



Grades K-5 Unit Summaries: 2nd Edition

Kindergarten Unit Summaries¹

Who Is in School today?: Classroom Routines and Materials

This unit introduces the processes, structures, and materials that are important features of the kindergarten math curriculum. It also introduces routines, common to many kindergarten classrooms, that students will encounter regularly throughout the year. These routines include taking attendance, using the calendar to count and to keep track of time and events, counting sets of objects, and collecting and discussing data about the class. They offer reinforcement of number concepts that are central to the kindergarten curriculum.

Counting and Comparing: Measurement and The Number System 1

Students explore numbers through a variety of counting activities. They build knowledge of the counting sequence, use numerals to represent quantities, represent equivalent amounts, and develop skills for accurate counting. They also begin to compare quantities. As an introduction to linear measurement, students measure and compare the lengths of objects using direct comparison.

What Comes Next?: Patterns and Functions

In this unit, students investigate what makes a repeating pattern. They focus on attributes of objects and think about which attributes (i.e., size, color, shape, orientation) are important in the patterns they are making. Students work with simple and complex repeating patterns. They have many opportunities to copy, create, and extend repeating patterns using a variety of materials and common objects. They use patterns to determine what comes next and focus on the part, or unit, of a pattern that repeats.

¹ This document applies to the 2nd edition of *Investigations* (2008, 2012). See <http://investigations.terc.edu/CCSS/> for changes when implementing *Investigations and the Common Core Standards*.

Measuring and Counting: Measurement and the Number System 2

Students gain a deeper understanding of numbers and number relationships as they engage in activities in which they count, combine, and compare amounts. They develop visual images of numbers and solve problems in which they find different combinations of the same number. Students are introduced to addition and subtraction situations through story problem contexts. Work with linear measurement continues as students use nonstandard units to measure the length of objects and paths.

Make a Shape, Build a Block: 2-D and 3-D Geometry

Students explore geometry using a variety of materials, including Geoblocks, pattern blocks, interlocking cubes and geoboards. They describe, sort, and compose and decompose two- and three-dimensional shapes. They think about shapes in their environment and match two-dimensional shapes to three-dimensional objects. The *Shapes* software is introduced as a tool for extending and deepening this work. This tool is designed for K–2 students to explore how different shapes go together, experiment with different sorts of geometric transformations (rotations, translation, reflection), explore patterning, and investigate symmetry.

How Many Do You Have?: Addition, Subtraction, and the Number System

Students continue to work with counting and number composition as they count sets of objects and find multiple combinations of the same number as they decompose numbers to 10. They use numbers and notation to describe arrangements of tiles and number combinations. Students continue to develop an understanding of the operations of addition and subtraction as they act out, model, solve story problems, and play games that involve combining or separating small amounts.

Sorting and Surveys: Data Analysis

This unit develops ideas about sorting and classifying, counting, representing, conducting a data investigation, and using data to solve a problem. In this unit, students sort objects according to common attributes, as well as sort data about their class. They collect, record, and represent categorical and numerical data about their class, and they carry out their own data investigation by collecting responses to their own survey questions.



Grade 1 Unit Summaries¹

How Many of Each?: Addition, Subtraction, and the Number System 1

In this first number unit in Grade 1, students count, order, compare quantities, and work with the operation of addition. Students also work on finding addition combinations up to 10 and learn to make sense of and solve story problems. They are introduced to several of the classroom routines that practice and reinforce work with counting, developing visual images of number, collecting data, and working with concepts of time (calendar/clock).

Making Shapes and Designing Quilts: 2-D Geometry

This geometry unit focuses on two-dimensional shapes and the relationships between them. Students observe, describe, compare, classify, represent, and compose and decompose 2-D shapes. Students learn to use geometric language to describe and identify important features of familiar 2-D shapes. As they sort and describe groups of shapes, they begin to distinguish specific attributes of triangles and quadrilaterals. As a final project, students create paper quilts by repeating combinations of triangles and squares. The *Shapes* software is introduced as a tool for extending and deepening this work. This tool is designed for K–2 students to explore how different shapes go together, experiment with different sorts of geometric transformations (rotations, translation, reflection), explore patterning, and investigate symmetry.

Solving Story Problems: Addition, Subtraction, and the Number System 2

This unit focuses on counting to higher numbers (forward and back, counting sets of objects, comparing larger quantities, composing and decomposing numbers, and finding all the two-addend combinations of a number). Students revisit familiar addition activities with variations that encourage counting on, and they are introduced to the operation of subtraction. Through games and story problems, students' work focuses on developing an understanding of addition and subtraction, using numbers and notation to represent these operations, and developing strategies for solving addition and subtraction problems.

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What Would You Rather Be?: Data Analysis

Students pose questions and collect and sort information about data. They make representations of their findings and share them with others. Students sort a group of objects according to a given attribute.

Fish Lengths and Animal Jumps: Measurement

This unit focuses on developing the ideas about linear measurement, which include understanding what length is and developing a foundation of skills for accurate linear measurement using nonstandard and standard units. As students measure with a variety of units, they investigate the idea that different-sized units result in different measurements. Using a real-world context, students measure with inch tiles and grapple with the idea of partial units and “at least as long as,” ideas that are important in both measurement and number and operations. They also solve story problems, which involve comparing length.

Number Games and Crayon Puzzles: Addition, Subtraction, and the Number System 3

Students work on composing numbers with two and three addends, and in a variety of contexts, they work with combinations that equal 10 and explore relationships among those combinations. The addition and subtraction work of this unit continues to focus on making sense of the operations of addition and subtraction, practicing adding and subtracting single-digit numbers, and solving addition and subtraction story problems. There is a focus on naming and comparing different strategies used for solving problems such as counting all, counting on or back, and using known-number combinations. Students also discuss how different tools such as objects, the number line, and 100 chart can be used to model and solve problems.

Color, Shape, and Number Patterns: Patterns and Functions

Students make, describe, and extend repeating patterns. As they analyze the regularities of these patterns and identify the unit of the pattern that repeats, they build an understanding of what makes patterns predictable. They use this information to determine what comes next or what comes several steps ahead in a repeating pattern. Students also work on constructing, describing, and extending number sequences with a constant increase generated by various problem contexts.

Twos, Fives, and Tens: Addition, Subtraction, and the Number System 4

Students revisit the number sequence as they count and write numbers to 100 and beyond. Students work on achieving fluency with the two-addend combinations of ten, they are introduced to ideas about equivalence ($8 + 5 = 10 + 3$), and they engage in activities that highlight the importance of ten in our Base-

10 number system. As students work with contexts that provide opportunities to count by groups of 2s, 5s, and 10s, they think about ways to organize objects so that they are easier to count and combine, and they begin to make sense of what it means to count by equal groups.

Blocks and Boxes: 3-D Geometry

This second geometry unit in first grade focuses on three-dimensional shapes and the relationships between them. Students observe, describe, compare, classify, represent, and build with 3-D shapes. They develop vocabulary for naming and describing 3-D shapes and explore the relationship between 2-D and 3-D shapes. In this unit, students focus on the attributes of rectangular prisms. As a final project, they use 3-D shapes to construct a town and work with directions and paths as they plan routes through the town.



Grade 2 Unit Summaries¹

Counting, Coins, and Combinations: Addition, Subtraction, and the Number System 1

This unit focuses on counting and comparing quantities, composing and decomposing numbers, and understanding the operations of addition and subtraction. Students develop strategies for comparing, combining, and doubling quantities, as well as taking one quantity away. They also achieve fluency with three sets of addition combinations (10s, + 1, + 2). During this first unit of the year, students are introduced to several year-long classroom routines that offer regular practice with composing and decomposing numbers; developing visual images of quantities; counting, collecting, and analyzing data; and telling time.

Shapes, Blocks, and Symmetry: 2-D and 3-D Geometry

Students identify two- and three-dimensional shapes, focus on the properties of rectangles and rectangular prisms, and identify and create symmetrical designs. Students also achieve fluency with the doubles addition combinations.

The *Shapes* software is introduced as a tool for extending and deepening this work. This tool is designed for K–2 students to explore how different shapes go together, experiment with different sorts of geometric transformations (rotations, translation, reflection), explore patterning, and investigate symmetry.

Stickers, Number Strings, and Story Problems: Addition, Subtraction, and the Number System 2

In this second number unit, students solve problems with multiple addends and consider whether order matters in addition. For example, does $7 + 4 + 3 + 6 = 7 + 3 + 4 + 6$? Students revisit addition and subtraction story problems, investigate even and odd numbers, and begin to make sense of counting by groups and place value (tens and ones). Work on addition combinations continues as students achieve fluency with the Near Doubles.

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Pockets, Teeth, and Favorite Things: Data Analysis

Students engage in all the phases of data analysis as they pose questions, collect and sort information, and make representations of data as a way of sharing their findings with others. They work with Venn diagrams and line plots, and they read and interpret a variety of representations of numerical and categorical data. Students are also assessed on fluency with the +10 addition combinations.

How Many Floors? How Many Rooms?: Patterns and Functions

In this unit, students describe and represent ratios, use tables to represent and predict change, and work with numeric sequences as they construct and describe patterns. Students extend repeating patterns and determine which element of the pattern will be in a particular position.

How Many Tens? How Many Ones?: Addition, Subtraction, and the Number System 3

Students continue to build their understanding of place value (ones, tens, hundreds) as they compose and decompose numbers into tens and ones and work with contexts and models for the Base-10 number system. Students apply their work with place value as they play games that involve composing and decomposing 100 and solve addition and subtraction problems to 100. There is continuing work on developing coin equivalencies and combinations, developing visual images of numbers, and telling time.

Parts of a Whole, Parts of a Group: Fractions

Students investigate what fractions are and the many ways they can be represented and used. They identify fractions of a single object ($\frac{1}{2}$ of a square, $\frac{1}{4}$ of a rectangle, etc.) as well as find fractions of a set ($\frac{1}{2}$ of 12). Students begin to learn how fractions are expressed in words and represented using fraction notation.

Partners, Teams, and Paper Clips: Addition, Subtraction, and the Number System 4

This final number unit of Grade 2 is a culmination of the number and operations work students have done in Grade 2. Students refine their strategies for adding and subtracting numbers as they work toward developing fluency with addition and subtraction of two-digit numbers up to 100. They investigate and make generalizations about what happens when you add even and odd numbers. They learn the remaining single-digit addition combinations, achieving fluency with all single-digit addition combinations. Work continues with telling time, place value, and coin combinations.

Measuring Length and Time: Measurement

Students investigate linear measurement as it applies to length and distance. They work with a variety of linear units, including standard units of inches, feet, yards, centimeters, and meters. Students build on their work with telling time as they measure, record, and calculate duration of events using timelines and schedules.



Grade 3 Unit Summaries¹

Trading Stickers, Combining Coins: Addition, Subtraction, and the Number System 1

In this first of three addition, subtraction, and number system units, students solve addition problems with two and small three-digit numbers, solve subtraction problems involving two-digit numbers, find combinations of numbers that add to 100, and work with coins and coin values. Their understanding of place value develops as they add and subtract 10s to and from three-digit numbers, break three-digit numbers into hundreds, tens, and ones in different ways, and solve story problems involving hundreds, tens, and ones.

Surveys and Line Plots: Data Analysis

In this unit, students collect, represent, describe, categorize, and interpret both categorical and numerical data. They begin the important work of seeing a data set as a whole as they design and carry out their own data investigations, create representations of the data collected, and compare and discuss these representations. Students draw conclusions about the data by identifying characteristics in their representations. (Where is most of the data clumped? Where is the mode?) Students' collection of numerical data includes measuring length in inches and feet. Students review the basic units of inches, feet, and yards and their relationships (e.g., one foot is equivalent to 12 inches, one yard is equivalent to 3 feet or 36 inches) by measuring lengths longer than one foot.

Collections and Travel Stories: Addition, Subtraction, and the Number System 2

Students practice and refine their strategies for solving addition problems with three-digit numbers to 400 and subtraction problems with two- and three-digit numbers to 300. In addition to solving removal problems, they expand their understanding of subtraction as they solve comparison problems and problems in which they find the missing part of a whole. They increase their understanding of place-value as they extend their work into three-digit numbers up to 1,000 and study the structure of 1,000.

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Perimeter, Angles, and Area: 2-D Geometry and Measurement

This unit develops ideas about the attributes of 2-D objects and how they are classified (the definition of a triangle, rectangle, and square), linear measurement (which includes perimeter), area, and the measurement of angles. Using the context of perimeter, students continue to develop their ability to use measurement tools as they work on accurate linear measurement techniques. Students learn to identify angles by their relationship to a right angle. (Is the angle greater than, less than, or equal to a 90-degree angle?) They develop an understanding of area as the amount of flat space an object covers and determine the area of 2-D shapes in square units.

LogoPaths, a *Logo* programming environment designed for *Investigations* students in Grades 3–5 is introduced in this unit. It allows students to explore geometrical relationships, especially focusing on angle, length, and perimeter, patterns in sides and angles, and characteristics of specific shapes.

Equal Groups: Multiplication and Division

In this unit, students develop an understanding of multiplication as combining a number of equal groups and division as splitting a quantity into equal groups. This understanding is developed as students highlight multiples on 100 charts, describe patterns in sets of multiples, and compare sets of multiples to each other. Students represent multiplication and division situations with groups, rectangular arrays, and by writing multiplication and division story problems. In this unit, students achieve fluency with multiplication combinations with products to 50 and consider the relationship between multiplication and division (e.g., $6 \times 4 = 24$; $24 \div 6 = 4$).

Stories, Tables, and Graphs: Patterns, Functions, and Change

In this unit, students use tables and line graphs to show changes over time. These include representations of functions involving constant change that can be described by mathematical rules and functions involving variable changes that cannot, such as temperature over time. Students interpret graphs to describe and compare temperature trends. They also compare different situations of constant change. In addition, students construct, describe, and extend visual and number sequences.

Finding Fair Shares: Fractions and Decimals

Using a variety of contexts (rectangles representing “brownies,” pattern block “cookies,” and groups of objects), students develop their understanding of fractions as representing equal parts of a whole. They work with commonly used fractions and their equivalencies (e.g., $\frac{3}{6}$ and $\frac{2}{4}$ both equal one-half of the same whole) and use fractions and mixed numbers as they solve sharing problems and build wholes from fractional parts. They are introduced to decimal fractions in the context of money and gain familiarity with decimal equivalents for one-fourth and one-half.

How Many Hundreds? How Many Miles?: Addition, Subtraction and the Number System 3

In this final addition and subtraction unit in Grade 3, students further refine their addition strategies with problems involving any three-digit numbers as they identify and name these strategies. They continue to solve a variety of subtraction problems and examine their strategies for subtracting any two- and three-digit numbers in greater depth. Students extend their work with place value by estimating the sum of three-digit numbers (Will the sum be more or less than 400?) and adding and subtracting multiples of 10 and 100 to and from three-digit numbers. In this unit, students are assessed on fluency with subtraction facts.

Solids and Boxes: 3-D Geometry and Measurement

Students develop ideas about the attributes of 3-D shapes and how these attributes determine classification as they sort and build common geometric solids. Throughout the unit, they move back and forth between 2-D and 3-D as they build and describe 2-D representations of 3D objects and create 3-D objects from their 2-D representations. They begin to develop important ideas about the measurement of volume as they examine the structure of 2-D box patterns and the number of cubes the 3-D box will hold.



Grade 4 Unit Summaries¹

Factors, Multiples, and Arrays: Multiplication and Division 1

In this first unit in the multiplication and division strand, students deepen their understanding of the operation of multiplication. Students use rectangular arrays to represent the relationship between factors and multiples, use what they know to solve problems that increase in size, and focus on solving problems efficiently. They continue to develop fluency with multiplication combinations (facts up to 12×12).

Describing the Shape of the Data: Data Analysis and Probability

This unit develops ideas about collecting, describing, and representing data. Students collect data through counting and measuring and use bar graphs and line plots to represent their data involving one group and compare data of two groups. They interpret the data and draw conclusions based on the data using terms such as mode, median, range, and outlier. Students begin their study of probability by placing events on a “likelihood line” that goes from impossible to certain and work with mixtures of colored cubes to describe the probability of different outcomes.

Multiple Towers and Division Stories: Multiplication and Division 2

Students develop strategies for solving multiplication problems with two-digit numbers and deepen their understanding of the operation of division by focusing on the relationship between multiplication and division. Using story contexts and multiple towers, students continue their investigation of the relationship between numbers and their factors. Students practice multiplying by 10 and multiples of 10, break problems into smaller parts that can be multiplied easily, and find the multiples of two-digit numbers. They gain fluency with all multiplication combinations to 12×12 . Students solve, represent, and discuss division story problems, including some that have a remainder.

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Size, Shape, and Symmetry: 2-D Geometry and Measurement

This first geometry and measurement unit focuses on classifying two-dimensional shapes, comparing the size of angles, and working with linear and area measurement. Students define and categorize polygons by identifying sets of shapes that have a common attribute and use 90 degrees as a reference for finding the measurement of other angles. They continue their measurement work from earlier grades by measuring distance and perimeter, using both U.S. and metric units and finding the area of polygons in square units.

LogoPaths, a *Logo* programming environment designed for *Investigations* students in Grades 3–5 is introduced in this unit. It allows students to explore geometrical relationships, especially focusing on angle, length, and perimeter, patterns in sides and angles, and characteristics of specific shapes.

Landmarks and Large Numbers: Addition, Subtraction, and the Number System

Students extend their knowledge of the number system by examining the structure of 10,000 and practice and refine strategies for adding and subtracting whole numbers up to 10,000. They continue to study place value by adding and subtracting multiples of 10 and 100 to numbers in the thousands, and they consolidate their understanding of the operation of addition by studying a variety of addition strategies and algorithms, including the U.S. algorithm for addition. Students continue their study of subtraction by solving, representing, and discussing their strategies for a variety of subtraction problems.

Fraction Cards and Decimal Squares: Rational Numbers

Students develop ideas about fractions by identifying fractions of an area ($\frac{3}{4}$ of a rectangle), fractions of a group of objects ($\frac{3}{4}$ of 24), and decimal fractions (.75). They compare fractions of different wholes ($\frac{1}{3}$ of a 6 x 4 rectangle and $\frac{1}{3}$ of a 10 x 10 rectangle), and combine fractions using models and reasoning. Students use 10 x 10 grids to represent, compare, and combine common decimals in the tenths and hundredths.

Moving Between Solids and Silhouettes: 3-D Geometry and Measurement

In this second geometry and measurement unit, students examine the relationships between 3-D solids and their 2-D representations. They learn and use the mathematical terminology for these solids and their attributes. They translate between 3-D shapes and their 2-D representations as they build cube configurations from pictures and mental images and investigate silhouettes of solids from several different perspectives. Students build an understanding of measuring volume as they examine the structure of rectangular prisms and determine the number of cubes that fit inside given box patterns.

How Many Packages? How Many Groups?: Multiplication and Division 3

In this last multiplication and division unit in Grade 4, students continue to develop efficient strategies for solving multiplication problems by breaking problems into smaller parts or changing one or both numbers to create an easier problem. Students also focus on recording their work with clear and concise notation. Students develop strategies for solving division problems (three-digit divided by two-digit), which involve making groups of the divisor. These problems are presented both in story contexts and numerically.

Penny Jars and Plant Growth: Patterns, Functions, and Change

Students explore situations in which two quantities change in relation to each other. They work with changes over time, such as increasing or decreasing speed or the growth of a plant, and situations of constant change, such as how the number of windows in a building depends on the height of the building if every floor has the same number of windows. Students create and interpret graphs and tables for these linear and nonlinear functions and connect these graphs to the situations they represent.



Grade 5 Unit Summaries¹

Number Puzzles and Multiple Towers: Multiplication and Division 1

In the first of two units about multiplication and division, students continue to develop and practice efficient strategies to solve multiplication problems both in and out of a context. Students refine and gain fluency in solving two-digit by two-digit multiplication problems, develop strategies for division problems with one- and two-digit divisors, and increase their knowledge of multiplication relationships by learning about prime factorization (e.g., $36 = 4 \times 9 = (2 \times 2) \times 9 = 2 \times 2 \times 3 \times 3$).

Prisms and Pyramids: 3-D Geometry and Measurement

Students investigate concepts of volume by finding the volume of prisms, pyramids, cylinders, and cones. They use patterns of open boxes and build prisms from cubes to develop a strategy for finding the volume of any rectangular prism. Using concrete materials, they also examine the 3-to-1 volume relationship between related (having the same base and height) prisms and pyramids, and related cylinders and cones. Geometry work includes naming geometric solids and their attributes.

Thousands of Miles, Thousands of Seats: Addition, Subtraction, and the Number System

Students study place value in large numbers by building a 10,000 chart and by adding multiples of 10 to and subtracting multiples of 10 from four- and five-digit numbers. Students finalize their study of subtraction by refining and gaining fluency in solving subtraction problems, including a study of the U.S. algorithm for subtraction. Using a context of the capacities of stadiums and arenas, they solve addition and subtraction problems involving four- and five-digit numbers. Students also demonstrate fluency with the division facts up to $144 \div 12$.

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What's That Portion?: Fractions and Percents

Students study the relationship among fractions and between fractions and percents and use this knowledge to find equivalent fractions, order fractions, and add commonly used fractions. They use a variety of contexts and models, including area, number lines, and rotation, to further understand the meaning of fractions and model their strategies. This is the first of two units in Grade 5 about rational numbers.

Measuring Polygons: 2-D Geometry and Measurement

Students create polygons using “power polygon” pieces and discuss, apply, and evaluate definitions of these polygons. They focus on properties of quadrilaterals and also study similarity of 2-D shapes. Measurement work includes finding measures of angles using known angles and finding perimeter and area of rectangles.

LogoPaths, a *Logo* programming environment designed for *Investigations* students in Grades 3–5, is introduced in this unit. It allows students to explore geometrical relationships, especially focusing on angle, length and perimeter, patterns in sides and angles, and characteristics of specific shapes.

Decimals on Grids and Number Lines: Decimals, Fractions, and Percents

In this unit, students focus primarily on decimals and how the number system extends to numbers less than one. Students use their understanding of fractions and percents and their relationship to decimals to solve computation problems involving decimals. Students use contexts (time and precipitation) and models (area and number lines) to order and add decimals. This is the second of two rational number units in Grade 5.

How Many People? How Many Teams?: Multiplication and Division 2

In the second unit on multiplication and division, students find and study equivalent expressions for multiplication and division problems (e.g., $112 \div 8 = 28 \div 2$). Students practice solving larger multiplication problems (3 digit x 2 digit) accurately and efficiently and study the U.S. algorithm for multiplication. Students gain fluency solving division problems with one-, two-, and three-digit divisors.

Growth Patterns: Patterns, Functions, and Change

Students investigate situations in which two quantities change in relation to each other. Students describe data about functional relationships, develop an overall sense of change from a graph, and understand how the changes and totals are related. They also compare two linear functions with different rates of change.

How Long Can You Stand on One Foot?: Data Analysis and Probability

Students describe major features of a set of data, represented in a line plot or bar graph, and quantify the description by using medians or fractional parts of the data. Students draw conclusions about how two groups compare based on summarizing the data for each group. They conduct their own data experiment. Students also look at the probability of various events. They express the probabilities of the possible outcomes (e.g., landing on the green part of the spinner, landing on the white part of the spinner) by using numbers from 0 to 1. Then they conduct experiments to see what actually occurs. Students also consider the notion of fairness in the context of probability by playing fair and unfair games, that is, games in which players do or do not have equal chances of winning.