A Correlation of

to the

Alabama Course of Study Mathematics

Grades K-5

T/M-130

INTRODUCTION

This document demonstrates how well ***Investigations in Number, Data, and Space®*** integrates with the Alabama Course of Study: Mathematics. The citations within this correlation provide Investigation Curriculum Unit titles, Investigation numbers and Session/Focus Time/Choice Time numbers or titles that correlate to the standards of the Alabama Course of Study. Thus, teachers know exactly where instruction is located to prepare students for mastery of the Alabama Course of Study.

Investigations in Number, Data, and Space® is a Kindergarten through Grade 5 curriculum consisting of a series of Teacher's Editions that focus on major mathematical ideas, content, and pedagogy. Each book emphasizes depth of mathematical thinking over fragmented topics. Students invent strategies and approaches to solving problems and rely less on rote learning stressed in traditional textbooks. The program blends concrete materials with appropriate technology, including calculators in everyday mathematical lessons.

Developed by TERC under a grant from the National Science Foundation, ***Investigations in Number, Data, and Space®*** is comprehensive in its approach to students of diverse cultural, ethnic and language groups. In an effort to give mathematical lessons a broader spectrum, students are encouraged to explore working in groups, individually and as a whole class. By incorporating these methods into everyday learning, students learn to express mathematical thinking through talking, drawing, and writing.

Investigations in Number, Data and Space® was developed after three years of nationwide field-testing and includes teacher's practical suggestions, student dialogues, and teacher notes.

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Investigations in Number, Data & Space
to the
Alabama Course of Study—Mathematics

Kindergarten

During the kindergarten year, students learn to listen, share, cooperate, use materials responsibly, and follow directions in a formal school setting. Mathematics is introduced at this level through play-based opportunities that develop and deepen the students conceptual understanding. Connections are beginning to be made between the informal knowledge of mathematics and the formal system of numerical expressions. To foster these connections, the kindergarten environment should provide a variety of concrete learning experiences.

The physical arrangement of the kindergarten classroom should allow for exploration, for manipulation of objects, and for active movement. Manipulative materials enable students to count, engage in active learning, and broaden simple mathematical concepts. Students benefit from planned, thought-provoking activities that allow for active participation and provide a rich introduction to mathematical language.

In Kindergarten, mathematical concepts include recognizing patterns and shapes, demonstrating one-to-one correspondence, making comparisons, using classification skills, and ordering sets of objects. By the end of Kindergarten, students are able to recognize numbers and basic shapes, replicate simple patterns, and communicate using mathematical terms.

Number and Operations

Students will:

1. Demonstrate concepts of number sense by using one-to-one correspondence, counting in sequence by ones from 1 to 20, counting backward from 10, recognizing numerals 0–9, and comparing sets of objects up to 10 by using vocabulary terms including *more than, less than, most,* or *leas*t.
References:

Mathematical Thinking in Kindergarten
- Investigations 1, 2, 3, 4

Pattern Trains and Hopscotch Paths
- Investigations I, 2, 3,
- Investigation 4: Choice Time: Tile Paths

Collecting, Counting, and Measuring
- Investigations 1, 2, 4, 5, 6
- Investigation 3: Choice Time: Measuring Table

Counting Ourselves and Others
- Investigations 1, 2, 3, 4

How Many in All?
- Investigations 1, 2, 3, 4

2. Demonstrate addition by using numbers totaling 5 or less and subtraction by using numbers less than or equal to 5.
References:

Collecting, Counting, and Measuring
Investigation 4: Choice Time: Collect 10 Together
Investigation 5: Choice Time: Collect 10 Together
Investigation 6
How Many in All?
Investigation 1: Choice Time: Collect 15 Together
Investigations 2, 3, 4

3. Recognize that a whole object can be divided into parts.

•Dividing a whole object into equal parts

In a geometric application of this concept, Kindergarten students using ***Investigations in Number, Data, and Space*** find combinations of shapes that fill an area and explore relationships between pattern block shapes. Grade 1 students divide shapes and groups into equal parts and equal groups.

Reference:

Making Shapes and Building Blocks
Investigation 4: Choice Time: Fill the Hexagons

4. Identify a penny, nickel, dime, and quarter.

Reference:

Counting Ourselves and Others
Investigation 2: Choice Time: The Grocery Store

Algebra

5. Replicate patterns using concrete objects.

•Sorting objects by characteristics

References:

Mathematical Thinking in Kindergarten
Investigation 1: Choice Time: Exploring Color Tiles
Investigation 1: Choice Time: Exploring Pattern Blocks
Investigation 1: Choice Time: Exploring Geoblocks
Investigation 3: Choice Time: Exploring Interlocking Cubes
Pattern Trains and Hopscotch Paths
Investigations 1, 2, 3, 4

Collecting, Counting, and Measuring
Investigations 3, 4, 5, 6
Counting Ourselves and Others
Investigation 1: Choice Time: Self-Portraits
Investigations 2, 3, 4
Making Shapes and Building Blocks
Investigations 1,2, 3, 4, 5

•Describing characteristics of patterns and/or objects
References:
Mathematical Thinking in Kindergarten
Investigation 1: Choice Time: Exploring Color Tiles
Investigation 1: Choice Time: Exploring Pattern Blocks
Investigation 1: Choice Time: Exploring Geoblocks
Investigation 3: Choice Time: Exploring Interlocking Cubes
Pattern Trains and Hopscotch Paths
Investigations 1, 2, 3, 4
Counting Ourselves and Others
Investigations 2, 3, 4
Making Shapes and Building Blocks
Investigations 1, 2, 3, 4, 5

Geometry

6. Create combinations of rectangles, squares, circles, and triangles using shapes or drawings.

•Describing relative location of objects using positional terms
References:
Collecting, Counting, and Measuring
Investigation 6
Making Shapes and Building Blocks
Investigation2
Investigation 3: Choice Time: Shape Hunt
Investigation 4: Choice Time: Exploring Geoblocks
Investigation 5: Choice Time: The Shape of Things on the Computer
How Many in All?
Investigation 2
Investigations 3, 4: Choice Time: Cover Up

7. Identify rectangles, squares, circles, and triangles.

•Recognizing like shapes in the environment

References:

Mathematical Thinking in Kindergarten
Investigation 1: Choice Time: Exploring Pattern Blocks
Investigation 1: Choice Time: Exploring Geoblocks
Making Shapes and Building Blocks
Investigations 1, 2, 3, 4, 5

Measurement

8. Use vocabulary associated with length, height, volume, and weight to compare objects.

References:

Collecting, Counting, and Measuring
Investigations 3, 4, 5, 6
How Many in All?
Investigation 1

9. Use vocabulary associated with the measurement of time, including words related to clocks and calendars.

In addition to the following reference, each unit of study in the kindergarten course of ***Investigations in Number, Data, and Space*** includes an appendix entitled, “About Classroom Routines.” This appendix is comprised of activities which can be incorporated into the daily classroom schedule. The recurring *Calendar* activity includes experiences with the sequences of, and the relationships between, days, weeks, and months; concepts of before and after, yesterday, today, and tomorrow, this week and next week, how many more days until and how many days since; and numbers and patterns on the calendar.

Reference:

Mathematical Thinking in Kindergarten
Investigation 3

Data Analysis and Probability

10. Complete data displays such as single-loop Venn diagrams and yes/no charts using real objects, concrete representations, or pictorial representations.

•Responding to questions for the purpose of data collection

In addition to the following references, the end of each unit of ***Investigations in Number, Data, and Space*** contains a feature entitled, About Classroom Routines. In Kindergarten this includes a section entitled, *Today's Question*, which consists of an activity involving students collecting, displaying, and interpreting data. Students may represent data using charts or graphs.

References:

Mathematical Thinking in Kindergarten
Investigations 1, 4

Collecting, Counting, and Measuring
Investigation 1: Choice Time: Grab and Count
Investigation 1: Choice Time: Counting Jar
Investigation 2
Investigation 3: Choice Time: Grab and Count

Counting Ourselves and Others
Investigations 1, 2, 3, 4

Investigations in Number, Data & Space
to the
Alabama Course of Study—Mathematics

Grade One

The focus in first grade is to provide foundational experiences and opportunities in mathematics that stimulate students to become independent thinkers and life-long problem solvers. First-grade students need a rich mathematical environment that encourages communication, introduces the use of multiple representations, and integrates mathematical concepts into everyday life. Students also need instructional time that provides reflection and justification of diverse approaches.

Students enter first grade with a wide range of mathematical abilities and experiences. They need time to develop conceptual knowledge, to connect mathematical concepts with their own experiences, and to transfer their understanding into written expression. An effective instructional environment allows for the use of hands-on materials, in-depth reasoning, verbal communication, and visual representations. Additionally, the integration of literature, incorporation of cooperative learning strategies, and inclusion of active participation in classroom activities help students make strong connections.

By the end of first grade, students should have established a foundation for future mathematical success. This foundation supports a conceptual understanding of the base ten system of numeration. It helps students to develop the ability to use the basic operations of addition and subtraction and to apply knowledge of simple data displays to organize objects and information. The establishment of a link between measurement and geometry also enables students to develop skills for describing and explaining their world mathematically.

Number and Operations

Students will:

1. Demonstrate concepts of number sense by counting forward and backward by ones, twos, fives, and tens up to 100; counting forward and backward from an initial number other than 1; and using multiple representations for a given number.

- **Identifying position using the ordinal numbers 1st through 10th**

  References:

  Mathematical Thinking at Grade 1

  Investigation 2: Sessions 2–3

•Using vocabulary, including the terms *equal, all,* and *none*, to identify sets of objects

References:

Mathematical Thinking at Grade 1
- Investigation 4: Sessions 1–3
- Investigation 5: Sessions 1–5

Building Number Sense
- Investigation 1: Sessions 2–4, 7–9
- Investigation 2: Sessions 6–9

Number Games and Story Problems
- Investigation 1: Sessions 1–10
- Investigation 2: Sessions 1–8, 10–13
- Investigation 3: Sessions 1–13

•Recognizing that the quantity remains the same when the spatial arrangement changes

References:

Mathematical Thinking in Grade 1
- Investigation 1: Sessions 2–4
- Investigation 2: Session 4–6
- Investigation 4: Sessions 1–4

Building Number Sense
- Investigation1: Sessions 1–4, 7–8
- Investigation 2: Sessions 1–2

Number Games and Story Problems
- Investigation 1: Session 1–5, 10
- Investigation 3: Sessions 6–8

•Determining the value of the digit in the ones place and the value of the digit in the tens place in a numeral

References:

Building Number Sense
- Investigation 2: Sessions 6–8
- Investigation 3: Sessions 1–2, 5–7, 9

Survey Questions and Secret Rules
- Investigation 2: Sessions 1–2, 5–6
- Investigation 3: Sessions 1–2
- Investigation 4: Sessions 2–3

Number Games and Story Problems
- Investigation 2: Sessions 6–8
- Investigation 3: Sessions 10–12

•Determining the value of a number given the number of tens and ones

References:

Building Number Sense
- Investigation 2: Sessions 6–8
- Investigation 3: Sessions 1–2, 5–7, 9

Survey Questions and Secret Rules
- Investigation 2: Sessions 1–2, 5–6
- Investigation3: Sessions 1–2
- Investigation 4: Sessions 2–3

Number Games and Story Problems
- Investigation 2: Sessions 6–8
- Investigation 3: Sessions 10–12

•Determining the value of a number that is 10 more or 10 less than a given number

References:

Building Number Sense
- Investigation 3: Sessions 1–2

Number Games and Story Problems
- Investigation 2: Sessions 6–8

•Determining the monetary value of individual coins and sets of like coins up to $1.00

References:

Number Games and Story Problems
- Investigation 2: Sessions 3–8

2. Demonstrate conceptual understanding of addition and subtraction by telling number stories; joining, separating, and comparing sets of objects; and applying signs (+ and .) to the actions of joining and separating sets.

•Solving simple word problems using a variety of strategies and distinguishing between relevant and irrelevant information

References:

Mathematical Thinking in Grade 1
- Investigation 2: Sessions 1–6
- Investigation 4: Sessions 2–4, 6

Building Number Sense
- Investigation 1: Sessions 1–2, 5–6, 9
- Investigation 2: Sessions 1, 4–9
- Investigation 4: Sessions 1–10

Number Games and Story Problems
Investigation 1: Sessions 1–10
Investigation 2: Sessions 1–8, 10–13
Investigation 3: Sessions 1–13

•Solving problems requiring the addition and subtraction of one- or two-digit numerals without regrouping

References:

Mathematical Thinking in Grade 1
Investigation 2: Sessions 1–6
Investigation 4: Sessions 2–4, 6
Building Number Sense
Investigation 1: Sessions 1–2, 5–6, 9
Investigation 2: Sessions 1, 4–9
Investigation 4: Sessions 1–10
Quilt Squares and Block Towns
Investigation 1: Sessions 2–10
Investigation 3: Sessions 6–7
Number Games and Story Problems
Investigation 1: Sessions 1–10
Investigation 2: Sessions 1–8, 10–13
Investigation 3: Sessions 1–13

•Using three or more addends

Reference:

Number Games and Story Problems
Investigation 2: Session 13

3. Demonstrate computational fluency of basic addition and subtraction facts by identifying sums to 10 and differences with minuends of 10 or less.

References:

Mathematical Thinking in Grade 1
Investigation 2: Sessions 4–6
Investigation 4: Sessions 1–4, 6
Building Number Sense
Investigation 2: Sessions 1–9
Investigation 4: Sessions 1–10
Number Games and Story Problems
Investigation 1: Sessions 1–10
Investigation 2: Sessions 1–8, 10–12
Investigation 3: Sessions 1–13

4. Identify parts of a whole with two, three, or four equal parts.

•Dividing an object into equal parts

Grade 1 students using ***Investigations in Number, Data, and Space*** are introduced to the concept of fractions as parts of measurement units. They also divide a whole and a set into equal parts.

References:

Building Number Sense
Investigation 1: Session 2
Bigger, Taller, Heavier, Smaller
Investigation 2: Sessions 2–4
Investigation 3: Session 2

Algebra

5. Create repeating patterns.

•Describing characteristics of patterns

References:

Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Sessions 2–3, 5
Building Number Sense
Investigation 3: Sessions 1–8
Investigation 4: Session 10: Activity, page 163
Survey Questions and Secret Rules
Investigation 3: Sessions 2–3
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Number Games and Story Problems
Investigation 2: Sessions 2, 6–9

•Extending patterns including number patterns

References:

Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Sessions 2–3, 5
Building Number Sense
Investigation 3: Sessions 1–8
Investigation 4: Session 10: Activity, page 163
Survey Questions and Secret Rules
Investigation 3: Sessions 2–3

Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Number Games and Story Problems
Investigation 2: Sessions 2, 6–9

- **Identifying patterns in the environment**

References:
Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Sessions 2–3
Survey Questions and Secret Rules
Investigation 3: Sessions 2–3
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Number Games and Story Problems
Investigation 2: Session 2

6. Solve problems using the identity and commutative properties of addition.

References:
Mathematical Thinking in Grade 1
Investigation 2: Session 4–6
Investigation 4: Sessions 1–4
Building Number Sense
Investigation 2: Sessions 1–2, 6–9
Investigation 4: Sessions 1, 3–10
Number Games and Story Problems
Investigation 1: Session 1–5, 10
Investigation 3: Sessions 1, 6–13

7. Demonstrate relationships between operations.

References:
Building Number Sense
Investigation 2: Sessions 1–2
Investigation 4: Sessions 2–5
Number Games and Story Problems
Investigation 3: Sessions 2–8

Geometry

8. Differentiate among plane shapes, including circles, squares, rectangles, and triangles.

•Describing similarities and differences between plane and solid shapes

References:

Quilt Squares and Block Towns
Investigation 2: Sessions 1–10
Investigation 3: Sessions 1–5

•Transferring shape combinations from one representation (dimension) to another

References:

Mathematical Thinking in Grade 1
Investigation 1: Sessions 1–4
Building Number Sense
Investigation 1: Sessions 5–6
Survey Questions and Secret Rules
Investigation 1: Sessions 1–2
Quilt Squares and Block Towns
Investigation 1: Sessions 1–15
Investigation 2: Sessions 1–10
Investigation 3: Sessions 1–5
Bigger, Taller, Heavier, Smaller
Investigation 2: Sessions 2–7

•Recognizing real-life examples of line symmetry

Students investigate line symmetry beginning in grade 3.

•Changing the position of objects or shapes by sliding (translation) and turning (rotation)

References:

Quilt Squares and Block Towns
Investigation 1: Sessions 3–10, 13–15

•Combining shapes to fill in the area of a given shape

References:

Quilt Squares and Block Towns
Investigation 1: Sessions 2–10, 13–15
Investigation 2: Sessions 4–10
Investigation 3: Sessions 1–5
Appendix: *Shapes* Tutorial
Bigger, Taller, Heavier, Smaller
Investigation 2: Sessions 2–4

9. Identify solid shapes in the environment, including cubes, rectangular prisms, cones, spheres, and cylinders.

References:

Quilt Squares and Block Towns
Investigation 3: Sessions 3–5

Measurement

10. Compare objects according to length, weight, and capacity.

References:

Quilt Squares and Block Towns
Investigation 3: Sessions 6–7
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1–6
Investigation 2: Sessions 2–7
Investigation 3: Sessions 1–5

•Measuring the length of objects using a variety of nonstandard units

References:

Quilt Squares and Block Towns
Investigation 3: Sessions 6–7
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1–6
Investigation 3: Sessions 1–5

•Ordering according to attributes

References:

Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 5–6
Investigation 2: Sessions 5–7
Investigation 3: Sessions 3–5

11. Identify the hour using analog and digital clocks.

•Identifying the half hour using analog and digital clocks

Students investigate clock time beginning in Grade 2.

12. Locate days, dates, and months on a calendar.

•Using vocabulary associated with a calendar

Classroom Routines described in an appendix at the end of each of the texts in the ***Investigations in Number, Data, and Space*** series include Understanding Time and Changes, which consists of activities in which students sequence events, explore units of time and relationships among them, and use a calendar to solve problems. Students become familiar with calendar features; observe the cyclical nature of the sequence of months; and group, describe, organize, and order data about birthdays.

References:

Survey Questions and Secret Rules
Investigation 3: Sessions 1–3

Data Analysis and Probability

13. Organize objects or information into pre-determined and labeled data displays, including pictographs, tally charts, bar graphs, or double-loop Venn diagrams.

•Generating simple questions for data collection

In addition to the following references, the end of each unit of ***Investigations in Number, Data, and Space*** contains a feature entitled, “About Classroom Routines.” The Grade 1 series includes a section in the appendix entitled, “Exploring Data,” which includes ideas for class surveys, which involve students collecting, organizing, and displaying data. Another section, Understanding Time and Changes, includes ideas for collecting and displaying weather data.

References:

Mathematical Thinking at Grade 1
Investigation 5: Sessions 3–6
Survey Questions and Secret Rules
Investigation 2: Sessions 1–2, 5–6
Investigation 3: Sessions 1–3
Investigation 4: Sessions 2–5

- **Creating displays with appropriate labels**

  In addition to the following references, the end of each unit of ***Investigations in Number, Data, and Space*** contains a feature entitled, "About Classroom Routines." The Grade 1 series includes a section in the appendix entitled, "Exploring Data," which includes ideas for class surveys, which involve students collecting, organizing, and displaying data. Another section, Understanding Time and Changes, includes ideas for collecting and displaying weather data.

  References:

  Mathematical Thinking at Grade 1
  Investigation 5: Sessions 3–6

  Survey Questions and Secret Rules
  Investigation 2: Sessions 1–2, 5–6
  Investigation 3: Sessions 1–3
  Investigation 4: Sessions 1–5

Investigations in Number, Data & Space
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Grade Two

Students in second grade are able to solve increasingly challenging problems, explore mathematical ideas in a variety of ways, and consider multiple solutions to problems. They begin to evaluate their own thinking as well as that of others in classroom discourse about mathematical ideas.

The second-grade learning environment should reflect the developmental changes of students while focusing on the need for fundamental mathematics, interactive exploration, reflection, and justification of findings. The learning environment should allow students to investigate practical applications as they work to solve real-life problems. Students gain confidence and flexibility in problem solving as they demonstrate understanding of mathematical concepts using extended project investigations.

The content in second grade focuses on fluency with numbers, place value, reasoning, and problem solving. Algorithms for addition and subtraction may be formally introduced. Additionally, concepts such as using standard units of measure, creating and extending patterns, describing plane and solid figures through geometry, and collecting data are included. Learning with understanding is enhanced by students™ use of concrete objects and a variety of mathematical tools.

Number and Operations

Students will:

1. Demonstrate concepts of number sense by using multiple representations of whole numbers up to 1000, counting forward and backward by threes from a given number, identifying a number that is 100 more or 100 less than a given number, and differentiating between odd and even numbers.

•Identifying position using ordinal numbers to 100th

Grade 2 students using ***Investigations in Number, Data, and Space*** determine ways in which numbers are used.

References:

Mathematical Thinking at Grade 2
Investigation 2: Session 1
Coins, Coupons, and Combinations
Investigation 1: Session 1
Putting Together and Taking Apart
Investigation 1: Sessions 3–6

•Determining the value of a digit in the ones, tens, hundreds, and thousands place

Grade 2 students using ***Investigations in Number, Data, and Space*** describe and use numbers through hundreds.

References:

Coins, Coupons, and Combinations
- Investigation 4: Sessions 1–4

Putting Together and Taking Apart
- Investigation 2: Sessions 1–7
- Investigation 4: Sessions 2–4
- Investigation 5: Sessions 2–3, 6

•Determining the value of a number expressed in expanded notation

References:

Coins, Coupons, and Combinations
- Investigation 3: Session 1, 4–5

Putting Together and Taking Apart
- Investigation 1: Session 1, 3–4
- Investigation 5: Sessions 4–5

2. Apply the operations of addition and subtraction to solve problems involving two-digit numerals, using multiple strategies with and without regrouping.

•Demonstrating computational fluency for basic addition and subtraction facts with sums through 18 and differences with minuends through 18, using horizontal and vertical forms

References:

Mathematical Thinking at Grade 2
- Investigation 1: Session 1
- Investigation 2 : Sessions 1–5
- Session 6: Dialogue Box, page 45
- Session 8
- Investigation 4: Session 1
- Investigation 5: Session 3

Coins, Coupons, and Combinations
- Investigation 1:
- Sessions 1–6
- Sessions 8–9: Activity, pages 42–44
- Sessions 10–11

Putting Together and Taking Apart
Investigation 1: Sessions 1–6
Investigation 2: Sessions 1–7
Investigation 3: Sessions 1–5
Investigation 4: Sessions 1–4
Investigation 5: Sessions 1–8

•Interpreting multiplication as repeated addition and division as equal groupings

References:

Mathematical Thinking at Grade 2
Investigation 4: Session 1: Teacher Note, page 82
Coins, Coupons, and Combinations
Investigation 2: Sessions 1–10

•Solving multistep addition and subtraction problems originating from real-life experiences

References:

Putting Together and Taking Apart
Investigation 2: Session 1, 5–6
Investigation 4: Sessions 1–4
Investigation 5: Session 2–3, 6

•Justifying the strategy used to solve addition and subtraction problems

References:

Coins, Coupons, and Combinations
Investigation 1: Sessions 2–3, 6–11
Investigation 2: Sessions 7–9
Investigation 3: Sessions 1–2
Investigation 4: Sessions 2–5
Putting Together and Taking Apart
Investigation 1: Sessions 1–6
Investigation 2: Sessions1–4, 7
Investigation 3: Sessions 1–5
Investigation 5: Sessions 1–5, 7

•Using an estimate to determine if an answer is reasonable

References:

Coins, Coupons, and Combinations
Investigation 1: Session 7
Investigation 1: Sessions 8–9: Choice 1: Close to 20, p. 41
Investigation 2: Session 10

3. Label equal parts of a whole using ½, 1/3, and ¼

References:

Shapes, Halves, and Symmetry
Investigation 3: Sessions 1–8

4. Determine the monetary value of sets of coins and bills up to $2.00.

•Exchanging coins of equivalent value

References:

Coins, Coupons, and Combinations
Investigation 2: Sessions 6–9
Putting Together and Taking Apart
Investigation 2: Sessions 5–6
Investigation 4: Sessions 3–4: Choice Time, page 100; Follow-Up, page 101

•Applying monetary symbols, including dollar ($), cent (¢), and decimal point (.)

Grade 2 students using ***Investigations in Number, Data, and Space*** describe amounts of money using symbols. They use the dollar sign and/or the cent sign.

References:

Coins, Coupons, and Combinations
Investigation 2: Sessions 6–9
Putting Together and Taking Apart
Investigation 2: Sessions 5–6
Investigation 4: Sessions 3–4: Choice Time, page 100; Follow-Up, page 101

•Recognizing the decimal numbers .10, .25, .50, and .75 as related to money

Grade 2 students using ***Investigations in Number, Data, and Space*** describe amounts of money using symbols. They use the dollar sign and/or the cent sign.

References:

Coins, Coupons, and Combinations
Investigation 2: Sessions 6–9
Putting Together and Taking Apart
Investigation 2: Sessions 5–6
Investigation 4: Sessions 3–4: Choice Time, page 100; Follow-Up, page 101

Algebra

5. Create growing patterns.

References:

Timelines and Rhythm Patterns
Investigation 2: Sessions 1–5

6. Solve problems using the associative property of addition.

References:

Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons, and Combinations
Investigation 1: Session 10
Putting Together and Taking Apart
Investigation 2: Session 1
Investigation 4: Sessions 1–4
Investigation 5: Session 6

7. Describe change over time in observable (qualitative) and measurable (quantitative) terms.

Grade 2 students using ***Investigations in Number, Data, and Space*** describe qualitative changes in rhythm patterns. They find quantitative change as they calculate differences between numbers on a hundred chart, and as they calculate the change necessary to begin at a given number and end at one hundred. They explore and chart quantitative changes in time on timelines.

References:

Mathematical Thinking at Grade 2
Investigation 1: Session 1
Coins, Coupons, and Combinations
Investigation 4: Sessions 2–4: Dialogue Box, p. 120
Shapes, Halves, and Symmetry
Investigation 2: Session 3
Putting Together and Taking Apart
Investigation 2: Sessions 3–7
Investigation 3: Sessions 2–5
Timelines and Rhythm Patterns
Investigation 1: Sessions 1–6
Investigation 2: Sessions 1–5

Geometry

8. Describe attributes of two-dimensional (plane) and three-dimensional (solid) figures using the terms *side, surface, edge, vertex,* and *angl*e.

•Identifying quadrilaterals, pentagons, hexagons, or octagons

Grade 2 students using ***Investigations in Number, Data, and Space*** identify quadrilaterals, pentagons, and hexagons.

References:

Shapes, Halves, and Symmetry
Investigation 1: Sessions 1–8
Investigation 2: Sessions 1–6

•Identifying line symmetry in plane geometric figures

References:

Shapes, Halves, and Symmetry
Investigation 4: Sessions 1–7

•Creating designs that exhibit line symmetry

References:

Shapes, Halves, and Symmetry
Investigation 4: Sessions 1–7

•Recognizing the results of changing the position (transformation) of objects or shapes by sliding (translation), turning (rotation), or flipping (reflection)

References:

Shapes, Halves, and Symmetry
Investigation 1: Sessions 4–8
Investigation 4: Sessions 1–6

9. Describe the route from one location to another by applying concepts of direction and distance.

•Following multistep directions to locate objects

References:

How long? How Far
Investigation 1: Sessions 2–6
Investigation 2: Sessions 1–8

•Reading maps of the school environment

References:

How long? How Far
Investigation 1: Sessions 8
Investigation 2: Session 1, 4–5

•Using grids for movement between points

References:

How long? How Far
Investigation 1: Sessions 2–6
Investigation 2: Sessions 1–8

Measurement

10. Measure length in customary units, including inches, feet, and yards.

Grade 2 students using ***Investigations in Number, Data, and Space*** explore linear measurement using direct and indirect comparison, nonstandard units, and *GeoLogo* software. They construct, compare, and measure simple paths in both on-computer and off-computer activities.

References:

How Long? How Far?

Investigation 1: Sessions 1–8

Investigation 2: Sessions 4–5

•Using metric units

Grade 2 students using ***Investigations in Number, Data, and Space*** explore linear measurement using direct and indirect comparison, nonstandard units, and *GeoLogo* software. They construct, compare, and measure simple paths in both on-computer and off-computer activities.

References:

How Long? How Far?

Investigation 1: Sessions 1–8

Investigation 2: Sessions 4–5

•Using appropriate tools, including rulers, yard sticks, meter sticks, or tape measures

References:

How Long? How Far?

Investigation 1: Sessions 1–8

Investigation 2: Sessions 1–8

11. Estimate weight and capacity by making comparisons with familiar objects.

Grade 2 students using ***Investigations in Number, Data, and Space*** do not specifically study weight. In the Grade 1 curriculum, students lift and balance familiar objects to develop a sense of weight, and use a balance to compare weights. In the Grade 3 curriculum, students learn to weigh objects with a pan balance.

Grade 2 students using ***Investigations in Number, Data, and Space*** assemble structures with Geoblocks, using multiple arrangements of three-dimensional shapes to make a three-dimensional whole. They explore spatial relationships and use logical reasoning as they use interlocking cubes to construct rectangular prisms with given dimensions.

References:

Shapes, Halves, and Symmetry

Investigation 1

Sessions 2–3: Choice 2, pages 19–21

Sessions 6–8

12. Tell time to the minute using analog and digital clocks.

The Appendix: *About Classroom Routines*, which appears in every text in the ***Investigations in Number, Data, and Space*** series, includes a feature entitled, Time and Time Again. This section describes time-related activities which students can do on a daily basis, including discussion of the daily schedule at school each day, identification of relevant clock times and durations, the setting of a timer to go off at specified intervals, the development of a schedule of important times at home, comparison of important times in different students' days, descriptions of types of clocks students have in their homes, and the creation of a timeline of a student's life, called a Life Line. Time-related topics covered in the investigations in the series include sequencing events in time, comparing durations of time within a day, representing events in time, and interpreting traditional representations of time.

References:

Timelines and Rhythm Patterns
- Investigation 1: Sessions 4–5
- Investigation 2: Sessions 4–5

Data Analysis and Probability

13. Create displays for a given set of data using pictographs, tally charts, bar graphs, or single- or double-loop Venn diagrams, providing appropriate labels.

•Interpreting graphic displays

In addition to the following references, the end of each unit of ***Investigations in Number, Data, and Space*** contains a feature entitled, About Classroom Routines. The Grade 2 series includes a section entitled, How Many Pockets?, which describes a long-term activity in which students collect, organize, and represent data on how many pockets everyone in class is wearing on a particular day. Students may use a Hundred Number Wall Chart and a Pocket Data Chart to interpret and record their data.

References:

Mathematical Thinking at Grade 2
- Investigation 2: Session 6
- Investigation 5: Sessions 1–6

Coins, Coupons, and Combinations
- Investigation 1: Session 11
- Investigation 2: Sessions 2, 4–5, 10

Does It Walk, Crawl, or Swim?
- Investigation 1: Sessions 1–6
- Investigation 2: Sessions 1–4
- Investigation 3: Sessions 1–3
- Investigation 4: Sessions 1–3

How Many Pockets? How Many Teeth?
Investigation 1: Sessions 1–5
Investigation 2: Sessions 1–6
Investigation 3: Sessions 1–5
Timelines and Rhythm Patterns
Investigation 1: Sessions 1–6

14. Determine if one event related to everyday life is more likely or less likely to occur than another event.

Reference:
How Many Pockets? How Many Teeth?
Investigation 2: Session 6

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Grade Three

Students in third grade are active and inquisitive. They are primarily concrete learners, acquiring knowledge through hands-on experiences. Third-grade students are still primarily concrete learners and are interested in participating in instructional tasks that relate to their personal lives.

Third-grade students need a classroom environment that helps them learn to work together as a community of learners. This environment provides an atmosphere in which students are recognized as individuals whose ideas are valued, and one in which opportunities are provided for all individuals in the classroom to work together as members of a team. In such an environment, students feel less threatened about making mistakes and have a more positive attitude toward receiving ideas for improvement.

Third-grade students enjoy intellectually stimulating activities that promote enthusiasm and capture their interest. Such activities better enable students to make sense of mathematics. Students compare and order whole numbers, identify two-dimensional figures based on attributes, expand their knowledge of measurement and data analysis, and strengthen computational fluency by applying problem-solving strategies. The third-grade content enables students to use mathematics in other disciplines and to connect mathematics to the real world.

Number and Operations

Students will:

1. Demonstrate number sense by comparing, ordering, and expanding whole numbers through 9999.

- **Comparing numbers using the symbols >, <, =, and □,**

  The ***Investigations in Number, Data, and Space*** series does not provide third grade students with specific instruction in the use of inequality symbols to compare numbers; rather, quantities, including numbers of objects and areas of rectangles, are compared using words like “more” and “fewer.”

  References:

  Mathematical Thinking at Grade 3
  Investigation 3: Sessions 3–4

  Flips, Turns, and Area
  Investigation 1: Session 4

Combining and Comparing
Investigation 1: Sessions 1–3
Investigation 4: Sessions 1–2
Investigation 5: Sessions 1–3

•Identifying the place value of any digit within a four-digit number

References:

Mathematical Thinking at Grade 3
Investigation 1: Sessions 1–3
Investigation 4: Session 2
Things That Come in Groups
Investigation 2: Sessions 1–6
Landmarks in the Hundreds
Investigation 1: Sessions 4–7
Investigation 2: Sessions 1–3
Investigation 3: Sessions 1–3
Combining and Comparing
Investigation 3: Sessions 1–2
Investigation 4: Sessions 3–4
Fair Shares
Investigation 3: Sessions 1–2

•Writing a four-digit number in words and locating it on a number line

Grade 3 students using ***Investigations in Number, Data, and Space*** use a four-digit numbers. They construct groups up to 1,000, estimate and count quantities up to 1,000, and find the differences between large quantities.

References:

Landmarks in the Hundreds
Investigation 3: Session 1–3
Combining and Comparing
Investigation 4: Sessions 3–4

• Determining the value of a number written in expanded notation to the ten-thousands place

Grade 3 students using ***Investigations in Number, Data, and Space*** recognize and generate equivalent representations for the same number throughout the course as they use manipulatives, symbols, words, and pictorial models to represent whole numbers. They compose and decompose numbers to generate equivalent representations for the same number as they learn addition combinations (e.g., 3+4 = 2+5 = 6+1 = 7), explore factors and multiples (e.g., 3x4 = 2x6 = 1x12 = 12) and learn properties of operations (e.g., 3x4 = 4x3).

References:

Mathematical Thinking at Grade 3
Investigation 2:
Session 1: Teacher Note, pages 22–23

Session 2: Activity, pages 26–27
Ten-Minute Math: Calendar Math
Things That Come in Groups
Investigation 1: Session 2
Investigation 3: Sessions 1–5
Investigation 4: Sessions 1–2
Flips, Turns, and Area
Ten-Minute Math: Broken Calculator
Landmarks in the Hundreds
Investigation 1: Sessions 1–7
Investigation 2: Sessions 1–6
Investigation 3: Session 1
Ten-Minute Math: Calendar Math
Up and Down the Number Line
Investigation 1: Sessions 3–4, 6–7

•Rounding whole numbers to the nearest ten and hundred and money values to the nearest dollar

References:

From Paces to Feet
Investigation 1: Session 2
Investigation 1: Sessions 5–6
Ten Minute Math: Estimation and Number Sense
Landmarks in the Hundreds
Investigation 2: Sessions 5–6
Investigation 3: Sessions 2–3
Up and Down the Number Line
Ten Minute Math: Estimation and Number Sense
Combining and Comparing
Investigation 1: Sessions 1–2
Investigation 2: Sessions 1–2
Investigation 3: Sessions 1–3
Investigation 4: Sessions 1–4
Ten Minute Math: Estimation and Number Sense
Turtle Paths
Investigation 2: Sessions 2–3

2. Solve addition and subtraction problems, including word problems, involving two- and three-digit numbers with and without regrouping.

•Estimating sums and differences by using compatible numbers, front-end estimation, and rounding

References:

From Paces to Feet
- Investigation 1: Session 2
- Investigation 1: Sessions 5–6
- Ten Minute Math: Estimation and Number Sense

Up and Down the Number Line
- Ten Minute Math: Estimation and Number Sense

Combining and Comparing
- Investigation 1: Sessions 1–2
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1–3
- Investigation 4: Sessions 1–4
- Ten Minute Math: Estimation and Number Sense

Turtle Paths
- Investigation 2: Sessions 2–3

•Demonstrating computational fluency in addition and subtraction

References:

Mathematical Thinking at Grade 3
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 3–4
- Investigation 4: Session 1
- Ten-Minute Math: Calendar Math

Flips, Turns, and Area
- Ten-Minute Math: Broken Calculator

From Paces to Feet
- Ten-Minute Math: Broken Calculator

Landmarks in the Hundreds
- Ten-Minute Math: Calendar Math

Up and Down the Number Line
- Investigation 1: Sessions 1–8
- Ten-Minute Math: Estimation and Number Sense

Combining and Comparing
- Investigation 1: Sessions 1–3
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1–3
- Investigation 4: Sessions 1–4
- Investigation 5: Sessions 1–3
- Ten-Minute Math: Estimation and Number Sense

3. Multiply whole numbers with and without regrouping using single-digit multipliers.

•Applying concepts of multiplication through the use of manipulatives, number stories, arrays, repeated addition, or problem situations

References:

Things That Come in Groups
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 1–6
- Investigation 3: Sessions 2–3
- Investigation 5: Session 3–4
- Ten Minute Math: Counting Around the Class

Landmarks in the Hundreds
- Investigation 1: Sessions 2–7
- Investigation 2: Sessions 1–6
- Investigation 3: Sessions 1–3
- Ten Minute Math: Counting Around the Class

Up and Down the Number Line
- Investigation 3: Session 1

•Applying basic multiplication facts through 9x9 by using manipulatives, solving problems, and writing number stories

References:

Things That Come in Groups
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 1–6
- Investigation 3: Sessions 2–3
- Investigation 5: Session 3–4
- Ten Minute Math: Counting Around the Class

Landmarks in the Hundreds
- Investigation 1: Sessions 2–7
- Investigation 2: Sessions 1–6

Up and Down the Number Line
- Investigation 3: Session 1

•Recognizing properties of multiplication

Students apply the properties of multiplication in problem situations.

References:

Things That Come in Groups
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 3–4
- Investigation 3: Sessions 1–5
- Investigation 5: Session 2
- Ten Minute Math: Counting Around the Class

Landmarks in the Hundreds
Investigation 1: Sessions 2–7
Investigation 2: Sessions 1–6
Investigation 3: Sessions 1–3
Ten Minute Math: Counting Around the Class

4. Divide whole numbers using two-digit dividends and one-digit divisors.

•Recognizing division as repeated subtraction
References:
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3–4
Things That Come in Groups
Investigation 3: Sessions 3–5
Investigation 4: Sessions 1–2
Landmarks in the Hundreds
Investigation 1: Sessions 6–7
Investigation 2: Sessions 5–6

5. Model equivalent fractions with concrete objects or pictorial representations.
References:
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3–4
Investigation 4: Session 2
Flips, Turns, and Areas
Investigation 2: Sessions 1–5
Fair Shares
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–7
Investigation 3: Sessions 1–3

6. Use coins to make change up to $1.00.

•Determining monetary values of sets of unlike coins and bills up to $5.00
References:
Mathematical Thinking at Grade 3
Investigation 2: Sessions 5–7
Landmarks in the Hundreds
Investigation 1: Sessions 6–7
Investigation 2: Session 4
Combining and Comparing
Investigation 3: Sessions 1–2

Algebra

7. Complete a given numeric or geometric pattern.

References:

Mathematical Thinking at Grade 3
- Investigation 1: Sessions 2–3

Things That Come in Groups
- Investigation 2: Sessions 1–6
- Investigation 5: Session 1

Flips, Turns, and Area
- Investigation 1: Sessions 1–3

Fair Shares
- Investigation 2: Sessions 5–6

Geometry

8. Identify geometric representations for points, lines, perpendicular lines, parallel lines, angles, and rays.

•Recognizing real-life examples of points, lines, perpendicular lines, and parallel lines

References:

From Paces to Feet
- Investigation 1: Sessions 3–4

Turtle Paths
- Investigation 1: Session 1
- Investigation 1: Sessions 3–4
- Investigation 2: Sessions 1–3
- Investigation 3: Sessions 1–2

•Drawing points, lines, and perpendicular lines

References:

Turtle Paths
- Investigation 1: Session 1
- Investigation 1: Sessions 3–4
- Investigation 2: Sessions 1–3
- Investigation 3: Sessions 1–2

9. Specify locations on a coordinate grid by using horizontal and vertical movements.

References:

Turtle Paths

Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–6
Investigation 3: Sessions 1–7

Measurement

10. Measure length in metric units.

References:

From Paces to Feet

Investigation 2: Sessions 5–7
Investigation 3: Sessions 1–3
Investigation 4: Sessions 1–3

11. Determine elapsed time to the day with calendars and to the hour with a clock.

•Calculating elapsed time to the minute within the same hour

Grade 3 students using ***Investigations in Number, Data, and Space*** use a calendar to make time comparisons which involve the question, "How much longer?" They find distances between various time periods on the calendar. They also plan the activities and timing for a party that will last exactly two hours: the students are given the starting and ending times of the party, not the duration.

References:

Combining and Comparing

Investigation 3: Session 3
Investigation 5: Sessions 1–3

•Applying vocabulary associated with time using *a.m., p.m., noon,* or *midnight*

Reference:

Combining and Comparing

Investigation 3: Session 3

Data Analysis and Probability

12. Recognize data as either categorical or numerical.

- **Comparing related data sets**

References:

Mathematical Thinking at Grade 3
- Investigation 1: Sessions 2–3
- Investigation 3: Sessions 1–4

Things That Come in Groups
- Investigation 1: Session 1
- Investigation 2: Sessions 1, 5–6
- Investigation 5: Sessions 1–4

From Paces to Feet
- Investigation 1: Sessions 1–2, 5–6
- Investigation 2: Session 2

Landmarks in the Hundreds
- Investigation 1: Sessions 2–3, 6–7
- Investigation 2: Sessions 1–3
- Investigation 3: Session 1

Up and Down the Number Line
- Investigation 1: Sessions 1–2, 8
- Investigation 2: Sessions 1–4

Combining and Comparing
- Investigation 1: Session 3
- Investigation 4: Session 1
- Ten-Minute Math: Exploring Data

Fair Shares
- Investigation 2: Sessions 5–6

13. Determine the likelihood of different outcomes in a simple experiment.

References:

Thinks that Come in Groups
- Ten Minute Math: Likely or Unlikely?

Exploring Solids and Boxes
- Ten-Minute Math: What Is Likely?

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Grade Four

Students in fourth grade are intrigued with mathematics. To nurture this interest, students at this grade level need to be involved in an active learning process rather than one that only builds on memorization of concepts and procedures. Concrete experiences are also important at this stage of development. Such experiences allow students to develop and strengthen the skills needed to communicate, reason, solve mathematical problems, and reach higher levels of cognitive reasoning.

An effective classroom environment provides intellectually stimulating instruction and developmentally appropriate opportunities for students to learn mathematical concepts. This classroom environment fosters an atmosphere in which students are encouraged to find solutions through a variety of methods and feel less threatened about making and correcting mistakes. Instruction includes opportunities for students to communicate their mathematical thinking by talking, writing, and sharing with each other.

Fourth-grade content builds a foundation of basic number sense, operations, quantitative reasoning, patterns, relationships, geometric and spatial reasoning, measurement, and probability and statistics. The content builds on and expands students conceptual understanding of mathematics. Through the interweaving of mathematical concepts and processes, students learn to value mathematics, display confidence in their mathematical ability, solve problems, and make connections between mathematics and other subjects.

Number and Operations

Students will:

1. Demonstrate number sense by comparing and ordering decimals to hundredths and whole numbers to 999,999.

- **Identifying a number when given a pictorial representation of tenths and hundredths or groups of ones, tens, hundreds, and thousands**

  References:

  Mathematical Thinking at Grade 4
  - Investigation 1: Sessions 2–3
  - Investigation 2: Session 1
  - Investigation 2: Sessions 2–5
  - Investigation 3: Session 1–5
  - Investigation 4: Sessions 1–3

Money, Miles, and Large Numbers
Investigation 1: Sessions 1–8
Investigation 2: Sessions 1–4
Investigation 3: Sessions 1–3

•Writing a number in expanded notation through the hundred-thousands

References:

Mathematical Thinking at Grade 4
Investigation 1: Sessions 2–3
Landmarks in the Thousands
Investigation 4: Sessions 1–3

•Determining the place value of a digit in a whole number through the hundred-thousands and in a decimal to the hundredths

One of the central objectives of ***Investigations in Number, Data, and Space*** is to support students' understanding of number, number relationships, and the base-ten number system. In Grade 4, students explore hundreds, devise and practice grouping and ordering strategies, and compare and combine whole numbers through the thousands and decimals.

References:

Mathematical Thinking at Grade 4
Investigation 1: Session 1
Arrays and Shares
Investigation 1: Sessions 1–3
Landmarks in the Thousands
Investigation 4: Sessions 1–3
Different Shapes, Equal Pieces
Investigation 1: Sessions 2–4
The Shape of the Data
Investigation 2: 5–7
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2
Changes Over Time
Investigation 1: Sessions 5–6
Packages and Groups
Investigation 2: Sessions 1–3
Sunken Ships and Grid Patterns
Investigation 1: Sessions 2–4
Three Out of Four Like Spaghetti
Practice Pages 69–81

2. Write money amounts in words and dollar-and-cent notation.

•Identifying equivalent units of money

References:

Mathematical Thinking at Grade 4
Investigation 2: Sessions 1–4
Investigation 3: Sessions 4–5
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–8

3. Rename improper fractions as mixed numbers and mixed numbers as improper fractions.

•Using a number line to simplify, compare, and order fractions and mixed numbers

References:

Different Shapes, Equal Pieces
Investigation 3: Sessions 3–5
Three Out of Four Like Spaghetti
Investigation 1: Session 2

•Writing equivalent forms of fractions

References:

Different Shapes, Equal Pieces
Investigation 1: Session 5
Investigation 2: Sessions 1–4
Investigation 3: Sessions 3–5
Three Out of Four Like Spaghetti
Investigation 1: Sessions 2–3

4. Demonstrate addition and subtraction of fractions with common denominators.

References:

Different Shapes, Equal Pieces
Investigation 1: Session 5
Investigation 2: Session 3

5. Round whole numbers to the nearest ten, hundred, or thousand and decimals to the nearest tenth.

References:

Mathematical Thinking at Grade 4
Investigation 1: Sessions 2–4
Investigation 2: Sessions 3–4
Ten-Minute Math: Estimation and Number Sense

The Shape of the Data
Investigation 1: Sessions 1–3
Investigation 2: Sessions 1–2
Ten-Minute Math: Estimation and Number Sense
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2, 7–8
Investigation 2: Sessions 1–2
Investigation 3: Session 1
Packages and Groups
Investigation 2: Sessions 2–3

6. Solve problems, including word problems, that involve addition and subtraction of four-digit numbers with and without regrouping.

•Estimating sums and differences of whole numbers by using appropriate strategies such as rounding, front-end estimation, and compatible numbers

References:

Mathematical Thinking at Grade 4
Investigation 1: Sessions 2–4
Investigation 2: Sessions 3–4: Choice 2, page 42
Ten-Minute Math: Estimation and Number Sense
Landmarks in the Thousands
Investigation 3: Sessions 3–5
The Shape of the Data
Ten-Minute Math: Estimation and Number Sense

•Adding and subtracting decimals and money amounts

References:

Mathematical Thinking at Grade 4
Investigation 2: Sessions 1–2
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2, 4–8
Investigation 2: Sessions 1–2, 4

7. Solve problems, including word problems, involving the basic operations of multiplication and division on whole numbers through two-digit multipliers and one- digit divisors.

•Estimating products and quotients of whole numbers by using appropriate strategies such as rounding, front-end estimation, and compatible numbers

References:

Arrays and Shares
Investigation 1: Sessions 1–3
Investigation 2: Sessions 1–8

Investigation 3: Sessions 1–5
Ten-Minute Math: Counting Around the Class
Ten-Minute Math: Multiple BINGO
Landmarks in the Thousands
Investigation 1: Sessions 1–2
Investigation 2: Sessions 1–5
Ten-Minute Math: Counting Around the Class
Packages and Groups
Investigation 1: Sessions 1–5
Investigation 2: Sessions 1–3
Investigation 3: Sessions 1–10

•Identifying information needed to determine the appropriate operation to solve a problem

References:
Mathematical Thinking at Grade 4
Investigation 3: Sessions 1–5
Arrays and Shares
Investigation 3: Sessions 2–4
Landmarks in the Thousands
Investigation2: Sessions 2–4
Investigation 3: Sessions 3–5
Different Shapes, Equal Pieces
Ten Minute Math: Guess My Number
The Shape of the Data
Ten Minute Math: Broken Calculator
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2, 7–8
Changes Over Time
Investigation 1: Sessions 4–5
Ten Minute Math: Broken Calculator
Packages and Groups
Investigation 3: Sessions 1–2, 4–6, 10
Ten Minute Math: Guess My Number

•Demonstrating computational fluency in multiplication and division fact families through 12

References:
Mathematical Thinking at Grade 4
Investigation 3: Sessions 1–2
Arrays and Shares
Investigation 1: Sessions 1–3

Investigation 2: Sessions 2–3, 5–6
Investigation 3: Sessions 2–4
Ten-Minute Math: Multiple BINGO
Landmarks in the Thousands
Investigation 1: Sessions 1–2
Investigation 2: Sessions 1, 5
Packages and Groups
Investigation 1: Sessions 3–5
Investigation 3: Sessions 1–9

8. Recognize equivalent forms of commonly used fractions and decimals.

References:

Different Shapes, Equal Pieces
Investigation 1: Session 5
Investigation 2: Sessions 1–4
Three Out of Four Like Spaghetti
Investigation 1: Sessions 2–3

Algebra

9. Write number sentences for word problems that involve multiplication or division.

References:

Arrays and Shares
Investigation 2: Sessions 2–3
Packages and Groups
Investigation 3: Sessions 1–2

10. Complete addition and subtraction number sentences with a missing addend or subtrahend.

References:

Mathematical Thinking at Grade 4
Investigation 1: Session 4
Investigation 2: Sessions 3–4
Landmarks in the Thousands
Investigation 2: Sessions 2–4
Money, Miles, and Large Numbers
Investigation 1: Session 3, 7–8

Geometry

11. Identify triangles, quadrilaterals, pentagons, hexagons, or octagons based on the number of sides, angles, and vertices.

•Demonstrating slides (translations), flips (reflections), and turns (rotations) using triangles, quadrilaterals, pentagons, hexagons, or octagons

References:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 1–2, 5–6
Sunken Ships and Grid Patterns
Investigation 2: Sessions 1–9

•Drawing lines of symmetry in triangles, quadrilaterals, pentagons, hexagons, or octagons

References:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 1–6
Sunken Ships and Grid Patterns
Investigation 2: Sessions 2–3, 6–9

12. Find locations on a map or grid using ordered pairs.

References:

Sunken Ships and Grid Patterns
Investigation 1: Sessions 1–6
Investigation 2: Sessions 1–9
Ten-Minute Math: Lengths and Perimeters

Measurement

13. Calculate elapsed time in hours and minutes.

References:

The Shape of the Data
Investigation 3: Sessions 1–5
Changes Over Time
Unit Preparation: Growing Plants to Graph
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2
Investigation 3: Sessions 1–2, 7–8

14. Measure length, width, weight, and capacity, using metric and customary units, and temperature in degrees Fahrenheit and degrees Celsius.

Students using ***Investigations in Number, Data, and Space*** measure using customary and metric units. Students in grade 4 do not measure temperature.

References:

Seeing Solids and Silhouettes
Investigation 1: Session 1
The Shape of the Data
Investigation 2: Sessions 1–4
Money, Miles, and Large Numbers
Investigation 2: Sessions 3–4
Investigation 3: Sessions 2–4
Changes Over Time
Investigation 1: Session 3
Investigation 3: Session 3–4

•Estimating perimeter and area of irregular shapes using unit squares and grid paper

References:

Landmarks in the Thousands
Investigation 1: Session 2
Different Shapes, Equal Pieces
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2
Sunken Ships and Grid Patterns
Ten-Minute Math: Lengths and Perimeters

•Estimating area using unit squares

References:

Landmarks in the Thousands
Investigation 1: Session 2
Different Shapes, Equal Pieces
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2

Data Analysis and Probability

15. Represent categorical data using tables and graphs, including bar graphs, line graphs, and line plots.

•Collecting data using observations, surveys, or experiments

As the title of the course implies, data collection and analysis is an important feature in ***Investigations in Number, Data, and Space***. Students use observations, surveys, and experiments throughout the course to make and verify conjectures regarding properties of numbers and geometric shapes and solids as well as the environment inside and outside the classroom. In addition to the regular coursework, some appendices contain supplemental features related to data collection and analysis. The series for Grades 4 includes Ten-Minute Math exercises, which include a feature entitled, Exploring Data, which gives students further and ongoing opportunities to collect, organize, display, describe, and interpret data.

References:

The Shape of the Data
- Investigation 1: Sessions 1–3
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 1–5

Changes Over Time
- Unit Preparation: Sessions 1–3
- Investigation 1: Sessions 1–6
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1–8

Three Out of Four Like Spaghetti
- Investigation 1: Sessions 1, 3
- Investigation 2: Sessions 1–7

•Creating tally charts to represent data collected from real-life situations

References:

Mathematical Thinking at Grade 4
- Ten Minute Math: Exploring Data

Packages and Groups
- Ten Minute Math: Exploring Data

16. Determine if outcomes of simple events are likely, unlikely, certain, equally likely, or impossible.

References:

Landmarks in the Thousands
- Ten-Minute Math: What Is Likely?

Money, Miles, and Large Numbers
- Ten-Minute Math: Likely or Unlikely?

Three Out of Four Like Spaghetti
Ten-Minute Math: What Is Likely?

17. Represent numerical data using tables and graphs, including bar graphs and line graphs.

References:

The Shape of the Data
Investigation 2: Sessions 2–7
Investigation 3: Sessions 3–5
Changes Over Time
Preparation Session 3
Investigation 1: Sessions 1–4
Investigation 3: Sessions 1–8
Sunken Ships and Grid Patterns
Investigation 1: Sessions 1–6
Investigation 2: Sessions 1–9
Three Out of Four Like Spaghetti
Investigation 1: Session 2

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Grade Five

Students in fifth grade experience increased social and emotional development. They become more aware of their independence, opinions, and level of thinking as compared to others. Students enjoy and benefit from content presented in a way that allows for in-depth understanding, heightens interest and enthusiasm, and provides relevance to real-world situations.

In fifth grade, students need a positive learning environment that encourages and challenges student effort and progress toward learning mathematics. This environment is supported through the use of active learning experiences and content-related questions that foster mathematical communication.

The mathematics curriculum in fifth grade emphasizes fluency in computing and problem solving with whole numbers, decimals, and fractions. Students apply basic operations to problem-solving situations with a greater understanding of the meanings of operations and how they relate to one another. By actively acquiring new knowledge of symbolic representation, fifth-grade students move toward an abstract level of thinking.

Number and Operations

Students will:

1. Demonstrate number sense by comparing, ordering, rounding, and expanding whole numbers through millions and decimals to thousandths.

•Relating percents to parts out of 100 by using equivalent fractions and decimals

References:

Name That Portion
- Investigation 1: Sessions 1–7
- Investigation 3: Sessions 1–8
- Ten-Minute Math: Seeing Numbers

Between Never and Always
- Investigation 1: Sessions 1–4

Building on Numbers You Know
- Investigation 2: Session 3: Teacher Note, page 54

Data, Kids, Cats, and Ads
- Investigation 3: Session 1

•Determining the value of a digit to thousandths

References:

Name That Portion
- Investigation 1: Session 1
- Investigation 3: Sessions 1–7
- Investigation 4: Session 2

Between Never and Always
- Investigation 1: Sessions 1–2
- Ten Minute Math: Nearest Answer Number Line

Measurement Benchmarks
- Investigation 1: Sessions 4–6
- Investigation 2: Sessions 1–2

Patterns of Change
- Investigation 2: Sessions 2–4
- Investigation 3: Sessions 3–6

Data: Kids, Cats, and Ads
- Investigation 2: Session 1
- Investigation 3: Session 1
- Ten Minute Math: The Digits Game

2. Solve problems involving basic operations on whole numbers, including addition and subtraction of seven-digit numbers, multiplication with two-digit multipliers, and division with two-digit divisors.

•Estimating products and quotients

References:

Between Never and Always
- Ten-Minute Math: Nearest Answer

Building on Numbers You Know
- Investigation 3: Sessions 1–6
- Investigation 5: Sessions 1–2

Patterns of Change
- Ten-Minute Math: Nearest Answer

Name That Portion
- Investigation 1: Sessions 1–2
- Investigation 4: Sessions 1–7

•Determining divisibility by 2, 3, 4, 5, 6, 9, and 10

References:

Building on Numbers You Know
- Investigation 1: Sessions 3–5

Between Never and Always
- Investigation 1: Session 7

•Demonstrating computational fluency with addition, subtraction, multiplication, and division of whole numbers

References:

Mathematical Thinking at Grade 5
- Investigation 1: Sessions 1–2
- Investigation 2: Sessions 2–4
- Investigation 3: Sessions 1–5
- Investigation 4: Session 1–6

Picturing Polygons
- Investigation 1: Session 2
- Investigation 2: Sessions 4–5
- Investigation 3: Sessions 1–7
- Ten Minute Math: Multiple and Factor Bingo

Building on Numbers You Know
- Investigation 1: Sessions 1–8
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 1–10
- Investigation 4: Sessions 1–2
- Investigation 5 Sessions: 1–8

Measurement Benchmarks
- Investigation 1: Sessions 7–8
- Investigation 3: Session 2–3

Patterns of Change
- Investigation 1: Sessions 2–4
- Investigation 2: Session 1
- Ten Minute Math: Nearest Answer

3. Solve word problems that involve decimals, fractions, or money.

•Solving word problems involving elapsed time

References:

Measurement Benchmarks
- Investigation 3: Sessions 1–3

4. Determine the sum and difference of fractions with common and uncommon denominators.

•Changing mixed numbers to improper fractions

References:

Name That Portion
- Investigation 2: Sessions 6–8
- Investigation 3: Sessions 7

•Solving problems involving addition and subtraction of fractions with common and uncommon denominators

References:

Name That Portion

Investigation 2: Sessions 1–3, 7–8

•Using least common multiples

References:

Name That Portion

Investigation 2: Sessions 4–8

Investigation 3: Session 8

•Estimating sums and differences of fractions

References:

Name That Portion

Investigation 2: Session 3

5. Identify numbers less than zero by extending the number line.

References:

Mathematical Thinking at Grade 5

Investigation 4: Session 1: Teacher Note, page 79

Picturing Polygons

Investigation 1: Session 4

Investigation 2: Sessions 4–5

6. Demonstrate the commutative, associative, and identity properties of addition and multiplication of whole numbers.

References:

Mathematical Thinking at Grade 5

Investigation 2: Sessions 1–4

Investigation 3: Sessions 2–5

Building on Numbers You Know

Investigation 1: Sessions 3–4, 6–7

Investigation 2: Sessions 5–6

Investigation 3: Sessions 1–3

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

7. Write a number sentence for a problem expressed in words.

References:

Mathematical Thinking at Grade 5
- Investigation 2: Session 1
- Investigation 3: Sessions 2–5
- Investigation 4: Session 1

Name That Portion
- Ten-Minute Math: Seeing Numbers

Building on Numbers You Know
- Investigation 1: Sessions 1, 3–4, 6–8
- Investigation 2: Sessions 1–2, 5–6
- Investigation 3: Sessions 1–10
- Investigation 5: Sessions 4–7

Geometry

8. Identify regular polygons and congruent polygons.

•Identifying angles as right, obtuse, acute, or straight

References:

Picturing Polygons
- Investigation 2: Sessions 1–3, 6–9
- Investigation 3: Sessions 1–3

•Classifying triangles as equilateral, isosceles, or scalene

References:

Picturing Polygons
- Investigation 2: Sessions 1–3, 6–7
- Investigation 3: Sessions 1–3

•Identifying figures that have rotational symmetry

References:

Picturing Polygons
- Investigation 2: Sessions 1–5

•Predicting the results of a flip (reflection), turn (rotation), or slide (translation)

References:

Picturing Polygons
- Investigation 2: Sessions 1–5

9. Identify components of the Cartesian plane, including the x-axis, y-axis, origin, and quadrants.

References:

Picturing Polygons
- Investigation 1: Sessions 3–4
- Investigation 2: Sessions 4–7, 9
- Investigation 3: Sessions 1–2, 5–6

10. Identify the center, radius, and diameter of a circle.

References:

Name That Portion
- Investigation 1: Session 7, page 31
- Investigation 2: Sessions 1–2
- Investigation 3: Session 8
- Investigation 4: Sessions 2–7

Measurement

11. Estimate perimeter and area of irregular shapes using unit squares and grid paper.

References:

Mathematical Thinking at Grade 5
- Investigation 1: Sessions 1–3

Picturing Polygons
- Investigation 3: Sessions 4–6

Containers and Cubes
- Investigation 2: Sessions 3–5

Data: Kids, Cats, and Ads
- Ten-Minute Math: Volume and Surface Area

12. Calculate the perimeter of rectangles from measured dimensions.

Picturing Polygons
- Investigation 3: Sessions 4–6

Containers and Cubes
- Investigation 2: Sessions 3–5

Data: Kids, Cats, and Ads
- Ten-Minute Math: Volume and Surface Area

13. Convert a larger unit of measurement to a smaller unit of measurement within the same system, customary or metric.

References:

Measurement Benchmarks
- Investigation 1: Sessions 4, 7–8
- Investigation 2: Sessions 1–4, 7–8
- Investigation 3: Session 2

Data Analysis and Probability

14. Analyze data collected from a survey or experiment to distinguish between what the data show and what might account for the results.

•Evaluating different representations of the same data to determine how well each representation shows important aspects of the data

Students using ***Investigations in Number, Data, and Space*** create and interpret representations of categorical and numerical data throughout the course. As an explicit example of experience in this area, Grade 5 students are asked to make choices regarding the most appropriate way to display the associations between categorical and numerical variables of cat data: categorical variables in a particular study included gender and fur color, and numerical variables included body length and tail length.

References:

Name That Portion
- Investigation 4: Sessions 2–7

Between Never and Always
- Investigation 1: Session 6

Measurement Benchmarks
- Investigation 2: Sessions 7–8

Patterns of Change
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 3–5
- Investigation 3: Sessions 1–6
- Ten Minute Math: Nearest Answer Number Line Problems
- Ten Minute Math: Graph Stories

Data: Kids, Cats, and Ads
- Investigation 1: Session 1
- Investigation 2: Session 2
- Investigation 5: Sessions 3–5

•Using given measures of central tendency (mean, median, and mode) to analyze data

Grade 5 students gain experience with measures of central tendency through finding the median of a set of data and through discussion of the spread and clustering of data.

References:

Between Never and Always
Investigation 1: Sessions 3–6
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1–4
Investigation 2: Session 1

15. Use common fractions to represent the probability of events that are neither certain nor impossible.

References:

Between Never and Always
Investigation 1: Sessions 1–2, 5
Investigation 2: Sessions 4–5