A Correlation of

SCOTT FORESMAN
Investigations
IN NUMBER, DATA, AND SPACE®

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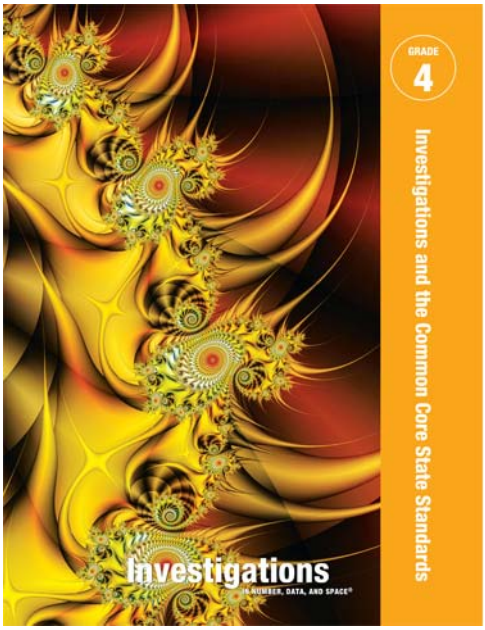

to the

Common Core State Standards for Mathematics

Grade 4

A Correlation of Investigations in Number, Data, and Space, ©2012 to the Common Core State Standards for Mathematics

Introduction

This document demonstrates how ***Investigations in Number, Data, and Space*** ©2012 meets the indicators of the Common Core State Standards for Mathematics, Grade 4. Correlation references are to the unit number and are cited at the session level. This correlation includes Classroom Routines but does not include ongoing review in Daily Practice and Homework.

Investigations in Number, Data, and Space supports students in making sense of mathematics and becoming mathematical thinkers. The program is designed to help all elementary children understand the fundamental ideas underlying number and arithmetic, geometry, data, measurement, and algebraic thinking. Students are encouraged to reason mathematically, develop problem-solving strategies, and represent their thinking using models, diagrams, and graphs. In addition to engaging the range of math learners, Investigations communicates mathematics content and pedagogy to teachers, offering them greater support built into every lesson, so that all students are successful.

Each grade level consists of a set of units, presented through investigations that involve students in the exploration of major mathematical ideas. Students gain a greater understanding of math, with meaningful practice and review that result in computational fluency. They build a greater foundation for algebra that prepares them for the challenges in middle and high school math courses.

Approaching the mathematics content through investigations helps student develop flexibility and confidence in approaching problems, fluency in using mathematical skills and tools to solve problems, and proficiency in evaluating their solutions. Students also build a repertoire of ways to communicate about their mathematical thinking, while their enjoyment and application of mathematics grows.

New to the program for the Common Core State Standards

INVESTIGATIONS AND THE COMMON CORE STATE STANDARDS Resource Book contains:

- Overview of the Common Core State Standards and Investigations
- Alignment to the Standards for Mathematical Practice
- Correlation to the Standards for Mathematical Content
- Instructional Plan for each Unit
- New Teacher Material for each Unit
- Common Core Student Activity Black Line Masters

Curriculum Units

Grade 4

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Common Core State Standards for Mathematics, Grade 4	Investigations in Number, Data, and Space, ©2012 Grade 4
Operations and Algebraic Thinking 4.OA	
Use the four operations with whole numbers to solve problems.	
1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. [4.OA.1.]	**U1 Sessions:** 3.2, 3.3 **U1 ICCG:** 1.6A **U3 Sessions:** 3.1, 3.2, 3.3, 4.1, 4.3
2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. [4.OA.2.]	**U1 Sessions:** 3.2, 3.3 **U1 ICCG:** 1.6A **U3 Sessions:** 3.1, 3.2, 3.3, 4.1, 4.3
3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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. [4.OA.3.]	**U1 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5, 3.2 **U1 ICCG:** 1.6A **U3 Sessions:** 1.1, 2.2, 2.3, 2.4 **U8 Sessions:** 1.5, 2.1, 2.2, 3.3, 3.5 **U8 ICCG:** 2.4A
Gain familiarity with factors and multiples.	
4. Find all factor pairs for a whole number in the range1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite. [4.OA.4.]	**U1 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4 **U3 Sessions:** 1.4, 1.5, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4
Generate and analyze patterns.	
5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. [4.OA.5.]	**U8 Sessions:** 1.4, 1.5, 2.4, 2.5, 3.2, 3.3, 3.4, 3.5, 3.6 **U9 Sessions:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.2, 3.3, 3.5

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Common Core State Standards for Mathematics, Grade 4	Investigations in Number, Data, and Space, ©2012 Grade 4
Number and Operations in Base Ten 4.NBT**	
Generalize place value understanding for multi-digit whole numbers.	
1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. [4.NBT.1.]	**U5 Sessions:** 1.1, 3.1, 3.2 **U5 ICCG:** 3.6A
2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. [4.NBT.2.]	**U5 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5A, 1.5, 1.6, 2.1, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6A, 4.1, 4.2, 4.3, 4.4A, 4.4, 4.5, 4.6 **U5 ICCG:** 3.6A **U6 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7 **U7 ICCG:** 3.5A, 3.5B
3. Use place value understanding to round multi- digit whole numbers to any place. [4.NBT.3.]	**U5 ICCG:** 1.5A, 3.6A
Use place value understanding and properties of operations to perform multi-digit arithmetic.	
4. Fluently add and subtract multi-digit whole numbers using the standard algorithm. [4.NBT.4.]	**U2 Sessions:** 1.1, 1.2, 1.3, 2.1, 2.2, 2.4, 2.5, 2.6, 3.5 **U4 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5, 3.1, 3.2, 3.3, 4.5, 4.6, 4.7 **U4 ICCG:** 2.3A, 3.4A **U5 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 **U5 ICCG:** 4.4A
5. Multiply a whole number of up to four digits by a one-digit whole number and multiply two two-digit numbers using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations rectangular arrays and/or area models. [4.NBT.5.]	**U3 Sessions:** 1.1, 1.3, 1.4, 1.5, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5 **U8 Sessions:** 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.4, 3.5, 3.6 **U8 ICCG:** 2.4A **U9 Sessions:** 2.1, 2.4, 2.5, 2.6, 2.8, 3.3, 3.4

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Common Core State Standards for Mathematics, Grade 4	**Investigations in Number, Data, and Space, ©2012 Grade 4**
6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors using strategies based on place value the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations rectangular arrays and/or area models. [4.NBT.6.]	**U3 Sessions:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 4.1 **U8 Sessions:** 3.1, 3.2, 3.3, 3.4, 3.6 **U8 ICCG:** 3.5A **U9 Sessions:** 2.1, 2.2, 2.4, 2.5, 2.6, 2.8, 3.3, 3.4
Number and Operations—Fractions + 4.NF	
Extend understanding of fraction equivalence and ordering.	
1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. [4.NF.1.]	**U6 Sessions:** 1.1, 1.5, 2.1, 2.3, 2.5, 2.6
2. Compare two fractions with different numerators and different denominators e.g. by creating common denominators or numerators or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols > = or < and justify the conclusions e.g. by using a visual fraction model. [4.NF.2.]	**U6 Sessions:** 1.7, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.7
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	
3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. [4.NF.3.]	
a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. [4.NF.3.a.]	**U6 Sessions:** 1.1, 1.2, 1.5, 1.6, 1.7, 2.5 **U6 ICCG:** 1.8A
b. Decompose a fraction into a sum of fractions with the same denominator in more than one way recording each decomposition by an equation. Justify decompositions e.g. by using a visual fraction model. [4.NF.3.b.]	**U6 Sessions:** 1.1, 1.2, 1.6

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c. Add and subtract mixed numbers with like denominators e.g. by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction. [4.NF.3.c.]	**U6 ICCG:** 2.7A
d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators e.g. by using visual fraction models and equations to represent the problem. [4.NF.3.d.]	**U6 Sessions:** 1.3, 1.4 **U6 ICCG:** 1.8A
4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. [4.NF.4.]	
a. Understand a fraction *a*/*b* as a multiple of 1/*b*. [4.NF.4.a.]	**U6 ICCG:** 3A.1, 3A.2, 3A.3
b. Understand a multiple of *a*/*b* as a multiple of 1/*b* and use this understanding to multiply a fraction by a whole number. [4.NF.4.b.]	**U6 ICCG:** 3A.1, 3A.2, 3A.3
c. Solve word problems involving multiplication of a fraction by a whole number e.g. by using visual fraction models and equations to represent the problem. [4.NF.4.c.]	**U6 ICCG:** 3A.1, 3A.2, 3A.3
Understand decimal notation for fractions and compare decimal fractions.	
5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions with respective denominators 10 and 100. [4.NF.5.]	**U6 Sessions:** 3.1, 3.3
6. Use decimal notation for fractions with denominators 10 or 100. [4.NF.6.]	**U6 Sessions:** 3.1, 3.2, 3.3

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7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols > = or < and justify the conclusions e.g. by using a visual model. [4.NF.7.]	**U6 Sessions:** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7 **U7 Sessions:** 3.1, 3.2
Measurement and Data 4.MD	
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	
1. Know relative sizes of measurement units within one system of units including km m cm; kg g; lb oz.; l ml; hr min sec. Within a single system of measurement express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. [4.MD.1.]	**U4 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5 **U7 ICCG:** 3.5A, 3.5B **U9 Sessions:** 3.1, 3.2, 3.3, 3.5
2. Use the four operations to solve word problems involving distances intervals of time liquid volumes masses of objects and money including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. [4.MD.2.]	**U2 Sessions:** 1.2, 1.3, 1.4, 1.5, 2.4, 2.5 **U4 Sessions:** 1.3, 1.5 **U5 Sessions:** 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 3.4, 3.5, 4.5, 4.6 **U6 Sessions:** 3.1, 3.4, 3.5, 3.6 **U7 ICCG:** 3.5B **U8 Sessions:** 2.1, 3.1, 3.5 **U8 ICCG:** 2.4A
3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. [4.MD.3.]	**U4 Sessions:** 1.1, 1.3, 1.4, 1.5, 2.3, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7
Represent and interpret data.	
4. Make a line plot to display a data set of measurements in fractions of a unit (1/2 1/4 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. [4.MD.4.]	**U6 ICCG:** 2.7A **U9 Sessions:** 3.1, 3.2

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Geometric measurement: understand concepts of angle and measure angles.	
5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint and understand concepts of angle measurement: [4.MD.5.]	
a. An angle is measured with reference to a circle with its center at the common endpoint of the rays by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle" and can be used to measure angles. [4.MD.5.a.]	**U4 ICCG:** 2.3A, 3.4A
b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. [4.MD.5.b.]	**U4 ICCG:** 3.4A
6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. [4.MD.6.]	**U4 Sessions:** 3.1, 3.2, 3.3 **U4 ICCG:** 3.4A
7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems e.g. by using an equation with a symbol for the unknown angle measure. [4.MD.7.]	**U4 Sessions:** 3.1, 3.2, 3.3
Geometry 4.G	
Draw and identify lines and angles and classify shapes by properties of their lines and angles.	
1. Draw points lines line segments rays angles (right acute obtuse) and perpendicular and parallel lines. Identify these in two-dimensional figures. [4.G.1.]	**U4 Sessions:** 2.1, 2.2, 2.3, 2.4, 2.5, 4.7 **U4 ICCG:** 2.3A, 3.4A
2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category and identify right triangles. [4.G.2.]	**U4 Sessions:** 2.1, 2.3, 2.4, 2.5, 4.1, 4.2, 4.3, 4.4, 4.7 **U4 ICCG:** 2.3A

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3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. [4.G.3.]	**U4 Sessions:** 4.1, 4.2, 4.3, 4.4, 4.6
Math Practices	
1. Make sense of problems and persevere in solving them.	A major goal of **Investigations in Number, Data, and Space** is to support students to make sense of mathematics and learn that they can become mathematical thinkers. To this end, students create, use, and share contexts and representations to make sense of problems. Classroom discussions highlight different ways of interpreting a problem, solving it, and using representations to communicate the pertinent mathematical ideas. Students persevere in solving problems by investigating and practicing problem-solving strategies. Please find representative examples from the Grade 4 program: **U1 Sessions:** 3.1, 3.2, 3.3 **U3 Sessions:** 4.3, 4.4 **U5 Sessions:** 3.4, 3.5, 4.4, 4.5, 4.6 **U7 Sessions:** 3.1, 3.2, 3.3, 3.4 **U8 Sessions:** 3.1, 3.2, 3.3, 3.4, 3.5

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2. Reason abstractly and quantitatively.	Another major goal of **Investigations** is to provide a curriculum that emphasizes reasoning about mathematical ideas. Students move between concrete examples with specific quantities, objects, or data and generalizations about what works in similar situations. They express these generalizations in words, with variables, and with various representations including contexts, diagrams, and manipulatives. Abstract and quantitative reasoning are reinforced in strategically challenging games as well as Ten-Minute Math (Grades 3–5). Students flexibly use different properties of operations to solve problems. Please find representative examples from the Grade 4 program: **U1 Sessions:** 2.3, 2.4, 2.5 **U3 Sessions:** 1.3, 1.4, 1.5 **U6 Sessions:** 1.6, 1.7 **U9 Sessions:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 **U1, U2, U4, U5 Ten-Minute Math:** Today's Number

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3. Construct viable arguments and critique the reasoning of others.	The program provides ongoing opportunities for students to express and defend mathematical arguments. Students use a variety of representations, contexts, and examples to "prove" their conclusions and provide feedback about the arguments made by their classmates. The program emphasizes that there is often more than one strategy for solving a problem. Students defend their strategies as they listen to and evaluate the choices made by others. Students' strategies are often recorded on a chart and posted so that all students can analyze, review, and use their classmates' ideas. Please find representative examples from the Grade 4 program: **U2 Sessions:** 2.3, 2.4, 2.5 **U4 Sessions:** 2.4, 2.5 **U5 Sessions:** 2.1, 2.2, 2.3 **U6 Sessions:** 2.1, 2.2, 2.3 **U8 Sessions:** 2.1, 2.2, 2.3, 2.4
4. Model with mathematics.	Throughout the curriculum, students use representations and contexts to visualize, describe, and analyze mathematical relationships. Using these models allows students to express and further develop their ideas, and to engage in the ideas of others. They develop a repertoire of models they know well and can apply when faced with unfamiliar problem situations. Students use representations and contexts judiciously and with purpose. Please find representative examples from the Grade 4 program: **U3 Sessions:** 1.1, 3.2, 3.3 **U5 Session:** 4.2 **U6 Sessions:** 1.3, 1.4 **U7 Sessions:** 3.1, 3.2, 3.3, 3.4 **U9 Sessions:** 2.1, 2.2, 2.3, 2.4

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5. Use appropriate tools strategically.	Students have access to an array of tools, such as connecting cubes, pattern blocks, 100 charts, and technology. Students use other tools, such as drawings, the number line, or a rectangular array. Mathematical tools are introduced that are useful for a whole class of problems and can be extended to accommodate more complex problems and/or students' expanding repertoire of numbers. Analysis of the solution to a problem includes consideration of the effectiveness and choice of the tools. During Math Workshops, students continue to use tools to foster mathematical understanding and to practice skills. Please find representative examples from the Grade 4 program: **U4 Sessions:** 1.1, 1.2, 1.3, 1.4. 1.5, 2.3, 3.1, 3.2, 3.3 **U5 Sessions:** 1.2, 1.3, 1.4, 1.5, 1.6 **U6 Sessions:** 2.5, 3.1, 3.2, 3.3 **U8 Sessions:** 3.2, 3.3 **U9 Sessions:** 3.1, 3.2, 3.3, 3.4
6. Attend to precision.	Every session requires students to communicate with precision. The Student Math Handbook provides support in this endeavor. Strategies that students use are often named by the mathematics used in order to foster precise communication. Many of the sessions' focal points stress the use of "clear and concise" notation. Students are expected to solve problems efficiently and accurately. Please find representative examples from the Grade 4 program: **U3 Sessions:** 4.3, 4.4 **U4 Sessions:** 2.1, 2.2, 2.3, 2.4, 2.5 **U5 Sessions:** 2.1, 2.2, 2.3, 2.4 **U6 Sessions:** 3.1, 3.2

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7. Look for and make use of structure.	In each unit, students work between the concrete to the abstract, from numerical and geometrical patterns to general representations. Students are given opportunities and support to investigate, discover, conjecture, and make use of commonalities among related problems. Students use the structure of carefully chosen contexts and representations that embody important characteristics of mathematical relationships. Ten-Minute Math (Grades 3–5)afford more situations in which students discover and use the various structures of mathematics. Please find representative examples from the Grade 4 program: **U2 Sessions:** 2.5, 2.6 **U5 Sessions:** 1.1, 1.2, 1.3, 1.4, 1.5 **U6 Session:** 3.3 **U8 Sessions:** 1.3, 1.4, 1.5 **U9 Sessions:** 2.7, 2.8 **U1, U4, U7 Ten-Minute Math:** Quick Images **U5–U7: Ten-Minute Math:** Practicing Place Value
8. Look for and express regularity in repeated reasoning.	A hallmark of the **Investigations** program is its emphasis on helping students become mathematical thinkers as they explore and practice strategies for solving problems. Through repeated application and comparison of various strategies and algorithms, students develop an understanding of which method is efficient for a particular type of problem. Each Investigations unit on numbers and operations includes a focus on reasoning and generalizing about number and operations and highlights what students already notice in regularities about numbers and operations. Please find representative examples from the Grade 4 program: **U3 Sessions:** 4.1, 4.2, 4.3, 4.4 **U5 Sessions:** 2.1, 2.2, 2.3, 2.4 **U7 Sessions:** 3.1, 3.2, 3.3, 3.4 **U8 Sessions:** 2.2, 2.3, 2.4, 3.4

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