

A Correlation of



to the

Oklahoma
Priority Academic Student Skills
for Mathematics—PASS
Grades K-5



C/M-89A

INTRODUCTION

This document demonstrates how well ***Investigations in Number, Data, and Space®*** integrates with the *Oklahoma Priority Academic Student Skills for Mathematics—PASS*. The citations within this correlation provide Investigation Curriculum Unit titles, and the Investigation number and Session number or Focus Time/Choice Time title correlated to the standards of the Oklahoma Priority Academic Student Skills for Mathematics—PASS.

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.....	8
Grade Two.....	16
Grade Three.....	26
Grade Four.....	35
Grade Five.....	45

**Investigations in Number, Data, & Space
to the
Oklahoma Priority Academic Student Skills
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Kindergarten

Standard 1: Patterns - The student will sort and classify objects and analyze simple patterns.

1. Sort and group objects into a set and explain verbally what the objects have in common (e.g., color, size, shape).

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

2. Explain verbally and extend simple patterns (e.g., □, ○, □, ○).

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

Standard 2: Number Sense - The student will understand the relationship between numbers and quantities.

1. Compare a group or set to another group, set or numerical quantity and verbally explain which has more, less or equivalent quantities.

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, Counting Jar

2. Pair and count objects using one-to-one correspondence (e.g., one napkin for each child at snack time).

Kindergarten students develop mathematical arguments for using one-to-one and two-to-one correspondences. They also experience the concept of one-to-one correspondence as they explore counting methods.

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: Attendance, Counting Jar

3. Count forward to twenty and backward from ten.

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: Attendance, Counting Jar

4. Count objects in a set one-by-one from one through ten.

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: Counting Jar

5. Identify and create sets of objects zero through ten.

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: Counting Jar

6. Identify and write numerals zero through ten, in and out of sequence. Children may still be reversing some numerals.

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: Counting Jar

7. Identify the ordinal position (first through fifth) of objects.

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

8. Combine and remove objects from sets and verbally describe the result (e.g., adding objects to a set makes the set larger, subtracting objects from a set makes the set smaller).

References:

Collecting, Counting, and Measuring

Investigation 4: Choice Time: Collect 10 Together

How Many in All?

Investigations 2, 3, 4

Standard 3: Geometry and Spatial Sense - The student will identify common geometric shapes and explore the relationship of objects in the environment.

1. Identify, compare and draw basic two-dimensional geometric shapes (e.g., circle, square, triangle, rectangle).

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

2. Model and use words indicating relative position or direction (e.g., students describe the relationships between self and objects in space using on, above, below, beside, under, on top of, behind, and over).

In addition to physical manipulation of shapes and objects, Kindergarten students using *Investigations in Number, Data, and Space* apply concepts of relative position or direction 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

Standard 4: Measurement - The student will explore the concepts of nonstandard and standard measurement.

1. Measure objects using nonstandard units of measurement (e.g., pencil, paper clip, block).

References:

Collecting, Counting, and Measuring

Investigations 3

Investigation 5: Dialogue Box, pp. 76-77

How Many In All?

Investigation 1

2. Compare objects according to observable attributes (e.g., long, longer, longest; short, shorter, shortest; big, bigger, biggest; small, smaller, smallest; small, medium, large).

References:

Collecting, Counting, and Measuring

Investigations 3, 4

Investigation 5: Dialogue Box, pages 76-77

How Many in All?

Investigation 1

3. Compare and order objects in graduated order (e.g., shortest to tallest, thinnest to thickest).

References:

Collecting, Counting, and Measuring

Investigations 3, 4

Investigation 5: Dialogue Box, pages 76-77

How Many in All?

Investigation 1

4. Identify the appropriate instrument used to measure length (ruler), weight (scale), time (clock: digital and analog; calendar: day, month, year, season), and temperature (thermometer).

References:

Mathematical Thinking in Kindergarten

Investigation 3

Collecting, Counting, and Measuring

Investigation 1: Focus Time Follow-Up, page 9

Investigations 3, 4

Investigation 5: Dialogue Box, pp. 76-77

How Many In All?

Investigation 1

All units: Appendix: About Classroom Routines: Calendar

5. Tell time on digital and analog clocks to the hour.

Kindergarten students using *Investigations in Number, Data, and Space* develop a sense of time in days and weeks.

References:

Mathematical Thinking in Kindergarten

Investigation 3

All units: Appendix: About Classroom Routines: Calendar

6. Identify the days of the week and months of the year.

References:

Mathematical Thinking in Kindergarten

Investigation 3

All units: Appendix: About Classroom Routines: Calendar

7. Identify the coins penny, nickel, dime and quarter.

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

Standard 5: Data Analysis - The student will collect and analyze data in a group setting.

1. Collect and analyze information about objects and events in the environment.

References:

Mathematical Thinking in Kindergarten

Investigation 1

Counting Ourselves and Others

Investigations 1, 2, 3, 4

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

2. Create and verbally explain a data display or graph (e.g., real object graph, pictorial graphs).

References:

Mathematical Thinking in Kindergarten

Investigation 1

Counting Ourselves and Others

Investigations 1, 2, 3

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

**Investigations in Number, Data, & Space
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Grade One

Standard 1: Patterns - The student will use a variety of problem-solving approaches to model, describe and extend patterns.

1. Describe, extend and create a variety of patterns using concrete objects (e.g., sort a bag of objects by attributes and orally communicate the pattern for each grouping).

References:

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Investigation 4: Sessions 2-3

Building Number Sense

Investigation 3: Sessions 5-8

Investigation 4: Session 10: Activity, page 163

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

Quilt Squares and Block Towns

Investigation 1: Sessions 13-15

Number Games and Story Problems

Investigation 2: Sessions 6-9

2. Describe and extend number patterns in a variety of situations (e.g., addition charts, skip counting, calendars).

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, 5-7

Investigation 3: Session 8, page 107

Investigation 4: Session 10: Activity, page 63

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

Number Games and Story Problems

Investigation 2: Sessions 2, 6-9

Standard 2: Number Sense - The student will read, write and model numbers and number relationships to 100.

***1. Use concrete models of tens and ones to develop the concept of place value.**

In addition to using counters and cubes, Grade 1 students using *Investigations in Number, Data, and Space* use pictorial models, the hundred chart, and counting stories to model tens and ones.

References:

Building Number Sense
Investigation 2: Session 2
Investigation 3: Sessions 1-2, 9
Number Games and Story Problems
Investigation 2: Sessions 6-12

2. Compare and Order Objects

a. Compare objects by size and quantity (e.g., more than, less than, equal to).

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
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 3-4
Investigation 2: Sessions 5-7
Investigation 3: Session 1
All Units: Appendix: About Classroom Routines: Counting

b. Use ordinal numbers first through tenth to order objects.

References:

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

3. Read and write numerals to 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

4. Count as many as 100 objects by ones, twos, fives, and tens.

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

***5. Investigate concepts of fractional parts (e.g., halves, thirds, fourths).**

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

References:

Building Number Sense

Investigation 1: Session 2: Teacher Note, page 12

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 2-4

Investigation 3: Session 2

Standard 3: Number Operations and Computation - The student will use models to construct addition and subtraction facts with whole numbers through 10.

1. Develop and apply the concepts of addition and subtraction.

***a. Use models to construct addition and subtraction facts through 10 (e.g., counters, cubes).**

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2

Investigation 5: Sessions 3-4: Follow-Up, page 133

Building Number Sense

Investigation 1: Sessions 1-2

Investigation 1: Session 9: Activity, pages 33-35

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

b. Perform addition by joining sets of objects and subtraction by separating and by comparing sets of objects.

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2

Investigation 5: Sessions 3-4: Follow-Up, page 133

Building Number Sense

Investigation 1: Sessions 1-2

Investigation 1: Session 9: Activity, pages 33-35

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

c. Demonstrate fluency with basic addition and subtraction facts through 10.

References:

Mathematical Thinking in Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2

Investigation 5: Sessions 3-4: Follow-Up, page 133

Building Number Sense

Investigation 1: Sessions 1-2

Investigation 1: Session 9: Activity, pages 33-35

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

***d. Recognize and apply the commutative and identity properties of addition using models and manipulatives to develop computational skills (e.g., $2 + 4 = 4 + 2$, $3 + 0 = 3$).**

References:

Mathematical Thinking at Grade 1

Investigation 2: Session 4: Teacher Note, page 50

Investigation 4: Session 4

Building Number Sense

Investigation 2: Sessions 1-2, 4-9

Investigation 4: Sessions 7-9: Teacher Note, page 159

Number Games and Story Problems

Investigation 1: Sessions 4-6, 10

2. Write addition and subtraction number sentences for problem-solving situations.

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 4-6

Investigation 4: Sessions 4, 6

Building Number Sense

Investigation 2: Sessions 1-2, 6-8

Investigation 4: Sessions 1-2, 7-10

Number Games and Story Problems

Investigation 1: Sessions 1, 6, 10

Investigation 2: Sessions 1, 10-12

Investigation 3: Sessions 1-13

3. Acquire strategies for making computations (e.g., use estimation, number sense to judge reasonableness, counting on).

References:

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-4, 6

Investigation 5: Sessions 2

Investigation 5: Sessions 3-4: Follow-Up, page 133

Building Number Sense

Investigation 1: Sessions 1-2

Investigation 1: Session 9: Activity, pages 33-35

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

Standard 4: Geometry and Measurement - The student will use geometric properties and relationships to recognize and describe shapes and use measurement skills to tell time, identify money and develop calendar concepts.

1. Geometric Properties and Relationships

a. Sort and identify congruent shapes.

References:

Quilt Squares and Block Towns

Investigation 1: Sessions 2-10, 13-15

Appendix: *Shapes* Tutorial: pages 163-164

b. Identify two-dimensional geometric shapes and objects in everyday situations (e.g., the face of a round clock is a circle, a desktop is a rectangle).

References:

Quilt Squares and Block Towns

Investigation 1: Session 1

Investigation 3: Sessions 3-4

c. Use language to describe relationships of objects in space (e.g., above, below, behind, between).

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* Tutorial

2. Measurement

a. Tell time on digital and analog clocks to the hour and half-hour.

Time concepts taught in the Grade 1 series of *Investigations in Number, Data, and Space* include calendar features: the cyclical nature of the sequence of months and dates, units of time and relationships among them, birthday data, and problem solving. Students investigate clock time beginning in Grade 2.

References:

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

All units: Appendix: About Classroom Routines: Understanding Time and Changes

b. Identify and name the value of pennies, dimes, nickels, and quarters.

References:

Number Games and Story Problems

Investigation 2

Session 3

Sessions 4-5: Choice Time:

Collect 25¢ Together

c. Use the calendar to develop the concepts of days, weeks, and months.

References:

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

All units: Appendix: About Classroom Routines: Understanding Time and Changes

Standard 5: Data Analysis - The student will demonstrate an understanding of data collection and display.

1. Organize, describe, and display data using concrete objects, pictures, grids, and numbers.

References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Survey Questions and Secret Rules

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-5

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

All Units: Appendix: About Classroom Routines: Exploring Data, Understanding Time and Changes

2. Formulate and solve problems that involve collecting and analyzing data common to children's lives (e.g., color of shoes, numbers of pets, favorite foods).

References:

Mathematical Thinking at Grade 1

Investigation 5: Sessions 1-6

Survey Questions and Secret Rules

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

**Investigations in Number, Data, & Space
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Grade Two

Standard 1: Patterns - The student will use a variety of problem-solving approaches to extend and create patterns.

1. Describe, extend, and create patterns using symbols, shapes or designs (e.g., repeating and growing patterns made up of sets of shapes or designs, create patterns by combining different shapes and taking them apart).

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

2. Formulate and record generalizations about number patterns in a variety of situations (e.g., addition and subtraction patterns, build a table showing the cost of one pencil at 10 cents, 2 pencils at 20 cents)

References:

Coins, Coupons, and Combinations

Investigation 2: Sessions 1-5, 10

Investigation 3: Session 1, pages 91 and 93

Investigation 4: Session 1

Investigation 4: Sessions 2-4: Choice 3: 100 Chart, pages 116-117

Putting Together and Taking Apart

Investigation 2: Sessions 1-2

Shapes, Halves, and Symmetry

Investigation 3: Sessions 3-5, page 85

Standard 2: Number Sense - The student will use numbers and number relationships to acquire basic facts.

***1. Place Value**

a. Use concrete models of hundreds, tens, and ones to develop the concepts of place value.

References:

Coins, Coupons, and Combinations

Investigation 2: Session 10

Investigation 4: Sessions 1-4

Putting Together and Taking Apart

Investigation 1: Session 1: Dialogue Box, pages 18-19

Investigation 2: Sessions 1-7

Investigation 4: Sessions 2-4

Investigation 5: Sessions 2-3, 6

b. Demonstrate (using concrete objects, pictures, and numerical symbols) fractional parts including halves, thirds, and fourths.

References:

Shapes, Halves, and Symmetry

Investigation 3: Sessions 1-8

2. Reading and Writing Numbers

a. Link place value concepts to the reading and writing of numbers (e.g., base-10 blocks).

References:

Coins, Coupons, and Combinations

Investigation 2: Session 10

Investigation 4: Sessions 1-4

Putting Together and Taking Apart

Investigation 1: Session 1: Dialogue Box, pages 18-19

Investigation 2: Sessions 1-7

Investigation 4: Sessions 2-4

Investigation 5: Sessions 2-3, 6

b. Represent a number in a variety of ways (e.g., write the calendar day in different ways, write 15 as $8 + 7$, write 25 as 2 tens + 5 ones or as 1 ten + 15 ones).

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-8

Investigation 4: Sessions 1-2, 5

Investigation 5: Sessions 1-3

Coins, Coupons, and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Sessions 3, 6-9

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

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

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 4-5

Investigation 2: Sessions 1-2

All Units: Appendix: About Classroom Routines: Today's Number

c. Write a number sentence to compare numbers less than 100 (e.g., 5 is more than 2, 3 is less than 7, page 51 comes after 50, and 51 is between 50 and 60).

References:

Mathematical Thinking at Grade 2

Investigation 4: Sessions 1, 5

Investigation 5: Session 3

Coins, Coupons, and Combinations

Investigation 2: Session 10: Activity, pages 83-84

Investigation 3: Session 1: Activity, page 89

Investigation 3: Session 3: Activity, page 100

Investigation 3: Sessions 4-5: Teacher Note, page 107

Putting Together and Taking Apart

Investigation 1: Session 1: Teacher Note, page 11

Investigation 3: Sessions 3-5: Teacher Note, p. 85

3. Develop and use strategies of estimation (e.g., compose, decompose and regroup numbers, use knowledge of 10 to estimate quantities and sums [two numbers less than 10 can not add up to more than 20], use body parts to estimate measurements).

References:

Mathematical Thinking at Grade 2

Investigation 2: Session 6: Activity, page 41

Coins, Coupons, and Combinations

Investigation 1: Session 7: Activity, page 35

Investigation 1: Sessions 8-9

Choice 1: Close to 20, page 41

Investigation 2: Session 10: Activity, page 83

Shapes, Halves, and Symmetry

Investigation 1: Sessions 2-3: Choice Time: Predict and Cover

4. Determine whether a number is odd or even.

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, and as they predict which numbers can be represented with “half-and-half” rectangles.

References:

Mathematical Thinking at Grade 2

Investigation 4: Session 2: Teacher Note, page 91

Coins, Coupons, and Combinations

Investigation 2: Sessions 1-5

Investigation 3: Session 1, page 91

Shapes, Halves, and Symmetry

Investigation 3: Sessions 3-5, page 85

Standard 3: Number Operations and Computation - The student will compute with whole numbers less than 100.

1. Develop and apply the concepts of addition and subtraction.

a. Demonstrate fluency with basic addition and subtraction facts and fact families to 18.

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

b. Solve two-digit addition and subtraction problems with and without regrouping using a variety of techniques (e.g., concrete, paper and pencil, mental math).

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

***c. Develop operation sense by applying the associative property of addition (e.g., $3 + (2 + 1) = (3 + 2) + 1$).**

Grade 2 students using *Investigations in Number, Data, and Space* implicitly apply the associative property of addition as they develop strategies for combining more than two addends by regrouping and recombining compatible numbers.

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1, page 5

Investigation 2: Session 1, page 23

Investigation 2: Session 6: Dialogue Box, page 45

Investigation 2: Session 8, page 50

Investigation 4: Session 1

Investigation 5: Sessions 1-2: Follow-Up, page 109

Investigation 5: Session 3, page 115

Coins, Coupons, and Combinations

Investigation 1: Sessions 1, 6, 10, 11

Putting Together and Taking Apart

Investigation 1: Session 1: Teacher Note, page 15

Investigation 2: Session 1

Investigation 4: Sessions 1-4

Investigation 5: Session 6

All Units: Appendix: About Classroom Routines: Today's Number

d. Describe the relationship between addition and subtraction (e.g., addition and subtraction are inverse operations).

References:

Mathematical Thinking at Grade 2

Investigation 5: Session 3, page 115

Putting Together and Taking Apart

Investigation 1: Session 1

Teacher Notes, pages 13-14 and 15-16

Dialogue Box, page 18

Investigation 2: Sessions 3-4: Dialogue Box, page 65

Investigation 3: Sessions 1-5

Investigation 5: Sessions 7-8

2. Use mental strategies (or decomposition strategies) for addition and subtraction (e.g., make a group of 10 objects and 2 objects from a group of 7 objects and 5 objects).

References:

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-6, 8

Investigation 4: Sessions 1-2, 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

3. Complete addition number sentences with a missing addend and use to solve everyday problems.

References:

Putting Together and Taking Apart
Investigation 3: Sessions 1-5
Investigation 4: Session 1
Investigation 5: Session 6

Standard 4: Geometry and Measurement - The student will use geometric properties and relationships to recognize and describe shapes and use appropriate units of measure in a variety of situations.

1. Geometric Properties and Relationships

a. Sort and classify symmetric and congruent figures.

References:

Shapes, Halves, and Symmetry
Investigation 3: Sessions 3-5
Investigation 4: Sessions 1-7

b. Identify two-dimensional geometric shapes in everyday situations (e.g., a stop sign is an octagon).

References:

Shapes, Halves, and Symmetry
Investigation 1: Session 1
Investigation 2: Session 1: Teacher Note, page 50
Investigation 4: Sessions 1-2, page 97
Investigation 4: Session 7

2. Measurement

a. Measure objects with nonstandard and standard units (e.g., use a human foot [nonstandard] then a ruler [standard] to measure length to the nearest inch).

References:

Shapes, Halves, and Symmetry
Investigation 2: Sessions 3-6
How Long? How Far?
Investigation 1: Sessions 1-8
Investigation 2: Sessions 4-8
Timelines and Rhythm Patterns
Investigation 1: Sessions 4-6

b. Select and use appropriate units of measurement in problem solving and everyday situations.

References:

How Long? How Far?

Investigation 1: Sessions 1-8

Investigation 2: Sessions 4-8

Timelines and Rhythm Patterns

Investigation 1: Sessions 4-6

All Units: Appendix: About Classroom Routines: Time and Time Again

3. Time and Money

a. Tell time on digital and analog clocks to the quarter-hour.

References:

Timelines and Rhythm Patterns

Investigation 1: Sessions 4-6

All Units: Appendix: About Classroom Routines: Time and Time Again

b. Identify and count money; connect coins and bills with place value.

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

Standard 5: Data Analysis - The student will demonstrate an understanding of data collection, display and interpretation.

1. Collect, sort, organize, and display data in charts, bar graphs, and tables (e.g., collect data on teeth lost and display results in a chart).

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 4-6, 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?

2. Summarize and interpret data in charts, bar graphs, and tables.

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 4-6, 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?

***3. Make predictions and estimates to describe data (e.g., predict what data on teeth lost might look like for younger children and/or older children).**

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 4-6, 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?

**Investigations in Number, Data, & Space
to the
Oklahoma Priority Academic Student Skills
for Mathematics—PASS**

Grade Three

Standard 1: Patterns and Algebraic Reasoning - The student will use a variety of problem-solving approaches to extend and create patterns.

1. Describe (orally or in written form), create, extend and predict patterns using numbers (e.g., 3, 6, 9, 12 . . . , use a function machine to generate input and output values for a table, show multiplication patterns on a hundreds chart).

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

2. Analyze tables to formulate generalizations about patterns in a variety of situations (e.g., list the multiples of 5 in a table to show that multiples of 5 have a 0 or 5 in the ones place; given pairs of numbers with a common relationship, determine the rule and generate additional pairs with the same relationship).

References:

Things That Come in Groups

Investigation 2: Sessions 1-6

Investigation 5: Session 1

Landmarks in the Hundreds

Investigation 1: Sessions 2-3, 6-7

Fair Shares

Investigation 2: Sessions 5-6

Standard 2: Number Sense - The student will use numbers and number relationships to acquire basic facts.

1. Place Value

a. Model the concept of place value through 4 digits (e.g., base-10 blocks, bundles of 10s, place value mats).

References:

Mathematical Thinking at Grade 3

Investigation 1: Sessions 1-3

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

b. Read, model and write whole numbers up to 4 digits (e.g., base-10 blocks, expanded form).

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

Flips, Turns, and Area

Ten-Minute Math: Broken Calculator

Combining and Comparing

Investigation 4: Sessions 3-4

Fair Shares

Investigation 3: Sessions 1-2

Ten-Minute Math: Broken Calculator

2. Whole Numbers and Fractions

a. Compare and order whole numbers up to 4 digits.

References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Flips, Turns, and Area

Investigation 1: Session 4

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

b. Compare and order fractions including halves, thirds and fourths using a model (e.g., fraction circles, pictures, egg cartons, fraction strips).

References:

Fair Shares
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-4
Investigation 3: Sessions 1-2

Standard 3: Number Operations and Computation - The student will estimate and compute with whole numbers.

1. Estimate, find the sum and difference, with and without regrouping, of 3- and 4-digit numbers to solve application problems.

References:

Combining and Comparing
Investigation 1
Session 1: Teacher Note, page 10
Session 3: Teacher Notes, pages 16 and 17
Investigation 3: Session 3: Teacher Note, pages 37-38, 39

2. Multiplication Concepts

a. Demonstrate fluency with basic multiplication facts and fact families.

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

***b. Develop multiplication algorithms (e.g., use physical materials to show 4 groups of 3 objects, show multiplication as repeated addition).**

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

c. Estimate the product of 2-digit numbers by rounding to the nearest multiple of 10 to solve application problems.

Grade 3 students using *Investigations in Number, Data, and Space* estimate sums and differences of whole numbers and decimals.

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

***d. Recognize and apply the commutative and identity properties of multiplication using models and manipulatives to develop computational skills (e.g., $3 \times 5 = 5 \times 3$, $7 \times 1 = 7$).**

References:

Things That Come in Groups

Investigation 3: Sessions 1-2

Investigation 5: Session 2

Flips, Turns, and Area

Investigation 1: Sessions 4-5

3. Solve problems involving money that require addition and subtraction.

References:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Combining and Comparing

Investigation 3, Sessions 1-2

Standard 4: Geometry and Measurement - The student will use geometric properties and relationships to recognize and describe shapes and use customary and metric measurements to solve problems.

1. Spatial Reasoning and Coordinate Locations

a. Describe and compare two- and three-dimensional shapes (e.g., count the edges and faces of a cube, combine or divide basic shapes to form new shapes, identify and draw congruent shapes).

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

b. Identify locations on a grid with ordered pairs (e.g., give the location of a ship on a grid by selecting D, 1).

References:

Turtle Paths

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-7

2. Measurement

a. Solve problems with customary units involving length using half-inch and quarter-inch measurements and weight using pound and ounce.

Grade 3 students using *Investigations in Number, Data, and Space* estimate and measure with customary units of length; they use a pan balance with paperclips for units of weight to weigh, and compare the weights of, objects.

References:

From Paces to Feet

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-2

b. Solve problems with metric units involving length using meter and centimeter and mass using gram and kilogram.

Grade 3 students using *Investigations in Number, Data, and Space* estimate and measure with metric units of length; they use a pan balance with paperclips for units of weight to weigh, and compare the weights of, objects.

References:

From Paces to Feet

Investigation 2: Sessions 5-7

Investigation 4: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

c. Use manipulatives to develop the concept of perimeter and area (e.g., cover a shape with pattern blocks to find area).

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

***3. Develop and use strategies to estimate measurements (e.g., use parts of the body as benchmarks for measuring length).**

References:

From Paces to Feet

Investigation 1: Session 1-4

Combining and Comparing

Investigation 3: Sessions 1-2, p. 32

Turtle Paths

Investigation 2: Sessions 1-2, 4

4. Tell time on digital and analog clocks to 5 minutes and use information to solve problems involving time and temperature (e.g., read a thermometer).

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

References:

Landmarks in the Hundreds

Ten-Minute Math: Calendar Math

Combining and Comparing

Investigation 3: Session 3

Investigation 5: Sessions 1-3

Standard 5: Data Analysis and Probability - The student will demonstrate an understanding of data collection, display and interpretation.

1. Data Analysis

***a. Pose questions, collect, record, and interpret data to help answer questions (e.g., Which was the most popular booth at our carnival?).**

References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-4

Things That Come in Groups

Investigation 1: Sessions 1, 4

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 6-7
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

b. Read graphs and charts; identify the main idea, draw conclusions, make predictions based on the data (e.g., predict how many children will bring their lunch based on a menu).

References:

Mathematical Thinking at Grade 3
Investigation 3: Sessions 1-4
Things That Come in Groups
Investigation 1: Session 1
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 6-7
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

c. Construct a bar graph or pictograph with labels and a title from a set of data.

References:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-4

Things that Come in Groups

Investigation 5: Session 3

From Paces to Feet

Investigation 1: Sessions 5-6: Dialogue Box, page 25

Investigation 2: Session 2

Combining and Comparing

Investigation 4: Session 1

Ten-Minute Math: Exploring Data

2. Probability

a. Describe the probability (more, less, or equally likely) of chance events.

References:

Things That Come in Groups

Ten-Minute Math: Likely or Unlikely?

Exploring Solids and Boxes

Ten-Minute Math: What Is Likely?

b. List arrangements (permutations) and combinations of up to three items (e.g., possible ways to arrange scoops of chocolate, strawberry and vanilla ice cream on a cone).

Grade 3 students using *Investigations in Number, Data, and Space* find all possible geometric arrangements of a given number of squares, find all possible combinations of numbers which will result a given net change, find all possible paths from a given starting point to a fixed destination, and design different boxes with given constraints.

References:

Flips, Turns, and Area

Investigation 1: Sessions 1, 4-5

Up and Down the Number Line

Investigation 1: Sessions 3-4, 6-7

Turtle Paths

Investigation 1: Sessions 3-4

Exploring Solids and Boxes

Investigation 3: Sessions 1-2

Investigation 4: Session 2

**Investigations in Number, Data, & Space
to the
Oklahoma Priority Academic Student Skills
for Mathematics—PASS**

Grade Four

Standard 1: Patterns and Algebraic Reasoning - The student will use a variety of problem-solving approaches to analyze, extend and create patterns.

1. Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes).

2. Elementary Function Concepts

a. Use a variety of techniques to generalize number patterns (e.g., use function machines and “t-tables” to demonstrate “What is the rule?”).

References:

Landmarks in the Thousands

Investigation 1: Session 1

Investigation 3: Sessions 1-2

Investigation 4: Sessions 1-3

Ten-Minute Math: Counting Around the Class

b. Solve simple open sentences involving operations on whole numbers (with a variable, e.g., $a + 17 = 23$).

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

Standard 2: Number Sense - The student will use numbers and number relationships to acquire basic number facts.

1. Place Value

a. Apply the concept of place value through 6 digits (e.g., write numbers in expanded form, play a trading game involving place value).

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

b. Read, write and rename whole numbers through 6 digits and decimal numbers to the hundredths (e.g., money, numerals to words).

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 and decimals through the hundredths.

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

2. Compare and order whole numbers and decimals to the hundredths place (e.g., pictures of shaded regions of two-dimensional figures, use $>$, $<$, $=$ symbols).

References:

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-2

Packages and Groups

Investigation 2: Sessions 2-3

3. Fractions

a. Use 0, $\frac{1}{2}$, and 1 or 0, 0.5, and 1, as benchmarks and place additional fractions and decimals on a number line (e.g., $\frac{1}{3}$, $\frac{3}{4}$, 0.7, 0.4).

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

b. Create physical and pictorial models of equivalent and nonequivalent fractional parts to be compared, added or subtracted (e.g., egg cartons, fraction strips, circles, and squares).

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

Standard 3: Number Operations and Computation - The student will estimate and compute with whole numbers.

1. Estimate and find the product of 2- and 3-digit numbers to solve application problems.

In addition to the following references, several of the Grade 4 texts in the *Investigations in Number, Data, and Space* series include either Estimation and Number Sense or Counting Around the Class as one of the Ten-Minute Math appendices.

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

2. Division Concepts

a. Demonstrate fluency with basic division facts and fact families.

References:

Arrays and Shares

Investigation 1: Session 3

Investigation 2: Sessions 2-3, 7-8

Investigation 3: Sessions 2-4

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 3: Sessions 1-10

***b. Develop division algorithms (e.g., use physical materials to show 12 objects arranged in 3 groups, show division as repeated subtraction and as the inverse of multiplication).**

References:

Arrays and Shares

Investigation 2: Sessions 7-8

Investigation 3: Sessions 2-4

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 3: Sessions 1-10

c. Estimate and find the quotient (with and without remainders) with a 1-digit divisor and a 2- or 3-digit dividend to solve application problems.

References:

Arrays and Shares
Investigation 2: Sessions 7-8
Investigation 3: Sessions 2-4
Landmarks in the Thousands
Investigation 2: Session 1
Packages and Groups
Investigation 3: Sessions 1-8, 10

3. Apply a variety of estimation and mental math techniques to simplify computations (e.g., use rounding to estimate $82 - 58$ is about $80 - 60$ or 20 , use 30×5 to find the product of 300×5).

Students in Grade 4 using *Investigations in Number, Data, and Space* apply a variety of estimation and mental math techniques to simplify computations throughout the course. For example, students estimate hundreds in sums of numbers; use multiplication relationships and clusters to break down large problems; use landmark numbers to add and subtract; estimate, add, and subtract to 1,000; and solve a variety of numeric and verbal problems involving properties of and operations on numbers, including “ins and outs” problems and problems that “look hard but aren’t.”

Sample References:

Mathematical Thinking at Grade 4
Investigation 3: Sessions 4-5
Arrays and Shares
Investigation 3: Session 1
Landmarks in the Thousands
Investigation 2: Sessions 1-5
Different Shapes, Equal Pieces
Investigation 1: Session 5
The Shape of the Data
Ten-Minute Math: Estimation and Number Sense
Money, Miles, and Large Numbers
Investigation 3: Session 1
Changes Over Time
Investigation 1: Sessions 5-6

Packages and Groups

Investigation 2: Sessions 2-3

Sunken Ships and Grid Patterns

Ten-Minute Math: Lengths and Perimeters

***4. Develop operation sense by applying the associative property of multiplication (e.g., $6 \times (2 \times 3) = (6 \times 2) \times 3$).**

Grade 4 students using *Investigations in Number, Data, and Space* apply the Distributive Property as they use multiplication clusters to break apart complex multiplication and division problems.

References:

Packages and Groups

Investigation 2: Sessions 1-3

Investigation 3: Sessions 3-8

Standard 4: Geometry and Measurement - The student will use geometric properties and relationships to analyze shapes and use standard units of customary and metric measurements to solve problems.

1. Basic Characteristics of Lines and Angles

a. Identify, draw, and construct models of intersecting, parallel, and perpendicular lines (e.g., use spaghetti, straws, toothpicks).

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

Geo-Logo Teacher Tutorial

b. Identify and compare angles equal to, less than, or greater than 90 degrees (e.g., use right angles to determine the approximate size of other angles; make a variety of angles using flexible straws and compare).

References:

Sunken Ships and Grid Patterns

Investigation 1: Sessions 5-6

Investigation 2: Sessions 1, 5

Ten-Minute Math: Lengths and Perimeters

Appendix: *Geo-Logo* Teacher Tutorial

***2. Identify basic characteristics of the rectangular coordinate system and find the distance between horizontal and vertical lines of a rectangular coordinate system (e.g., the x-axis is the horizontal axis).**

References:

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

3. Spatial Reasoning

a. Describe the effects on two- and three-dimensional objects when they slide (translate), flip (reflect), and turn (rotate) (e.g., tessellations).

References:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 1-6
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

b. Predict and verify the effects of combining, subdividing, and changing two- and three-dimensional figures (e.g., folding paper, tiling, and rearranging pieces of solids).

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

4. Measurement

a. Establish benchmarks for customary and metric units and estimate the measures of a variety of objects and compare units (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter).

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: Session 3

b. Select appropriate customary and metric units of measure to solve application problems involving length, weight, mass, and volume.

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: Session 3

c. Solve application problems involving money, time and temperature (e.g., elapsed time).

References:

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-4

Investigation 3: Sessions 4-5

Money, Miles, and Large Numbers

Investigation 1: Sessions 1-8

Changes Over Time

Unit Preparation: Sessions 1-3

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-8

Standard 5: Data Analysis and Probability - The student will demonstrate an understanding of data collection, display and interpretation.

1. Data Analysis

a. Examine data displays such as tallies, tables, charts and graphs and use the observations to pose and answer questions (e.g., choose a table in social studies of population data and write problems).

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
Three out of Four Like Spaghetti
 Investigation 2: Sessions 1-7

b. Collect, organize and record data in tables and graphs (e.g., bar, pictograph, line plots).

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
Three out of Four Like Spaghetti
 Investigation 1: Sessions 1-4
 Investigation 2: Sessions 1-7

***2. Investigate and record probabilities by experimenting with devices that generate random outcomes (e.g., coins, number cubes, spinners).**

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?

**Investigations in Number, Data, & Space
to the
Oklahoma Priority Academic Student Skills
for Mathematics—PASS**

Grade Five

Standard 1: Patterns and Algebraic Reasoning - The student will use algebraic methods to describe patterns and solve problems in a variety of contexts.

1. Describe rules that produce patterns found in tables, graphs, and models, and use variables (e.g., boxes, letters, pawns, number cubes, or other symbols) to solve problems or to describe general rules in algebraic expression or equation form.

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

2. Use algebraic problem-solving techniques (e.g., use a balance to model an equation and show how subtracting a number from one side requires subtracting the same amount from the other side) to solve problems.

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

Standard 2: Number Sense - The student will demonstrate an understanding of the basic concepts and properties of real numbers.

1. Fractions, Decimals and Percents

a. Solve problems using decimal numbers to the 1000ths place.

References:

Name That Portion

Investigation 3: Sessions 1-8

Between Never and Always

Investigation 1: Sessions 1-2

Building on Numbers You Know

Investigation 2: Session 3: Teacher Note, page 54

Containers and Cubes

Ten-Minute Math: Counting Around the Class: Fractions and Decimals

Data: Kids, Cats, and Ads

Investigation 3: Session 1, page 50

b. Compare, convert, and order common fractions and decimals to the 100ths place to solve problems.

References:

Name That Portion

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-9

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 1-4

c. Represent with models the connection between fractions, decimals, and percents and be able to convert from one representation to another (e.g., use 10 x 10 grids, base-10 blocks; limit fractions to halves, fourths, fifths, and tenths).

References:

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

Building on Numbers You Know

Investigation 2: Session 3: Teacher Note, page 54

Data, Kids, Cats, and Ads

Investigation 3: Session 1-4

d. Explain verbally with manipulatives and diagrams 25%, 50%, 75%; use these percents to solve problems and relate them to their corresponding fractions and decimals.

References:

Name That Portion

Investigation 1: Sessions 1-7

Investigation 3

Session 1: Extension, page 71

Session 7

Investigation 4: Sessions 1-7

Data, Kids, Cats, and Ads

Investigation 3: Sessions 1-4

2. Basic Number Theory Concepts

a. Apply the basic properties of arithmetic: commutative, associative, distributive, and identity (e.g., show $2(5 + 1) = (2 \times 5) + (2 \times 1)$, given $(5 + 1) + (5 + 1)$ regroup to show this equals $(5 + 5) + (1 + 1)$ concluding with $(2 \times 5) + (2 \times 1)$) to solve problems.

References:

Mathematical Thinking at Grade 5

Investigation 2: Sessions 1-4

Investigation 3: Sessions 2-5

Building on Numbers You Know
Investigation 1: Sessions 3-4, 6-7
Investigation 2: Sessions 5-6
Investigation 3: Sessions 1-3
Measurement Benchmarks
Ten-Minute Math: Estimation and Number Sense

b. Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1-100 and classify as prime or composite).

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
Investigation 4: Session 1

Standard 3: Number Operations and Computation - The student will estimate and compute with whole numbers, decimals and fractions.

1. Estimation

a. Use estimation skills to determine solutions to problems involving decimals.

References:

Name That Portion
Investigation 3: Sessions 5-7
Between Never and Always
Ten-Minute Math: Nearest Answer
Building on Numbers You Know
Investigation 2: Session 3, page 51
Measurement Benchmarks
Ten-Minute Math: Estimation and Number Sense
Data: Kids, Cats, and Ads
Investigation 3: Session 4, page 65

b. Apply estimation skills to solve problems involving common percents and equivalent fractions.

References:

Name That Portion

Investigation 3: Sessions 5-6, page 90

Investigation 4: Session 1

Between Never and Always

Ten-Minute Math: Nearest Answer

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Data: Kids, Cats, and Ads

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

2. Whole Numbers, Decimals, and Fractions

a. Add and subtract decimal numbers with the same and different place values (e.g., $3.72 + 1.4$) to solve problems.

References:

Name That Portion

Investigation 3: Sessions 2-4, 7

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

b. Multiply and divide whole numbers and decimal numbers with 1- or 2-digit multipliers or divisors to solve problems.

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

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Containers and Cubes

Investigation 1: Sessions 1-5

Investigation 4: Sessions 7-9

Ten-Minute Math: Counting Around the Class

c. Add and subtract fractions and mixed numbers to solve problems using a variety of methods (e.g., use fraction strips, find the least common denominator [LCD]).

References:

Measurement Benchmarks

Ten-Minute Math: Estimation and Number Sense

Name That Portion

Investigation 2: Sessions 1–2, 3, 6, 7-8, 9

Data: Kids, Cats, and Ads

Investigation 3: Sessions 1–3

Investigation 4: Sessions 1–3

Standard 4: Geometry and Measurement - The student will apply geometric properties and relationships and use measurements within the metric and customary systems to solve problems in a variety of contexts.

1. Identify and describe the basic properties of figures (e.g., two or three-dimensionality, symmetry, number of faces, types of angles).

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

2. Find the perimeter of simple polygons and area of a rectangle (e.g., use 1-inch tiles to build rectangles of different perimeters and areas).

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

***3. Use nonstandard units (beans, rice, candies) and standard units (centimeter cubes, 1-inch cubes) to find the volume of rectangular solids and estimate the volume of other solids.**

References:

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

***4. Use the appropriate units and tools to estimate and measure temperature, distance, length, weight, and angles.**

References:

Picturing Polygons

Investigation 2: Sessions 1-3, 6-9

Investigation 3: Sessions 1-6

Measurement Benchmarks

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-8

Containers and Cubes

Investigation 4: Session 6

5. Convert basic measurements of volume, weight and distance within the same system for metric and customary units (e.g., inches to feet, hours to minutes, centimeters to meters).

References:

Measurement Benchmarks

Investigation 1: Sessions 4, 7-8

Investigation 2: Sessions 1-4, 7-8

Standard 5: Data Analysis and Probability - The student will use data analysis, statistics and probability to interpret data in a variety of contexts.

1. Data Analysis

a. Analyze data to create and interpret tables and graphs.

Students using *Investigations in Number, Data, and Space* are encouraged to organize and represent data using a variety of displays, including tables, circle graphs, line graphs, line plots, and bar graphs. Tables may be provided to the students, or created by the students in various problem situations. Students are asked to choose an appropriate means to display their data, and are asked to explain or justify their choices.

References:

Mathematical Thinking at Grade 5

Investigation 3: Session 1

Picturing Polygons

Investigation 1: Session 4

Investigation 2: Sessions 4-5

Investigation 3: Sessions 1-2, 4-6

Name That Portion

Investigation 1: Session 1

Investigation 3: Sessions 1, 5-7

Investigation 4: Sessions 2-4, 7

Between Never and Always

Investigation 1: Sessions 6-7

Investigation 2: Sessions 1-3

Building on Numbers You Know

Investigation 1: Sessions 3-4

Investigation 4: Sessions 1-2

Investigation 5: Sessions 4-6

Measurement Benchmarks

Investigation 1: Sessions 7-8

Investigation 2: Sessions 1-2, 7-8

Investigation 3: Sessions 2-3

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 1-7

Ten-Minute Math: Nearest Answer Number Line Problems

Containers and Cubes

Investigation 4: Sessions 2-5, 7-9

Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-3
Investigation 4: Sessions 2-3
Investigation 5: Sessions 1, 3-5

b. Justify the selection of the type of table or graph (e.g., a line graph may be more appropriate than a bar graph when displaying the height of a person over time).

References:

Name That Portion
Investigation 3: Session 1
Investigation 4: Sessions 2-4, 7
Measurement Benchmarks
Investigation 2: Sessions 7-8
Investigation 3: Sessions 2-3
Patterns of Change
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-6
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-3
Investigation 4: Sessions 2-3
Investigation 5: Sessions 1, 3-5

c. Compare and translate between displays of data (e.g., multiple sets of data on the same graph, Venn diagrams, a combination of diagrams, charts, tables, graphs).

References:

Name That Portion
Investigation 4: Sessions 2-4, 7
Between Never and Always
Investigation 1: Sessions 6-7
Investigation 2: Session 3
Measurement Benchmarks
Investigation 2: Sessions 7-8
Investigation 3: Sessions 2-3
Patterns of Change
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-6

Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-3
Investigation 4: Sessions 2-3
Investigation 5: Sessions 1, 3-5

***d. Formulate questions, design investigations, consider samples, and collect, organize, and analyze data using observation, measurement, surveys, or experiments (e.g., how far can 5th graders throw a softball based on where it first hits the ground?).**

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 2: Session 3
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

e. Determine the range (spread) and the mean (average) of a set of data.

Students gain experience with measures of central tendency and dispersion as they find the median of a set of data, determine “typical” data, and discuss the spread and clustering of data.

References:

Between Never and Always
Investigation 1: Sessions 3-6
Measurement Benchmarks
Investigation 2: Sessions 7-8
Investigation 3: Session 2
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1-4
Investigation 2: Session 1

2. Probability

a. Determine the probability of events occurring in familiar contexts or experiments and express probabilities as fractions (e.g., find the fractional probability of an event given a biased spinner).

References:

Name That Portion

Investigation 4: Sessions 3-4: Teacher Note, page 117

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?

b. List permutations and combinations of up to five items.

References:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Investigation 2: Sessions 2-4

Between Never and Always

Investigation 2: Sessions 1-2, pages 51-52

Building on Numbers You Know

Investigation 4: Session 1