

A Correlation of



to the

**Clark County
Curriculum Overview**
Grades K-5



M/M-108

INTRODUCTION

This document demonstrates how well ***Investigations in Number, Data, and Space®*** integrates with the Clark County Curriculum Overview. The citations within this correlation provide Investigation Curriculum Unit titles, the Investigation number and Session number or FocusTime/Choice Time title correlated to the objectives of the Clark County Curriculum Overview. Thus, teachers know exactly where instruction is located to prepare students for mastery of Clark County Curriculum Overview.

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.

Table of Contents

Kindergarten.....	1
Grade One.....	22
Grade Two.....	48
Grade Three.....	82
Grade Four.....	122
Grade Five.....	162

Investigations in Number, Data, & Space to the Clark County Curriculum Overview

KINDERGARTEN

Kindergarten students begin to count; combine, sort and compare sets of objects; describe simple patterns; and recognize shapes of figures and objects. Learning experiences in mathematics begin with the concrete, connect the concrete to symbols, and proceed to the abstract or purely symbolic. Students learn concepts and skills, which are necessary for understanding the mathematics of the next grade level.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **count up to 20 objects to determine quantity**

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

- **count by ones to 20**

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

• **compare sets of objects and describe more/less/equal**

References:

Mathematical Thinking in Kindergarten

Investigation 2: Choice Time, pages 32-33

Investigation 4

Collecting, Counting, and Measuring

Investigations 3, 4, 5, 6

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls

All Units: Appendix: About Classroom Routines: Attendance

• **match the number of objects to the correct numeral, 0 –10**

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

• **recognize, read, and write numerals, 0 – 10**

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

• **recognize number words, 0 – 10**

Kindergarten students using *Investigations in Number, Data, and Space* are encouraged to use a variety of representations of numbers, including objects, pictures, numbers, and words.

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

• use ordinal positions of first, second, and third

References:

Mathematical Thinking in Kindergarten

Investigation 2: Teacher Note, page 36

Collecting, Counting, and Measuring

Investigation 1: Teacher Note, page 16

Counting Ourselves and Others

Investigation 1: Teacher Note, page 12

• describe whole number relationships, 0-10

References:

Mathematical Thinking in Kindergarten

Investigation 2: Choice Time, pages 32-33

Investigation 4

Collecting, Counting, and Measuring

Investigations 3, 4, 5, 6

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls

All Units: Appendix: About Classroom Routines: Attendance

• combine sets of objects (addition) and describe results

References:

Collecting, Counting, and Measuring

Investigation 4: Choice Time: Collect 10 Together

How Many in All?

Investigations 2, 3, 4

• remove objects from a set (subtraction) and describe results

References:

How Many in All?

Investigations 3, 4

• compare two sets to determine the difference (subtraction)

References:

Collecting, Counting, and Measuring

Investigation 3: Teacher Note, page 71

Investigation 4: Teacher Note, pages 86-87

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls, Towers of Six

All Units: Appendix: About Classroom Routines: Attendance

• use concrete objects to model simple sums and differences

References:

Collecting, Counting, and Measuring

Investigation 4: Choice Time: Collect 10 Together

How Many in All?

Investigations 2, 3, 4

All Units: Appendix: About Classroom Routines: Attendance

• add and subtract whole numbers to 10, using objects

References:

Collecting, Counting, and Measuring

Investigation 4: Choice Time: Collect 10 Together

How Many in All?

Investigations 2, 3, 4

All Units: Appendix: About Classroom Routines: Attendance

• estimate the number of objects in a set to 10 and verify by counting

References:

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls

All Units: Appendix: About Classroom Routines: Counting Jar

• use number sense, computation, and estimation to solve mathematical and real-world problems

References:

Mathematical Thinking in Kindergarten

Investigations 1, 2, 3

Collecting, Counting, and Measuring

Investigations 1, 2, 3, 4, 5, 6

Counting Ourselves and Others

Investigations 1, 3, 4

How Many in All?

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: The Counting Jar

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **sort and describe objects by similar characteristics (attributes)**

References:

Mathematical Thinking in Kindergarten

Investigation 1: Choice Time: Exploring Color Tiles, Pattern Blocks, Geoblocks

Investigation 3: Choice Time: Exploring Interlocking Cubes

Investigation 4: Teacher Note: pages 61-64

Collecting, Counting, and Measuring

Investigation 3: Choice Time: Measuring Table

Investigation 4

Choice Time: Comparing Names

Choice Time: Grab and Count: Compare

Investigation 5

Investigation 6: Focus Time: Six Tiles

Counting Ourselves and Others

Investigation 1

Choice Time: Self-Portraits

Choice Time: Pattern Block Grab

Investigation 2: Focus Time: What Did You Eat for Lunch?

Making Shapes and Building Blocks

Investigation 1

Choice Time: Book of Shapes

Investigation 3

Focus Time: 3-D Shapes in the Classroom

Choice Time: Shape Hunt

Choice Time: Exploring Geoblocks

Investigation 4

Focus Time: Clay Shapes

- **create and describe patterns using objects, words, and numbers**

References:

Mathematical Thinking in Kindergarten

Investigation 3

Pattern Trains and Hopscotch Paths

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: Calendar, Patterns on the Pocket Chart

- **recognize, replicate, and extend repeating patterns**

References:

Mathematical Thinking in Kindergarten

Investigation 3

Pattern Trains and Hopscotch Paths

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: Calendar, Patterns on the Pocket Chart

- **identify and create sets of objects with unequal amounts, describing them as having more or less**

References:

Mathematical Thinking in Kindergarten

Investigation 4

Collecting, Counting, and Measuring

Investigations 3, 4, 5, 6

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls, pages 40-41

MEASUREMENT

It is expected that students will:

- **compare and order objects by size and communicate their similarities and differences**

References:

Collecting, Counting, and Measuring

Investigations 3, 4

How Many in All?

Investigation 1

- **order objects by size and weight**

Students using the series *Investigations in Number, Data, and Space* explore the concept of weight comparison beginning in Grade 1.

References:

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

- **identify and sort pennies, nickels, dimes**

Kindergarten students using *Investigations in Number, Data, and Space* are given an opportunity to explore monetary values as they simulate the purchase of items in a classroom grocery store.

Reference:

Counting Ourselves and Others
Investigation 2: Choice Time: page 50

- **identify year, day, month using a calendar**

References:

Mathematical Thinking in Kindergarten
Investigation 3
All Units: Appendix: About Classroom Routines: Calendar

- **recite, in order, the days of the week**

References:

Mathematical Thinking in Kindergarten
Investigation 3
All Units: Appendix: About Classroom Routines: Calendar

SPATIAL RELATIONSHIPS AND GEOMETRY

It is expected that students will:

- **identify and describe geometric figures (sphere, cylinder, rectangular prism, cube, cone)**

References:

Mathematical Thinking in Kindergarten
Investigation 1
Choice Time: Exploring Geoblocks
Teacher Note, page 22

Making Shapes and Building Blocks
Investigations 3, 4, 5

- **identify and describe two-dimensional shapes (circles, triangles, rectangles [squares]) regardless of position**

References:

Mathematical Thinking in Kindergarten

Investigation 1: Choice Time: Exploring Pattern Blocks

Making Shapes and Building Blocks

Investigations 1, 2, 3, 4, 5

Shapes Teacher Tutorial, pages 117-154

- **use position words such as next to, between, under, over, top, bottom, before, after, middle, down to place and describe location of objects**

In addition to physical manipulation of shapes and objects, Kindergarten students using *Investigations in Number, Data, and Space* apply concepts of relative location and use of position words through the use of *Shapes*, a software program which allows students to construct and manipulate geometric shapes, see objects move according to rules they specify, and explore rotation and reflection.

References:

Making Shapes and Building Blocks

Investigations 2, 3, 4

Shapes Teacher Tutorial: pages 117-154

- **identify two-dimensional figures as they appear in the environment (e.g., windows are shaped like rectangles)**

References:

Making Shapes and Building Blocks

Investigations 1, 3

DATA ANALYSIS

It is expected that students will:

- **collect and describe data**

References:

Mathematical Thinking in Kindergarten

Investigations 1, 4

Counting Ourselves and Others

Investigations 1, 2, 3, 4

All Units: Appendix: About Classroom Routines: Today's Question, Attendance

- **describe and compare information (data) on graphs made with objects, pictures, or numbers**

References:

Mathematical Thinking in Kindergarten

Investigation 1

Counting Ourselves and Others

Investigations 1, 2, 3

All Units: Appendix: About Classroom Routines: Today's Question, Attendance

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Kindergarten students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems throughout the course. For example, students recognize, construct, extend, and predict what comes next in patterns on a pocket chart and with color tiles, and apply these concepts to practical problems as they investigate patterns on the calendar.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 3

Pattern Trains and Hopscotch Paths

Investigation 2

Collecting, Counting, and Measuring

Investigation 1

Counting Ourselves and Others

Investigation 4

Making Shapes and Building Blocks

Investigation 2

How Many in All?

Investigation 4

- **apply previous experience and knowledge to new problem-solving situations**

Kindergarten students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, children expand on their previous experiences in a grocery store by applying newly practiced skills in organizing and sorting objects with similar attributes.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 4

Pattern Trains and Hopscotch Paths

Investigation 4

Collecting, Counting, and Measuring

Investigation 1

Counting Ourselves and Others

Investigation 2: Choice Time: The Grocery Store

Making Shapes and Building Blocks

Investigation 4

How Many in All?

Investigation 3

- **formulate own problems; use various approaches to investigate and solve problems**

Kindergarten students using *Investigations in Number, Data, and Space* are given a great deal of freedom to explore mathematical concepts and, in so doing, formulate their own problems and use various approaches to investigate and solve problems. For example, students explore color tiles, pattern blocks, Geoblocks, and their attributes; they recognize, describe, create, and extend patterns; and they employ a variety of approaches to counting and representing quantities.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 1

Pattern Trains and Hopscotch Paths

Investigation 1

Collecting, Counting, and Measuring

Investigation 1

Counting Ourselves and Others

Investigation 4

Making Shapes and Building Blocks

Investigation 1

How Many in All?

Investigation 3

• explain and verify results with respect to the original problem

Kindergarten students using *Investigations in Number, Data, and Space* explain and verify results with respect to the original problem throughout the course. For example, in the recurrent activity, Today's Question, students interpret the data they have collected and focus on the content and meaning of the data collection experience.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 2
Collecting, Counting, and Measuring
Investigation 2
Counting Ourselves and Others
Investigation 1
Making Shapes and Building Blocks
Investigation 2
How Many in All?
Investigation 3

• try more than one strategy when the first strategy proves to be unproductive

Kindergarten students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, they count and keep track of quantities by manipulating concrete objects, using one-to-one correspondence, drawing pictures or tally marks, writing words, and constructing graphs. Students are encouraged to try different strategies and are exposed to the alternative strategies used by their classmates.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 1
Pattern Trains and Hopscotch Paths
Investigation 2
Collecting, Counting, and Measuring
Investigation 2
Counting Ourselves and Others
Investigation 4
Making Shapes and Building Blocks
Investigation 2
How Many in All?
Investigation 2

- **apply solutions and strategies from earlier problems to new problem situations**

Kindergarten students using *Investigations in Number, Data, and Space* apply solutions and strategies from earlier problems to new problem situations throughout the course. For example, students develop and apply strategies for solving combining and separating story problems.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 3

Pattern Trains and Hopscotch Paths

Investigation 2

Collecting, Counting, and Measuring

Investigation 4

Counting Ourselves and Others

Investigation 4

Making Shapes and Building Blocks

Investigation 1

How Many in All?

Investigation 3

- **use technology, including calculators, to understand quantitative relationships (e.g., for skip counting and pattern exploration)**

References:

Making Shapes and Building Blocks

Investigations 2, 3, 4, 5

Appendix: *Shapes* Teacher Tutorial: 128-131

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Kindergarten students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. One example cited in a Dialogue Box describes students brainstorming ways to record the number of balls in the Counting Jar.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 2

Pattern Trains and Hopscotch Paths

Investigation 2: Dialogue Box, page 31

- Collecting, Counting, and Measuring
 - Investigation 2: Dialogue Box, page 33
- Counting Ourselves and Others
 - Investigation 3: Dialogue Box, pages 72-73
- Making Shapes and Building Blocks
 - Investigation 4: Dialogue Box, pages 80-81
- How Many in All?
 - Investigation 2: Dialogue Box, page 50

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Kindergarten students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a strategy for learning is a fundamental emphasis of the investigation-based curriculum. The teacher asks guiding questions of the students, and the students discuss ideas, question methods and results, conduct research, and gather and interpret data.

- **Sample References:**

- Mathematical Thinking in Kindergarten
 - Investigation 4
- Pattern Trains and Hopscotch Paths
 - Investigation 2
- Collecting, Counting, and Measuring
 - Investigation 1
- Counting Ourselves and Others
 - Investigation 1
- Making Shapes and Building Blocks
 - Investigation 1
- How Many in All?
 - Investigation 2

- **use pictorial representations to identify mathematical operations and concepts**

Kindergarten students using *Investigations in Number, Data, and Space* use pictorial representations to identify mathematical operations and concepts throughout the course. For example, students create their own counting books with pages from 0 through 6, including pictorial and numerical representations of quantities.

- **Sample References:**

- Mathematical Thinking in Kindergarten
 - Investigation 3
- Pattern Trains and Hopscotch Paths
 - Investigation 3

Collecting, Counting, and Measuring
Investigation 1
Counting Ourselves and Others
Investigation 3
Making Shapes and Building Blocks
Investigation 2
How Many in All?
Investigation 2

• **use physical materials, models, pictures, or writing to represent and communicate mathematical ideas**

Kindergarten students using *Investigations in Number, Data, and Space* use physical materials, models, pictures, and writing to represent and communicate mathematical ideas throughout the course. Students explore and employ a variety of physical materials, including geoblocks, pattern blocks, interlocking cubes, and color tiles. They use pictorial and graphic models to organize information and to communicate mathematical ideas. They interpret and solve story problems.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 3
Pattern Trains and Hopscotch Paths
Investigation 1
Collecting, Counting, and Measuring
Investigation 3
Counting Ourselves and Others
Investigation 2
Making Shapes and Building Blocks
Investigation 4
How Many in All?
Investigation 3

• **explain and justify thinking about mathematical ideas and solutions**

Kindergarten students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 3
Pattern Trains and Hopscotch Paths
Investigation 2

- Collecting, Counting, and Measuring
Investigation 2
- Counting Ourselves and Others
Investigation 3
- Making Shapes and Building Blocks
Investigation 4
- How Many in All?
Investigation 2

• use everyday language to explain thinking about strategies and solutions to mathematical problems

Kindergarten students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, the teacher and students discuss the various meanings and usages of the words “pattern” and “arrange.”

Sample References:

- Mathematical Thinking in Kindergarten
Investigation 3
- Pattern Trains and Hopscotch Paths
Investigation 1
- Collecting, Counting, and Measuring
Investigation 6
- Counting Ourselves and Others
Investigation 1
- Making Shapes and Building Blocks
Investigation 1
- How Many in All?
Investigation 3

• express mathematical ideas and use them to define, compare, and solve problems orally and in writing

Kindergarten students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies.

Sample References:

- Mathematical Thinking in Kindergarten
Investigation 2
- Pattern Trains and Hopscotch Paths
Investigation 1: Dialogue Box, pages 21-23

- Collecting, Counting, and Measuring
 - Investigation 2: Teacher Note, pages 34-35
- Counting Ourselves and Others
 - Investigation 1
- Making Shapes and Building Blocks
 - Investigation 3: Dialogue Box, page 54
- How Many in All?
 - Investigation 3: Dialogue Box, pages 72-73

• use mathematical notation to communicate and explain mathematical situations

Kindergarten students using *Investigations in Number, Data, and Space* use mathematical notation to communicate and explain mathematical situations throughout the course. Students may use letters to label types of patterns, they use numerals to represent quantities, they label data representations, and they use symbolic notation for sum and difference equations.

Sample References:

- Mathematical Thinking in Kindergarten
 - Investigation 2
- Pattern Trains and Hopscotch Paths
 - Investigation 2: Teacher Note, page 43
- Collecting, Counting, and Measuring
 - Investigation 1
- Counting Ourselves and Others
 - Investigation 1
- Making Shapes and Building Blocks
 - Investigation 2
- How Many in All?
 - Investigation 2: Teacher Note, page 45

MATHEMATICAL REASONING

It is expected that students will:

• justify and explain the solutions to problems using manipulatives and physical models

Kindergarten students using *Investigations in Number, Data, and Space* justify and explain the solutions to problems using physical materials throughout the course. Students use an extensive array of manipulative materials, including interlocking cubes, dot cubes, number cubes, color tiles, pattern blocks, geoblocks, containers, countable objects, clothespins, and teddy bear counters.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 2
Pattern Trains and Hopscotch Paths
Investigation 1
Collecting, Counting, and Measuring
Investigation 3
Counting Ourselves and Others
Investigation 2
Making Shapes and Building Blocks
Investigation 3
How Many in All?
Investigation 1

• use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems

Kindergarten students using *Investigations in Number, Data, and Space* use cubes, color tiles, and calendars to explore and relate patterns. They represent quantities with pictures and numerals as they develop counting strategies and relate numerals to the quantities they represent. They look at the relationships between different representations of the same set of data. They examine spatial relationships. They relate combinations of numbers and arrangements of objects.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 1
Pattern Trains and Hopscotch Paths
Investigation 1
Collecting, Counting, and Measuring
Investigation 1
Counting Ourselves and Others
Investigation 1
Making Shapes and Building Blocks
Investigation 4
How Many in All?
Investigation 2

• ask questions to reflect on, clarify, and extend thinking

Kindergarten students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 1
Collecting, Counting, and Measuring
Investigation 3
Counting Ourselves and Others
Investigation 1
Making Shapes and Building Blocks
Investigation 4
How Many in All?
Investigation 1

• review and refine the assumptions and steps used to derive conclusions in mathematical arguments

Kindergarten students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. Students use inductive reasoning as they generalize solution processes and draw conclusions from several trials or examples. They reason deductively as they determine and apply relationships between operations on numbers, between elements in patterns, between geometric shapes and solids, and between events in time. Cooperative learning and group discussion, as described in the Focus Time activities for each investigation and in the Dialogue Box feature which recurs throughout the series, help facilitate this review and refinement of students' conceptualization and application of mathematical properties.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 3
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting, and Measuring
Investigation 6
Counting Ourselves and Others
Investigation 1
Making Shapes and Building Blocks
Investigation 5
How Many in All?
Investigation 2

- **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Kindergarten students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process. For example, students need to determine sufficient information to identify the unit of a pattern, and whether they have enough information to continue the pattern.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 2
Collecting, Counting, and Measuring
Investigation 6
Counting Ourselves and Others
Investigation 2
Making Shapes and Building Blocks
Investigation 3
How Many in All?
Investigation 3

MATHEMATICAL CONNECTIONS

It is expected that students will:

- **link new concepts to prior knowledge**

Kindergarten students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students link concepts and properties of geometric shapes and solids to the objects in their natural environment. They build on previously learned concepts of counting to add the number zero.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 3
Pattern Trains and Hopscotch Paths
Investigation 2
Collecting, Counting, and Measuring
Investigation 4
Counting Ourselves and Others
Investigation 4

Making Shapes and Building Blocks

Investigation 1

How Many in All?

Investigation 4

• identify practical applications of mathematical principles that can be applied to other disciplines

Kindergarten students using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course. For example, a Teacher Note describes patterns and related concepts in children’s literature.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 1

Pattern Trains and Hopscotch Paths

Investigation 1: Teacher Note, page 18

Collecting, Counting, and Measuring

Investigation 3

Counting Ourselves and Others

Investigation 3

Making Shapes and Building Blocks

Investigation 1

How Many in All?

Investigation 1

• apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g., rhythm in music and motion in science)

Kindergarten students using *Investigations in Number, Data, and Space* apply mathematical thinking and modeling to solve problems that arise in other disciplines throughout the course. For example, students apply concepts of surveys and statistics to science and probability as they investigate whether or not all or some of the sunflower seeds they have planted will germinate.

Sample References:

Mathematical Thinking in Kindergarten

Investigation 4

Pattern Trains and Hopscotch Paths

Investigation 4

Collecting, Counting, and Measuring

Investigation 1

Counting Ourselves and Others

Investigation 3: Dialogue Box, pages 74-75

Making Shapes and Building Blocks
Investigation 4
How Many in All?
Investigation 3

• **identify, explain, and use mathematics in everyday life**

Kindergarten students using *Investigations in Number, Data, and Space* identify, explain, and use mathematics in everyday life throughout the course. For example, students use calendars and apply mathematical concepts to determine the number of school days which have passed, and the number of school days which remain in the current school year. They identify geometric shapes and solids in their environment. They conduct surveys with classmates and family members.

Sample References:

Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 3
Collecting, Counting, and Measuring
Investigation 2
Counting Ourselves and Others
Investigation 3
Making Shapes and Building Blocks
Investigation 4
How Many in All?
Investigation 3

Investigations in Number, Data, & Space

to the Clark County Curriculum Overview

GRADE ONE

First grade students learn the basic addition facts through sums of ten and the corresponding subtraction facts. They also begin to learn about fractions, continue to develop sorting and patterning skills, and use nonstandard units of measure.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **count up to 100 objects to determine quantity**

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-6

Investigation 5: Sessions 1-4

Building Number Sense

Investigation 1: Sessions 1-9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 2: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

- **count on and count back**

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Session 2

Building Number Sense

Investigation 1: Session 9

Investigation 2: Sessions 1-9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-5, 10-13

Investigation 3: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

• compare and order groups of objects and numerals less than 100

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-3

Building Number Sense

Investigation 1: Session 2

Investigation 2: Session 3

Investigation 3: Sessions 1-7, 9

All Units: Appendix: About Classroom Routines: Counting

• use the inherent patterns in numbers to count by 1's, 2's, 5's, 10's to 100

References:

Mathematical Thinking at Grade 1

Investigation 3: Session 1: Teacher Note, page 65

Investigation 4: Session 5

Building Number Sense

Investigation 3

Sessions 1-2

Sessions 5-7, pages 99-100, 104-105

Session 8, page 107

Number Games and Story Problems

Investigation 2: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

• read, write, order, and compare numerals, 0 –100

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 5-6, 9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-7, 9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-13

Investigation 3: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

• read and write number words, 0 –10

Grade 1 students using *Investigations in Number, Data, and Space* are encouraged to use a variety of representations of numbers, including objects, pictures, numbers, and words.

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 5-6, 9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-7, 9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-13

Investigation 3: Sessions 1-13

• use ordinal positions first through tenth

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 2-3

• use, model, and identify place value positions (ones, tens)

References:

Building Number Sense

Investigation 2: Session 2

Investigation 3: Sessions 1-2, 9

Number Games and Story Problems

Investigation 2: Sessions 6-12

• explain and model the meaning of addition and subtraction

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-6, 9

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, 10-13

Investigation 3: Sessions 1-13

• identify and describe whole number relationships (0 -10)

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1, 4-6

Investigation 4: Session 4

Building Number Sense

Investigation 1: Session 2

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-7, 9

Investigation 4: Session 2

Number Games and Story Problems

Investigation 1: Sessions 1-10

All Units: Appendix: About Classroom Routines: Counting

• identify and model a whole

References:

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

Investigation 3: Session 2

• identify and model $\frac{1}{2}$

References:

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

Investigation 3: Session 2

- **identify decimals to show money amounts**

Grade 1 students using *Investigations in Number, Data, and Space* count values of coins and explore coin equivalencies and trades.

References:

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

- **identify and model basic addition facts (sums to 10) and the corresponding subtraction facts**

References:

Mathematical Thinking in Grade 1
Investigation 2: Sessions 1-6
Investigation 4: Sessions 1-4, 6
Investigation 5: Sessions 2-4
Building Number Sense
Investigation 1: Sessions 1-6, 9
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, 10-13
Investigation 3: Sessions 1-13

- **know basic addition facts (sums to 10) and the corresponding subtraction facts**

References:

Mathematical Thinking in Grade 1
Investigation 2: Sessions 1-6
Investigation 4: Sessions 1-4, 6
Investigation 5: Sessions 2-4
Building Number Sense
Investigation 1: Sessions 1-6, 9
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, 10-13
Investigation 3: Sessions 1-13

- **write number sentences for the basic addition and subtraction facts (sums to 10 or less) and corresponding subtraction facts**

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-6, 9

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, 10-13

Investigation 3: Sessions 1-13

- **add and subtract one- and two-digit numbers, with no regrouping, with and without objects**

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-6, 9

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, 10-13

Investigation 3: Sessions 1-13

- **estimate the number of objects in a set to 10; verify the estimate by counting, and revise estimate, as needed, based on results**

References:

Building Number Sense

Investigation 3: Sessions 3-4, 9

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

All Units: Appendix: About Classroom Routines: Counting

- **use mental computation in appropriate situations to solve problems**

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-6, 9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 5-7

Investigation 4: Sessions 1-10

Quilt Squares and Block Towns

Investigation 3: Sessions 6-7

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-13

Investigation 3: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

- **use number sense, computation, and estimation to solve mathematical and real-world problems**

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-6, 9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 3-7, 9

Investigation 4: Sessions 1-10

Quilt Squares and Block Towns

Investigation 3: Sessions 6-7

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-13

Investigation 3: Sessions 1-13

All Units: Appendix: About Classroom Routines: Counting

- **write, model, and describe one-step addition and subtraction word problems**

References:

Mathematical Thinking in Grade 1

Investigation 2: Session 4

Investigation 4: Sessions 4-6

Building Number Sense

Investigation 2: Sessions 1-2, 9

Investigation 4: Sessions 1-5, 7-10

Number Games and Story Problems

Investigation 1: Session 10

Investigation 2: Sessions 1-2, 13

Investigation 3: Sessions 1-13

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **sort and categorize objects, shapes, and numbers in a variety of ways**

References:

Survey Questions and Secret Rules

Investigation 1: Sessions 1-6

Investigation 2: Sessions 3-6

Investigation 4: Sessions 2-3

Quilt Shapes and Block Towns

Investigation 1: Sessions 11-12

All Units: Appendix: About Classroom Routines:

Exploring Data: Guess My Rule, Guess My Object

- **recognize, describe, extend, and create simple repeating patterns using symbols, objects, and manipulatives**

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

- **determine possible combinations for a given number (0 -10)**

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 4-6

Investigation 4: Session 4

Building Number Sense

Investigation 2: Sessions 1-9

Number Games and Story Problems

Investigation 1: Sessions 1-10

- **create, compare, and describe sets of objects as having more, less, or equal amounts**

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-3

Building Number Sense

Investigation 1: Session 2

Investigation 2: Session 3

Investigation 3: Sessions 1-7, 9

All Units: Appendix: About Classroom Routines: Counting

MEASUREMENT

It is expected that students will:

- **compare and order objects by length and weight and communicate their similarities and differences**

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

- **compare and measure length and weight using non-standard units of measure**

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

- **distinguish between day and night (i.e., between A.M. and P.M.)**

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. Students investigate clock time beginning in Grade 2.

- **read time to the hour and half-hour**

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. The only other references to time in the Grade 1 texts of the *Investigations in Number, Data, and Space* series are to dates and months on a calendar. Students become familiar with calendar features; observe the cyclical nature of the sequence of months; and group, describe, organize, and order data about birthdays. Students investigate clock time beginning in Grade 2.

Calendar References:

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

- **use a calendar to identify months, weeks, and days**

References:

Survey Questions and Secret Rules
Investigation 3: Sessions 1-3
All units: Appendix: About Classroom Routines: Understanding Time and Changes

- **identify and sort coins and bills**

References:

Number Games and Story Problems
Investigation 2
Session 3
Sessions 4-5: Choice Time:
Collect 25¢ Together

- **identify values of pennies, nickels, dimes, and quarters**

References:

Number Games and Story Problems
Investigation 2
Session 3
Sessions 4-5: Choice Time:
Collect 25¢ Together

- **determine the value of any set of pennies, nickels, and dimes**

References:

Number Games and Story Problems
Investigation 2
Session 3
Sessions 4-5: Choice Time:
Collect 25¢ Together

SPATIAL RELATIONSHIPS AND GEOMETRY

It is expected that students will:

- **use position words such as between, on, inside, outside, near, left, right to describe location of objects**

References:

Building Number Sense
Investigation 1: Sessions 3-4
Quilt Squares and Block Towns
Investigation 1: Sessions 3-6, 8-10
Investigation 3: Sessions 6-7
Appendix: *Shapes* Teacher Tutorial

- **identify, describe, and name geometric figures (sphere, cylinder, rectangular prism, cube, cone)**

References:

Building Number Sense
Investigation 1: Sessions 3-4
Quilt Squares and Block Towns
Investigation 2: Sessions 1-10
Investigation 3: Sessions 1-5

- **identify, name, sort, and sketch two-dimensional geometric shapes (circles, triangles, rectangles [squares]) regardless of position**

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
Investigation 2: Sessions 3-4
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Appendix: *Shapes* Teacher Tutorial

- **identify and replicate two-dimensional designs that contain a line of symmetry**

Students using Investigations in Number, Data, and Space are not formally introduced to the concept of symmetry until Grade 2. Grade 1 students explore preliminary skills, including the manipulation of shapes through physical manipulation, drawing, and computer technology, as they construct murals and create designs and drawings using basic shapes. They are exposed to symmetry as they examine and manipulate geometric shapes and solids.

References:

Mathematical Thinking at Grade 1
Investigation 1: Sessions 1-4
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Investigation 2: Sessions 1-10
Investigation 3: Sessions 1-7
Appendix: *Shapes* Teacher Tutorial

- **recognize and describe different shapes in the environment**

References:

Quilt Squares and Block Towns
Investigation 1: Session 1
Investigation 3: Sessions 3-4

DATA ANALYSIS

It is expected that students will:

- **collect, organize, and describe data**

References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Survey Questions and Secret Rules

Investigation 1: Session 6

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-5

All Units: Appendix: About Classroom Routines:

Exploring Data, Understanding Time and Changes

- **read and interpret information (data) on graphs made with objects, pictures, or numbers**

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

All Units: About Classroom Routines:

Exploring Data, Understanding Time and Changes

- **use data to make decisions and solve problems**

References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Survey Questions and Secret Rules

Investigation 1: Session 6

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-5

All Units: Appendix: About Classroom Routines:

Exploring Data, Understanding Time and Changes

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Grade 1 students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems throughout the course. For example, students use pictures, numbers, words, and equations to solve combining and separating story problems.

Sample References:

Mathematical Thinking at Grade 1

Investigation 2: Session 1

Building Number Sense

Investigation 4: Session 10

Survey Questions and Secret Rules

Investigation 2: Sessions 5-6

Quilt Squares and Block Towns

Investigation 3: Sessions 1-2

Number Games and Story Problems

Investigation 3: Sessions 10-12

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 5-7

- **apply previous experience and knowledge to new problem-solving situations**

Grade 1 students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, students analyze data about birthdays and ages of family members.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 5

Building Number Sense

Investigation 4: Session 6

Survey Questions and Secret Rules

Investigation 3: Session 1

Quilt Squares and Block Towns

Investigation 2: Sessions 1-2

Number Games and Story Problems

Investigation 2: Session 1

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-2

• **formulate own problems; use various approaches to investigate and solve problems**

Grade 1 students using *Investigations in Number, Data, and Space* are given a great deal of freedom to explore mathematical concepts and, in so doing, formulate their own problems and use various approaches to investigate and solve problems. For example, students make and investigate conjectures regarding sorting rules.

Sample References:

Mathematical Thinking at Grade 1

Investigation 3: Sessions 3-4

Building Number Sense

Investigation 3: Sessions 3-4

Survey Questions and Secret Rules

Investigation 1: Sessions 1-2

Quilt Squares and Block Towns

Investigation 2: Session 7

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-2

• **explain and verify results with respect to the original problem**

Grade 1 students using *Investigations in Number, Data, and Space* explain and verify results with respect to the original problem throughout the course. For example, students estimate and verify comparisons and volumes of containers.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 6

Building Number Sense

Investigation 3: Sessions 3-4

Survey Questions and Secret Rules

Investigation 1: Session 5

Quilt Squares and Block Towns

Investigation 3: Sessions 1-2

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

- **try more than one strategy when the first strategy proves to be unproductive**
Grade 1 students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, students explore a variety of strategies for solving a problem involving combinations of objects, a problem which has multiple solutions.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 4

Building Number Sense

Investigation 2: Session 1

Survey Questions and Secret Rules

Investigation 1: Session 3

Quilt Squares and Block Towns

Investigation 1: Sessions 7-10

Number Games and Story Problems

Investigation 1: Sessions 2-3

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 5-6

- **apply solutions and strategies from earlier problems to new problem situations**

Grade 1 students using *Investigations in Number, Data, and Space* apply solutions and strategies from earlier problems to new problem situations throughout the course. For example, students progress and apply concepts learned from solving problems involving things that come in pairs to problems involving things that occur in groups of four, e.g., wheels on a car.

Sample References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 5-6

Building Number Sense

Investigation 2: Session 2

Survey Questions and Secret Rules

Investigation 4: Sessions 4-5

Quilt Squares and Block Towns

Investigation 2: Sessions 4-6

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 3: Session 2

- **use technology, including calculators, to understand quantitative relationships (e.g., for skip counting and pattern exploration)**

References:

Mathematical Thinking at Grade 1

Investigation 1: Sessions 2-4: Teacher Note, pages 20-21

Building Number Sense

Investigation 3: Sessions 3-4: Choice 4: Exploring Calculators

Quilt Squares and Block Towns

Investigation 1

Sessions 3-6

Sessions 8-10: Choice 2, pages 36-37

Investigation 1: Sessions 13-15

Investigation 3: Sessions 6-7

Appendix: Shapes Tutorial

Number Games and Story Problems

Investigation 2: Sessions 10-12: Choice 3: Exploring Calculators

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Grade 1 students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. For example, in one session students share solutions and strategies as they keep track of groups of animals and determine the total number of animals.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 6

Building Number Sense

Investigation 3: Sessions 3-4

Survey Questions and Secret Rules

Investigation 1: Session 5

Quilt Squares and Block Towns

Investigation 3: Sessions 1-2

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Grade 1 students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a strategy for learning is a fundamental emphasis of the investigation-based curriculum. The teacher asks guiding questions of the students, and the students discuss ideas, question methods and results, conduct research, and gather and interpret data. First graders conduct class surveys on a variety of topics for which they collect data, organize information, and interpret results.

Sample References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 2-3

Building Number Sense

Investigation 4: Session 1

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 1: Sessions 11-12

Number Games and Story Problems

Investigation 3: Sessions 6-8

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

- **use pictorial representations to identify mathematical operations and concepts**

Grade 1 students using *Investigations in Number, Data, and Space* use pictorial representations to identify mathematical operations and concepts throughout the course. For example, they draw pictures to record solutions to story problems involving combinations of ten.

Sample References:

Mathematical Thinking in Grade 1

Investigation 5: Sessions 5-6

Building Number Sense

Investigation 2: Session 2

Survey Questions and Secret Rules

Investigation 1: Session 6

Quilt Squares and Block Towns

Investigation 3: Sessions 1-2

Number Games and Story Problems

Investigation 3: Session 13

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 4-5

- **use physical materials, models, pictures, or writing to represent and communicate mathematical ideas**

Grade 1 students using *Investigations in Number, Data, and Space* use physical materials, models, pictures, and writing to represent and communicate mathematical ideas throughout the course. Students explore and employ a variety of physical materials, including number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimos, and snap cubes to model numbers, operations, patterns, and problem situations. They use pictorial and graphic models to organize information and to communicate mathematical ideas. They interpret and solve story problems.

Sample References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 3-4

Building Number Sense

Investigation 4: Session 6

Survey Questions and Secret Rules

Investigation 1: Session 6

Quilt Squares and Block Towns

Investigation 3: Session 5

Number Games and Story Problems

Investigation 2: Session 13

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 4-5

- **explain and justify thinking about mathematical ideas and solutions**

Grade 1 students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 6

Building Number Sense

Investigation 3: Sessions 3-4

Survey Questions and Secret Rules

Investigation 1: Session 5

Quilt Squares and Block Towns

Investigation 3: Sessions 1-2

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

use everyday language to explain thinking about strategies and solutions to mathematical problems

Grade 1 students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, students make and explain predictions after reading the first half of a story.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 5

Building Number Sense

Investigation 3: Session 9

Survey Questions and Secret Rules

Investigation 2: Sessions 5-6

Quilt Squares and Block Towns

Investigation 1: Session 1

Number Games and Story Problems

Investigation 1: Session 10

Bigger, Taller, Heavier, Smaller

Investigation 3: Session 1

• express mathematical ideas and use them to define, compare, and solve problems orally and in writing

Grade 1 students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies.

Sample References:

Mathematical Thinking at Grade 1

Investigation 2: Session 1

Building Number Sense

Investigation 4: Sessions 7-9

Survey Questions and Secret Rules

Investigation 2: Sessions 5-6

Quilt Squares and Block Towns

Investigation 1: Sessions 11-12

Number Games and Story Problems

Investigation 3: Session 9

Bigger, Taller, Heavier, Smaller

Investigation 3: Session 3

- **use mathematical notation to communicate and explain mathematical situations**

Grade 1 students using *Investigations in Number, Data, and Space* use mathematical notation to communicate and explain mathematical situations throughout the course. For example, students use operational symbols for addition and subtraction and tally marks for recording data.

Sample References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 3-4

Building Number Sense

Investigation 2: Sessions 6-8

Survey Questions and Secret Rules

Investigation 4: Session 1

Quilt Squares and Block Towns

Investigation 1: Session 2

Number Games and Story Problems

Investigation 3: Session 13

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1: Dialogue Box, page 40

MATHEMATICAL REASONING

It is expected that students will:

- **justify and explain the solutions to problems using manipulatives and physical models**

Grade 1 students using *Investigations in Number, Data, and Space* justify and explain the solutions to problems using physical materials throughout the course. Students use an extensive array of manipulative materials, including number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimoes, and snap cubes.

Sample References:

Mathematical Thinking at Grade 1

Investigation 1: Sessions 1-4

Building Number Sense

Investigation 3: Sessions 3-4

Survey Questions and Secret Rules

Investigation 1: Session 5

Quilt Squares and Block Towns

Investigation 3: Session 5

Number Games and Story Problems

Investigation 1: Session 6

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 4-5

- **use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems**

Grade 1 students using *Investigations in Number, Data, and Space* use patterns and relationships to analyze mathematical situations and draw logical conclusions about mathematical problems throughout the course. For example, students explore number patterns and relationships between combinations of a given number.

Sample References:

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Building Number Sense

Investigation 2: Sessions 6-8

Survey Questions and Secret Rules

Investigation 1: Session 4

Quilt Squares and Block Towns

Investigation 1: Sessions 11-15

Number Games and Story Problems

Investigation 2: Session 2

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 5-6

- **ask questions to reflect on, clarify, and extend thinking**

Grade 1 students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher. In one investigation, students ask comparing questions to ascertain the identity of a “mystery person.”

Sample References:

Mathematical Thinking at Grade 1

Investigation 3: Session 1

Building Number Sense

Investigation 4: Session 2

Survey Questions and Secret Rules

Investigation 4: Sessions 2-3

Quilt Squares and Block Towns

Investigation 2: Sessions 8-10

Number Games and Story Problems

Investigation 1: Session 10

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 5-7

- **review and refine the assumptions and steps used to derive conclusions in mathematical arguments**

Grade 1 students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. For example, first graders develop and evaluate mathematical arguments for solving combining and separating story problems.

Sample References:

Mathematical Thinking at Grade 1

Investigation 2: Session 1

Building Number Sense

Investigation 4: Sessions 3-5

Survey Questions and Secret Rules

Investigation 2: Sessions 1-2

Quilt Squares and Block Towns

Investigation 3: Sessions 6-7

Number Games and Story Problems

Investigation 2: Session 13

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 5-7

- **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Grade 1 students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process. For example, students determine whether they have sufficient information to find a number of missing counters.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 5

Building Number Sense

Investigation 2: Sessions 4-5

Survey Questions and Secret Rules

Investigation 1: Sessions 1-2

Quilt Squares and Block Towns

Investigation 1: Sessions 11-12

Number Games and Story Problems

Investigation 1: Sessions 7-9

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 5-7

MATHEMATICAL CONNECTIONS

It is expected that students will:

- **link new concepts to prior knowledge**

Grade 1 students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students build on, break apart, and recombine familiar number combinations to learn new combinations.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 6

Building Number Sense

Investigation 2: Session 9

Survey Questions and Secret Rules

Investigation 4: Session 1

Quilt Squares and Block Towns

Investigation 2: Session 3

Number Games and Story Problems

Investigation 1: Sessions 4-5: Teacher Note, pages 22-23

Bigger, Taller, Heavier, Smaller

Investigation 3: Session 1

- **use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics**

In Grade 1, Building Number Sense focuses on the system of whole numbers and includes the following investigations: Visualizing Numbers, Building Numbers in Different Ways, Counting, and Addition and Subtraction. The Sessions within each Investigation involve students directly experiencing how the mathematical ideas presented in each unit are interconnected and build on one another. In Number Games and Story Problems, students relate combining and separating situations, combining with unknown change, and addition and subtraction. Recurring features in the series, including About Classroom Routines and software applications, allow teachers opportunities to integrate all of the units of study with a common thread.

Sample References:

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Building Number Sense

Investigation 3: Sessions 1-9

Survey Questions and Secret Rules

Investigation 1: Sessions 1-6

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

Number Games and Story Problems

Investigation 2: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 1-5

• identify practical applications of mathematical principles that can be applied to other disciplines

Grade 1 students using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course. For example, students apply geometric concepts to build a simulated town.

Sample References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

Quilt Squares and Block Towns

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

• apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g., rhythm in music and motion in science)

Grade 1 students using *Investigations in Number, Data, and Space* apply mathematical thinking and modeling to solve problems that arise in other disciplines throughout the course. For example, students explore math concepts in children's literature.

Sample References:

Mathematical Thinking at Grade 1

Investigation 4: Session 5

Building Number Sense

Investigation 1: Sessions 3-4

Survey Questions and Secret Rules

Investigation 3: Session 3

Quilt Squares and Block Towns

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 1: Session 10

Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 3-4

• **identify, explain, and use mathematics in everyday life**

Grade 1 students using *Investigations in Number, Data, and Space* identify, explain, and use mathematics in everyday life throughout the course as they perform the investigations on which the curriculum is based. In addition to the following sample references, every unit of study concludes with a section entitled, “About Classroom Routines.” The pages in this section include suggestions for applying mathematical concepts and skills to everyday situations in the classroom. Students practice counting routines, examine attendance and weather data, conduct surveys, and explore the calendar.

Sample References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

Quilt Squares and Block Towns

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

Investigations in Number, Data, & Space to the Clark County Curriculum Overview

GRADE TWO

Second grade students extend their learning of whole numbers to include three-digit numbers. They continue to learn and use the basic addition facts through sums of eighteen and the corresponding subtraction facts. Students also develop problem solving strategies, estimate, and read and interpret bar graphs.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **read, write, order, and compare numbers from 0 – 999**

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-6, 8

Investigation 4: Sessions 1, 5

Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Session 10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

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

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-5

- **count up to 100 objects by 2's, 5's, and 10's**

References:

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Investigation 4: Sessions 1-4

Investigation 5: Sessions 4-5

Coins, Coupons, and Combinations
Investigation 2: Sessions 1-10

• **count on and count back**

References:

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

Coins, Coupons, and Combinations
Investigation 1: Sessions 1-3, 6, 8-11
Investigation 2: Session 10
Investigation 3: Sessions 1-5
Investigation 4: Sessions 2-4

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

• **compare and order groups of objects and numerals less than 1,000**

References:

Mathematical Thinking at Grade 2
Investigation 5: Session 3

Coins, Coupons, and Combinations
Investigation 3: Sessions 1-5

Putting Together and Taking Apart
Investigation 1: Sessions 5-6
Investigation 3: Sessions 3-5: Teacher Note, p. 85
Investigation 5: Session 7

• **use ordinal positions first through twentieth**

While Grade 2 students using *Investigations in Number, Data, and Space* are not explicitly instructed in the use of ordinal numbers, they are exposed to these expressions as part of the natural course of communication in a mathematics class. They explore the concepts of order and sequence on the Hundred Number Wall Chart and on timelines.

References:

Putting Together and Taking Apart
Investigation 2: Sessions 1-4
Investigation 5: Sessions 2-3, 6, 8

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-5

• **identify odd and even numbers**

Although Grade 2 students using *Investigations in Number, Data, and Space* do not use the specific terms “even” and “odd,” they gain experience with even numbers as they count by twos.

References:

Mathematical Thinking at Grade 2

Investigation 4: Session 2: Teacher Note, page 91

Coins, Coupons, and Combinations

Investigation 2: Sessions 1-5

• **use the inherent patterns in numbers to skip count by 2’s, 3’s, 5’s, and 10’s to 100 and beyond**

References:

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Investigation 4: Sessions 1-4

Investigation 5: Sessions 4-5

Coins, Coupons, and Combinations

Investigation 2: Sessions 1-10

• **use, model, and identify place value positions (ones, tens, and 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

• **read and write number words (0 - 20)**

References:

Mathematical Thinking at Grade 2

Investigation 4: Session 1: Teacher Note, page 83

Coins, Coupons, and Combinations

Investigation 1: Session 1: Activity, page 7

Investigation 1: Sessions 4-5: Activity, pages 24-25

- **demonstrate understanding of the processes of addition and subtraction**

References:

Mathematical Thinking at Grade 2
Investigation 1: Session 1
Investigation 2: Sessions 1-6, 8
Investigation 4: Sessions 1, 5
Investigation 5: Sessions 1-3
Coins, Coupons, and Combinations
Investigation 1: Sessions 1-11
Investigation 2: Sessions 3, 10
Investigation 3: Sessions 1-5
Investigation 4: Sessions 2-4
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

- **identify, model, and label fractions as part of a whole, denominators 2, 4, and 8**

References:

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

- **compare fractions with denominators 2, 4, and 8, using models**

References:

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

- **identify decimals (dollars, dimes, and pennies) as part of place value system**

Grade 2 students using Investigations in Number, Data, and Space view money in terms of whole numbers of cents, and explore combinations of coins and cents that can be traded for \$1. Students may be exposed to decimals as they explore the calculator as a computational tool.

References:

Coins, Coupons, and Combinations
Investigation 1: Session 7, pages 33-34
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

• use decimals to show money amounts

Grade 2 students using *Investigations in Number, Data, and Space* view money in terms of whole numbers of cents, and explore combinations of coins and cents that can be traded for \$1 or for \$2. Students may be exposed to decimals as they explore the calculator as a computational tool.

References:

Coins, Coupons, and Combinations

Investigation 1: Session 7, pages 33-34

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

• identify and model basic addition facts (sums to 18) and the corresponding subtraction facts

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-6, 8

Investigation 4: Sessions 1, 5

Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Session 10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

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

• immediately recall basic addition facts (sums to 18) and the corresponding subtraction facts

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-6, 8

Investigation 4: Sessions 1, 5

Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Session 10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

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

• add and subtract multi-digit numbers without regrouping

References:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1, 6

Investigation 5: Session 3

Coins, Coupons, and Combinations

Investigation 1: Sessions 7, 10

Investigation 2: Sessions 3, 10

Investigation 3: Sessions 1-5

Investigation 4: Session 5

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-4, 7

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-8

• add and subtract two-digit numbers with regrouping

References:

Mathematical Thinking at Grade 2

Investigation 2: Session 1

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

• **add and subtract money amounts**

References:

- Mathematical Thinking at Grade 2
 - Investigation 4, Session 2
- Coins, Coupons, and Combinations
 - Investigation 2, Sessions 6-9
- Putting Together and Taking Apart
 - Investigation 2: Sessions 5-6
 - Investigation 4: Sessions 3-4

• **describe and explain sequence of steps in addition and subtraction algorithms**

References:

- Mathematical Thinking at Grade 2
 - Investigation 1: Session 1
 - Investigation 2: Sessions 1-6, 8
 - Investigation 4: Sessions 1, 5
 - Investigation 5: Sessions 1-3
- Coins, Coupons, and Combinations
 - Investigation 1: Sessions 1-11
 - Investigation 2: Session 10
 - Investigation 3: Sessions 1-5
 - Investigation 4: Sessions 2-4
- 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

• **use a variety of appropriate strategies to compute and solve problems with whole numbers**

References:

- Mathematical Thinking at Grade 2
 - Investigation 1: Session 1
 - Investigation 2: Sessions 1-6, 8
 - Investigation 4: Sessions 1, 5
 - Investigation 5: Sessions 1-3
- Coins, Coupons, and Combinations
 - Investigation 1: Sessions 1-11
 - Investigation 2: Session 10
 - Investigation 3: Sessions 1-5
 - Investigation 4: Sessions 2-4

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

- **estimate the number of objects in a set to 20; verify by counting, and revise estimate, as needed, based on results**

References:

- Mathematical Thinking at Grade 2
 - Investigation 2: Session 6
- Coins, Coupons, and Combinations
 - Investigation 2: Session 10
- Shapes, Halves, and Symmetry
 - Investigation 1: Sessions 2-3: Choice Time:
Predict and Cover, page 18

- **generate and solve one-step addition and subtraction problems based on practical situations**

References:

- Mathematical Thinking at Grade 2
 - Investigation 1: Session 1
 - Investigation 2: Sessions 1-6, 8
 - Investigation 4: Sessions 1, 5
 - Investigation 5: Sessions 1-3
- Coins, Coupons, and Combinations
 - Investigation 1: Sessions 1-11
 - Investigation 2: Session 10
 - Investigation 3: Sessions 1-5
 - Investigation 4: Sessions 2-4
- 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

- **use estimation and mental computation in appropriate situations to solve problems**

References:

Mathematical Thinking at Grade 2
Investigation 2: Session 6
Coins, Coupons, and Combinations
Investigation 1: Session 7
Investigation 1: Sessions 8-9
Choice 1: Close to 20, p. 41
Investigation 2: Session 10
Shapes, Halves, and Symmetry
Investigation 1: Sessions 2-3: Choice Time:
Predict and Cover, page 18

- **use number sense, computation, and estimation to solve mathematical and real-world problems**

References:

Mathematical Thinking at Grade 2
Investigation 1: Session 1
Investigation 2: Sessions 1-6, 8
Investigation 4: Sessions 1, 5
Investigation 5: Sessions 1-3
Coins, Coupons, and Combinations
Investigation 1: Sessions 1-11
Investigation 2: Session 10
Investigation 3: Sessions 1-5
Investigation 4: Sessions 2-4
Shapes, Halves, and Symmetry
Investigation 1: Sessions 2-3: Choice Time:
Predict and Cover, page 18
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

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **compare and contrast attributes of objects, shapes, and numbers**

References:

Mathematical Thinking at Grade 2

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6, 8

Investigation 3: Sessions 1-6

Investigation 4: Sessions 1, 5

Investigation 5: Sessions 1-3

Appendix: Shapes Tutorial

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Session 10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

Shapes, Halves, and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-8

Investigation 4: Sessions 1-7

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

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-5

- **recognize, describe, extend, and create repeating and increasing patterns using symbols, objects, manipulatives, and calculators**

References:

Mathematical Thinking at Grade 2

Investigation 3: Sessions 1-4, 6

Coins, Coupons, and Combinations

Investigation 2: Sessions 1-2, 4-5, 10

Investigation 3: Session 1

Investigation 4: Sessions 1-4

- Shapes, Halves, and Symmetry
 - Investigation 1: Sessions 2-8
 - Investigation 2: Sessions 1, 3
 - Investigation 4: Sessions 1-7
- Putting Together and Taking Apart
 - Investigation 2: Sessions 1-2
- Timelines and Rhythm Patterns
 - Investigation 2: Sessions 1-5

• **use patterns and their extensions to solve problems**

References:

- Mathematical Thinking at Grade 2
 - Investigation 3: Sessions 1-4, 6
- Coins, Coupons, and Combinations
 - Investigation 2: Sessions 1-2, 4-5, 10
 - Investigation 3: Session 1
 - Investigation 4: Sessions 1-4
- Shapes, Halves, and Symmetry
 - Investigation 1: Sessions 2-8
 - Investigation 2: Sessions 1, 3
 - Investigation 4: Sessions 1-7
- Putting Together and Taking Apart
 - Investigation 2: Sessions 1-2
- Timelines and Rhythm Patterns
 - Investigation 2: Sessions 1-5

• **use variables and open sentences to express relationships**

Primary grade students using *Investigations in Number, Data, and Space* use pictures and manipulatives to represent known and unknown quantities in numerical problems as they investigate the operations of addition and subtraction of whole numbers and solve combining and separating problems. Additionally, Grade 2 students solve Problems with a Missing Part.

References:

- Mathematical Thinking at Grade 2
 - Investigation 1: Session 1
 - Investigation 2: Sessions 1-3, 6, 8
 - Investigation 4: Sessions 1-5
 - Investigation 5: Sessions 1-3
- Coins, Coupons, and Combinations
 - Investigation 1: Sessions 1-11
 - Investigation 2: Session 10
 - Investigation 3: Sessions 1-5
 - Investigation 4: Sessions 2-4

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

• **generate and solve problems based on various numerical sentences**

References:

Mathematical Thinking at Grade 2

- Investigation 1: Session 1
- Investigation 2: Sessions 1-3, 6, 8
- Investigation 4: Sessions 1-5
- Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

- Investigation 1: Sessions 1-11
- Investigation 2: Session 10
- Investigation 3: Sessions 1-5
- Investigation 4: Sessions 2-4

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

• **model, explain, and solve a number sentence involving addition and subtraction**

References:

Mathematical Thinking at Grade 2

- Investigation 1: Session 1
- Investigation 2: Sessions 1-3, 6, 8
- Investigation 4: Sessions 1-5
- Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

- Investigation 1: Sessions 1-11
- Investigation 2: Session 10
- Investigation 3: Sessions 1-5
- Investigation 4: Sessions 2-4

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

MEASUREMENT

It is expected that students will:

- **compare and order objects by various measurable attributes including time, temperature, length, weight, capacity, volume, and area, and communicate their similarities and differences**

References:

Shapes, Halves, and Symmetry

Investigation 1

Sessions 2-3: Choice 2, pages 19-21

Sessions 6-8

How Long? How Far?

Investigation 1: Sessions 1-8

Investigation 2: Sessions 4-5

- **compare objects to standard whole units such as inches, yards, centimeters, and meters to identify the objects as greater than, less than, or equal to the given units**

Grade 2 students use nonstandard units of length.

References:

How Long? How Far?

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-8

- **estimate and measure length, weight, and capacity of objects, using a standard or non standard unit of measure**

References:

Shapes, Halves, and Symmetry

Investigation 1

Sessions 2-3: Choice 2, pages 19-21

Sessions 6-8

How Long? How Far?

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-8

- **use a calendar to identify days, weeks, months, and year**

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 1-6

Investigation 2: Sessions 4-5

- **recite and use the months of the year in order**

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 1-6

Investigation 2: Sessions 4-5

- **read time to nearest quarter hour; distinguish between day and night (i.e., A.M. and P.M.)**

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 1-6

Investigation 2: Sessions 4-5

• determine the value of any given set of coins and bills**References:**

Mathematical Thinking at Grade 2

Investigation 4: Session 2

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

• read, write, and use money notations**References:**

Mathematical Thinking at Grade 2

Investigation 4: Session 2

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

SPATIAL RELATIONSHIPS AND GEOMETRY***It is expected that students will:*****• identify, name, sort, sketch, describe, compare and contrast two-dimensional shapes (circles, triangles, rectangles [squares]) regardless of position****References:**

Mathematical Thinking at Grade 2

Investigation 1: Sessions 2-3

*Investigation 3: Sessions 1-6*Appendix: *Shapes Tutorial*

Shapes, Halves, and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-8

Investigation 4: Sessions 1-7

• **use position words such as before, far, below, left to describe location of objects and to place objects**

Grade 2 students using *Investigations in Number, Data, and Space* apply concepts of location and relative position through the use of *Shapes*, a software program which allows students to construct and manipulate geometric shapes, see objects move according to rules they specify, and explore rotation and reflection. Students in Grade 2 also use *Geo-Logo* software, which enables students to extend their investigations to coordinate geometry and angles.

References:

Mathematical Thinking at Grade 2

Appendix: *Shapes* Teacher Tutorial

How Long? How Far?

Investigation 2: Sessions 2-8

Ongoing Excursion: Geo-Logo: Shapes and Pictures

• **identify congruent shapes**

References:

Shapes, Halves, and Symmetry

Investigation 3: Sessions 3-5

• **compare the size (larger and smaller) of similar two-dimensional figures such as circles, triangles**

References:

Shapes, Halves, and Symmetry

Investigation 2: Session 2

Investigation 3: Sessions 3-5

• **recognize and describe position of shapes after transformation (flip, turn, slide), using models**

Students use computer programs, including *Shapes* and *Geo-Logo*, to identify and demonstrate slides, flips, and turns.

References:

Mathematical Thinking at Grade 2

Appendix: *Shapes* Tutorial

How Long? How Far?

Investigation 2

Sessions 2-8

Ongoing Excursion: *Geo-Logo*:

Shapes and Pictures

- **identify figures with symmetry as they appear in the environment**

References:

Mathematical Thinking at Grade 2

Appendix: *Shapes* Teacher Tutorial

Shapes, Halves, and Symmetry

Investigation 4: Sessions 1-7

- **create two-dimensional designs that contain a line of symmetry**

References:

Mathematical Thinking at Grade 2

Appendix: *Shapes* Teacher Tutorial

Shapes, Halves, and Symmetry

Investigation 4: Sessions 1-7

- **identify, name, sort, describe, compare, and contrast two- and three-dimensional geometric figures such as circle/sphere, square/cube, triangle/pyramid**

References:

Shapes, Halves, and Symmetry

Investigation 1: Session 1

Investigation 1: Sessions 2-3 : Follow-Up, page 21

DATA ANALYSIS

It is expected that students will:

- **collect, organize, record, and explain classification of data using concrete materials**

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

All Units: Appendix: About Classroom Routines: How Many Pockets?

• collect, organize, tally, display, and interpret data in charts, tables, and graphs

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

All Units: Appendix: About Classroom Routines: How Many Pockets?

• read and interpret simple picture and bar graphs to solve problems

References:

Mathematical Thinking

Investigation 5: Sessions 1-2

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-2

Investigation 4: Sessions 2-3

How Long? How Far?

Investigation 2: Sessions 6-8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 2-3

Investigation 2: Sessions 3-6

Investigation 3: Session 5

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Grade 2 students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts throughout the course. For example, students explore strategies for creating and representing symmetrical figures.

Sample References:

Mathematical Thinking at Grade 2

Investigation 3: Session 6

Coins, Coupons, and Combinations

Investigation 1: Sessions 8-9

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 4: Sessions 5-6

Putting Together and Taking Apart

Investigation 3: Session 1

How Long? How Far?

Investigation 1: Session 8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 2-3

Timelines and Rhythm Patterns

Investigation 2: Sessions 2-3

- **apply previous experience and knowledge to new problem-solving situations**

Grade 2 students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, students learn to use Venn diagrams to organize data while considering two attributes at a time.

Sample References:

- Mathematical Thinking at Grade 2
 - Investigation 1: Sessions 2-3
- Coins, Coupons, and Combinations
 - Investigation 3: Sessions 4-5
- Does It Walk, Crawl, or Swim?
 - Investigation 1: Session 6
- Shapes, Halves, and Symmetry
 - Investigation 3: Sessions 7-8
- Putting Together and Taking Apart
 - Investigation 4: Session 2
- How Long? How Far?
 - Investigation 2: Sessions 6-8
- How Many Pockets? How Many Teeth?
 - Investigation 2: Sessions 1-2
- Timelines and Rhythm Patterns
 - Investigation 1: Sessions 1-2

• formulate own problems; use various approaches to investigate and solve problems

Grade 2 students using *Investigations in Number, Data, and Space* are given a great deal of freedom to explore mathematical concepts and, in so doing, formulate their own problems and use various approaches to investigate and solve problems. For example, students make and investigate conjectures regarding the identity of mystery photos.

Sample References:

- Mathematical Thinking at Grade 2
 - Investigation 2: Sessions 4-5
- Coins, Coupons, and Combinations
 - Investigation 1: Sessions 4-5
- Does It Walk, Crawl, or Swim?
 - Investigation 1: Sessions 1-2
- Shapes, Halves, and Symmetry
 - Investigation 1: Sessions 2-3
- Putting Together and Taking Apart
 - Investigation 2: Session 1
- How Long? How Far?
 - Investigation 1: Sessions 2-4
- How Many Pockets? How Many Teeth?
 - Investigation 2: Session 6
- Timelines and Rhythm Patterns
 - Investigation 2: Session 4

• explain and verify results with respect to the original problem

Grade 2 students using *Investigations in Number, Data, and Space* explain and verify results with respect to the original problem throughout the course. For example, students describe strategies and verify results when solving story problems involving combining, separating, comparing, or finding a missing part.

Sample References:

Mathematical Thinking at Grade 2

Investigation 3: Sessions 3-4

Coins, Coupons, and Combinations

Investigation 2: Sessions 4-5

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 3-4

Shapes, Halves, and Symmetry

Investigation 2: Session 3: Dialogue Box, pages 60-61

Putting Together and Taking Apart

Investigation 1: Session 2: Dialogue Box, pages 26-27

How Long? How Far?

Investigation 1: Session 8

How Many Pockets? How Many Teeth?

Investigation 3: Session 5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-2: Dialogue Box, page 13

• try more than one strategy when the first strategy proves to be unproductive

Grade 2 students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, students explore patterns and use them to express numbers in different ways, and they explore different strategies for counting and recording data.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Coins, Coupons, and Combinations

Investigation 1: Session 1

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 3: Sessions 7-8

Putting Together and Taking Apart

Investigation 2: Sessions 1-4

How Long? How Far?

Investigation 2: Sessions 2-3

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 2: Session 1

• apply solutions and strategies from earlier problems to new problem situations

Grade 2 students using *Investigations in Number, Data, and Space* apply solutions and strategies from earlier problems to new problem situations throughout the course. For example, students relate “missing change” problems to an earlier example problem about people leaving on a bus.

Sample References:

Mathematical Thinking at Grade 2

Investigation 4: Session 5

Coins, Coupons, and Combinations

Investigation 3: Sessions 4-5

Does It Walk, Crawl, or Swim?

Investigation 3: Sessions 2-3

Shapes, Halves, and Symmetry

Investigation 1: Sessions 2-3

Putting Together and Taking Apart

Investigation 3: Session 2

How Long? How Far?

Investigation 1: Sessions 2-4

How Many Pockets? How Many Teeth?

Investigation 2: Session 3

Timelines and Rhythm Patterns

Investigation 1: Sessions 4-5

• use technology, including calculators, to understand quantitative relationships (e.g., for skip counting and pattern exploration)

References:

Mathematical Thinking at Grade 2

Investigation 3: Sessions 1-2, 6

Appendix: *Shapes* Teacher Tutorial

Coins, Coupons, and Combinations

Investigation 1: Sessions 7-9

Investigation 2: Sessions 1-3, 10

Putting Together and Taking Apart

Investigation 2: Sessions 1-2

How Long? How Far?

Investigation 1: Sessions 2-7

Investigation 2

Sessions 2-8

Ongoing Excursion: *Geo-Logo* Shapes and Pictures

Appendix: *Geo-Logo* Tutorial

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Grade 2 students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. For example, students explore and discuss attributes of interlocking cubes, pattern blocks, and geoblocks; and they work with partners to investigate all possible combinations of ten.

Sample References:

Mathematical Thinking at Grade 2

Investigation 1: Sessions 2-3

Coins, Coupons, and Combinations

Investigation 1: Session 1

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 1: Sessions 2-3

Putting Together and Taking Apart

Investigation 1: Sessions 5-6

How Long? How Far?

Investigation 1: Sessions 2-4

How Many Pockets? How Many Teeth?

Investigation 2: Sessions 1-2

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-2

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Grade 2 students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a

strategy for learning is a fundamental emphasis of the investigation-based curriculum. The teacher asks guiding questions of the students, and the students discuss ideas, question methods and results, conduct research, and gather and interpret data. Second graders use inquiry techniques to guess sorting rules.

Sample References:

Mathematical Thinking at Grade 2
Investigation 5: Sessions 1-2
Coins, Coupons, and Combinations
Investigation 2: Session 10
Does It Walk, Crawl, or Swim?
Investigation 1: Sessions 1-2
Shapes, Halves, and Symmetry
Investigation 2: Session 1
Putting Together and Taking Apart
Investigation 2: Session 7
How Long? How Far?
Investigation 1: Session 1
How Many Pockets? How Many Teeth?
Investigation 2: Sessions 1-2
Timelines and Rhythm Patterns
Investigation 1: Sessions 4-5, pages 25-27

• use pictorial representations to identify mathematical operations and concepts

Grade 2 students using *Investigations in Number, Data, and Space* use pictorial representations to identify mathematical operations and concepts throughout the course. For example, they draw rectangles based on classmates' descriptions.

Sample References:

Mathematical Thinking at Grade 2
Investigation 1: Session 1, page 7
Coins, Coupons, and Combinations
Investigation 2: Session 1, page 60
Does It Walk, Crawl, or Swim?
Investigation 1: Session 6
Shapes, Halves, and Symmetry
Investigation 2: Session 6
Putting Together and Taking Apart
Investigation 3: Session 2, page 78
How Long? How Far?
Investigation 2: Session 1
How Many Pockets? How Many Teeth?
Investigation 3: Session 5
Timelines and Rhythm Patterns
Investigation 1: Sessions 1-2

- **use physical materials, models, pictures, or writing to represent and communicate mathematical ideas**

Grade 2 students using *Investigations in Number, Data, and Space* use physical materials, models, pictures, and writing to represent and communicate mathematical ideas throughout the course. Students use number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimoes, and snap cubes to model numbers, operations, patterns, and problem situations. They create graphs, charts, drawings, and tables to represent and solve problems. They draw pictures and write number phrases and sentences to model the solution to a problem.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 4-5

Coins, Coupons, and Combinations

Investigation 2: Session 6

Does It Walk, Crawl, or Swim?

Investigation 4: Sessions 1-3

Shapes, Halves, and Symmetry

Investigation 1: Sessions 6-8

Putting Together and Taking Apart

Investigation 2: Sessions 5-6

How Long? How Far?

Investigation 2: Sessions 2-3

How Many Pockets? How Many Teeth?

Investigation 2: Sessions 1-2

Timelines and Rhythm Patterns

Investigation 2: Sessions 2-3

- **explain and justify thinking about mathematical ideas and solutions**

Grade 2 students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

Sample References:

Mathematical Thinking at Grade 2

Investigation 4: Session 1

Coins, Coupons, and Combinations

Investigation 2: Sessions 4-5

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 3-4

Shapes, Halves, and Symmetry
Investigation 2: Session 3
Putting Together and Taking Apart
Investigation 3: Session 1
How Long? How Far?
Investigation 1: Session 8
How Many Pockets? How Many Teeth?
Investigation 1: Sessions 4-5
Timelines and Rhythm Patterns
Investigation 1: Sessions 4-5

• use everyday language to explain thinking about strategies and solutions to mathematical problems

Grade 2 students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, a Teacher Note points out the difficulties inherent in relying on “key words” to solve story problems.

Sample References:

Mathematical Thinking at Grade 2
Investigation 2: Sessions 2-3
Coins, Coupons, and Combinations
Investigation 3: Sessions 4-5: Teacher Note, page 107
Does It Walk, Crawl, or Swim?
Investigation 2: Sessions 1-2: Teacher Note, pages 46-47
Shapes, Halves, and Symmetry
Investigation 2: Sessions 4-5
Putting Together and Taking Apart
Investigation 1: Sessions 5-6
How Long? How Far?
Investigation 2: Session 1: Teacher Note, page 51
How Many Pockets? How Many Teeth?
Investigation 3: Session 1
Timelines and Rhythm Patterns
Investigation 1: Session 3

• express mathematical ideas and use them to define, compare, and solve problems orally and in writing

Grade 2 students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with

many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies. In one activity, students follow descriptions written by other students to build rectangles, and they write their own descriptions for other students to follow.

Sample References:

Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons, and Combinations
Investigation 1: Session 7
Does It Walk, Crawl, or Swim?
Investigation 2: Sessions 3-4
Shapes, Halves, and Symmetry
Investigation 1: Sessions 2-3
Putting Together and Taking Apart
Investigation 1: Sessions 1-2
How Long? How Far?
Investigation 2: Sessions 4-5
How Many Pockets? How Many Teeth?
Investigation 1: Sessions 2-3
Timelines and Rhythm Patterns
Investigation 1: Sessions 1-2

• use mathematical notation to communicate and explain mathematical situations

Grade 2 students using *Investigations in Number, Data, and Space* use mathematical notation to communicate and explain mathematical situations throughout the course. For example, students use the equal sign and operational symbols for addition and subtraction to write number sentences, and symbols representing rhythm patterns.

Sample References:

Mathematical Thinking at Grade 2
Investigation 2: Session 8
Coins, Coupons, and Combinations
Investigation 3: Session 2
Does It Walk, Crawl, or Swim?
Investigation 4: Sessions 2-3
Shapes, Halves, and Symmetry
Investigation 3: Sessions 1-2, page 76
Putting Together and Taking Apart
Investigation 3: Sessions 3-5: Teacher Note, page 85
How Long? How Far?
Investigation 1: Session 8

How Many Pockets? How Many Teeth?

Investigation 2: Sessions 4-5

Timelines and Rhythm Patterns

Investigation 2: Sessions 2-3

MATHEMATICAL REASONING

It is expected that students will:

- **justify and explain the solutions to problems using manipulatives and physical models**

Grade 2 students using *Investigations in Number, Data, and Space* justify and explain the solutions to problems using physical materials throughout the course. Students use an extensive array of manipulative materials, including number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimoes, and snap cubes.

Sample References:

Mathematical Thinking at Grade 2

Investigation 1: Sessions 1-4

Coins, Coupons, and Combinations

Investigation 2: Session 6

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 1: Sessions 6-8

Putting Together and Taking Apart

Investigation 3: Session 1

How Long? How Far?

Investigation 1: Session 8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 2-3

Timelines and Rhythm Patterns

Investigation 1: Session 3

- **use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems**

Grade 2 students using *Investigations in Number, Data, and Space* use patterns and relationships to analyze mathematical situations and draw logical conclusions about mathematical problems throughout the course. For example, students relate addition and subtraction as they solve “Problems with a Missing Part.”

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Session 1

Coins, Coupons, and Combinations

Investigation 4: Session 1

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 4-5

Shapes, Halves, and Symmetry

Investigation 1: Sessions 4-5

Putting Together and Taking Apart

Investigation 3: Session 2

How Long? How Far?

Investigation 1: Sessions 2-4: Dialogue Box, page 27

How Many Pockets? How Many Teeth?

Investigation 2: Session 3

Timelines and Rhythm Patterns

Investigation 2: Session 5

• **ask questions to reflect on, clarify, and extend thinking**

Grade 2 students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher. In one investigation, students interview adults about what scared them when they were children.

Sample References:

Mathematical Thinking at Grade 2

Investigation 4: Session 1

Coins, Coupons, and Combinations

Investigation 1: Sessions 4-5

Does It Walk, Crawl, or Swim?

Investigation 4: Session 1

Shapes, Halves, and Symmetry

Investigation 4: Sessions 5-6, page 112

Putting Together and Taking Apart

Investigation 1: Sessions 5-6

How Long? How Far?

Investigation 1: Sessions 2-4

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 4-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 4-5, pages 25-27

- **review and refine the assumptions and steps used to derive conclusions in mathematical arguments**

Grade 2 students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. For example, second graders develop and evaluate mathematical arguments for solving number string problems. They use mathematical reasoning, apply previously learned concepts, record their solutions, and share their strategies with their classmates.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Coins, Coupons, and Combinations

Investigation 1: Session 6

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 3-4

Shapes, Halves, and Symmetry

Investigation 2: Sessions 4-5

Putting Together and Taking Apart

Investigation 3: Sessions 1-2

How Long? How Far?

Investigation 2: Sessions 4-5

How Many Pockets? How Many Teeth?

Investigation 3: Session 5

Timelines and Rhythm Patterns

Investigation 2: Sessions 2-3

- **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Grade 2 students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process. For example, students analyze the information given in a problem to determine whether it involves combining, separating, comparing, or missing change.

Sample References:

Mathematical Thinking at Grade 2

Investigation 3: Session 6

Coins, Coupons, and Combinations

Investigation 1: Sessions 8-9

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 4: Sessions 5-6

- Putting Together and Taking Apart
Investigation 3: Session 3-5
- How Long? How Far?
Investigation 1: Session 8
- How Many Pockets? How Many Teeth?
Investigation 1: Sessions 2-3
- Timelines and Rhythm Patterns
Investigation 2: Sessions 2-3

MATHEMATICAL CONNECTIONS

It is expected that students will:

- **link new concepts to prior knowledge**

Grade 2 students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students use doubles and combinations of ten to solve related number combination problems.

Sample References:

- Mathematical Thinking at Grade 2
Investigation 2: Sessions 4-5, 7
- Coins, Coupons, and Combinations
Investigation 1: Session 6
- Does It Walk, Crawl, or Swim?
Investigation 3: Session 1
- Shapes, Halves, and Symmetry
Investigation 1: Session 1
- Putting Together and Taking Apart
Investigation 1: Sessions 3-4, pages 30-31
- How Long? How Far?
Investigation 1: Session 8
- How Many Pockets? How Many Teeth?
Investigation 2: Sessions 1-2
- Timelines and Rhythm Patterns
Investigation 1: Session 3

- **use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics**

Each unit of study in *Investigations in Number, Data, and Space* is organized to enable students to recognize and use connections among mathematical ideas. The titles of each of these units are listed in the Sample References below. The Investigations within each of these units and the Sessions within each Investigation

involve students directly experiencing the connections between the mathematical ideas presented in each unit. For example, in Grade 2, Putting Together and Taking Apart relates the concepts of addition and subtraction of numbers and includes the following investigations: Combining and Separating, Working with 100, Finding the Missing Part, Adding Up to 100, and Addition and Subtraction Strategies. Recurring features at all grade levels of the series, including About Classroom Routines and software applications, allow teachers opportunities to integrate all of the units of study with a common thread.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Does It Walk, Crawl, or Swim?

Investigation 1: Sessions 1-6

Shapes, Halves, and Symmetry

Investigation 2: Sessions 1-6

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 2: Sessions 1-8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

• identify practical applications of mathematical principles that can be applied to other disciplines

Grade 2 students using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course. For example, students describe uses of numbers both within and also outside mathematics.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Session 1, page 25

Coins, Coupons, and Combinations

Investigation 2: Sessions 7-9

Does It Walk, Crawl, or Swim?

Investigation 3: Session 1

Shapes, Halves, and Symmetry

Investigation 1: Sessions 6-8

Putting Together and Taking Apart

Investigation 4: Sessions 1-4

How Long? How Far?

Investigation 2: Session 1

How Many Pockets? How Many Teeth?

Investigation 2: Sessions 1-6

Timelines and Rhythm Patterns

Investigation 1: Session 6

• **apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g., rhythm in music and motion in science)**

Grade 2 students using *Investigations in Number, Data, and Space* apply mathematical thinking and modeling to solve problems that arise in other disciplines throughout the course. For example, students employ the scientific method of research and experimentation as they sort objects that sink or float.

Sample References:

Mathematical Thinking at Grade 2

Investigation 2: Session 7

Coins, Coupons, and Combinations

Investigation 1: Sessions 4-5

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 3-4

Shapes, Halves, and Symmetry

Investigation 4: Sessions 5-7

Putting Together and Taking Apart

Investigation 2: Sessions 5-6

How Long? How Far?

Investigation 2: Sessions 2-3

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 2: Session 5

• **identify, explain, and use mathematics in everyday life**

Grade 2 students using *Investigations in Number, Data, and Space* define problems in everyday situations throughout the course as they perform the investigations on which the curriculum is based. In one session, students construct timelines of their lives and of “a special day.” In addition to the following sample references, every unit of study concludes with a section entitled, “About Classroom Routines.” The pages in this section include suggestions for applying mathematical concepts and skills to everyday situations in the classroom. Students keep track of the number of days they have been in school, they collect data on how many pockets students are wearing on a given day, and they investigate concepts of time, including schedules, clock time, timelines, and duration of units of time.

Sample References:

Mathematical Thinking at Grade 2

Investigation 5: Sessions 1-6

Coins, Coupons, and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl, or Swim?

Investigation 4: Sessions 1-3

Shapes, Halves, and Symmetry

Investigation 1: Session 1

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

How Long? How Far?

Investigation 1: Session 8

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Session 3

Investigations in Number, Data, & Space to the Clark County Curriculum Overview

GRADE THREE

Third grade students learn the basic multiplication and division facts and demonstrate understanding of the processes of addition, subtraction, multiplication, and division. They extend their understanding of fractions and decimals and continue learning problem-solving strategies. Students increase their proficiency in solving problems involving money, and they measure attributes of temperature, length, weight/mass, and capacity.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **read, write, order and compare numbers (0 - 9,999)**

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 1-3

Investigation 3: Sessions 3-4

Investigation 4: Session 2

Landmarks in the Hundreds

Investigation 2: Sessions 1-3

Investigation 3: Session 1

Ten-Minute Math: Counting Around the Class

Flips, Turns, and Area

Investigation 1: Session 4

Ten-Minute Math: Broken Calculator

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-3

Fair Shares

Ten-Minute Math: Broken Calculator

- **read and write number words (0 - 1,000)**

In addition to learning and applying number words, including “tens” and “hundreds,” Grade 3 students using *Investigations in Number, Data, and Space* are introduced to the mathematical terms “factor,” “multiple,” “even” and “odd,” and “row” and “column.”

References:

Landmarks in the Hundreds

Investigation 1: Sessions 2-3, 6-7

Combining and Comparing

Investigation 4: Sessions 3-4

- **use ordinal positions first through hundredth**

There are no direct references to ordinal numbers in the Grade 3 course of *Investigations in Number, Data, and Space*. Students gain experience with order as they explore the Hundred Number Wall Chart and calendars, and as they compare and order numbers.

- **identify odd and even numbers**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 3-4

Investigation 4: Sessions 1-3

- **use, model, and identify place value positions up to 10,000**

Grade 3 students using *Investigations in Number, Data, and Space* explore concepts of place value as they construct and investigate patterns on hundred and thousand charts. They learn the significance of the decimal point and examine decimal place value in relation to the calculator and problems involving money. Counting by tens and hundreds supports students’ familiarity with the base-ten system.

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 1-3

Investigation 4: Session 2

Landmarks in the Hundreds

Investigation 2: Sessions 1-3

Investigation 3: Session 1

Ten-Minute Math: Counting Around the Class

Combining and Comparing

Investigation 4: Sessions 3-4

- **round numbers to nearest tens and hundreds to determine reasonableness of answers**

References:

From Paces to Feet

Ten-Minute Math: Estimation and Number Sense

Up and Down the Number Line

Ten-Minute Math: Estimation and Number Sense

Combining and Comparing

Investigation 3: Sessions 1-2

Ten-Minute Math: Estimation and Number Sense

- **explain and use the processes and properties of addition, subtraction, multiplication, and division, including correct notations and representations**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4

Investigation 4: Sessions 1-2

Things That Come in Groups

Investigation 1: Sessions 2-4

Investigation 2: Sessions 3-4

Investigation 4: Sessions 1-4

Investigation 5: Session 2

Landmarks in the Hundreds

Investigation 1: Sessions 2-3, 6-7

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 1: Sessions 6-7

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 3: Session 3

Investigation 4: Session 2

- **model concepts of multiplication and division, including groupings and arrays**

References:

Things That Come in Groups

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-4

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

Ten-Minute Math: Counting Around the Class

• use addition to model and explain multiplication

References:

Things That Come in Groups

Investigation 1:

Session 2

Session 4: Dialogue Box, page 19

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 4-5, page 17

Investigation 2:

Sessions 1-3: Teacher Note, page 38

Sessions 5-6: Dialogue Box, page 51

Ten-Minute Math: Counting Around the Class

• use subtraction to model and explain division

References:

Things That Come in Groups

Investigation 4: Session 1-2: Teacher Note, pages 68-69

• model, sketch, and label fractions with denominators to 10

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 3-4

Investigation 4: Session 2

Flips, Turns, and Areas

Investigation 2: Sessions 1-5

Up and Down the Number Line

Investigation 3: Session 1

Turtle Paths

Investigation 2: Sessions 1-2

Fair Shares

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

• write fractions with numerals and with number words

References:

- Mathematical Thinking at Grade 3
 - Investigation 2: Sessions 3-4
 - Investigation 4: Session 2
- Flips, Turns, and Areas
 - Investigation 2: Sessions 1-5
- Up and Down the Number Line
 - Investigation 3: Session 1
- Turtle Paths
 - Investigation 2: Sessions 1-2
- Fair Shares
 - Investigation 1: Sessions 1-4
 - Investigation 2: Sessions 1-7
 - Investigation 3: Sessions 1-3

• name and write fractions represented by drawings or models

References:

- Mathematical Thinking at Grade 3
 - Investigation 2: Sessions 3-4
 - Investigation 4: Session 2
- Flips, Turns, and Areas
 - Investigation 2: Sessions 1-5
- Up and Down the Number Line
 - Investigation 3: Session 1
- Turtle Paths
 - Investigation 2: Sessions 1-2
- Fair Shares
 - Investigation 1: Sessions 1-4
 - Investigation 2: Sessions 1-7
 - Investigation 3: Sessions 1-3

• identify the part of a set and/or region that represents a given fraction and write the corresponding fraction

References:

- Mathematical Thinking at Grade 3
 - Investigation 2: Sessions 3-4
 - Investigation 4: Session 2
- Flips, Turns, and Areas
 - Investigation 2: Sessions 1-5
- Up and Down the Number Line
 - Investigation 3: Session 1

Turtle Paths

Investigation 2: Sessions 1-2

Fair Shares

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

- **compare unit fractions and fractions with like denominators, with and without models**

References:

Up and Down the Number Line

Ten-Minute Math: Estimation and Number Sense

Fair Shares

Investigation 1: Sessions 1-2

Investigation 2: Session 3

- **identify the number of equal parts needed to make a whole or a fractional part of a whole, with and without models**

References:

Mathematical Thinking at Grade 3

Investigation 4: Session 2

Flips, Turns, and Areas

Investigation 2: Sessions 1-5

Up and Down the Number Line

Ten-Minute Math: Estimation and Number Sense

Turtle Paths

Investigation 2: Sessions 1-2

Fair Shares

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

- **read and write decimals (tenths and hundredths place)**

References:

Mathematical Thinking at Grade 3

Investigation 4: Session 2

Landmarks in the Hundreds

Investigation 2: Session 4

Combining and Comparing

Investigation 3: Sessions 1-2

Fair Shares

Investigation 3: Sessions 1-3

• **immediately recall and use addition and subtraction facts**

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

Up and Down the Number Line

Investigation 1: Sessions 1-8

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

• **immediately recall and use multiplication facts, products to 100**

References:

Things That Come in Groups

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-4

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

Ten-Minute Math: Counting Around the Class

• **recall division facts through the 10's**

References:

Things That Come in Groups

Investigation 1: Session 3: Teacher Note, page 15

Investigation 3: Sessions 3-5

Investigation 4: Sessions 1-4

Investigation 5: Session 4

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

• **add and subtract multi-digit numbers, with regrouping**

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

Up and Down the Number Line

Investigation 1: Sessions 1-8

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

• **multiply a two-or three-digit number by a one-digit number, with and without regrouping**

References:

Things That Come in Groups

Investigation 5: Sessions 1-4

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Ten-Minute Math: Counting Around the Class

• **multiply three one-digit numbers**

In a recurring Ten-Minute Math activity called “Calendar Math,” students are asked to write a numerical expression equivalent to the calendar date. Students are encouraged to use more than two numbers and more than one operation. This activity could be modified to include products of three one-digit numbers.

Sample Reference:

Landmarks in the Hundreds

Ten-Minute Math: Calendar Math

- **multiply a two-or three-digit number by a multiple of ten**

References:

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-3

Ten-Minute Math: Counting Around the Class

- **divide a two-digit number by a one-digit number, without a remainder**

References:

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

Ten-Minute Math: Counting Around the Class

- **divide a three-digit multiple of ten by a two-digit multiple of ten**

References:

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Investigation 2: Sessions 1-3

- **use estimation and mental computation in appropriate situations to solve problems**

References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4, page 60

From Paces to Feet

Ten-Minute Math: Estimation and Number Sense

Up and Down the Number Line

Ten-Minute Math: Estimation and Number Sense

Combining and Comparing

Investigation 3: Sessions 1-2

Ten-Minute Math: Estimation and Number Sense

- **add and subtract proper fractions and mixed numbers with like denominators (without regrouping or simplifying), with and without models**

References:

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

• **add and subtract decimals, using money as a model**

References:

Combining and Comparing

Investigation 3: Sessions 1-2

• **add and subtract decimals, tenths and hundredths**

References:

Combining and Comparing

Investigation 3: Sessions 1-2

• **generate and solve two-step addition and subtraction and one-step multiplication problems based on practical situations using pencil and paper, mental computation, and estimation**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4

Investigation 4: Sessions 1-2

Ten-Minute Math: Calendar Math

Things That Come in Groups

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-4

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

Ten-Minute Math: Counting Around the Class

Up and Down the Number Line

Investigation 1: Sessions 1-8

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

- **use a variety of appropriate strategies to estimate, compute, and solve mathematical and real-world problems**

References:

Mathematical Thinking at Grade 3

- Investigation 2: Sessions 1-7
- Investigation 3: Sessions 3-4
- Investigation 4: Sessions 1-2
- Ten-Minute Math: Calendar Math

Things That Come in Groups

- Investigation 1: Sessions 1-4
- Investigation 2: Sessions 1-6
- Investigation 3: Sessions 1-5
- Investigation 4: Sessions 1-4
- Investigation 5: Sessions 1-4
- Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

- Investigation 1: Sessions 1-7
- Investigation 2: Sessions 1-6
- Ten-Minute Math: Counting Around the Class

Up and Down the Number Line

- Investigation 1: Sessions 1-8

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

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **compare and categorize shapes and numbers**

References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Flips, Turns, and Area

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-5

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 4: Sessions 1-2

Investigation 5: Sessions 1-3

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

Exploring Solids and Boxes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-2

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-4

- **recognize, describe, and create repeating and increasing patterns using numbers**

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 2-3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 2: Sessions 1-6

Investigation 5: Session 1

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 1-5

Investigation 2: Sessions 5-6

Teacher Note, page 49

Ten-Minute Math: Counting Around the Class

Fair Shares

Investigation 2: Sessions 5-6

- **describe and label with letters, words, and numbers the patterns observed in models of repeating and increasing patterns**

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 2-3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 2: Sessions 1-6

Investigation 5: Session 1

Ten-Minute Math: Counting Around the Class

Flips, Turns, and Area

Investigation 1: Sessions 1-3

Landmarks in the Hundreds

Investigation 1: Sessions 1-5

Investigation 2: Sessions 5-6

Teacher Note, page 49

Ten-Minute Math: Counting Around the Class

Fair Shares

Investigation 2: Sessions 5-6

- **use number patterns and their extensions to solve problems**

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 2-3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 2: Sessions 1-6

Investigation 5: Session 1

Ten-Minute Math: Counting Around the Class

Landmarks in the Hundreds

Investigation 1: Sessions 1-5

Investigation 2: Sessions 5-6

Teacher Note, page 49

Ten-Minute Math: Counting Around the Class

Fair Shares

Investigation 2: Sessions 5-6

- **identify missing terms and missing numbers in open number sentences involving addition and subtraction number facts**

Students identify missing terms and numbers in open number sentences involving multiplication and division number facts. Also, students solve “missing information” problems by describing possible operations (addition or subtraction) and amounts of change given a starting point and an ending point.

References:

Things That Come in Groups

Investigation 1

Session 2

Session 3, page 15

Session 4, page 17

Investigation 4: Sessions 1-4

Up and Down the Number Line

Investigation 1: Sessions 6-7

- **complete number sentences with the appropriate words and symbols for addition, subtraction, less than, greater than, and equal to (+, -, <, >, =)**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4 : Dialogue Box, page 67

Investigation 4: Session 1

Ten-Minute Math: Calendar Math

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 3: Session 3

Investigation 4: Session 2

MEASUREMENT

It is expected that students will:

- **measure and record to a required degree of accuracy, evaluate for error, and identify the appropriateness of selected units of measure**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Investigation 2: Session 4

From Paces to Feet

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-2

Turtle Paths

Investigation 2: Sessions 1-2, 5-6

Investigation 3: Sessions 1-2

Ten-Minute Math: Lengths and Perimeters

Exploring Solids and Boxes

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-4

- **estimate and use measuring devices with standard (English and metric) and non-standard units to measure length, surface area, liquid volume (capacity), temperature, and weight**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Investigation 2: Session 4

From Paces to Feet

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-2

Turtle Paths

Investigation 2: Sessions 1-2, 5-6

Investigation 3: Sessions 1-2

Ten-Minute Math: Lengths and Perimeters

Exploring Solids and Boxes

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-4

- **communicate the relationships of more, less, and equivalent when measuring**

References:

From Paces to Feet

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

Exploring Solids and Boxes

Investigation 4: Session 2

- **identify perimeter and area of regular and irregular figures by counting units**

References:

Things That Come in Groups

Investigation 3: Sessions 1-5

Flips, Turns, and Area

Investigation 1: Sessions 4-5

Investigation 2: Sessions 1-5

Turtle Paths

Investigation 3: Sessions 1-2, 6-7

Ten-Minute Math: Lengths and Perimeters

- **identify dimensions and volume of rectangular prisms by counting cubes**

References:

Exploring Solids and Boxes

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-4

- **use the calendar to identify year/month/week/day(date)**

References:

Landmarks in the Hundreds

Ten-Minute Math: Calendar Math

Combining and Comparing

Investigation 5: Sessions 1-3

- **read time to nearest minute using digital and analog clocks**

Grade 3 students using *Investigations in Number, Data, and Space* plan the activities for a party that will begin at 5:00 PM and end at 7:00 PM. Students give the starting time and duration for each activity.

Reference:

Combining and Comparing
Investigation 3: Session 3

- **identify elapsed time using a clock**

Grade 3 students using *Investigations in Number, Data, and Space* plan the activities for a party that will begin at 5:00 PM and end at 7:00 PM. Students give the starting time and duration for each activity.

Reference:

Combining and Comparing
Investigation 3: Session 3

- **read thermometers and compare results**

There are no specific references to reading thermometers in the third grade series.

- **determine possible combinations of coins and bills to equal given monetary amounts**

Grade 3 students using *Investigations in Number, Data, and Space* recognize the value of coins and find the value of a collection of coins, they divide one dollar among different numbers of people, and they solve a variety of problems involving the addition, subtraction, multiplication, and/or division of amounts of money.

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

- **make change with coins and bills in problem solving and real-world situations**

Grade 3 students using *Investigations in Number, Data, and Space* recognize the value of coins and find the value of a collection of coins, they divide one dollar among different numbers of people, and they solve a variety of problems involving the addition, subtraction, multiplication, and/or division of amounts of money.

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

• read, write, and use money notation

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

• solve problems involving measurements

References:

Mathematical Thinking at Grade 3
Investigation 2: Sessions 5-7
Landmarks in the Hundreds
Investigation 1: Sessions 6-7
Investigation 2: Session 4
From Paces to Feet
Investigation 1: Sessions 1-6
Investigation 2: Sessions 1-7
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-3
Combining and Comparing
Investigation 2: Sessions 1-2
Investigation 3: Sessions 1-2
Turtle Paths
Investigation 2: Sessions 1-2, 5-6
Investigation 3: Sessions 1-2
Ten-Minute Math: Lengths and Perimeters
Exploring Solids and Boxes
Investigation 4: Sessions 1-3
Investigation 5: Sessions 1-4

SPATIAL RELATIONSHIPS AND GEOMETRY

It is expected that students will:

- **describe, sketch, compare, and contrast plane geometric figures**

References:

Flips, Turns, and Area

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-5

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

- **describe, sketch, model, build, compare, and contrast two- and three-dimensional geometric figures**

References:

Flips, Turns, and Area

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-5

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

Exploring Solids and Boxes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-2

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-4

- **identify and draw open and closed curves**

References:

Flips, Turns, and Area

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-5

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

• **describe and sketch intersecting and parallel lines**

Students use *Geo-Logo* software to construct paths and describe their properties. They make turns and use intersecting paths to construct closed figures.

References:

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

• **identify lines of symmetry**

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1, 3-4

• **demonstrate and describe the transformation (motion) of geometric figures as a slide, turn (rotation), or a flip**

References:

Mathematical Thinking at Grade 3

Investigation 2: Session 1

Flips, Turns, and Area

Investigation 1: Sessions 1-3

Investigation 2: Sessions 2-3

• **identify a figure after transformation (flips, turns, slides)**

References:

Mathematical Thinking at Grade 3

Investigation 2: Session 1

Flips, Turns, and Area

Investigation 1: Sessions 1-3

Investigation 2: Sessions 2-3

• **describe results of combining and subdividing shapes**

References:

Flips, Turns, and Area

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-5

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

Investigation 3: Session 1

- **recognize and describe similar and congruent figures**

References:

Flips, Turns, and Area

Investigation 2: Sessions 2-5

Turtle Paths

Investigation 1: Session 3

Investigation 3: Sessions 3-5

DATA ANALYSIS

It is expected that students will:

- **collect, organize, display, and describe simple data from surveys and experiments using number lines, pictographs, bar graphs, and frequency tables**

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: Sessions 2-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

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

- **read and interpret displays of data; draw conclusions from charts, tables, and graphs to solve problems**

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: Sessions 2-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

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

- **use concepts of probability such as equal, best, impossible, unlikely, likely, and certain to make predictions about future events**

References:

Things That Come in Groups

Ten-Minute Math: Likely or Unlikely?

Exploring Solids and Boxes

Ten-Minute Math: What Is Likely?

- **conduct simple probability experiments using spinners, number cubes, and random drawings**

References:

Things That Come in Groups

Ten-Minute Math: Likely or Unlikely?

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

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Grade 3 students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts throughout the course. For example, students investigate why certain tetrominoes can cover given rectangles, while others cannot, and make generalizations based on their explorations.

Sample References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 3

Flips, Turns, and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 2: Session 2

Landmarks in the Hundreds

Investigation 2: Session 4

Up and Down the Number Line

Investigation 2: Session 4

Combining and Comparing

Investigation 1: Sessions 1-3

Turtle Paths

Investigation 3: Sessions 1-2

Fair Shares

Investigation 3: Session 3

Exploring Solids and Boxes

Investigation 2: Sessions 4-5

- **apply previous experience and knowledge to new problem-solving situations**

Grade 3 students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, students use previously learned addition facts to learn new number combinations.

Sample References:

Mathematical Thinking at Grade 3

Investigation 2: Session 2

Things That Come in Groups

Investigation 3: Sessions 1-2

Flips, Turns, and Area

Investigation 2: Session 1

From Paces to Feet

Investigation 1: Session 1

Landmarks in the Hundreds

Investigation 2: Session 4

Up and Down the Number Line

Investigation 1: Sessions 1-2

Combining and Comparing

Investigation 1: Sessions 1-2

Turtle Paths

Investigation 1: Session 2

Fair Shares

Investigation 1: Sessions 1-2

Exploring Solids and Boxes

Investigation 4: Session 1

- **formulate own problems; use various approaches to investigate and solve problems**

Grade 3 students using *Investigations in Number, Data, and Space* are given a great deal of freedom to explore mathematical concepts and, in so doing, formulate their own problems and use various approaches to investigate and solve problems. For example, students write their own story problems and number riddles to solve and share.

Sample References:

Mathematical Thinking at Grade 3

Investigation 4: Session 1

Things That Come in Groups

Investigation 4: Sessions 3-4

Flips, Turns, and Area

Investigation 2: Sessions 2-3

From Paces to Feet

Investigation 4: Sessions 1-3

- Landmarks in the Hundreds
 - Investigation 1: Sessions 6-7
- Up and Down the Number Line
 - Investigation 3: Sessions 1-3
- Combining and Comparing
 - Investigation 3: Session 3
- Turtle Paths
 - Investigation 3: Sessions 6-7
- Fair Shares
 - Investigation 3: Session 3
- Exploring Solids and Boxes
 - Investigation 5: Sessions 1-4

• explain and verify results with respect to the original problem

Grade 3 students using Investigations in Number, Data, and Space explain and verify results with respect to the original problem throughout the course. For example, students predict results and then explain and verify their predictions as they examine patterns on a Hundred Chart.

Sample References:

- Mathematical Thinking at Grade 3
 - Investigation 4: Session 3
- Things That Come in Groups
 - Investigation 2: Sessions 5-6
- Flips, Turns, and Area
 - Investigation 2: Sessions 4-5
- From Paces to Feet
 - Investigation 2: Session 2
- Landmarks in the Hundreds
 - Investigation 2: Sessions 1-3
- Up and Down the Number Line
 - Investigation 1: Sessions 1-2
- Combining and Comparing
 - Investigation 1: Sessions 1-2
- Turtle Paths
 - Investigation 2: Sessions 5-6
- Fair Shares
 - Investigation 3: Sessions 1-2
- Exploring Solids and Boxes
 - Investigation 3: Session 1

- **try more than one strategy when the first strategy proves to be unproductive**

Grade 3 students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, students use Hundred Charts and Thousand Charts to solve number problems.

Sample References:

Mathematical Thinking at Grade 3

Investigation 2: Session 2

Things That Come in Groups

Investigation 2: Session 1

Flips, Turns, and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 1: Sessions 5-6

Landmarks in the Hundreds

Investigation 3: Session 1

Up and Down the Number Line

Investigation 1: Sessions 3-4

Combining and Comparing

Investigation 4: Sessions 1-2

Turtle Paths

Investigation 2: Sessions 5-6

Fair Shares

Investigation 3: Session 3

Exploring Solids and Boxes

Investigation 2: Session 3

- **apply solutions and strategies from earlier problems to new problem situations**

Grade 3 students using *Investigations in Number, Data, and Space* apply solutions and strategies from earlier problems to new problem situations throughout the course. For example, students apply what they learned by doing factor and array problems in Things That Come in Groups to problems in Landmarks in the Hundreds involving Dividing a Dollar

Sample References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 1: Session 4

Flips, Turns, and Area

Investigation 1: Session 4

From Paces to Feet

Investigation 1: Sessions 5-6

- Landmarks in the Hundreds
 - Investigation 1: Sessions 6-7
- Up and Down the Number Line
 - Investigation 1: Session 8
- Combining and Comparing
 - Investigation 5: Sessions 2-3
- Turtle Paths
 - Investigation 1: Sessions 3-4
- Fair Shares
 - Investigation 1: Sessions 3-4
- Exploring Solids and Boxes
 - Investigation 3: Session 2

- **use technology, including calculators, to understand quantitative relationships (e.g., for skip counting and pattern exploration)**

References:

- Mathematical Thinking at Grade 3
 - Investigation 3: Sessions 3-4
 - Investigation 4: Session 2
- Things that Come in Groups
 - Investigation 1: Session 4
 - Investigation 2: Sessions 2-4
 - Investigation 4: Sessions 3-4
- Flips, Turns, and Area
 - Investigation 1: Session 5
- Landmarks in the Hundreds
 - Investigation 2: Sessions 5-6
 - Investigation 3: Session 1
- Up and Down the Number Line
 - Investigation 1: Sessions 3-5
 - Investigation 3: Sessions 1-3
- Combining and Comparing
 - Investigation 4: Sessions 3-4
 - Investigation 5: Sessions 2-3
- Turtle Paths
 - Investigation 1: Sessions 2-4
 - Investigation 2: Sessions 1-2, 4-6
 - Investigation 3: Sessions 1-7
 - Appendix: *Geo-Logo* Tutorial
- Fair Shares
 - Investigation 3: Sessions 1-2
- Exploring Solids and Boxes
 - Investigation 5: Sessions 1-4

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Grade 3 students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. For example, students discuss and exchange ideas about what they have learned about odd and even numbers.

Sample References:

Mathematical Thinking at Grade 3

Investigation 4: Session 3

Things That Come in Groups

Investigation 2: Sessions 5-6

Flips, Turns, and Area

Investigation 1: Session 1

From Paces to Feet

Investigation 1: Session 2

Landmarks in the Hundreds

Investigation 2: Sessions 1-3

Up and Down the Number Line

Investigation 1: Sessions 6-7

Combining and Comparing

Investigation 1: Sessions 1-2

Turtle Paths

Investigation 1: Session 1

Fair Shares

Investigation 1: Sessions 3-4

Exploring Solids and Boxes

Investigation 2: Sessions 4-5

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Grade 3 students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a strategy for learning is a fundamental emphasis of the investigation-based curriculum. The teacher asks guiding questions of the students, and the students discuss ideas, question methods and results, conduct research, and gather and interpret data. Third graders use inquiry techniques to guess their teacher's and classmates' classification rules.

Sample References:

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

Things That Come in Groups
Investigation 1: Session 3

Flips, Turns, and Area
Investigation 1: Session 5

From Paces to Feet
Investigation 3: Session 1

Landmarks in the Hundreds
Investigation 1: Sessions 6-7

Up and Down the Number Line
Investigation 2: Session 1

Combining and Comparing
Investigation 1: Session 3

Turtle Paths
Investigation 3: Sessions 1-2

Fair Shares
Investigation 3: Sessions 1-2

Exploring Solids and Boxes
Investigation 1: Session 2

• identify and translate key words and phrases that imply mathematical operations

Grade 3 students using *Investigations in Number, Data, and Space* identify and translate key words and phrases that imply mathematical operations throughout the course. For example, students use key words to identify and distinguish between multiplication and division story problems.

Sample References:

Mathematical Thinking at Grade 3
Investigation 2: Session 1: Teacher Note, page 21

Things That Come in Groups
Investigation 4: Sessions 1-2

Flips, Turns, and Area
Investigation 1: Session 1

From Paces to Feet
Investigation 1: Sessions 5-6

Landmarks in the Hundreds
Investigation 1: Sessions 2-3: Teacher Note, page 15

Up and Down the Number Line
Investigation 2: Sessions 2-3

Combining and Comparing
Investigation 4: Session 2: Teacher Note, page 52

- Turtle Paths
 - Investigation 2: Session 3
- Fair Shares
 - Investigation 2: Session 7
- Exploring Solids and Boxes
 - Investigation 2: Sessions 4-5

• use physical materials, models, pictures, or writing to represent and communicate mathematical ideas

Grade 3 students using *Investigations in Number, Data, and Space* use physical materials, models, pictures, and writing to represent and communicate mathematical ideas throughout the course. Students use a wide variety of manipulatives, including cubes, tiles, balances, pattern blocks, geoblocks, tetronimoes, and snap cubes to model numbers, operations, patterns, and problem situations. They create graphs, charts, drawings, and tables to organize, record, and communicate mathematical ideas. They write story problems, riddles, descriptions, and problem solutions.

Sample References:

- Mathematical Thinking at Grade 3
 - Investigation 3: Sessions 3-4
- Things That Come in Groups
 - Investigation 1: Session 2
- Flips, Turns, and Area
 - Investigation 2: Sessions 2-3
- From Paces to Feet
 - Investigation 4: Sessions 1-3
- Landmarks in the Hundreds
 - Investigation 3: Session 1
- Up and Down the Number Line
 - Investigation 1: Sessions 3-4
- Combining and Comparing
 - Investigation 2: Sessions 1-2
- Turtle Paths
 - Investigation 1: Sessions 3-4
- Fair Shares
 - Investigation 1: Sessions 1-4
- Exploring Solids and Boxes
 - Investigation 2: Sessions 1-2

- **explain and justify thinking about mathematical ideas and solutions**

Grade 3 students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

Sample References:

Mathematical Thinking at Grade 3

Investigation 4: Session 1

Things That Come in Groups

Investigation 3: Sessions 1-2

Flips, Turns, and Area

Investigation 2: Sessions 4-5

From Paces to Feet

Investigation 2: Session 2

Landmarks in the Hundreds

Investigation 2: Session 4

Up and Down the Number Line

Investigation 1: Sessions 6-7

Combining and Comparing

Investigation 1: Sessions 1-2

Turtle Paths

Investigation 3: Sessions 1-2

Fair Shares

Investigation 2: Session 3

Exploring Solids and Boxes

Investigation 3: Session 2

- **use everyday language to explain thinking about strategies and solutions to mathematical problems**

Grade 3 students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, students interpret and write problems in everyday language which can be solved using mathematics.

Sample References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 3

Flips, Turns, and Area

Investigation 2: Sessions 4-5

From Paces to Feet

Investigation 1: Session 2: Teacher Note, page 13

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 1: Sessions 1-2

Combining and Comparing

Investigation 1: Sessions 1-2

Turtle Paths

Investigation 1: Session 1

Fair Shares

Investigation 3: Sessions 1-2

Exploring Solids and Boxes

Investigation 2: Sessions 1-2

• **express mathematical ideas and use them to define, compare, and solve problems orally and in writing**

Grade 3 students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies. In one activity, students write mathematical arguments to support the need for a standard unit of measurement.

Sample References:

Mathematical Thinking at Grade 3

Investigation 4: Session 3

Things That Come in Groups

Investigation 2: Sessions 5-6

Flips, Turns, and Area

Investigation 2: Sessions 4-5

From Paces to Feet

Investigation 2: Session 2

Landmarks in the Hundreds

Investigation 2: Sessions 1-3

Up and Down the Number Line

Investigation 1: Sessions 1-2

Combining and Comparing

Investigation 1: Sessions 1-2

Turtle Paths

Investigation 2: Sessions 5-6

Fair Shares

Investigation 3: Sessions 1-2

Exploring Solids and Boxes
Investigation 3: Session 1

- **use mathematical notation to communicate and explain mathematical situations**

Grade 3 students using *Investigations in Number, Data, and Space* use mathematical notation to communicate and explain mathematical situations throughout the course. For example, students depict multiplication situations symbolically as mathematical expressions using multiplication and repeated addition.

Sample References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Things That Come in Groups

Investigation 2: Session 2

Flips, Turns, and Area

Investigation 1: Session 5: Follow-Up, page 29

From Paces to Feet

Investigation 2: Sessions 6-7

Landmarks in the Hundreds

Investigation 1: Sessions 4-5: Teacher Note, page 21

Up and Down the Number Line

Investigation 1: Sessions 3-4

Combining and Comparing

Investigation 1: Sessions 1-2: Activity: Close to 100

Turtle Paths

Investigation 2: Sessions 5-6

Fair Shares

Investigation 1: Sessions 1-2

Exploring Solids and Boxes

Investigation 4: Session 1

MATHEMATICAL REASONING

It is expected that students will:

- **justify and explain the solutions to problems using manipulative and physical models**

Grade 3 students using *Investigations in Number, Data, and Space* justify and explain the solutions to problems using physical materials throughout the course. Students use an extensive array of manipulative materials, including number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimoes, and snap cubes. For example, students are introduced to skip counting using interlocking cubes.

Sample References:

Mathematical Thinking at Grade 3
Investigation 1: Session 1

Things That Come in Groups
Investigation 2: Sessions 3-4

Flips, Turns, and Area
Investigation 1: Session 1

From Paces to Feet
Investigation 4: Sessions 1-3

Landmarks in the Hundreds
Investigation 1: Session 1

Up and Down the Number Line
Investigation 3: Session 1

Combining and Comparing
Investigation 4: Session 1

Turtle Paths
Investigation 3: Sessions 3-5

Fair Shares
Investigation 1: Sessions 1-2

Exploring Solids and Boxes
Investigation 2: Sessions 4-5

- **use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems**

Grade 3 students using *Investigations in Number, Data, and Space* use patterns and relationships to analyze mathematical situations and draw logical conclusions about mathematical problems throughout the course. For example, students use Hundred Charts, Thousand Charts, arrays, and interlocking cubes to explore number patterns and relationships.

Sample References:

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

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

Flips, Turns, and Area
Investigation 1: Session 1

From Paces to Feet
Investigation 1: Session 1

Landmarks in the Hundreds
Investigation 3: Sessions 1-3

Up and Down the Number Line
Investigation 1: Sessions 3-4

Combining and Comparing
Investigation 5: Sessions 1-3
Turtle Paths
Investigation 2: Sessions 5-6
Fair Shares
Investigation 2: Session 3
Exploring Solids and Boxes
Investigation 4: Session 2

• **ask questions to reflect on, clarify, and extend thinking**

Grade 3 students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher. In one investigation, students write multiplication questions to share with a partner.

Sample References:

Mathematical Thinking at Grade 3
Investigation 3: Sessions 1-2
Things That Come in Groups
Investigation 1: Session 1
Flips, Turns, and Area
Investigation 2: Sessions 2-3
From Paces to Feet
Investigation 3: Sessions 2-3
Landmarks in the Hundreds
Investigation 2: Sessions 5-6
Up and Down the Number Line
Investigation 1: Sessions 6-7
Combining and Comparing
Investigation 2: Session 1
Turtle Paths
Investigation 2: Sessions 5-6
Fair Shares
Investigation 2: Sessions 5-6
Exploring Solids and Boxes
Investigation 2: Sessions 4-5

- **review and refine the assumptions and steps used to derive conclusions in mathematical arguments**

Grade 3 students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. For example, Grade 3 students work together to decide on a “middle-sized pace,” based on an analysis of data collected in the classroom.

Sample References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 2-3

Things That Come in Groups

Investigation 2: Sessions 5-6

Flips, Turns, and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 1: Sessions 5-6

Landmarks in the Hundreds

Investigation 3: Session 1

Up and Down the Number Line

Investigation 1: Sessions 3-4

Combining and Comparing

Investigation 5: Session 1

Turtle Paths

Investigation 3: Sessions 1-2

Fair Shares

Investigation 1: Sessions 1-2

Exploring Solids and Boxes

Investigation 2: Sessions 4-5

- **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Grade 3 students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process. For example, in one activity students collect, sort, classify, organize, and display information as they play a game called Guess My Rule.

Sample References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 3

Flips, Turns, and Area

Investigation 1: Session 5

From Paces to Feet
Investigation 2: Session 2
Landmarks in the Hundreds
Investigation 2: Session 4
Up and Down the Number Line
Investigation 2: Session 4
Combining and Comparing
Investigation 1: Sessions 1-3
Turtle Paths
Investigation 3: Sessions 1-2
Fair Shares
Investigation 3: Session 3
Exploring Solids and Boxes
Investigation 2: Sessions 4-5

MATHEMATICAL CONNECTIONS

It is expected that students will:

- **link new concepts to prior knowledge**

Grade 3 students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students link graphs of numbers and changes to numerical and verbal expressions of elevator trips.

Sample References:

Mathematical Thinking at Grade 3
Investigation 2: Sessions 3-4
Things That Come in Groups
Investigation 3: Sessions 3-4
Flips, Turns, and Area
Investigation 2: Sessions 2-3
From Paces to Feet
Investigation 2: Session 2
Landmarks in the Hundreds
Investigation 2: Sessions 1-3
Up and Down the Number Line
Investigation 2: Session 1
Combining and Comparing
Investigation 1: Session 3
Turtle Paths
Investigation 2: Sessions 1-2
Fair Shares
Investigation 2: Sessions 1-2
Exploring Solids and Boxes
Investigation 2: Sessions 1-2

- **use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics**

Each unit of study in *Investigations in Number, Data, and Space* is organized to enable students to recognize and use connections among mathematical ideas. The titles of each of these units are listed in the Sample References below. The Investigations within each of these units and the Sessions within each Investigation involve students directly experiencing the connections between the mathematical ideas presented in each unit. For example, in Grade 3, the following concepts are connected in Combining and Comparing: developing strategies for combining and comparing numbers, collecting and comparing data, numeration through hundreds and thousands, using measurement to combine heights and compare weights, adding amounts to make a sum of money, and exploring mathematical characteristics of the calendar. Recurring features at all grade levels, including Ten-Minute Math and software applications, allow teachers opportunities to integrate all of the units of study with a common thread.

Sample References:

Mathematical Thinking at Grade 3

Investigation 4: Sessions 1-3

Things That Come in Groups

Investigation 4: Sessions 1-2

Flips, Turns, and Area

Investigation 1: Sessions 1-5

From Paces to Feet

Investigation 1: Sessions 1-2

Landmarks in the Hundreds

Investigation 1: Sessions 2-3

Up and Down the Number Line

Investigation 1: Sessions 1-4

Combining and Comparing

Investigation 1: Session 3

Turtle Paths

Investigation 2: Session 3

Fair Shares

Investigation 1: Sessions 3-4

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **identify practical applications of mathematical principles that can be applied to other disciplines**

Students in Grades 3 using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course; in fact, this is a fundamental emphasis of the series. For example, students apply statistical analysis to real-world data, apply computation strategies to solve real-world problems, measure objects in their immediate or larger environment, and describe objects in their environment in geometric terms.

Sample References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 1: Session 4

Flips, Turns, and Area

Investigation 2: Sessions 4-5

From Paces to Feet

Investigation 3: Sessions 1-3

Landmarks in the Hundreds

Investigation 2: Session 4

Up and Down the Number Line

Investigation 1: Sessions 1-2

Combining and Comparing

Investigation 3: Sessions 1-3

Turtle Paths

Investigation 1: Session 1

Fair Shares

Investigation 1: Sessions 1-4

Exploring Solids and Boxes

Investigation 5: Sessions 1-4

- **apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g., rhythm in music and motion in science)**

Grade 3 students using *Investigations in Number, Data, and Space* apply mathematical thinking and modeling to solve problems that arise in other disciplines throughout the course. For example, students apply statistical analysis to real-world data; they study economics, geography, and urban planning; they employ reading and writing to learn and express ideas; and they apply computation strategies to a science problem involving different numbers of legs on different species of animals.

Sample References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 5: Session 2

- Flips, Turns, and Area
 - Investigation 2: Sessions 4-5
- From Paces to Feet
 - Investigation 1: Sessions 3-4
- Landmarks in the Hundreds
 - Investigation 2: Session 4
- Up and Down the Number Line
 - Investigation 3: Sessions 2-3
- Combining and Comparing
 - Investigation 3: Sessions 1-3
- Turtle Paths
 - Investigation 1: Sessions 3-4
- Fair Shares
 - Investigation 3: Sessions 1-2
- Exploring Solids and Boxes
 - Investigation 5: Sessions 1-4

• **identify, explain, and use mathematics in everyday life**

Grade 3 students using *Investigations in Number, Data, and Space* define problems in everyday situations throughout the course as they perform the investigations on which the curriculum is based. For example, students measure the heights of their classmates and use coupons to make purchases within a budget.

Sample References:

- Mathematical Thinking at Grade 3
 - Investigation 3: Sessions 1-2
- Things That Come in Groups
 - Investigation 3: Sessions 1-2
- Flips, Turns, and Area
 - Investigation 1: Sessions 2-3
- From Paces to Feet
 - Investigation 2: Session 2
- Landmarks in the Hundreds
 - Investigation 2: Session 4
- Up and Down the Number Line
 - Investigation 1: Sessions 1-2
- Combining and Comparing
 - Investigation 3: Sessions 1-2
- Turtle Paths
 - Investigation 1: Session 1
- Fair Shares
 - Investigation 3: Sessions 1-2
- Exploring Solids and Boxes
 - Investigation 3: Sessions 1

Investigations in Number, Data, & Space to the Clark County Curriculum Overview

GRADE FOUR

Fourth grade students extend their learning of multiplication and division of whole numbers. They solve problems, which involve addition and subtraction of fractions and decimals. Students also refine their estimation skills and solve problems involving geometric figures, probability, and measurement.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **read, write, order, and compare numbers from 0-999,999**

Students explore hundreds and thousands, including landmark numbers; they devise and practice grouping and ordering strategies; and they compare, combine, and perform operations on whole numbers through the thousands.

Sample 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

- **explain relative size (magnitude) of numbers using powers of ten (hundreds and thousands) as benchmarks**

References:

Mathematical Thinking at Grade 4
Investigation 1: Session 4
Packages and Groups
Investigation 2: Sessions 2-3

- **round numbers to the nearest tens, hundreds, or thousands to determine the reasonableness of answers**

The following references are to a variety of estimation techniques, including rounding.

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
Packages and Groups
Investigation 2: Sessions 2-3
Money, Miles, and Large Numbers
Investigation 1: Sessions 1-2, 7-8
Investigation 2: Sessions 1-2
Investigation 3: Session 1

- **identify and use place value positions up to 100,000**

References:

Landmarks in the Thousands
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-5
Investigation 4, Sessions 1-3
Money, Miles, and Large Numbers
Investigation 1, Sessions 1-8
Investigation 2, Sessions 1-2
Investigation 3, Sessions 1-4

- **use subtraction to model and explain division**

References:

Packages and Groups

Investigation 3: Sessions 3: Teacher Note, page 45

- **describe the relationships of operations (addition, subtraction, multiplication, and division)**

References:

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 2: Sessions 2-3

Ten-Minute Math: Counting Around the Class

Ten-Minute Math: Multiple BINGO

Landmarks in the Thousands

Investigation 2: Sessions 1-4

Ten-Minute Math: Counting Around the Class

Packages and Groups

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-3

- **describe and use the processes and properties of addition, subtraction, multiplication, and division, including correct notations and related words**

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

Investigation 3: Session 2

Different Shapes, Equal Pieces

Investigation 1: Session 5

Investigation 2: Session 3

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2, 4-8

Investigation 2: Sessions 1-2, 4

Packages and Groups

- Investigation 1: Sessions 1-5
- Investigation 2: Sessions 1-3
- Investigation 3: Sessions 1-10
- Ten-Minute Math: Guess My Number

• use concepts of multiples, factors, and divisors

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 1-3
 - Investigation 2: Sessions 1-5
 - Investigation 4: Sessions 1-3
- Packages and Groups
 - Investigation 1: Sessions 3-5
 - Investigation 3: Sessions 4-9

• read and write symbols for proper and improper fractions and mixed numbers

References:

- Different Shapes, Equal Pieces
 - Investigation 1: Sessions 1-5
 - Investigation 2: Sessions 1-4
 - Investigation 3: Sessions 1-5
- Money, Miles, and Large Numbers
 - Investigation 2: Sessions 1-3
- Sunken Ships and Grid Patterns
 - Investigation 2: Session 5
- Three out of Four Like Spaghetti
 - Investigation 1: Sessions 1-4

• read and write symbols for decimals, extending to the thousandths place

References:

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

- **compare fractions and/or decimals, and describe as nearer one whole number than another**

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
Money, Miles, and Large Numbers
Investigation 1: Sessions 1-2
Investigation 2: Sessions 1-2

- **describe the need for fractions and their relationship to whole numbers**

References:

Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-4
Investigation 3: Sessions 1-5
Money, Miles, and Large Numbers
Investigation 2: Sessions 1-3
Sunken Ships and Grid Patterns
Investigation 2: Session 5
Three out of Four Like Spaghetti
Investigation 1: Sessions 1-4

- **describe the relationship of fractions to decimals**

References:

Money, Miles, and Large Numbers
Investigation 2: Sessions 1-4
Three out of Four Like Spaghetti
Investigation 1: Sessions 1-4

- **identify and compare fractions with like denominators, using models and drawings**

References:

Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-4
Investigation 3: Sessions 1-5

Money, Miles, and Large Numbers
Investigation 2: Sessions 1-3
Sunken Ships and Grid Patterns
Investigation 2: Session 5
Three out of Four Like Spaghetti
Investigation 1: Sessions 1-4

• compare fractions with like denominators, without models

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

• immediately recall and use basic facts of multiplication and division through the 12's

References:

Mathematical Thinking at Grade 4
Investigation 1: Sessions 2-3
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 2: Session 1
Ten-Minute Math: Counting Around the Class
Packages and Groups
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-10

• describe and use algorithms for addition, subtraction, multiplication, and division

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
 - Investigation 3: Session 2
- Different Shapes, Equal Pieces
 - Investigation 1: Session 5
 - Investigation 2: Session 3
- Money, Miles, and Large Numbers
 - Investigation 1: Sessions 1-2, 4-8
 - Investigation 2: Sessions 1-2, 4
- Packages and Groups
 - Investigation 1: Sessions 1-5
 - Investigation 2: Sessions 1-3
 - Investigation 3: Sessions 1-10
 - Ten-Minute Math: Guess My Number

• add and subtract multi-digit numbers, with and without regrouping

References:

- Mathematical Thinking at Grade 4
 - Investigation 3: Sessions 3-5
 - Ten-Minute Math: Estimation and Number Sense
- Landmarks in the Thousands
 - Investigation 2: Sessions 2-4
 - Investigation 3: Sessions 3-5
- Money, Miles, and Large Numbers
 - Investigation 1: Sessions 3, 6
 - Investigation 3: Sessions 1-4

• multiply by multiples of ten or a hundred

References:

- Mathematical Thinking at Grade 4
 - Investigation 1: Sessions 2-3
- Arrays and Shares
 - Investigation 2: Session 1
 - Investigation 3:
 - Session 1
 - Sessions 2-4: Teacher Note, page 54
 - Session 5
- Packages and Groups
 - Investigation 2: Session 1

- **multiply multi-digit numbers by one-digit numbers, with regrouping**

References:

Arrays and Shares

Investigation 3: Sessions 1-5

Packages and Groups

Investigation 1: Sessions 4-5

Investigation 2: Sessions 1-3

Investigation 3: Sessions 4-6

- **multiply a two- or three-digit number by a two-digit number, with and without regrouping**

References:

Packages and Groups

Investigation 2: Sessions 1-3

Investigation 3: Sessions 4-6

- **divide multiples of ten or one hundred by multiples of ten**

Reference:

Landmarks in the Thousands

Investigation 2: Session 1

- **divide a two- or three-digit number by a one-digit number, with or without a remainder**

References:

Landmarks in the Thousands

Investigation 2: Session 1

Packages and Groups

Investigation 3: Sessions 1-2

- **rename fractions and identify simplest form**

References:

Different Shapes, Equal Pieces

Investigation 1: Session 5

Investigation 2: Session 3

Investigation 3: Sessions 1-2

- **rename fractions as decimals and vice versa (e.g., $1/4 = .25$, $1/2 = .50$)**

References:

Money, Miles, and Large Numbers

Investigation 2: Session 3

- **add and subtract fractions and mixed numbers with like denominators**

References:

Different Shares, Equal Pieces

Investigation 1: Session 5

Investigation 2: Session 3

- **add and subtract decimals**

References:

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2, 4-8

Investigation 2: Sessions 1-2, 4

- **multiply and divide money amounts by a one-digit whole number producing a solution with no remainder**

Grade 4 students using *Investigations in Number, Data, and Space* add and subtract money values.

References:

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-8

- **generate and solve two-step multiplication and division problems based on practical situations, using pencil and paper, mental computation, and estimation**

References:

Arrays and Shares

Investigation 3: Sessions 1-5

Packages and Groups

Investigation 2: Sessions 1-3

Investigation 3: Sessions 3-8, 10

- **use estimation and mental computation in appropriate situations to solve problems**

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

Packages and Groups

Investigation 2: Sessions 2-3

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2, 7-8

Investigation 2: Sessions 1-2

Investigation 3: Session 1

- **use a variety of appropriate strategies to estimate, compute, and solve mathematical and real-world problems**

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

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

Investigation 3: Sessions 2-5

The Shape of the Data

Ten-Minute Math: Estimation and Number Sense

Different Shapes, Equal Pieces

Investigation 1: Session 5

Investigation 2: Session 3

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2, 4-8

Investigation 2: Sessions 1-2, 4

Packages and Groups

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-10

Ten-Minute Math: Guess My Number

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **classify, compare, and contrast shapes, numbers, and data**

References:

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Ten-Minute Math: Exploring Data

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

Ten-Minute Math: Quick Images

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-5

The Shape of the Data

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-2

Changes Over Time

Unit Preparation: Sessions 1-3

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-8

Ten-Minute Math: Quick Images

Packages and Groups

Investigation 2: Sessions 2-3

Ten-Minute Math: Exploring Data

Sunken Ships and Grid Patterns

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-9

Ten-Minute Math: Lengths and Perimeters

Three Out of Four Like Spaghetti

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-7

- **analyze, describe, create, and extend patterns using numbers, appropriate tables, and calculators**

References:

Landmarks in the Thousands

Investigation 3, Sessions 1, 2

Investigation 4, Sessions 1-3

- **identify, describe, and explain patterns and relationships including those formed by multiples, factors, and powers of 10, using paper and pencil**

References:

Landmarks in the Thousands

Investigation 3, Sessions 1, 2

Investigation 4, Sessions 1-3

- **complete open number sentences using correct numerals or operation symbols**

References:

Arrays and Shares

Investigation 2: Sessions 2-3: Teacher Note, page 23

Landmarks in the Thousands

Investigation 2: Sessions 2-4: Dialogue Box, page 32

Changes Over Time

Investigation 1: Sessions 5-6

Packages and Groups

Investigation 1: Sessions 4-5, page 15

Investigation 3: Sessions 7-8, page 53

- **find solutions to open sentences from a given replacement set (e.g., find the solution to $3 \times 7 = \underline{\quad}$, given the replacement set {19, 20, 21})**

References:

Arrays and Shares

Investigation 2: Sessions 2-3: Teacher Note, page 23

Landmarks in the Thousands

Investigation 2: Sessions 2-4: Dialogue Box, page 32

Changes Over Time

Investigation 1: Sessions 5-6

Packages and Groups

Investigation 1: Sessions 4-5, page 15

Investigation 3: Sessions 7-8, page 53

MEASUREMENT

It is expected that students will:

- **estimate and measure length (including perimeter), capacity, weight/mass, volume, and area using standard measuring devices (English and metric)**

References:

Arrays and Shares

Investigation 2: Sessions 1-6

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Ten-Minute Math: Lengths and Perimeters

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles, and Large Numbers

Investigation 2: Sessions 1-4

Investigation 3: Sessions 2-4

Changes Over Time

Unit Preparation: Session 3

- **measure and compare length in inches, feet, yards, and miles to the closest fractional part ($\frac{1}{4}$, $\frac{1}{2}$); convert within this system of measurement**

References:

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles, and Large Numbers

Investigation 2: Sessions 1-4

Investigation 3: Sessions 2-4

Changes Over Time

Unit Preparation: Sessions 1-3

Sunken Ships and Grid Patterns

Investigation 1: Sessions 1-6

- **determine totals for monetary amounts in problem-solving situations**

References:

Money, Miles, and Large Numbers
Investigation 1: Sessions 1-8

- **describe and determine the perimeter of polygons**

References:

Sunken Ships and Grid Patterns
Ten-Minute Math: Lengths and Perimeters

- **describe and determine the area of rectangles (including squares)**

References:

Arrays and Shares
Investigation 2: Sessions 1-6
Landmarks in the Thousands
Investigation 1: Session 2
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-4

SPATIAL SENSE AND GEOMETRY

It is expected that students will:

- **identify parts of a solid figure (base, face, edge, vertex)**

References:

Seeing Solids and Silhouettes
Investigation 1: Sessions 1-2
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-4

- **identify, describe, and classify two- and three-dimensional figures by relevant properties including the number of vertices and edges, and the number and shapes of faces**

References:

Seeing Solids and Silhouettes
Investigation 1: Sessions 1-2
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4
Ten-Minute Math: Quick Images
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-4
Investigation 3: Sessions 1-2
Sunken Ships and Grid Patterns
Investigation 1: Sessions 1-6
Investigation 2: Sessions 1-9
Ten-Minute Math: Lengths and Perimeters
Changes Over Time
Ten-Minute Math: Quick Images

- **identify, describe, and draw basic plane figures (points, lines, line segments, rays, and angles)**

References:

Seeing Solids and Silhouettes
Ten-Minute Math: Quick Images
Changes Over Time
Ten-Minute Math: Quick Images
Sunken Ships and Grid Patterns
Investigation 1: Sessions 1-6
Investigation 2: Sessions 1-9
Ten-Minute Math: Lengths and Perimeters

- **identify, describe, and draw intersecting and parallel lines**

Grade 4 students using the *Investigations in Number, Data, and Space* series gain experience with parallel lines and perpendicular lines as they use the computer to construct and manipulate points, segments, and rectangles on coordinate grids.

References:

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

- **identify, draw, and classify angles (acute, right, obtuse) according to their measurements**

References:

Sunken Ships and Grid Patterns
Investigation 2: Sessions 1, 5
Ten-Minute Math: Lengths and Perimeters
Appendix: *Geo-Logo* Tutorial

- **predict, verify, and describe results of combining, subdividing, and changing shapes**

References:

Seeing Solids and Silhouettes
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-4
Ten-Minute Math: Quick Image Geometric Designs
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-4
Investigation 3:
Sessions 1-2
Sessions 4-5: Teacher Note, pages 53-54
Changes Over Time
Ten-Minute Math: Quick Image Geometric Designs
Sunken Ships and Grid Patterns
Investigation 2: Sessions 4, 8-9

- **use motion geometry including flips, turns, and slides to examine the concepts of symmetry, similarity, and congruence**

References:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 5-6
Different Shapes, Equal Pieces
Investigation 1: Session 1
Money, Miles, and Large Numbers
Investigation 2: Session 4
Investigation 3: Sessions 2-4
Sunken Ships and Grid Patterns
Investigation 2: Sessions 1-9

- **determine lines of symmetry and recognize rotational symmetry**

References:

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

DATA ANALYSIS

It is expected that students will:

- **collect, organize, display, describe, and interpret simple data using number lines, pictographs, bar graphs, and frequency tables**

References:

Mathematical Thinking at Grade 4

 Ten-Minute Math: Exploring Data

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

Packages and Groups

 Ten-Minute Math: Exploring Data

Sunken Ships and Grid Patterns

 Investigation 1: Sessions 5-6

 Investigation 2: Sessions 1-9

 Ten-Minute Math: Lengths and Perimeters

Three out of Four Like Spaghetti

 Investigation 1: Sessions 1-4

 Investigation 2: Sessions 1-7

- **read, interpret, and discuss charts, tables, and graphs from books, newspapers, and magazines**

References:

The Shape of the Data

 Investigation 1: Sessions 2-3: Extensions, page 17

 Investigation 2:

 Session 4

 Sessions 6-7: Teacher Note, page 49

Changes Over Time

 Investigation 2: Sessions 1-2

 Investigation 3: Sessions 7-8: Extensions, page 68

Three out of Four Like Spaghetti

 Investigation 1: Session 3, page 19

- **conduct simple probability experiments using concrete materials and represent the results using fractions**

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?

- **use simple probability experiments to predict outcomes such as impossible, very unlikely, equally likely, very likely, certain, best chance, equal chance**

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?

- **solve problems and make predictions based on collected data**

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 2: Sessions 1-2, 5-7

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Grade 4 students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts throughout the course. For example, through exploration and investigation, students learn to visualize what objects look like from different perspectives.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Sessions 4-5

Arrays and Shares

Investigation 1: Session 3

Seeing Solids and Silhouettes

Investigation 2: Session 5

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 3: Session 3

The Shape of the Data

Investigation 1: Sessions 1-3

Money, Miles, and Large Numbers

Investigation 3: Session 1

Changes Over Time

Investigation 1: Sessions 5-6

Packages and Groups

Investigation 2: Session 1

Sunken Ships and Grid Patterns

Ten-Minute Math: Lengths and Perimeters

Three out of Four Like Spaghetti

Investigation 2: Sessions 5-7

- **apply previous experience and knowledge to new problem-solving situations**

Grade 4 students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, students extend their knowledge of the base-ten number system; they perform operations on larger and different sets of numbers, including fractions and decimals; and they expand their experience with concepts of geometry and statistics.

Sample References:

Mathematical Thinking at Grade 4

Investigation 1: Sessions 2-3

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 1: Session 1

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Unit Preparation: Sessions 1-3

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Session 1

Three out of Four Like Spaghetti

Investigation 2: Session 4

- **verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation**

Grade 4 students using *Investigations in Number, Data, and Space* verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation, throughout the course. For example, students develop and evaluate strategies for adding and subtracting large numbers and for estimating quantities of objects.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Sessions 4-5

Arrays and Shares

Investigation 2: Sessions 7-8

Seeing Solids and Silhouettes

Investigation 3: Session 1

- Landmarks in the Thousands
 - Investigation 3: Sessions 3-5
- Different Shapes, Equal Pieces
 - Investigation 1: Sessions 2-4
- The Shape of the Data
 - Investigation 2: Sessions 2-3
- Money, Miles, and Large Numbers
 - Investigation 1: Session 6
- Changes Over Time
 - Investigation 3: Session 3
- Packages and Groups
 - Investigation 3: Session 10
- Sunken Ships and Grid Patterns
 - Investigation 2: Session 5
- Three out of Four Like Spaghetti
 - Investigation 1: Session 4

• **try more than one strategy when the first strategy proves to be unproductive**

Grade 4 students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, students work cooperatively with a partner to replicate patterns and use mirror symmetry to create new patterns.

Sample References:

- Mathematical Thinking at Grade 4
 - Investigation 4: Session 1
- Arrays and Shares
 - Investigation 2: Session 1
- Seeing Solids and Silhouettes
 - Investigation 4: Sessions 1-4
- Landmarks in the Thousands
 - Investigation 4: Sessions 1-3
- Different Shapes, Equal Pieces
 - Investigation 3: Sessions 4-5
- The Shape of the Data
 - Investigation 1: Session 1
- Money, Miles, and Large Numbers
 - Investigation 2: Session 4
- Changes Over Time
 - Investigation 3: Session 5
- Packages and Groups
 - Investigation 1: Sessions 1-2
- Sunken Ships and Grid Patterns
 - Investigation 1: Session 1

Three out of Four Like Spaghetti
Investigation 2: Sessions 5-7

- **generalize solutions and strategies from earlier problems to new problem situations**

Grade 4 students using *Investigations in Number, Data, and Space* generalize solutions and strategies from earlier problems to new problem situations throughout the course. For example, students apply concepts from previously practiced division exercises to solve sharing and partitioning problems

Sample References:

Mathematical Thinking at Grade 4

Investigation 1: Sessions 2-3

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 1: Session 1

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Unit Preparation: Sessions 1-3

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Session 1

Three out of Four Like Spaghetti

Investigation 2: Session 4

- **interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable**

Grade 4 students using *Investigations in Number, Data, and Space* interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable, throughout the course. For example, students examine information in a problem to determine whether it is a multiplication or a division situation, choose from a variety of solution strategies, and work in small groups to verify their solutions.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Sessions 4-5

Arrays and Shares

Investigation 3: Sessions 2-4

Seeing Solids and Silhouettes

Investigation 1: Session 2

Landmarks in the Thousands

Investigation 2: Sessions 2-4

Different Shapes, Equal Pieces

Investigation 3: Session 3

The Shape of the Data

Investigation 2: Session 4

Money, Miles, and Large Numbers

Investigation 1: Sessions 4-5

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 3: Session 3

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Three out of Four Like Spaghetti

Investigation 1: Session 1

- **use technology, including calculators, to understand quantitative relationships (e.g., for skip counting and pattern exploration)**

References:

Mathematical Thinking at Grade 4

Investigation 2: Session 1

Investigation 3: Sessions 1-2

Money, Miles, and Large Numbers

Investigation 1: Sessions 4-5, 7-8

Investigation 2: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-9

Ten-Minute Math: Lengths and Perimeters

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Grade 4 students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. For example, students work in groups to solve sets of related problems involving addition, subtraction, and money. They reflect on what they learned from the other students in their group.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 2: Sessions 2-3

Seeing Solids and Silhouettes

Investigation 1: Session 2

Landmarks in the Thousands

Investigation 1: Session 1

Different Shapes, Equal Pieces

Investigation 1: Sessions 2-4

The Shape of the Data

Investigation 2: Session 1

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 1: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Session 2

Three out of Four Like Spaghetti

Investigation 1: Session 2

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Grade 4 students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a strategy for learning is a fundamental emphasis of the investigation-based curriculum. The teacher asks guiding questions of the students, and the students

discuss ideas, question methods and results, conduct research, and gather and interpret data. For example, fourth graders use inquiry techniques to search for factors of large numbers.

Sample References:

Mathematical Thinking at Grade 4

Investigation 1: Sessions 2-3

Arrays and Shares

Investigation 2: Sessions 5-6

Seeing Solids and Silhouettes

Investigation 3: Sessions 2-3

Landmarks in the Thousands

Investigation 1: Session 1

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 3: Sessions 1-2

Money, Miles, and Large Numbers

Investigation 2: Sessions 1-2

Changes Over Time

Investigation 1: Sessions 1-2

Packages and Groups

Investigation 3: Sessions 7-8

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti

Investigation 2: Session 2

• identify and translate key words and phrases that imply mathematical operations

Grade 4 students using *Investigations in Number, Data, and Space* identify and translate key words and phrases that imply mathematical operations throughout the course. For example, students recognize key words to identify division situations.

Sample References:

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Arrays and Shares

Investigation 2: Sessions 7-8

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 2: Sessions 2-4: Dialogue Box, page 33

Different Shapes, Equal Pieces

Investigation 3: Session 3

The Shape of the Data

Investigation 2: Session 5

Money, Miles, and Large Numbers

Investigation 3: Session 1

Changes Over Time

Investigation 3: Sessions 1-2

Packages and Groups

Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6: Dialogue Box, page 41

Three out of Four Like Spaghetti

Investigation 1: Session 4

• **use physical materials, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats**

Grade 4 students using *Investigations in Number, Data, and Space* use physical materials, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats throughout the course. For example, students use arrays as models for multiplication; they relate cube configurations to two-dimensional drawings, mental images, and verbal descriptions; they model numbers with a 100 Chart, a 1,000 Book, and a 10,000 Wall Chart; they model fractions with “crazy cakes;” they analyze displays of Mystery Data in tables, line plots, and graphs; and they use equations to model problem situations.

Sample References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 3-4

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 1: Session 1

Landmarks in the Thousands

Investigation 4: Sessions 1-3

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 2: Session 4

Money, Miles, and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti
Investigation 2: Session 3

- **explain and justify thinking about mathematical ideas and solutions**

Grade 4 students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

- **Sample References:**

Mathematical Thinking at Grade 4

Investigation 4: Session 2

Arrays and Shares

Investigation 2: Sessions 2-3

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 3: Session 2

Different Shapes, Equal Pieces

Investigation 3: Sessions 4-5

The Shape of the Data

Investigation 1: Session 1

Money, Miles, and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 3: Session 4

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Session 2

Three out of Four Like Spaghetti

Investigation 2: Session 4

- **make conjectures and present arguments in discussions of mathematical ideas**

Grade 4 students using *Investigations in Number, Data, and Space* make conjectures and present arguments in discussions of mathematical ideas throughout the curriculum as they perform the activities for each investigation. Grade 4 students make and investigate conjectures regarding numeric and geometric patterns and symmetry.

Sample References:

Mathematical Thinking at Grade 4

Investigation 4: Session 2

Arrays and Shares

Investigation 2: Sessions 2-3

Seeing Solids and Silhouettes

Investigation 1: Session 1

Landmarks in the Thousands

Investigation 1: Session 3

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 2: Sessions 2-3

Money, Miles, and Large Numbers

Investigation 2: Session 3

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 1: Sessions 4-5

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti

Investigation 1: Session 3

- **use everyday language to explain thinking about strategies and solutions to mathematical problems**

Grade 4 students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, students use everyday language to discuss the relevance of a remainder in a division problem situation involving packages of pencils.

Sample References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-4

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 3: Session 1

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 1: Session 1

Money, Miles, and Large Numbers

Investigation 1: Session 1

Changes Over Time

Investigation 3: Session 5

Packages and Groups

Investigation 3: Sessions 1-2: Dialogue Box, page 40

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4, page 19

Three out of Four Like Spaghetti

Investigation 2: Session 1

• express mathematical ideas and use them to define, compare, and solve problems orally and in writing

Grade 4 students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies. In one activity, students articulate their understanding of the concepts of pattern and symmetry, and they share and apply their ideas to solve problems.

References:

Mathematical Thinking at Grade 4

Investigation 4: Session 2

Arrays and Shares

Investigation 2: Sessions 2-3

Seeing Solids and Silhouettes

Investigation 1: Session 1

Landmarks in the Thousands

Investigation 1: Session 3

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 2: Sessions 2-3

Money, Miles, and Large Numbers

Investigation 2: Session 3

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 1: Sessions 4-5

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti

Investigation 1: Session 3

- **use mathematical notation to communicate and explain mathematical situations**

Grade 4 students using *Investigations in Number, Data, and Space* use mathematical notation to communicate and explain mathematical situations throughout the course. For example, students use numbers and operational and relational symbols in expressions and number sentences to represent problem situations.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 2: Sessions 7-8

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 2: Session 5

Different Shapes, Equal Pieces

Investigation 3: Sessions 4-5

The Shape of the Data

Investigation 2: Sessions 2-3: Teacher Note, page 31

Money, Miles, and Large Numbers

Investigation 1: Sessions 4-5

Changes Over Time

Investigation 1: Sessions 5-6

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti

Investigation 1: Session 3

MATHEMATICAL REASONING

It is expected that students will:

- **justify and explain the solutions to problems using manipulatives and physical models**

Grade 4 students using *Investigations in Number, Data, and Space* justify and explain the solutions to problems using physical materials throughout the course. Students use an extensive array of manipulative materials, including number cubes, dot cubes, square color tiles, hundred charts, balances, pattern blocks, buttons, coins, counters, attribute logic blocks, geoblocks, tetronimoes, and snap cubes. For example, students use interlocking cubes to model rectangular arrays.

Sample References:

Mathematical Thinking at Grade 4

Investigation 1: Session 1

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 4: Sessions 1-4

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 1: Sessions 2-4

The Shape of the Data

Investigation 1: Session 1

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Unit Preparation: Sessions 1-3

Packages and Groups

Investigation 3: Session 3

Sunken Ships and Grid Patterns

Investigation 2: Session 1: Activity, pages 48-49

Three out of Four Like Spaghetti

Investigation 1: Session 2

• use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems

Grade 4 students using *Investigations in Number, Data, and Space* use patterns and relationships to analyze mathematical situations and draw logical conclusions about mathematical problems throughout the course. For example, students describe relationships between operations, they match solids and silhouettes, they relate fractions to geometric models and use them to compare and order fractions and benchmarks, they describe and extend geometric and numeric patterns, they relate fractions and decimals, and they use landmarks to describe the nature of a data set.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 3: Session 1

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

Landmarks in the Thousands

Investigation 2: Sessions 2-4

Different Shapes, Equal Pieces

Investigation 3: Sessions 1-5

The Shape of the Data
Investigation 2: Sessions 6-7
Money, Miles, and Large Numbers
Investigation 2: Sessions 1-2
Changes Over Time
Investigation 3: Session 5
Packages and Groups
Investigation 3: Session 3
Sunken Ships and Grid Patterns
Investigation 2: Sessions 8-9
Three Out of Four Like Spaghetti
Investigation 1: Sessions 3-4

• **follow a logical argument and judge its validity**

Grade 4 students using *Investigations in Number, Data, and Space* follow logical arguments and judge their validity throughout the course. For example, students use logical reasoning to match mystery graphs created by students to a list of places and activities.

References:

Mathematical Thinking at Grade 4
Investigation 4: Session 2
Arrays and Shares
Investigation 2: Sessions 2-3
Seeing Solids and Silhouettes
Investigation 1: Session 1
Landmarks in the Thousands
Investigation 1: Session 3
Different Shapes, Equal Pieces
Investigation 1: Session 1
The Shape of the Data
Investigation 2: Sessions 2-3
Money, Miles, and Large Numbers
Investigation 2: Session 3
Changes Over Time
Investigation 3: Sessions 7-8
Packages and Groups
Investigation 1: Sessions 4-5
Sunken Ships and Grid Patterns
Investigation 1: Sessions 5-6
Three out of Four Like Spaghetti
Investigation 1: Session 3

- **apply deductive and inductive reasoning in mathematical situations to extend logical reasoning**

Grade 4 students using *Investigations in Number, Data, and Space* apply deductive and inductive reasoning in mathematical situations to extend logical reasoning throughout the course. Students use inductive reasoning as they generalize solution processes and draw conclusions from several trials or examples. They apply inductive reasoning as they sort and classify objects, identify similar attributes, and identify and extend patterns. They reason deductively as they use models, known facts, and properties to draw conclusions. They reason by determining and applying relationships between operations on numbers, between elements in patterns, between geometric shapes and solids, and between events in time. They apply logical reasoning to solve problems involving classification and sorting of objects by one or more attributes.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Sessions 1-2

Arrays and Shares

Investigation 3: Session 1

Seeing Solids and Silhouettes

Investigation 2: Sessions 3-4

Landmarks in the Thousands

Investigation 1: Session 1

Different Shapes, Equal Pieces

Investigation 1: Sessions 2-4

The Shape of the Data

Investigation 2: Session 4

Money, Miles, and Large Numbers

Investigation 3: Session 1

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 1: Session 3

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three out of Four Like Spaghetti

Investigation 2: Sessions 5-7

- **ask questions to reflect on, clarify, and extend thinking**

Grade 4 students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher. For example, students ask yes-or-no questions to eliminate and isolate possibilities in a game of Guess My Number.

Sample References:

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

Arrays and Shares
Investigation 2: Session 1

Seeing Solids and Silhouettes
Investigation 3: Session 1

Landmarks in the Thousands
Investigation 2: Session 1

Different Shapes, Equal Pieces
Ten-Minute Math: Guess My Number

The Shape of the Data
Investigation 2: Sessions 2-3

Money, Miles, and Large Numbers
Investigation 1: Sessions 7-8

Changes Over Time
Investigation 3: Sessions 7-8

Packages and Groups
Investigation 3: Sessions 7-8

Sunken Ships and Grid Patterns
Investigation 1: Sessions 3-4

Three out of Four Like Spaghetti
Investigation 2: Session 3

• review and refine the assumptions and steps used to derive conclusions in mathematical arguments

Grade 4 students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. For example, third graders share their procedures for solving division problems involving remainders in a real-world setting.

Sample References:

Mathematical Thinking at Grade 4
Investigation 4: Session 2

Arrays and Shares
Investigation 2: Sessions 7-8

Seeing Solids and Silhouettes
Investigation 1: Session 1

Landmarks in the Thousands
Investigation 1: Session 3

Different Shapes, Equal Pieces
Investigation 1: Session 1

The Shape of the Data
Investigation 2: Sessions 2-3

Money, Miles, and Large Numbers

Investigation 2: Session 3

Changes Over Time

Investigation 3: Sessions 7-8

Packages and Groups

Investigation 1: Session 3

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Three out of Four Like Spaghetti

Investigation 1: Session 3

• **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Grade 4 students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process. For example, students analyze the information given in graphs representing the growth patterns of plants and describe in words how each plant grew.

Sample References:

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 1: Session 1

Landmarks in the Thousands

Investigation 2: Session 5

Different Shapes, Equal Pieces

Investigation 3: Session 3

The Shape of the Data

Investigation 2: Session 4

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Investigation 3: Session 6

Packages and Groups

Investigation 3: Sessions 1-2

Sunken Ships and Grid Patterns

Investigation 2: Session 1

Three out of Four Like Spaghetti

Investigation 1: Session 1

MATHEMATICAL CONNECTIONS

It is expected that students will:

- **link new concepts to prior knowledge**

Grade 4 students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students use what they know about multiplication to solve “harder” problems.

Sample References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-2

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

Landmarks in the Thousands

Investigation 4: Sessions 1-3

Different Shapes, Equal Pieces

Investigation 1: Session 1

The Shape of the Data

Investigation 1: Sessions 2-3

Money, Miles, and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 1: Sessions 1-2

Packages and Groups

Investigation 2: Session 1

Sunken Ships and Grid Patterns

Investigation 1: Session 1

Three out of Four Like Spaghetti

Investigation 2: Session 1

- **use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics**

Each unit of study in *Investigations in Number, Data, and Space* is organized to enable students to recognize and use connections among mathematical ideas. The titles of each of these units are listed in the Sample References below. The Investigations within each of these units and the Sessions within each Investigation involve students directly experiencing the connections between the mathematical ideas presented in each unit. For example, in Grade 4, the following mathematical ideas are connected in Arrays and Shares: grouping strategies for multiplication, array strategies for multiplication, multiplication patterns and relationships, dividing quantities into equal shares, partitioning quantities into equal parts, and identifying and creating multiplication and division situations.

Sample References:

Mathematical Thinking at Grade 4
Investigation 3: Sessions 1-5
Arrays and Shares
Investigation 1: Sessions 1-3
Seeing Solids and Silhouettes
Investigation 2: Sessions 1-5
Landmarks in the Thousands
Investigation 2: Sessions 1-5
Different Shapes, Equal Pieces
Investigation 2: Sessions 1-4
The Shape of the Data
Investigation 2: Sessions 1-7
Money, Miles, and Large Numbers
Investigation 1: Sessions 1-8
Changes Over Time
Investigation 1: Sessions 1-6
Packages and Groups
Investigation 1: Sessions 1-5
Sunken Ships and Grid Patterns
Investigation 1: Sessions 1-6
Three out of Four Like Spaghetti
Investigation 1: Sessions 1-4

• use models to explain the relationship of concepts to procedures

Grade 4 students using *Investigations in Number, Data, and Space* use models to explain the relationship of concepts to procedures throughout the course. For example, students use arrays to model whole number multiplication.

Sample References:

Mathematical Thinking at Grade 4
Investigation 2: Sessions 3-4
Arrays and Shares
Investigation 2: Session 1
Seeing Solids and Silhouettes
Investigation 1: Session 1
Landmarks in the Thousands
Investigation 4: Sessions 1-3
Different Shapes, Equal Pieces
Investigation 1: Session 1
The Shape of the Data
Investigation 2: Session 4
Money, Miles, and Large Numbers
Investigation 3: Sessions 2-4

Changes Over Time
Investigation 3: Sessions 7-8
Packages and Groups
Investigation 3: Sessions 1-2
Sunken Ships and Grid Patterns
Investigation 1: Sessions 5-6
Three out of Four Like Spaghetti
Investigation 2: Session 3

• **identify practical applications of mathematical principles that can be applied to other disciplines**

Grade 4 students using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course. For example, students conduct a data project investigating bedtimes and sleep.

Sample References:

Mathematical Thinking at Grade 4
Investigation 2: Sessions 1-4
Arrays and Shares
Investigation 2: Session 1
Seeing Solids and Silhouettes
Investigation 4: Sessions 1-4
Landmarks in the Thousands
Investigation 3: Sessions 3-5
Different Shapes, Equal Pieces
Investigation 1: Session 5
The Shape of the Data
Investigation 3: Sessions 1-5
Money, Miles, and Large Numbers
Investigation 3: Sessions 1-4
Changes Over Time
Investigation 3: Sessions 1-8
Packages and Groups
Investigation 1: Session 3
Sunken Ships and Grid Patterns
Investigation 1: Sessions 3-4
Three out of Four Like Spaghetti
Investigation 2: Sessions 1-7

- **apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g., rhythm in music and motion in science)**

References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-4

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

The Shape of the Data

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-4

Changes Over Time

Unit Preparation: Sessions 1-3

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-8

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Three out of Four Like Spaghetti

Investigation 2: Sessions 1-7

- **identify, explain, and use mathematics in everyday life**

References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-4

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

The Shape of the Data

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-4

Changes Over Time

Unit Preparation: Sessions 1-3

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-8

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Three out of Four Like Spaghetti

Investigation 2: Sessions 1-7

Investigations in Number, Data, & Space to the Clark County Curriculum Overview

GRADE FIVE

Fifth grade students develop proficiency in using whole numbers, fractions, and decimals to solve problems. They design surveys and collect, display, and analyze data to draw conclusions and make predictions. Students also solve problems involving perimeter, area, and volume and use a grid (coordinate plane) to identify coordinates or locate points.

NUMBERS, NUMBER SENSE, AND COMPUTATION

It is expected that students will:

- **read and write numbers, number words, and ordinals**

References:

Mathematical Thinking at Grade 5

Investigation 2: Session 5

Investigation 3: Session 1

Investigation 4: Sessions 1-6

Building on Numbers You Know

Investigation 4: Sessions 1-2

Investigation 5: Sessions 4-7

- **identify and use place value**

References:

Mathematical Thinking at Grade 5

Investigation 2: Session 5

Investigation 3: Session 1

Investigation 4: Sessions 1-6

Building on Numbers You Know

Investigation 4: Sessions 1-2

Investigation 5: Sessions 4-7

- **round numbers to an appropriate place value**

References:

Between Never and Always

Ten-Minute Math: Nearest Answer

Building on Numbers You Know

Investigation 1: Session 2

Investigation 3: Sessions 1-6

Investigation 5: Sessions 1-2

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Data: Kids, Cats, and Ads

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

- **when rounding, identify which place value will be most helpful in estimating an answer; determine the reasonableness of the answer**

References:

Between Never and Always

Ten-Minute Math: Nearest Answer

Building on Numbers You Know

Investigation 1: Session 2

Investigation 3: Sessions 1-6

Investigation 5: Sessions 1-2

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Data: Kids, Cats, and Ads

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

- **describe and use properties and relationships of operations (addition, subtraction, multiplication, and division)**

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 1-3, 5-6

Investigation 3: Sessions 1-6

Investigation 5: Sessions 1-2, 4-7

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

• identify and use least common multiples, greatest common factors

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-5

Investigation 4: Sessions 5-6

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Building on Numbers You Know

Investigation 1: Sessions 1, 3-5

• identify prime and composite numbers

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

• compare and order negative numbers within the context of practical situations and plot those numbers on a number line

References:

Mathematical Thinking at Grade 5

Investigation 4: Session 1: Teacher Note, page 79

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 4-5

• identify fractional parts of regions and sets

References:

Name That Portion

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-9

Investigation 3: Sessions 5-8

Investigation 4: Sessions 1, 3-6

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: Sessions 1-4

Investigation 4: Sessions 1-3

- **compare and order fractions and/or decimals with like and unlike denominators**

References:

Name That Portion

Investigation 1: Sessions 5-7

Investigation 2: Sessions 4-8

Investigation 3: Sessions 2-6

- **describe the place of fractions (including decimal notations) in the number system**

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

- **identify and/or generate equivalent fractions**

References:

Name That Portion

Investigation 1: Sessions 2-6

Investigation 2: Sessions 3-8

Investigation 3: Sessions 1

Between Never and Always

Investigation 1: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 3: Session 1

- **rename, identify fractions in simplest form**

References:

Name That Portion

Investigation 1: Sessions 2-6

Investigation 2: Sessions 3-8

Investigation 3: Sessions 1

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

• explain the relationships among fractions, decimals, percents, and ratios, using objects and symbols

References:

Name That Portion
Investigation 1: Sessions 1-7
Investigation 3: Sessions 1-8
Investigation 4: Sessions 1-7
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 1-4

• rename fractions as decimals and vice versa

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

• immediately recall and use basic facts of multiplication and division through the 12's

References:

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

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Building on Numbers You Know

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-10

Investigation 5: Sessions 3-4

Containers and Cubes

Investigation 1: Sessions 1-5

Investigation 4: Sessions 7-9

Ten-Minute Math: Counting Around the Class

- **use basic facts of addition, subtraction, multiplication, and division with speed and accuracy in computation and problem solving**

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 2-5

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Between Never and Always

Investigation 1: Session 7

Building on Numbers You Know

Investigation 1: Sessions 1, 3-5

Investigation 2: Session 3: Teacher Note

Investigation 4: Session 1

- **describe and use algorithms for addition, subtraction, multiplication, and division**

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 2-5

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Name That Portion

- Investigation 1: Sessions 1-7
- Investigation 2: Sessions 1-9
- Investigation 3: Sessions 1-8
- Investigation 4: Sessions 1, 7
- Ten-Minute Math: Seeing Numbers

Between Never and Always

- Investigation 1: Session 7

Building on Numbers You Know

- Investigation 1: Sessions 1, 3-5
- Investigation 2: Session 3: Teacher Note
- Investigation 4: Session 1

Measurement Benchmarks

- Ten-Minute Math: Estimation and Number Sense

Containers and Cubes

- Ten-Minute Math: Counting Around the Class

Data, Kids, Cats, and Ads

- Investigation 4: Sessions 1-3

• add and subtract multi-digit numbers

References:

Mathematical Thinking at Grade 5

- Investigation 4: Session 1

Building on Numbers You Know

- Investigation 1: Sessions 3-4: Teacher Note, pp. 23-24
- Investigation 1: Sessions 6-8
- Investigation 5: Sessions 4-6

• multiply multi-digit numbers by two-digit numbers, including powers of 10

References:

Mathematical Thinking at Grade 5

- Investigation 1: Sessions 1-3
- Investigation 2: Sessions 1-4
- Investigation 3: Sessions 1-5

Picturing Polygons

- Ten-Minute Math: Multiple and Factor BINGO

Building on Numbers You Know

- Investigation 1: Sessions 3-4
- Investigation 2: Sessions 1-7
- Investigation 3: Sessions 1-10
- Investigation 5: Sessions 4-6

Containers and Cubes

Investigation 1: Sessions 1-5

Investigation 4: Sessions 7-9

Ten-Minute Math: Counting Around the Class

• **divide multi-digit numbers by two-digit numbers, including powers of 10**

References:

Mathematical Thinking at Grade 5

Investigation 2: Session 1, page 33

Building on Numbers You Know

Investigation 1: Sessions 3-4

Investigation 5: Sessions 4-6

• **multiply and divide multi-digit numbers**

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-5

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Building on Numbers You Know

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-10

Investigation 5: Sessions 4-6

Containers and Cubes

Investigation 1: Sessions 1-5

Investigation 4: Sessions 7-9

Ten-Minute Math: Counting Around the Class

• **use order of operations to solve problems**

References:

Name That Portion

Ten-Minute Math: Seeing Numbers

Building on Numbers You Know

Investigation 1:

Sessions 3-4: Teacher Note, pages 23-24

Sessions 6-8: Teacher Note, page 34; Dialogue Box, page 35

Investigation 3: Sessions 1-3, 7-10
Investigation 4: Session 1

- **use models and drawings to identify, compare, add, and subtract fractions with like denominators and to solve problems**

References:

Name That Portion

Investigation 1: Sessions 5-6

Investigation 2: Sessions 1-9

Investigation 3: Session 7

Data: Kids, Cats, and Ads

Investigation 4: Session 3

- **add and subtract fractions and mixed numbers with like denominators**

References:

Name That Portion

Investigation 2: Sessions 1-3, 6-9

Investigation 3: Session 7

Data: Kids, Cats, and Ads

Investigation 4: Session 3

- **use models and drawings to identify, compare, add, and subtract decimals and to solve problems**

References:

Name That Portion

Investigation 3: Sessions 2-7

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

- **add and subtract decimals**

References:

Name That Portion

Investigation 3: Sessions 2-4, 7

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

• **multiply and divide money amounts by one-digit whole numbers**

Grade 5 students using *Investigations in Number, Data, and Space* relate decimals in money to decimals used in other situations.

Reference:

Name That Portion

Investigation 3: Session 1, page 67

• **generate and solve addition, subtraction, multiplication, and division problems using whole numbers in practical situations**

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 2-5

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

Between Never and Always

Investigation 1: Session 7

Building on Numbers You Know

Investigation 1: Sessions 1, 3-5

Investigation 2: Session 3: Teacher Note

Investigation 4: Session 1

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Containers and Cubes

Ten-Minute Math: Counting Around the Class

• **use estimation and mental computation in appropriate situations to solve problems**

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

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Patterns of Change

Ten-Minute Math: Nearest Answer

- **use a variety of appropriate strategies to estimate, compute, and solve mathematical and real-world problems**

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 2-5

Investigation 3: Sessions 1-5

Investigation 4: Sessions 2-4

Picturing Polygons

Ten-Minute Math: Multiple and Factor BINGO

Name That Portion

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-8

Investigation 4: Sessions 1, 7

Ten-Minute Math: Seeing Numbers

Between Never and Always

Investigation 1: Sessions 1-4, 7

Ten-Minute Math: Nearest Answer

Building on Numbers You Know

Investigation 1: Sessions 1, 3-5

Investigation 2: Session 3: Teacher Note

Investigation 3: Sessions 1-6

Investigation 4: Session 1

Investigation 5: Sessions 1-2

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Containers and Cubes

Ten-Minute Math:

Counting Around the Class: Fractions and
Decimals

Guess My Number: Guess My Fraction

Patterns of Change

Ten-Minute Math: Nearest Answer

Data, Kids, Cats, and Ads

Investigation 3: Sessions 1-4

Investigation 4: Sessions 1-3

PATTERNS, FUNCTIONS, AND ALGEBRA

It is expected that students will:

- **classify, compare, and contrast numbers and data**

References:

Mathematical Thinking at Grade 5

Investigation 2: Session 5

Name That Portion

Investigation 1: Sessions 5-7

Investigation 2: Sessions 4-8

Investigation 3: Sessions 2-6

Building on Numbers You Know

Investigation 1: Session 2

- **identify, describe, and explain patterns and relationships in the number system (e.g., patterns formed by triangular numbers, perfect squares, arithmetic and geometric sequences) using concrete materials, paper and pencil, and calculators**

References:

Mathematical Thinking at Grade 5

Investigation 2: Sessions 1-4

Investigation 3: Session 1

Name That Portion

Investigation 3: Sessions 5-6:

Activity, pages 86-88

Building on Numbers You Know

Investigation 1: Sessions 1-5

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-7

Ten-Minute Math: Graph Stories

Containers and Cubes

Ten-Minute Math: Counting Around the Class

- **using whole numbers as a replacement set, find possible solutions to such inequalities as $8 + 4 > n$**

Grade 5 students using *Investigations in Number, Data, and Space* solve equations of the form $3 \times \underline{\quad} = 72$ and complete number sentences.

References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-5: Teacher Note, page 63

Investigation 4: Session 1

Building on Numbers You Know

Investigation 1: Sessions 1-4, 6-8

Investigation 2: Sessions 5-6

Investigation 3: Session 10

• use variables in open sentences

Students use variables in *Geo-Logo* and in data analysis.

References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 4-7

Investigation 3: Sessions 1-2, 4-6

Building on Numbers You Know

Investigation 2: Sessions 5-6

Investigation 5: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 2: Session 1

• use variables to describe simple functions and relationships

Students use variables in *Geo-Logo* and in data analysis.

References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 4-7

Investigation 3: Sessions 1-2, 4-6

Building on Numbers You Know

Investigation 2: Sessions 5-6

Investigation 5: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 2: Session 1

- **generate number sequences given the first term of the sequence and a simple computation rule (e.g., if the first term of a sequence is 4 and the rule is “add 6,” then the sequence can be written as 4, 10, 16, 22,...)**

References:

Mathematical Thinking at Grade 5

Investigation 2: Sessions 1-4

Investigation 3: Session 1

Name That Portion

Investigation 3: Sessions 5-6:

Activity, pages 86-88

Building on Numbers You Know

Investigation 1: Sessions 1-5

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-7

Ten-Minute Math: Graph Stories

Containers and Cubes

Ten-Minute Math: Counting Around the Class

- **solve simple equations using a variety of methods including inverse operations, mental mathematics, and estimation**

Grade 5 students using *Investigations in Number, Data, and Space* solve equations of the form $3 \times \underline{\quad} = 72$ and complete number sentences.

References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-5: Teacher Note, page 63

Investigation 4: Session 1

Building on Numbers You Know

Investigation 1: Sessions 1-4, 6-8

Investigation 2: Sessions 5-6

Investigation 3: Session 10

MEASUREMENT

It is expected that students will:

- **measure, compare, and convert length to the closest fractional part ($\frac{1}{4}$ and $\frac{1}{2}$) of inches, feet, yards, and miles**

References:

Measurement Benchmarks
Investigation 1: Sessions 1-8

- **measure, compare, and convert length to the closest decimal unit of milli-, centi-, kilo-, and meters**

References:

Measurement Benchmarks
Investigation 1: Sessions 1-8

- **estimate measures of length, volume, capacity, quantity, and weight, and communicate the degree of accuracy needed and when a more precise measure is required**

References:

Picturing Polygons
Investigation 2: Sessions 8-9
Measurement Benchmarks
Investigation 1: Sessions 1-3
Investigation 3: Session 1

- **determine totals and change due for monetary amounts in problem solving situations**

Grade 5 students using *Investigations in Number, Data, and Space* relate decimals in money to decimals used in other situations.

Reference:

Name That Portion
Investigation 3: Session 1, page 67

- **describe and determine the perimeter of polygons**

References:

Picturing Polygons
Investigation 3: Sessions 5-6: Extension, page 108
Measurement Benchmarks
Investigation 1: Sessions 5-6

- **describe and determine the area of right triangles and rectangles [squares]**

References:

Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-3
Picturing Polygons
Investigation 3: Sessions 4-6
Name That Portion
Investigation 1: Sessions 2-4
Investigation 3: Sessions 2, 8

- **describe the difference between perimeter and area of polygons**

References:

Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-3
Picturing Polygons
Investigation 3: Sessions 4-6
Extension, page 108
Measurement Benchmarks
Investigation 1: Sessions 5-6
Name That Portion
Investigation 1: Sessions 2-4
Investigation 3: Sessions 2, 8

- **identify equivalent periods of time, including relationships between and among seconds, minutes, hours, days, months, and years, such as 60 sec. = 1 min.**

Grade 5 students use “lifetime strips” to represent and compare ages; they use stories, graphs, and tables to represent changes in speed and position over time.

References:

Measurement Benchmarks
Investigation 3: Sessions 1-3
Patterns of Change
Investigation 2: Sessions 1-5
Ten-Minute Math: Graph Stories

SPATIAL RELATIONSHIPS AND GEOMETRY

It is expected that students will:

- **identify, describe, compare, and classify two- and three-dimensional figures by relevant properties including the number of vertices and edges and the number and shapes of faces**

References:

Mathematical Thinking at Grade 5

Ten-Minute Math: Quick Images

Picturing Polygons

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-6

Building on Numbers You Know

Ten-Minute Math: Quick Images

Containers and Cubes

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-4

Investigation 4: Sessions 1-9

Data: Kids, Cats, and Ads

Ten-Minute Math: Volume and Surface Area

- **identify, define, draw, and describe points, lines, line segments, rays, angles, and planes**

References:

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-3, 5-6

- **identify, define, draw, and describe intersecting, parallel, and perpendicular lines**

References:

Picturing Polygons

Investigation 2: Sessions 1-7

- **measure, compare, draw, and classify acute, right, and obtuse angles and triangles**

References:

Picturing Polygons

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-3

- **identify and draw circles and parts of circles and describe the relationships between the various parts such as arcs, diameter, and central angles**

References:

Grade 5 students using *Investigations in Number, Data, and Space* investigate properties and relationships of circles as they explore fractional areas of a clock face and as they construct circle graphs.

References:

Name That Portion

Investigation 1: Session 7, page 31

Investigation 2: Sessions 1-2

Investigation 3: Session 8

Investigation 4: Sessions 2-7

- **identify shapes that have congruence, similarity, and/or symmetry using transformational motions such as translation/slide, rotation/turn, reflection/flip, and enlargement/reduction**

References:

Picturing Polygons

Investigation 2: Sessions 1-7

Investigation 3: Sessions 4-6

Measurement Benchmarks

Investigation 1: Sessions 7-8

- **use models, drawings, and measurement tools to identify congruent and similar shapes and symmetry of figures**

References:

Picturing Polygons

Investigation 2: Sessions 4-7

Investigation 3: Sessions 4-6

Measurement Benchmarks

Investigation 1: Sessions 7-8

- **identify and predict the results of combining, dividing, and changing of shapes into other shapes**

References:

Mathematical Thinking at Grade 5

Ten-Minute Math: Quick Images

Picturing Polygons

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-6

Building on Numbers You Know

Investigation 3: Sessions 1-3

Investigation 5: Sessions 1-2

Containers and Cubes

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-4

Investigation 4: Sessions 1-9

Data: Kids, Cats, and Ads

Ten-Minute Math: Volume and Surface Area

- **using a grid, identify coordinates for a given point or locate points of given coordinates in the first quadrant**

References:

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 4-7, 9

Investigation 3: Sessions 1-2, 5-6

- **describe uses of geometry in practical problems and situations**

References:

Picturing Polygons

Investigation 1: Session 1: Follow-Up, page 7

Name That Portion

Investigation 4: Sessions 1-7

Containers and Cubes

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-4

Data: Kids, Cats, and Ads

Investigation 4: Sessions 1-3

DATA ANALYSIS

It is expected that students will:

- **collect, organize, read, and interpret data using a variety of graphic representations including tables, line plots, stem and leaf plots, scatter plots, and histograms**

References:

Mathematical Thinking at Grade 5

Ten-Minute Math: Exploring Data

Name That Portion

Investigation 4: Sessions 1-7

Ten-Minute Math: Exploring Data

Between Never and Always

Investigation 1: Sessions 3-5

Investigation 2: Session 3

Measurement Benchmarks

Investigation 2: Sessions 7-8

Investigation 3: Sessions 1-2

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-6

Ten-Minute Math: Graph Stories

Data: Kids, Cats, and Ads

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-4

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-5

- **describe the limitations of various graph formats**

References:

Picturing Polygons

Investigation 1: Session 4

Investigation 2: Sessions 4-5

Investigation 3: Sessions 1-2, 4-6

Between Never and Always

Investigation 2: Sessions 1-3

Measurement Benchmarks

Investigation 2: Sessions 7-8

Investigation 3: Sessions 1-2

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-6
Ten-Minute Math: Graph Stories
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3

- **select an appropriate type of graph to accurately represent the data and justify the selection**

References:

Picturing Polygons
Investigation 1: Session 4
Investigation 2: Sessions 4-5
Investigation 3: Sessions 1-2, 4-6
Between Never and Always
Investigation 2: Sessions 1-3
Measurement Benchmarks
Investigation 2: Sessions 7-8
Investigation 3: Sessions 1-2
Patterns of Change
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-6
Ten-Minute Math: Graph Stories
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3

- **use data from graphs, tables, and charts to draw and explain conclusions and predictions**

References:

Mathematical Thinking at Grade 5
Ten-Minute Math: Exploring Data
Name That Portion
Investigation 4: Sessions 1-7
Ten-Minute Math: Exploring Data
Between Never and Always
Investigation 1: Sessions 3-5
Investigation 2: Session 3
Measurement Benchmarks
Investigation 2: Sessions 7-8
Investigation 3: Sessions 1-2
Patterns of Change
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-6
Ten-Minute Math: Graph Stories
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-4
Investigation 4: Sessions 1-3
Investigation 5: Sessions 1-5

- **conduct simple probability experiments using concrete materials and represent the results using fractions**

References:

Between Never and Always
Investigation 1: Sessions 1-7
Investigation 2: Sessions 1-5
Building on Numbers You Know
Ten-Minute Math: What Is Likely?

- **solve probability problems using a variety of methods including constructing sample spaces and tree diagrams**

References:

Between Never and Always
Investigation 1: Sessions 1-7
Investigation 2: Sessions 1-5
Building on Numbers You Know
Ten-Minute Math: What Is Likely?

- **model and compute measures of central tendency including mean, median, and mode**

Students gain experience with measures of central tendency and dispersion as they find the median of a set of data and discuss 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

PROBLEM SOLVING

It is expected that students will:

- **select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts**

Grade 5 students using *Investigations in Number, Data, and Space* select, modify, develop, and apply strategies to solve a variety of mathematical and practical problems and to investigate and understand mathematical concepts throughout the course. For example, students create polygons with shape pieces; construct, apply, discuss, and evaluate mathematical definitions of polygons; draw polygons on coordinate grids, on and off the computer; and investigate similar and regular polygons. They find fraction and decimal equivalents and solve problems that involve amounts less than one.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons

Investigation 1: Session 3

Name That Portion

Investigation 3: Sessions 5-6

Between Never and Always

Investigation 1: Session 7

Building on Numbers You Know

Investigation 4: Session 1

Measurement Benchmarks

Investigation 3: Session 1

Patterns of Change

Investigation 1: Sessions 1-4

Containers and Cubes

Investigation 1: Sessions 1-4

Data: Kids, Cats, and Ads

Investigation 4: Session 1

- **apply previous experience and knowledge to new problem-solving situations**

Grade 5 students using *Investigations in Number, Data, and Space* apply previous experience and knowledge to new problem-solving situations throughout the course. For example, students apply what they have learned about necessary and sufficient characteristics of polygons to create and draw polygons.

Sample References:

Mathematical Thinking at Grade 5

Investigation 2: Session 1

Picturing Polygons
Investigation 1: Session 2

Name That Portion
Investigation 1: Session 1

Between Never and Always
Investigation 2: Sessions 1-2

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

Measurement Benchmarks
Investigation 3: Session 2

Patterns of Change
Investigation 2: Session 5

Containers and Cubes
Investigation 3: Session 3

Data: Kids, Cats, and Ads
Investigation 3: Sessions 2-3

• **verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation**

Grade 5 students using *Investigations in Number, Data, and Space* verify, interpret, and evaluate results with respect to the original problem situation, determining an efficient strategy for the given situation, throughout the course. For example, students make generalizations regarding data and patterns given particular examples, and they formulate problem-solving strategies by trying several options and discovering “what works.”

Sample References:

Mathematical Thinking at Grade 5
Ten-Minute Math: Exploring Data

Picturing Polygons
Investigation 2: Sessions 1-3

Name That Portion
Investigation 4: Sessions 5-6

Between Never and Always
Investigation 1: Session 5

Building on Numbers You Know
Investigation 1: Sessions 3-4

Measurement Benchmarks
Investigation 1: Sessions 7-8

Patterns of Change
Investigation 1: Sessions 3-4

Containers and Cubes
Investigation 2: Session 5

Data: Kids, Cats, and Ads
Investigation 1: Session 4

- **try more than one strategy when the first strategy proves to be unproductive**
Grade 5 students using *Investigations in Number, Data, and Space* develop and evaluate a variety of strategies for solving problems; for example, students explore strategies for finding possible dimensions of rectangles with an area of 1000 square units.

Sample References:

Mathematical Thinking at Grade 5
Investigation 2: Session 5
Picturing Polygons
Investigation 1: Session 3
Name That Portion
Investigation 1: Sessions 5-6
Between Never and Always
Investigation 2: Session 3
Building on Numbers You Know
Investigation 2: Sessions 5-6
Measurement Benchmarks
Investigation 3: Session 2
Patterns of Change
Investigation 1: Sessions 1-4
Containers and Cubes
Investigation 2: Sessions 1-5
Data: Kids, Cats, and Ads
Investigation 5: Session 2

- **apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists**
Grade 5 students using *Investigations in Number, Data, and Space* apply multi-step, integrated, mathematical problem-solving strategies, persisting until a solution is found or until it is clear that no solution exists. The investigative nature of the curriculum naturally lends itself to multi-step, integrated, and persistent problem solving. Students are encouraged to freely discuss and exchange ideas with their classmates and teacher, facilitating a greater chance of following through to a successful resolution of their problem solving activities.

Sample References:

Mathematical Thinking at Grade 5
Investigation 4: Sessions 5-6
Picturing Polygons
Investigation 3: Sessions 5-6
Name That Portion
Investigation 4: Session 2
Between Never and Always
Investigation 1: Sessions 3-4

Building on Numbers You Know

Investigation 4: Session 2

Measurement Benchmarks

Investigation 3: Session 3

Patterns of Change

Investigation 3: Session 3

Containers and Cubes

Investigation 4: Sessions 7-9

Data: Kids, Cats, and Ads

Investigation 2: Session 3

• **generalize solutions and strategies from earlier problems to new problem situations**

Grade 5 students using *Investigations in Number, Data, and Space* generalize solutions and strategies from earlier problems to new problem situations throughout the course. For example, students practice and apply what they have learned about polygons with a computer drawing program.

Sample References:

Mathematical Thinking at Grade 5

Investigation 4: Sessions 5-6

Picturing Polygons

Investigation 1: Session 3

Name That Portion

Investigation 2: Sessions 1-2

Between Never and Always

Investigation 2: Sessions 4-5

Building on Numbers You Know

Investigation 5: Session 3

Measurement Benchmarks

Investigation 1: Sessions 5-6

Patterns of Change

Investigation 2: Session 5

Containers and Cubes

Investigation 2: Session 5

Data: Kids, Cats, and Ads

Investigation 3: Sessions 2-3

- **interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable**
Grade 5 students using *Investigations in Number, Data, and Space* interpret and solve a variety of mathematical problems by paraphrasing, identifying necessary and extraneous information, selecting and justifying efficient methods and/or strategies, and ensuring the answer is reasonable, throughout the course. For example, students employ cooperative learning strategies to measure space inside and outside the classroom.

Sample References:

Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-6
Picturing Polygons
Investigation 3: Sessions 5-6
Name That Portion
Investigation 4: Sessions 1-7
Between Never and Always
Investigation 2: Sessions 1-5
Building on Numbers You Know
Investigation 5: Sessions 1-7
Measurement Benchmarks
Investigation 1: Sessions 1-8
Patterns of Change
Investigation 3: Sessions 1-7
Containers and Cubes
Investigation 3: Sessions 1-4
Data: Kids, Cats, and Ads
Investigation 5: Sessions 1-5

- **use technology, including calculators, to solve problems and verify solutions**

References:

Mathematical Thinking at Grade 5
Investigation 1, Sessions 1-6
Patterns of Change
Investigation 2: Session 5
Investigation 3: Sessions 1-3
Containers and Cubes
Investigation 4: Sessions 7-9, page 89
Data: Kids, Cats, and Ads
Investigation 2: Session 3

MATHEMATICAL COMMUNICATION

It is expected that students will:

- **discuss and exchange ideas about mathematics as a part of learning**

Grade 5 students using *Investigations in Number, Data, and Space* discuss and exchange ideas about mathematics as a part of learning throughout the investigation-based curriculum. In fact, this is a fundamental emphasis of the program. For example, a discussion among students deepens their understanding of what makes a number even or odd.

Sample References:

Mathematical Thinking at Grade 5

Investigation 2: Session 1

Picturing Polygons

Investigation 2: Sessions 6-7

Name That Portion

Investigation 2: Session 6

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 1: Sessions 3-4: Dialogue Box, page 25

Measurement Benchmarks

Investigation 3: Session 2

Patterns of Change

Investigation 1: Sessions 3-4

Containers and Cubes

Investigation 2: Sessions 3-4

Data: Kids, Cats, and Ads

Investigation 5: Sessions 3-5

- **use inquiry techniques (e.g., discussion, questioning, research, data gathering) to solve mathematical problems**

Grade 5 students using *Investigations in Number, Data, and Space* use inquiry techniques, including discussion, questioning, research, and data gathering, to solve mathematical problems throughout the course. In fact, the use of inquiry as a strategy for learning is a fundamental emphasis of the investigation-based curriculum. As the title of the course implies, data collection and analysis is an important feature in *Investigations in Number, Data, and Space*. In addition to the regular coursework, some appendices contain supplemental features related to the inquiry techniques of data collection and research. The series for Grade 5 include 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. Students are asked to propose and justify conclusions and predictions that are based on given data as well as on data which are collected by the students. They are frequently asked to carry investigations further, or to think about how the shape of the data might change if additional information were collected.

References:

Mathematical Thinking at Grade 5

Ten-Minute Math: Exploring Data

Name That Portion

Investigation 4: Sessions 1-7

Ten-Minute Math: Exploring Data

Measurement Benchmarks

Investigation 2: Sessions 7-8

Investigation 3: Sessions 1-3

Data: Kids, Cats, and Ads

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-4

Investigation 4: Sessions 1-3

Investigation 5: Sessions 1-5

• identify and translate key words and phrases that imply mathematical operations

Grade 5 students using *Investigations in Number, Data, and Space* identify and translate key words and phrases that imply mathematical operations throughout the course. For example, students recognize key words to identify division situations.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 2: Sessions 1-3

Name That Portion

Investigation 1: Sessions 3-4

Between Never and Always

Investigation 1: Sessions 3-4

Building on Numbers You Know

Investigation 1: Session 1

Measurement Benchmarks

Investigation 1: Session 4

Patterns of Change

Investigation 3: Session 2

Containers and Cubes

Investigation 1: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 2: Session 2

• use physical materials, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats

Grade 5 students using *Investigations in Number, Data, and Space* use physical materials, diagrams, and tables to represent and then communicate mathematical ideas through oral, verbal, and written formats throughout the course. Indeed, the fundamental emphasis of this curriculum is modeling problem situations. Students are encouraged to devise their own problem-solving strategies and representations, so that it is usually the case that a wide variety of representations will be created for any given problem. Students gain experience with several different types of graphs, including real graphs, bar graphs, line graphs, and line plots. Students frequently construct and complete tables as they analyze patterns and functions and collect and interpret data. Students use equations to represent and solve problems.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons

Investigation 1: Sessions 3-4

Name That Portion

Investigation 4: Sessions 1-7

Between Never and Always

Investigation 2: Sessions 1-2

Building on Numbers You Know

Investigation 4: Sessions 1-2

Measurement Benchmarks

Investigation 1: Sessions 5-6

Patterns of Change

Investigation 1: Sessions 1-4

Containers and Cubes

Investigation 1: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 1: Sessions 1-4

• explain and justify thinking about mathematical ideas and solutions

Grade 5 students using *Investigations in Number, Data, and Space* explain and justify thinking about mathematical ideas and solutions throughout the curriculum as they perform the activities for each investigation. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teachers and students in which the teacher encourages students to describe their solution processes and justify their thinking.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons

Investigation 1: Session 1

Name That Portion

Investigation 1: Sessions 3-4

Between Never and Always

Investigation 2: Session 3

Building on Numbers You Know

Investigation 1: Session 1

Measurement Benchmarks

Investigation 2: Sessions 1-2

Patterns of Change

Investigation 2: Session 3

Containers and Cubes

Investigation 1: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 1: Sessions 2-3

• make conjectures and present arguments in discussions of mathematical ideas

Grade 5 students using *Investigations in Number, Data, and Space* make conjectures and present arguments in discussions of mathematical ideas throughout the curriculum as they perform the activities for each investigation. For example, students make and investigate mathematical conjectures as they solve Number Puzzles.

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 2: Sessions 1-3

Name That Portion

Investigation 1: Sessions 3-4

Between Never and Always

Investigation 1: Sessions 3-4

Building on Numbers You Know
Investigation 1: Session 1
Measurement Benchmarks
Investigation 1: Session 4
Patterns of Change
Investigation 3: Session 2
Containers and Cubes
Investigation 1: Sessions 1-2
Data: Kids, Cats, and Ads
Investigation 2: Session 2

• use everyday language to explain thinking about strategies and solutions to mathematical problems

Grade 5 students using *Investigations in Number, Data, and Space* use everyday language to explain thinking about strategies and solutions to mathematical problems throughout the course. For example, students describe everyday uses of fractions, decimals, and percents.

Sample References:

Mathematical Thinking at Grade 5
Investigation 2: Session 1: Dialogue Box, page 34
Picturing Polygons
Investigation 2: Sessions 1-3: Dialogue Box, pages 44-45
Name That Portion
Investigation 1: Session 1
Between Never and Always
Investigation 1: Sessions 3-4: Dialogue Box, page 26
Building on Numbers You Know
Investigation 5: Session 7
Measurement Benchmarks
Investigation 2: Session 6
Patterns of Change
Investigation 2: Session 1
Containers and Cubes
Investigation 3: Sessions 1-2: Dialogue Box, pages 48-49
Data: Kids, Cats, and Ads
Investigation 2: Session 1

- **express mathematical ideas and use them to define, compare, and solve problems orally and in writing**

Grade 5 students using *Investigations in Number, Data, and Space* express mathematical ideas and use them to define, compare, and solve problems orally and in writing throughout the course. The Dialogue Box is a feature that appears with many investigations and contains the text of discussions between teacher and students in which the teacher encourages the students to express and share mathematical ideas and solution strategies.

Sample References:

Mathematical Thinking at Grade 5

Investigation 2: Sessions 1-4

Picturing Polygons

Investigation 2: Sessions 1-3

Name That Portion

Investigation 2: Session 6

Between Never and Always

Investigation 2: Sessions 1-2

Building on Numbers You Know

Investigation 2: Sessions 1-2

Measurement Benchmarks

Investigation 1: Session 4

Patterns of Change

Investigation 1: Sessions 3-4

Containers and Cubes

Investigation 3: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 3: Session 4

- **use mathematical notation to communicate and explain mathematical situations**

References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 6-7

Name That Portion

Investigation 1: Session 7

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-8

Investigation 4: Sessions 1-7

Building on Numbers You Know
Investigation 1: Session 1
Investigation 2: Sessions 1-7
Investigation 3: Sessions 1-10
Investigation 5: Sessions 1-8
Containers and Cubes
Investigation 4: Sessions 7-9

MATHEMATICAL REASONING

It is expected that students will:

- **justify answers and the steps taken to solve problems with and without manipulatives and physical models**

Grade 5 students using *Investigations in Number, Data, and Space* justify answers and the steps taken to solve problems with and without manipulatives and physical models throughout the course. Students use a wide variety of manipulatives, including cubes, tiles, balances, pattern blocks, geoblocks, tetronimoos, and snap cubes to model numbers, operations, patterns, and problem situations. They also create graphs, charts, drawings, and tables to organize information needed to solve a problem.

Sample References:

Mathematical Thinking at Grade 5
Investigation 2: Session 5
Picturing Polygons
Investigation 1: Session 3
Name That Portion
Ten-Minute Math: Seeing Numbers
Between Never and Always
Investigation 2: Session 3
Building on Numbers You Know
Investigation 2: Sessions 5-6
Measurement Benchmarks
Investigation 3: Session 2
Patterns of Change
Investigation 3: Sessions 5-6
Containers and Cubes
Investigation 2: Sessions 3-4
Data: Kids, Cats, and Ads
Investigation 5: Sessions 3-5

- **use patterns and relationships to analyze mathematical situations; draw logical conclusions about mathematical problems**

Grade 5 students using *Investigations in Number, Data, and Space* use patterns and relationships to analyze mathematical situations and draw logical conclusions about mathematical problems throughout the course.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Picturing Polygons

Investigation 1: Session 4

Name That Portion

Investigation 3: Sessions 5-6

Between Never and Always

Investigation 2: Session 3

Building on Numbers You Know

Investigation 2: Sessions 5-6

Measurement Benchmarks

Investigation 1: Session 4

Patterns of Change

Investigation 2: Sessions 1-5

Containers and Cubes

Investigation 1: Sessions 1-4

Data: Kids, Cats, and Ads

Investigation 1: Sessions 2-3

- **follow a logical argument and judge its validity**

Grade 4 students using *Investigations in Number, Data, and Space* follow logical arguments and judge their validity throughout the course. For example, students share and evaluate cluster strategies for multiplying larger numbers.

Sample References:

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Picturing Polygons

Investigation 2: Sessions 1-3

Name That Portion

Investigation 4: Sessions 5-6

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 1: Sessions 3-4

Measurement Benchmarks

Investigation 1: Sessions 7-8

- Patterns of Change
 - Investigation 1: Sessions 3-4
- Containers and Cubes
 - Investigation 2: Session 5
- Data: Kids, Cats, and Ads
 - Investigation 1: Session 4

• **apply deductive and inductive reasoning in mathematical situations to extend logical reasoning**

Grade 5 students using *Investigations in Number, Data, and Space* apply a variety of types of reasoning to solve problems, including inductive, deductive, spatial, numerical, and logical reasoning, throughout the course.

References:

- Mathematical Thinking at Grade 5
 - Investigation 3: Session 5
 - Investigation 4: Sessions 1-6
- Picturing Polygons
 - Investigation 2: Sessions 1-3
- Building on Numbers You Know
 - Investigation 1: Session 1
 - Investigation 2: Sessions 5-6
- Measurement Benchmarks
 - Investigation 2: Session 4
 - Investigation 3: Session 1
 - Ten-Minute Math: Guess My Number
- Patterns of Change
 - Investigation 1: Sessions 1-4
 - Investigation 2: Sessions 1-5
 - Investigation 3: Sessions 1-7
- Containers and Cubes
 - Investigation 1: Sessions 1-4
 - Investigation 4: Session 1
 - Ten-Minute Math: Guess My Number

• **ask questions to reflect on, clarify, and extend thinking**

Grade 5 students using *Investigations in Number, Data, and Space* are encouraged to ask questions to reflect on, clarify, and extend thinking. The Dialogue Box is a recurrent feature which details several discussions between students and teacher which include questions and reflections on the part of students and probing questions and encouragement on the part of the teacher. For example, students investigate necessary and sufficient conditions for a polygon and sort geometric figures.

Sample References:

Mathematical Thinking at Grade 5
Investigation 4: Sessions 5-6

Picturing Polygons
Investigation 1: Session 1

Name That Portion
Investigation 1: Session 2

Between Never and Always
Investigation 1: Session 5

Building on Numbers You Know
Investigation 3: Sessions 7-9

Measurement Benchmarks
Investigation 1: Sessions 7-8

Patterns of Change
Investigation 1: Sessions 3-4

Containers and Cubes
Investigation 3: Session 3

Data: Kids, Cats, and Ads
Investigation 2: Session 2

• review and refine the assumptions and steps used to derive conclusions in mathematical arguments

Grade 5 students using *Investigations in Number, Data, and Space* informally review and refine the assumptions and steps used to derive conclusions in mathematical arguments as they employ mathematical reasoning in a variety of forms and settings. For example, students outline mathematical arguments to justify conclusions regarding the equivalence of fractions, decimals, and percents.

Sample References:

Mathematical Thinking at Grade 5
Investigation 1: Sessions 4-6

Picturing Polygons
Investigation 2: Sessions 1-3

Name That Portion
Investigation 1: Sessions 3-4

Between Never and Always
Investigation 1: Sessions 3-4

Building on Numbers You Know
Investigation 1: Session 1

Measurement Benchmarks
Investigation 1: Session 4

Patterns of Change
Investigation 3: Session 2

Containers and Cubes

Investigation 1: Sessions 1-2

Data: Kids, Cats, and Ads

Investigation 2: Session 2

- **determine relevant, irrelevant, and/or sufficient information to solve mathematical problems**

Grade 5 students using *Investigations in Number, Data, and Space* determine relevant, irrelevant, and/or sufficient information to solve mathematical problems throughout the course. Informational analysis is a fundamental component of the problem-solving process.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Picturing Polygons

Investigation 3: Sessions 5-6

Name That Portion

Investigation 4: Sessions 1-7

Between Never and Always

Investigation 2: Sessions 1-5

Building on Numbers You Know

Investigation 5: Sessions 1-7

Measurement Benchmarks

Investigation 1: Sessions 1-8

Patterns of Change

Investigation 3: Sessions 1-7

Containers and Cubes

Investigation 3: Sessions 1-4

Data: Kids, Cats, and Ads

Investigation 5: Sessions 1-5

MATHEMATICAL CONNECTIONS***It is expected that students will:***

- **link new concepts to prior knowledge**

Grade 5 students using *Investigations in Number, Data, and Space* link new concepts to prior knowledge throughout the course. For example, students link square numbers to geometric squares.

Sample References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons
Investigation 1: Session 1
Name That Portion
Investigation 4: Sessions 3-4
Between Never and Always
Investigation 1: Sessions 1-2
Building on Numbers You Know
Investigation 2: Session 7
Measurement Benchmarks
Investigation 1: Sessions 7-8
Patterns of Change
Investigation 2: Session 2
Containers and Cubes
Investigation 3: Session 3
Data: Kids, Cats, and Ads
Investigation 2: Sessions 1-3

• **use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics**

Each unit of study in *Investigations in Number, Data, and Space* is organized to enable students to recognize and use connections among mathematical ideas. The titles of each of these units are listed in the Sample References below. The Investigations within each of these units and the Sessions within each Investigation involve students directly experiencing the connections between the mathematical ideas presented in each unit.

Sample References:

Mathematical Thinking at Grade 5
Investigation 2: Sessions 1-5
Picturing Polygons
Investigation 1: Sessions 1-4
Name That Portion
Investigation 1: Sessions 1-7
Between Never and Always
Investigation 1: Sessions 1-7
Building on Numbers You Know
Investigation 2: Sessions 1-7
Measurement Benchmarks
Investigation 2: Sessions 1-8
Patterns of Change
Investigation 2: Sessions 1-5
Containers and Cubes
Investigation 3: Sessions 1-4
Data: Kids, Cats, and Ads
Investigation 3: Sessions 1-4

- **use models to explain the relationship of concepts to procedures**

Grade 5 students using *Investigations in Number, Data, and Space* use models to explain the relationship of concepts to procedures throughout the course. Students choose between and among concrete materials and symbols, tables and graphs, drawings and diagrams, and computer models.

Sample References:

Mathematical Thinking at Grade 5

Investigation 4: Sessions 5-6

Picturing Polygons

Investigation 3: Sessions 5-6

Name That Portion

Investigation 4: Session 2

Between Never and Always

Investigation 1: Sessions 3-4

Building on Numbers You Know

Investigation 4: Session 2

Measurement Benchmarks

Investigation 3: Session 3

Patterns of Change

Investigation 3: Session 3

Containers and Cubes

Investigation 4: Sessions 7-9

Data: Kids, Cats, and Ads

Investigation 2: Session 3

- **identify practical applications of mathematical principles that can be applied to other disciplines**

Grade 5 students using *Investigations in Number, Data, and Space* identify practical applications of mathematical principles that can be applied to other disciplines throughout the course. For example, students conduct statistical studies of age and gender.

Sample References:

Mathematical Thinking at Grade 5

Ten-Minute Math: Exploring Data

Picturing Polygons

Investigation 1: Session 4

Name That Portion

Investigation 4: Sessions 5-6

Between Never and Always

Investigation 2: Sessions 1-2

Building on Numbers You Know

Investigation 2: Session 7

Measurement Benchmarks
Investigation 1: Sessions 7-8
Patterns of Change
Investigation 2: Session 1
Containers and Cubes
Investigation 2: Sessions 3-4
Data: Kids, Cats, and Ads
Investigation 3: Session 2-3

• **apply mathematical thinking and modeling to solve problems that arise in other disciplines (e.g. ,rhythm in music and motion in science)**

Grade 5 students using *Investigations in Number, Data, and Space* apply mathematical thinking and modeling to solve problems that arise in other disciplines throughout the course. For example, students apply probability to gaming strategies.

Sample References:

Mathematical Thinking at Grade 5
Ten-Minute Math: Exploring Data
Picturing Polygons
Investigation 3: Session 4
Name That Portion
Investigation 4: Session 1
Between Never and Always
Investigation 2: Session 3
Building on Numbers You Know
Investigation 2: Session 4
Measurement Benchmarks
Investigation 2: Sessions 7-8
Patterns of Change
Investigation 3: Session 7
Containers and Cubes
Investigation 4: Sessions 7-9
Data: Kids, Cats, and Ads
Investigation 5: Sessions 1-5

• **identify, explain, and use mathematics in everyday life**

Sample References:

Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-3
Picturing Polygons
Investigation 3: Sessions 5-6
Name That Portion
Investigation 4: Session 2

Between Never and Always
Investigation 1: Sessions 1-2
Building on Numbers You Know
Investigation 2: Session 7
Measurement Benchmarks
Investigation 1: Sessions 7-8
Patterns of Change
Investigation 3: Session 1
Containers and Cubes
Investigation 3: Session 4
Data: Kids, Cats, and Ads
Investigation 2: Session 3