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Program Alignment to K-3 Common Core Standards

mCLASS® Math

On June 2, 2010 the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO) released the K-12 Common Core State Standards.

The table that follows illustrates alignment of mCLASS®:Math components with the Common Core in Mathematics standards for Grades K-3. Specifically, the alignment pertains to the following:

- Counting and Cardinality
- Operations and Algebraic Thinking
- Number and Operations in Base Ten

Full descriptions of mCLASS assessment measures are included at the end of this document.

Kindergarten

Common Core Summary	mCLASS:Math Screening/ Progress Monitoring	mCLASS:Math Interviews
In Kindergarten, instructional time should focus on two critical areas: (1) Representing, comparing and ordering whole numbers and joining and separating sets, initially with sets of objects. (2) Describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.	**Counting** **Missing Number** **Number Identification** **Quantity Discrimination**	**Counting**: Forwards, Running Start, Backwards, By Tens, How Many? **Addition**: Small Numbers, Zero Principle **Subtraction**: Small Numbers, Zero Principle, Same Number Principle

Counting and Cardinality	mCLASS:Math Assessment
Know number names and the count sequence.	
Count to 100 by ones and by tens.	Counting Counting Interview: By Tens
Count forward beginning from a given number within the known sequence (instead of having to begin at 1).	Missing Number Counting Interview: Running Start
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).	Not applicable

For more information, please visit www.wirelessgeneration.com/commoncore.

Count to tell the number of objects.	
Understand the relationship between numbers and quantities; connect counting to cardinality. (1) When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. (2) Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. (3) Understand that each successive number name refers to a quantity that is one larger.	Counting Interview: How Many?
Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.	Counting Interview: How Many?
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.	Not applicable
Compare two numbers between 1 and 10 presented as written numerals.	Quantity Discrimination
Operations and Algebraic Thinking	**mCLASS:Math Assessment**
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	
Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.	Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.	Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
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).	Not applicable
For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.	Not applicable
Fluently add and subtract within 5.	Not applicable
Number and Operations in Base Ten	**mCLASS:Math Assessment**
Work with numbers 11–19 to gain foundations for place value.	
Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.	Not applicable

First Grade

Common Core Summary	mCLASS:Math Screening/ Progress Monitoring	mCLASS:Math Interviews
In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for additions and subtractions within 20; (2) developing understanding of whole number relationships, including grouping in tens and ones, (3) developing understanding of linear measurement and measuring lengths (4) reasoning about attributes of, and composing and decomposing geometric shapes.	**Counting** **Missing Number** **Next Number** **Number Facts** **Number Identification** **Quantity Discrimination**	**Counting**: Forwards, Running Start, Backwards, By Tens, How Many? **Addition**: Small Numbers, Zero Principle, Order Principle, Mental Calculation **Subtraction**: Small Numbers, Zero Principle, Same Number Principle, Inverse Principle, Mental Calculation **Written**: Write Numbers, Setup a Problem, Place Value

Operations and Algebraic Thinking	mCLASS:Math Assessment
Represent and solve problems involving addition and subtraction.	
Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	Not applicable
Understand and apply properties of operations and the relationship between addition and subtraction.	
Apply properties of operations as strategies to add and subtract. Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)	Addition Interview: Order Principle
Understand subtraction as an unknown-addend problem. For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.	Subtraction Interview: Inverse Principle

Add and subtract within 20.	
Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).	Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 +7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).	Number Facts, Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
Work with addition and subtraction equations.	
Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.	Not applicable
Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 =? – 3, 6 + 6 = ?.	Not applicable
Number and Operations in Base Ten	**mCLASS:Math Assessment**
Extend the counting sequence.	
Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.	Counting, Counting Interview: Running Start, Number Identification, Written Interview: Place Value
Understand place value.	
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).	Written Interview: Place Value, Number Identification
Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.	*Quantity Discrimination**

* Students identify the larger number or faction from a pair, but do not use =, >, or < symbols

Use place value understanding and properties of operations to add and subtract.	
Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.	Addition Interview: Mental Calculation
Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	Counting Interview: By Tens
Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	Not applicable

Second Grade

Common Core Summary	mCLASS:Math Screening/ Progress Monitoring	mCLASS:Math Interviews
In Grade 2, instructional time should focus on three critical areas: (1) extending understanding of base-ten notation (2) building fluency with addition and subtraction (3) using standard units of measure	**Computation** **Concepts** **Missing Number** **Number Facts** **Quantity Discrimination**	**Addition**: Small Numbers, Zero Principle, Order Principle, Mental Calculation **Subtraction**: Small Numbers, Zero Principle, Same Number Principle, Inverse Principle, Mental Calculation **Multiplication Interview**: Small Numbers, Zero Principle, Order Principle, Identity Principle, Mental Calculation **Written**: Write Numbers, Setup a Problem, Place Value, Computation (Add, Subtract)

Operations and Algebraic Thinking	mCLASS:Math Assessment
Represent and solve problems involving addition and subtraction.	
Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	Addition Interview: Small Numbers, Subtraction Interview: Small Numbers
Add and subtract within 20.	
Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.	Number Facts
Work with equal groups of objects to gain foundations for multiplication.	
Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.	Not applicable
Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	Not applicable

Number and Operations in Base Ten	mCLASS:Math Assessment
Understand place value.	
Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases: a) 100 can be thought of as a bundle of ten tens — called a "hundred." b) The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).	Written Interview: Place Value
Count within 1000; skip-count by 5s, 10s, and 100s.	Missing Number
Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.	Not applicable
Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.	Quantity Discrimination
Use place value understanding and properties of operations to add and subtract.	
Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	Computation Written Interview: Computation
Add up to four two-digit numbers using strategies based on place value and properties of operations.	Not applicable
Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	Addition Interview: Mental Calculation Subtraction Interview: Mental Calculation
Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.	Addition Interview: Mental Calculation Subtraction Interview: Mental Calculation
Explain why addition and subtraction strategies work, using place value and the properties of operations.	Written Interview: Computation

Third Grade

Common Core Summary	mCLASS:Math Screening/ Progress Monitoring	mCLASS:Math Interviews
In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1) (3) Multiplication, division, and fractions are the most important developments in Grade 3.	**Computation** **Concepts** **Missing Number** **Number Facts** **Quantity Discrimination**	**Addition**: Small Numbers, Zero Principle, Order Principle, Mental Calculation **Subtraction**: Small Numbers, Zero Principle, Same Number Principle, Inverse Principle, Mental Calculation **Multiplication Interview**: Small Numbers, Zero Principle, Order Principle, Identity Principle, Mental Calculation **Written**: Write Numbers, Setup a Problem, Place Value, Computation (Add, Subtract)

Operations and Algebraic Thinking	mCLASS:Math Assessment
Represent and solve problems involving multiplication and division.	
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.	Multiplication Interview: Small Numbers
Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.	Not applicable
Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	Multiplication Interview: Mental Calculation
Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = ? ÷ 3, 6 × 6 = ?.	Not applicable

Understand properties of multiplication and the relationship between multiplication and division.	
Apply properties of operations as strategies to multiply and divide.2 Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)	Multiplication Interview: Order Principle
Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.	Not applicable
Multiply and divide within 100.	
Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	Number Facts
Solve problems involving the four operations, and identify and explain patterns in arithmetic.	
Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Not applicable
Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.	*Missing Number**
Number and Operations in Base Ten	**mCLASS:Math Assessment**
Use place value understanding and properties of operations to perform multi-digit arithmetic.	
Use place value understanding to round whole numbers to the nearest 10 or 100.	Not applicable
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.	Computation, Concepts
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.	Not applicable

* Students identify arithmetic patterns to find the number missing from a pattern (e.g. 25, __ 30, 35), without explanation of operations.

Number and Operations—Fractions	mCLASS:Math Assessment
Develop understanding of fractions as numbers.	
Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.	Concepts
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.	Not applicable
Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a) Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b) Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model. c) Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram. d Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.	Concepts, Quantity Discrimination

Descriptions of Measures

Math Screening and Progress Monitoring (K-3)

mCLASS:Math Screening and Progress Monitoring uses brief, timed, curriculum-based measures that are indicators of early numeracy and are individually administered to each student.

Oral Counting (K-1): Student counts as high as possible starting from 1.

Number Identification (K-1): Student identifies printed numbers from set of randomly-assigned digits ranging from 0-100.

Quantity Discrimination (K-3): Student points to or says the larger number from pairs of printed numbers. (e.g. [2] [15]) In grades 2-3, the comparisons become more complex (e.g. [40] [30+9] , [1/2] [1/3], [.70] [.8])

Missing Number (K-3): Student identifies the missing number from a pattern of three numbers. Examples: (1,__ ,3 … __, 9, 10). In grades 2-3, the missing number is part of a number pattern. Examples: (11, __, 31, 67, 69, __)

Next Number (G1): Student says the number that follows the number verbally presented by the teacher, ranging from 0-100.

Number Facts (G1-3): Student responds to verbally presented addition problems (e.g. "Four plus two?"). In grades 2-3, worksheets contain mixed number facts including all operations.

Computation (G2-3): Students solve multi-digit computation problems across all operations.

Concepts G(2-3): Students respond to a variety items assessing fundamental number concepts.

mCLASS: Math Diagnostic Interviews (K-3)

mCLASS:Math Diagnostic is designed to help teachers delve deeper into how students think about math, uncover student problem-solving methods, and elicit the understanding that underlies their students' performance. The Interviews focus on the fundamental skills and concepts in number and operations, with five interviews spanning grades K-3. The interviews in Counting, Addition, Subtraction, Multiplication, and Written are summarized below.

Counting
The Counting Interview analyzes a student's familiarity with fundamental concepts of number -- the counting words ("one", "two", "three"…), fluidity with numbers beyond memorization of the words and sequences, one-to-one correspondence, and enumeration of a set (e.g. a set of objects described as "four").

Counting by ones
One of the first steps is learning the counting sequence from 1 to 100. Kindergarten students can often count by ones up past 42, which crosses several decade transitions. Students move beyond reciting the sequence of counting words to demonstrating a greater awareness of number. Within the range of numbers with which a student is familiar, a student should be able to pick up counting from any number and cross the subsequent decade threshold.

Students can make a variety of errors as they learn the counting words and the rules governing the counting sequence. Some may be relatively minor, such as skipping a number ("3…4…6"), reversing two numbers ("13…15…14…16"), or repeating a number ("13….14….14….15"). Further, students produce specific, systematic errors in counting, particularly around the teens ("8 … 9 … 10 … 10-one … 10-two") and decade transitions ("18 … 19 … 10-teen … 11-teen"). These errors may seem perfectly rational to the student, who may think

she has correctly figured out the pattern for counting. These specific errors are posed back to the student in follow-up questioning ("Is it okay to say, '3…4…6'?" that facilitate self-correction.

Counting by tens
Counting by tens is an important step towards solving problems without counting every unit (e.g. 31-10 = 21 without counting out ten individual steps) and understanding place value. Students in grade one count by tens to 100, with similar contingent follow-up questions based on any errors (e.g. "Is it okay to say 'twenty, forty, thirty?'")

Counting backwards
Counting backwards is harder than counting forwards, reveals fluidity with numbers, and is the first step towards understanding subtraction. First grade students count backwards from twenty, while Kindergarten students begin at nine to avoid simply repeating the "blast-off sequence" (ten!...nine!...eight!...) by rote memory.

How Many (counting objects)

Counting objects is a fundamental skill and concept that students develop in early mathematics. To successfully answer "How many chips are there?", a student must know that each chip represents a one unit, that together the chips represent a set that has an abstract property of "fourness", all of which can be described by a number word ("four").

Addition, Subtraction, Multiplication
The format is very similar for the Interviews in Addition, Subtraction, and Multiplication. Counting chips, paper, and pencil are provided for all tasks except Mental Calculation, where students must solve problems in their head.

Small Numbers
Students are asked to solve problems involving digits less than ten (e.g. 6 - 4, 8 x 5, 2 + 1), and the difficulty of the problems vary by grade. Teachers record any strategies they observe as the student solves the problem. After a student answers, the teacher is prompted to ask "How did you know that?", and "Is there another way you could figure it out?" These questions press students to articulate their problem-solving methods and reveal the depth (or lack thereof) of student understanding. The measures also serve as confirmation of mastery as students learn to recall basic facts from memory, but must also explain why those facts must be so.

Principles
Children who grasp and can generalize underlying operations from basic principles demonstrate an abstract understanding of mathematics and can solve problems more efficiently by reducing the need for computation. The interviews assess students' understanding of these principles by presenting a relatively simple problem, followed by a larger generalization question.

Zero Principle(s)
Zero plays a special role in equations depending on the operation. Zero subtracted from or added to any number results in the original number (n + 0 = n, n - 0 = n), while zero multiplied by any number results in zero (n x 0 = 0). Students are asked a relatively simple problem involving zero, then are pressed to generalize the principle to a problem involving larger numbers.

Order (Commutativity) Principle
The order of numbers in addition or multiplication problems does not affect the answer (a + b = b + a, and a x b = b x a).

Same Number (Negation) Principle
Any number subtracted from itself results in zero. (a – a = 0).

Inverse Principle
Subtraction combinations can be solved by recalling a complimentary addition combination, and vice versa. If a – b = c, then b + c = a.

Identity Principle
Any number multiplied by one equals that number. (n x 1 = n). Note: the identity elements for Addition and Subtraction are referenced under "Zero Principle(s)"

Mental Calculation
In grades one through three, solving problems without the aid of manipulatives is a critical step in mathematical learning. Successful students should be able to use base ten concepts and other mental strategies to decompose and solve complex problems mentally.

Writing Numbers (Written)
Translating spoken numbers into correctly written numerals is an important step in written mathematics. Students who have mastered this piece will write the correct numerals (7 for "seven") and put them in the correct order ("23" for "twenty-three"). Errors in writing numbers can often reveal misunderstandings of deeper concepts, as in writing "203" for "twenty-three." Students need a pencil and a blank sheet of paper for this task.

Setup a Problem (Written)
Proper set-up and alignment of a written problem is critical to executing the algorithm and getting the appropriate answer. Students must add the ones together, subtract the tens from the tens column, and cross-multiply appropriately. It is also important to know which written symbol (+,-, x) corresponds to each operation. Correctly setting up a problem demonstrates some understanding of place value. Students need a pencil and blank sheet of paper for this task.

Place Value (Written)
Place value concepts are allowing us to represent any numbers with a few written symbols. Students who have a strong understanding of place value can explain what specific numerals represent in the context of a written number (e.g. the 2 in 5,024) and can identify how many of a given unit there are (e.g. "how many tens are there in 5,024"). Teachers need sheets with the grade-appropriate numbers pre-printed.

Computation (Written)
Solving written problems involves completing several steps correctly and in sequence. Students are taught to keep track of these steps using notations for carrying and borrowing. Students who understand the principles behind carrying and borrowing are able to explain what these notations mean, while some students simply execute the set of steps they are taught. Students with greater conceptual understanding are more likely to catch their own errors and tackle larger problems.

As students are exposed to and learn these procedures for solving written problems, they can produce specific, systematic errors in executing those procedures. These errors may seem perfectly rational to the student, who has simply mislearned or misapplied the steps for solving problems. These "bugs" can lead to baffling incorrect answers that could lead a teacher to believe the student is way off track, when really the remedy may be quite simple. A small set of written problems designed with these specific errors in mind can quickly diagnose these "bugs." Teachers need sheets with the grade-appropriate problems pre-printed.