addition Strategies, Grade 1		1.OA Understand and apply properties of operations and the relationship between addition and subtraction. 1.OA Add and subtract within 20.	5.NBT Perform operations with multi-digit whole numbers and decimals to hundredths.						

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4	Teaching Subtraction Strategies, Grade 2			2.NBT Use place value understanding and properties of operations to add and subtract. 2.NBT Explain why addition and subtraction strategies work, using place value and the properties of operations.						
4	Teaching Division Strategies, Grade 5			5.NBT Find whole-number quotients of whole numbers . . . using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.						

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4	Connecting Multiplication Strategies and Concepts, Grade 4			4.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic.						
4	Developing Fraction Sense, Grade 4				4.NF Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.					
4	Placing Fractions on a Number Line, Grade 6								6.NS Understand a rational number as a point on the number line. Find and position	

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5	The Pencil Problem, Grade 4		4.OA Use the four operations with whole numbers to solve problems.						integers and other rational numbers on a number line diagram. 6.NS Apply and extend previous understandings of numbers to the system of rational numbers.	
5	The Birthday Party Problem, Grade 3		3.OA Solve problems involving the four operations, and identify and explain patterns in arithmetic.							

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5	The Coin Problem, Grade 3		3.OA Represent and solve problems involving multiplication and division.							
5	The Field Trip Problem, Grade 1		1.OA Represent and solve problems using addition and subtraction. 1.OA Add and subtract within 20.							
5	The Newspaper Club Problem, Grade 6					6.RP Understand ratio concepts and use ratio reasoning to solve problems.				
6	The Baseball Logic Problem, Grade 4*									

\*Indicates a discussion vignette that is intended to demonstrate how productive math talk can be used to support the Standards for Mathematical Practice such as reasoning abstractly and quantitatively, attending to precision, and using appropriate tools strategically.

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6	Four Strikes and You're Out, Grade 3			3.NBT 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.						
6	What's the Same?, Kindergarten							K,MD Classify objects and count the number of objects in each category. 5,MD Understand concepts of volume and relate volume to multiplication and to addition.		
6	Volume of Rectangular Prisms, Grade 5									

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6	Weighing Fruit, Grade 6						6.EE Apply and extend previous understandings of arithmetic to algebraic expressions.			
7	Making Sense of Scale, Grade 6					6.RP Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.				
7	Making Sense of One-Half, Grade 2							2.MD Work with time and money.		
7	Making Sense of Quarter							2.MD Work with time and money.		
7	Using <i>More and Less</i> to Describe the Data in a Graph, Kindergarten	K.CC Compare numbers.						K.MD Classify objects and count the number of objects in each category.		

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7	Connecting Factors and Multiples, Grade 4		4.OA Gain familiarity with factors and multiples.							
7	Sorting: Attributes of Shapes, Grade 3									3.G Reason with shapes and their attributes.
7	Guess My Object: Attributes of Shapes, Kindergarten									K.G Analyze and compare shapes.
7	Differentiating between Squares and Cubes, Grade 5							5.MD Understand the concept of volume.		
7	Talking About Ratios, Grade 6					6.RP Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.				

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7	Recording Addition Number Sentences, Kindergarten		K.OA Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$ ).							
7	Making Sense of Subtraction Symbols, Grade 1		1.OA Represent and solve problems involving addition and subtraction.							
7	Interpreting Numerical Expressions, Grade 5		5.OA Write and interpret numerical expressions.							
8	Analyzing Data from a Bar Graph, Grade 3							3.MD and 4.MD Represent and interpret data.		