

OVERVIEW of INVESTIGATIONS 3

About Investigations

Investigations 3 is a focused, coherent and rigorous K-5 mathematics curriculum. Making sense of mathematics is the heart of the work for students and teachers. The culmination of over 25 years of research and development aimed at improving the teaching and learning of elementary mathematics, Investigations 3 is fully aligned to the content and practice standards of the Common Core State Standards (CCSS). Deep and careful attention is paid to mathematics content and to student thinking and understanding. Investigations 3 maintains and builds on the philosophy and pedagogy of the first and second editions, and continues to be based on the work of real teachers and students. Its goals remain the same, as do its underlying, student-centered guiding principles.

Guiding Principles

- Students have mathematical ideas. The curriculum supports all students in developing and expanding those ideas.
- Teachers are engaged in ongoing learning about mathematics content, pedagogy, and student learning. The curriculum supports them in this learning.
- Teachers collaborate with the students and curriculum materials to create the curriculum as enacted in the classroom. The curriculum provides a clear, focused, and coherent mathematical agenda and supports teachers in implementing in a way that accommodates the needs of their particular students.

Standards for Mathematical Practice

Developing an understanding of what it means to do mathematics is fundamentally about the practices of the discipline. *Investigations* has always integrated into the learning sequence those core mathematical practices that focus on reasoning, communication, and sense-making. *Investigations 3* makes explicit the CCSS Mathematical Practices. Support material for teachers—an essay about the two practices highlighted and assessed in each unit and sidebars that indicate opportunities for engaging students in all of the practices—provide images of what these practices look like in the elementary classroom, explain how math practices interact with math content, and offer guidance for helping young students learn how to use these practices in their mathematical work.

Components

Each grade is made up of 8 curriculum units, an Implementation Guide, and a Content Guide. Also available for teachers: a Spanish Companion and an Assessment Sourcebook specific to the grade. Each classroom uses manipulatives along with cards specific to their grade level and one Student Activity Book per student. The curriculum can be taught without access to technology, entirely digitally, or using a blended approach.

Features of The Curriculum

- Explicit and careful attention to the Standards for Mathematical Practice
- Embedded differentiation support
- Extensive assessment
- Regular review and practice
- Built-in professional development

Multiple Forms of Assessment

Investigations 3 supports teachers in assessing what students do and do not yet know in a variety of ways. There are daily opportunities for formative assessment (i.e. Observing the Students at Work). There are also three kinds of formal assessment: checklists to track information about the Mathematical Practices and about Benchmarks that can best be assessed via observation (K-5); brief Quizzes every 8-10 sessions that familiarize students with a variety of test question formats (1-5); and embedded assessments that ask students to show and/or explain their work (1-5). Assessment Teacher Notes accompany embedded assessments, and provide analysis of student work that meets, partially meets, or doesn't yet meet the benchmark, as well as suggestions for what to do with students in the latter two categories.

Support for the Range of Learners

All teachers are faced with the challenge of meeting the needs of the range of learners in their classrooms, which can include students who struggle or excel in certain areas of mathematics (but perhaps not in others), students who are learning English, and students who have particular learning needs. *Investigations 3* provides such support on several levels. Most sessions have some combination of activity-specific intervention, extension, and/or ELL suggestions. These are labeled with tags that describe generalizable strategies for differentiation (e.g. suggest a tool, provide sentence stems). An additional Intervention, Practice, and Extension activity is also included at the end of each Investigation (1-5), and a Spanish Companion provides teacher dialogue in Spanish.

Embedded Professional Development

From the beginning, *Investigations* was designed as a tool for teacher as well as student learning. Professional development resources embedded in the curriculum include Teacher Notes and Dialogue Boxes, found at the end of each unit, sidebar notes in the sessions, and essays at the beginning of each unit about mathematics content and the Mathematical Practices that are the focus of that unit. Together, these resources form a tool for professional development—a tool that supports teachers in learning about mathematics content and practices, how students learn, and effective student-centered pedagogy.

Kindergarten Scope and Sequence

Unit 1: Counting People, Sorting Buttons - Routines and Materials - This unit introduces the processes, structures, and materials that form the basis of math instruction throughout the year and establishes the mathematical community. It also introduces the Classroom Routines that develop and reinforce concepts and ideas in the Number and Operations, Data, and Geometry strands of Investigations.

Unit 2: Counting Quantities, Comparing Lengths - Counting and Measurement - This unit focuses on connecting number names, numerals, and quantities; counting and developing visual images of quantities up to 10; comparing and ordering two or more amounts; and describing and measuring the length of objects by direct comparison. Students develop strategies for accurately counting quantities up to 10.

Unit 3: Make a Shape, Fill a Hexagon - 2-D Geometry - The focus of this unit is on identifying, describing, and comparing attributes of 2-D shapes, naming shapes, considering the features of specific shapes, and composing and decomposing shapes from and into smaller shapes.

Unit 4: Collect, Count, and Measure - The focus of this unit is on counting and representing sets of up to 15 objects, applying counting skills by using multiple units to measure and compare lengths, decomposing numbers in many different ways, and beginning to make sense of the operations of addition and subtraction. Through this unit, they consider how notation can represent these situations.

Unit 5: Build a Block, Build a Wall - 3-D Geometry - The focus of this unit is on identifying, describing, and comparing attributes of 3-D shapes, naming 3-D shapes, constructing 3-D shapes, and composing and decomposing 3-D shapes from and into smaller shapes. Students look for, make, and compare 3-D shapes in their environment and describe how they are the same and different.

Unit 6: How Many Now? - Addition, Subtraction, and the Number System - The focus of this unit is on counting sets of up to 20 objects; decomposing the numbers to 10 in a variety of ways; using notation to describe addition and subtraction situations; finding and exploring combinations of a number; and solving addition and subtraction story problems.

Unit 7: How Many Noses? How Many Eyes? - Modeling with Data - The focus of this unit is on describing attributes of objects and data, and using this information to sort, classify, count, order, compare, and represent data, and to use this data to model real-world problems with mathematics.

Unit 8: Ten Frames and Teen Numbers - Addition, Subtraction, and the Number System - The focus of this unit is on extending the counting sequence to 100, including counting from numbers other than 1 and by 10s, adding and subtracting in a variety of contexts, and making sense of the teen numbers as a group of ten ones and some number of leftover ones. Students solve story problems, relate a problem to the equation it represents, and make up and solve stories for given expressions. Students develop fluency with addition and subtraction within 5, find the complement of 10 when given one addend, and work with the teen numbers in ways that highlights that those numbers are composed of ten ones and some number of ones.

1st Grade Scope and Sequence

Unit 1: Building Numbers and Solving Story Problems - Addition, Subtraction, and the Number System - This unit focuses on counting and comparing quantities, connecting counting to the operations of addition and subtraction, and developing an understanding of and strategies for solving addition and subtraction problems via story problems and games.

Unit 2: Comparing and Combining Shapes - 2-D Geometry - This unit focuses on observing and describing attributes of 2-D shapes, using attributes to build, compare, and sort 2-D shapes, and composing and decomposing 2-D shapes focusing on triangles and quadrilaterals.

Unit 3: How Many of Each? How Many in All? - Addition, Subtraction, and the Number System - This unit focuses on counting on/back as a strategy for adding/subtracting; composing and decomposing numbers into parts and playing games that involve an unknown change; adding more than two numbers; addition and subtraction notation, and counting and comparing larger quantities. Number composition and beginning place value is also a focus.

Unit 4: Fish Lengths and Fraction Rugs - Measurement and Fractions - This unit focuses on developing accuracy with linear measurement, solving comparison problems, and exploring time and fractions as equal parts of a whole. Students compare object lengths, and measure the lengths of various objects using several different units. They observe, describe, and decompose shapes into halves and fourths. Students tell time to the hour, and are also introduced to telling time to the half hour.

Unit 5: Number Games and Crayon Problems - Addition, Subtraction, and the Number System - This unit focuses on developing fluency with addition and subtraction within 10, and working with problems with unknown addends or an unknown change. Students continue to decompose 2-digit numbers into the sum of multiples of ten and ones, reinforcing foundational ideas of number composition and place value.

Unit 6: Would You Rather Be an Eagle or a Whale? - Modeling with Data - This unit focuses on collecting, recording, representing, describing and comparing data in two and three categories, and on conducting data investigations.

Unit 7: How Many Tens? How Many Ones? - Addition, Subtraction, and the Number System - This unit focuses on counting by numbers other than 1, with an emphasis on groups of 10; adding and subtracting groups of ten, and on representing 2-digit numbers with tens and ones and using those models to add within 100.

Unit 8: Blocks and Buildings - 3-D Geometry - The focus of this unit is on observing, describing, comparing, and building 3-D shapes and on developing vocabulary for naming and describing defining attributes of 2-D and 3-D shapes. As they describe, draw, and build students explore the relationship between 2-D and 3-D shapes. They also demonstrate fluency with telling time to the half hour.

2nd Grade Scope and Sequence

Unit 1: Coins, Number Strings, and Story Problems - Addition, Subtraction, and the Number System - In this unit students add and subtract single-digit numbers, focusing particularly on adding numbers in any order; shifting from counting by 1s to counting by groups, which lays the foundation for students' work with place value. They develop and refine strategies for solving addition and subtraction problems.

Unit 2: Attributes of Shapes and Parts of a Whole - Geometry and Fractions - The focus of this unit is on observing and describing attributes of 2-D and 3-D shapes (e.g. faces, length of sides, angles, and vertices), and using those attributes as they sort, construct, draw, and compare shapes. This unit also develops ideas about equal parts of a whole, focusing specifically on partitioning and describing halves, fourths, and thirds of one whole.

Unit 3: How Many Stickers? How Many Cents? - Addition, Subtraction, and the Number System - This unit focuses on the place value of 2-digit numbers, and operating on those numbers within 100. Students come to see 100 as ten 10s and multiples of 100 as being made up of hundreds groups. They solve a variety of types of story problems. Work on fluency with addition and subtraction within 100 continues, with a focus on using known facts and knowledge of the operation. Students also identify, read, and write numbers to 500.

Unit 4: Pockets, Teeth, and Guess My Rule - Modeling with Data - This unit focuses on sorting and classifying categorical data; ordering numerical data; and collecting and representing categorical and numerical data using a variety of representations. Students describe the data, and discuss what the data tell them about the group surveyed which develops their ability to model with data.

Unit 5: How Many Tens? How Many Hundreds? - Addition, Subtraction, and the Number System - This unit focuses on the place value of 3-digit numbers and operations within 100. They solve many types of story problems and play games to combine amounts to get to 100 or \$1. Fluency with addition within 100 is a benchmark in this unit. Students also read, and write numbers to 1,000 and add/subtract 10 and 100 to numbers in that range.

Unit 6: How Far Can You Jump? - Linear Measurement - This unit focuses on developing strategies for accurately measuring length with nonstandard and standard units and tools and for considering the relationship between different units and tools (e.g., the larger the unit, the smaller the count will be). Students represent measurement data on a line plot and solve story problems that involve adding, subtracting and comparing lengths.

Unit 7: Partners, Teams, and Other Groups - Foundations of Multiplication

The focus of this unit is on working with equal groups as the foundation of multiplication by investigating even and odd numbers and by representing equal groups with arrays and tables.

Unit 8: Enough for the Class? Enough for the Grade? - Addition, Subtraction, and the Number System - This unit focuses on developing and achieving fluency with subtraction within 100, and on achieving fluency with addition and subtraction facts within 20. Comparison problems with a smaller unknown are introduced. They end the year using strategies they know and use for adding and subtracting 2-digit to model addition and subtraction with 3-digit numbers. Students also demonstrate fluency with time to the nearest five minutes and using A.M. and P.M.

3rd Grade Scope and Sequence

Unit 1: Understanding Equal Groups - Multiplication and Division - This unit focuses on understanding multiplication and the inverse relationship between multiplication/division. Students solve multiplication/division story problems and equations. Multiples and arrays are introduced. Students work to develop fluency with many multiplication facts and find factors of numbers up to 100.

Unit 2: Graphs and Line Plots - Modeling with Data - This unit focuses on using bar graphs, pictographs, and line plots to represent, describe, and compare data. They solve 1 and 2 step graph problems. Students take measurements in inches, half-inches, feet, and yards.

Unit 3: Travel Stories and Collections - Addition, Subtraction, and the Number System - This unit focuses on extending knowledge of the number system to 1,000, and adding/subtracting efficiently. Students use place value to represent numbers in multiple ways. They develop strategies for adding/subtracting 2-digit and 3-digit numbers with sums and differences to 400.

Unit 4: Perimeter, Area, and Polygons - 2-D Geometry and Measurement - This unit focuses on finding perimeter and area and classifying 2-D figures. Students use standard tools to measure length and perimeter. They use square units to measure area and build on multiplication work to find area by multiplying length and width. Students explore attributes of triangles and categories of quadrilaterals.

Unit 5: Cube Patterns, Arrays, and Multiples of 10 - Multiplication and Division - This unit focuses on the meaning of multiplication and division and their relationship, solving multiplication and division problems, multiplying by multiples of 10, and learning the remaining multiplication facts. Students analyze patterns and multiply single-digit numbers by multiples of 10 and complete multi-step problems.

Unit 6: Fair Shares and Fractions on Number Lines - Fractions - This unit focuses on understanding the meaning of fractions as numbers and as equal parts of a whole; reasoning about equivalent fractions; comparing fractions; and using notation to model fractions and fraction relationships. Students represent and compare fractional quantities, including fractions greater than one.

Unit 7: How Many Miles? - Addition, Subtraction, and the Number System - This unit focuses on understanding the operations of addition and subtraction, and adding and subtracting fluently. Students add and subtract multiples of 10 and 100 from 3-digit numbers, and solve problems that involve liquid volume and mass. Students share, discuss, and compare different strategies for addition and subtraction.

Unit 8: Larger Numbers and Multi-Step Problems - Multiplication and Division - This unit focuses on strategies for solving multiplication and division problems including problems with remainders, learning the division facts, identifying arithmetic patterns, and multi-step problems.

4th Grade Scope and Sequence

Unit 1: Arrays, Factors, and Multiplicative Comparison - Multiplication and Division - This unit focuses on using arrays and multiplicative comparison problems to understand multiplication, and gaining familiarity with factors and multiples. Students use arrays to model multiplication situations and to find factors and identify prime numbers to 100. They use what they know about factors of 100 to find factors of multiples of 100, and examine the idea that factors of a number are also factors of a multiple of that number.

Unit 2: Generating and Representing Measurement Data - Modeling with Data - This unit focuses on using line plots to represent, describe, and compare measurement data; on modeling real-world problems with mathematics; and on constructing arguments based on data. Students measure and compare the heights of first and fourth graders. They collect measurement data of their choosing, and use line plots to represent and analyze the data.

Unit 3: Multiple Towers and Cluster Problems - Multiplication and Division - This unit focuses on solving multiplication problems with 2-digit numbers, understanding the meaning and structure of, and the relationship between, multiplication and division, and using that understanding to solve multiplication and division problems. Students use marked and unmarked arrays to represent multiplication strategies that involve breaking numbers apart. They solve and represent division story problems, including problems with remainders. Students develop strategies for breaking the numbers in larger multiplication problems apart in order to use number relationships that they know, including multiplying by a multiple of 10.

Unit 4: Measuring and Classifying Shapes - 2-D Geometry and Measurement - In this unit students work with linear measurement, sorting and classifying polygons, measuring angles using standards and nonstandard measuring tool, and symmetry and area.

Unit 5: Large Numbers and Landmarks - Addition, Subtraction, and the Number System - This unit focuses on understanding the meaning of addition and subtraction, understanding the base-10 number system with numbers to 1,000,000, and adding and subtracting multi-digit numbers fluently, including with the U.S. standard algorithms.

Unit 6: Fraction Cards and Decimal Grids - Fractions and Decimals - This unit focuses on understanding the meaning of fractions and decimals; and comparing fractions and decimals including finding equivalents. Students use contexts and representations such as rectangles (an area model) and number lines (a linear model) to add, subtract, and multiply fractions.

Unit 7: How Many Packages and Groups? - Multiplication and Division - This unit focuses on the operations of multiplication and division, including problems involving converting measurements. Students refine their strategies for solving multiplication problems with two 2-digit numbers and with a 4-digit number and a 1-digit number, and they use the relationship between multiplication and division to develop and practice strategies for solving division problems with up to a 4-digit dividend and a 1-digit divisor.

Unit 8: Penny Jars and Towers - Analyzing Patterns and Rules - This unit focuses on solving multi-step problems, generating and analyzing patterns, and using symbolic notation to model situations. Two contexts (Penny Jars and Windows and Towers) are used that include both additive and multiplicative situations.

5th Grade Scope and Sequence

Unit 1: Puzzles, Clusters, and Towers - Multiplication and Division - This unit focuses on the operations of multiplication and division. Students refine their strategies for solving multiplication problems with 2-digit numbers, and use the relationship between multiplication and division to develop and practice strategies for solving division problems. They use order of operations to solve computation problems.

Unit 2: Prisms and Solids - 3-D Geometry and Measurement - This unit focuses on the structure and volume of three-dimensional (3-D) shapes, specifically on rectangular prisms and solids composed of rectangular prisms. Students build models and patterns for boxes that hold quantities of cubes and calculate the volume of these boxes, using a cube as a unit of measure. Because volume is additive, students find the volume of solids by decomposing them into rectangular prisms. They use standard units of measure for volume and apply formulas for volume as they determine the volume of a variety of rectangular solids.

Unit 3: Rectangles, Clocks, and Tracks - Rational Numbers 1: Addition and Subtraction - This unit focuses on deepening and extending students' understanding of fractions and equivalent fractions and representing fractions using an area model (rectangles), a rotation model (a clock), and a linear model (number lines). They use these understandings to add and subtract fractions and mixed numbers.

Unit 4: How Many People and Teams? - Multiplication and Division 2 - This unit focuses on the operations of multiplication and division. Students refine their strategies for solving multiplication problems fluently, including using the U.S. standard algorithm. Students continue using the relationship between multiplication and division to efficiently solve division problems with 4-digit dividends and 2-digit divisors.

Unit 5: Temperature, Height, and Growth - Analyzing Patterns and Rules - This unit focuses on using coordinate graphs, ordered pairs, tables, and symbolic notation to model real world and mathematical situations. Students analyze arithmetic patterns in tables and the shapes of graphs to describe and compare these situations. Students work both with situations that follow patterns, allowing predictions of future values (e.g., how the area of a square varies as the length of a side increases) and situations based on data (e.g., temperature over time).

Unit 6: Between 0 and 1 - Rational Numbers 2: Addition and Subtraction - This unit focuses on deepening and extending students' understanding of decimals and the base-10 number system. Students represent decimals on grids and number lines. They use their understanding of decimals to compare, add, and subtract decimals.

Unit 7: Races, Arrays, and Grids - Rational Numbers 3: Multiplication and Division - This unit focuses on multiplying and dividing rational numbers, which includes extending students' understanding of the meaning of those operations and of place value. Students use contexts and representations (fraction bars, arrays, and grids) to solve problems involving multiplication and division of fractions and decimals. Students also apply their understandings of multiplication and division to solve measurement conversion problems.

Unit 8: Properties of Polygons - 2-D Geometry and Measurement - This unit focuses on classifying triangles and quadrilaterals based on their properties and on using patterns to describe how the perimeters and areas of rectangles change when the dimensions of the rectangle change. Students examine how categories of polygons are related and how a figure can belong to more than one category. As they build sequences of related rectangles, they analyze numerical relationships and practice adding and multiplying mixed numbers and decimals.