

A Correlation of



to the

**Maryland
Mathematics
Voluntary State Curriculum
Grades K-5**



O/M-152

INTRODUCTION

This document demonstrates how well *Investigations in Number, Data, and Space*[®] integrates with the Maryland Mathematics Voluntary State Curriculum. The citations within this correlation provide Investigations Curriculum Unit titles, the Investigation number and Session number or Focus Time/Choice Time title that correlates to the standards and indicator statements of the Maryland Mathematics Voluntary State Curriculum.

Note: Maryland's highlighted Assessment Limits will be tested in the no calculator section of MSA

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.....	21
Grade Two.....	45
Grade Three.....	76
Grade Four.....	113
Grade Five.....	150

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum
Kindergarten**

STANDARD 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify and copy numeric patterns

Objectives(s):

- **Use manipulatives with numeric qualities to build patterns**
Mathematical Thinking in Kindergarten
Investigation 3: Focus Time: Calendar

Indicator Statement:

Identify, copy, describe, create, and extend non-numeric patterns

Objectives(s):

- **Represent patterns kinesthetically such as: clap/snap/clap**
Pattern Trains and Hopscotch Paths
Investigation 1: Focus Time: Watching and Looking
- **Represent and analyze repeating patterns using no more than 3 objects in the core of the pattern**
Pattern Trains and Hopscotch Paths
Investigations 1-4
- **Sort a collection of objects according to a rule**
Mathematical Thinking in Kindergarten
Investigation 1: Choice Time
Investigation 3: Choice Time
Pattern Trains and Hopscotch Paths
Investigation 1: Focus Time: Cubes: What Do You Notice?
Collecting, Counting and Measuring
Investigation 4: Focus Time: Letters in Our Names
Counting Ourselves and Others
Investigations 2-4

Identify patterns in real life situations

Mathematical Thinking in Kindergarten

Investigation 3: Focus Time: Calendar

Pattern Trains and Hopscotch Paths

Investigations 1-4

- **Recognize the difference between patterns and non-patterns**

Pattern Trains and Hopscotch Paths

Investigations 1-4

- **Continue patterns**

Pattern Trains and Hopscotch Paths

Investigations 1-4

EXPRESSIONS, EQUATIONS, AND INEQUALITIES***Indicator Statement:*****Write and identify expressions*****Objectives(s):***

- **Represent numeric quantities using concrete and pictorial representations to model addition expressions with a value of no more than 10**

Collecting, Counting and Measuring

Investigation 4: Choice Time: Collect 10 Together

How Many in All?

Investigations 2-4

Indicator Statement:**Identify equations and inequalities*****Objectives(s):***

- **Represent relationships by comparing groups of no more than 10 objects to determine more or less**

Collecting, Counting and Measuring

Investigation 3: Focus Time: Measurement Towers

Choice Time: Grab and Count: Which Had More?

Investigations 4-6

How Many in All?

Investigation 2: Choice Time: Grab Two Handfuls

- **Model and name the value of the missing part in a part-part-whole situation using no more than 10 manipulatives**
How Many in All?
Investigations 2, 4
- **Describe addition using terms such as: and, add, plus, join, equal**
Collecting, Counting and Measuring
Investigation 4: Choice Time: Collect 10 Together
How Many in All?
Investigations 2-4

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS

Indicator Statement:

Locate points on a number line

Objectives(s):

- **Identify and represent whole numbers up to 10 on a number line using manipulatives, symbols, and one-to-one correspondence**
Mathematical Thinking in Kindergarten
Investigation 2: Focus Time: Counting Jar
Investigation 4: Choice Time: Counting Jar
Collecting, Counting and Measuring
Investigations 1-4
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES

Indicator Statement:

Recognize and describe the attributes of plane geometric figures

Objectives(s):

- **Sort and regroup everyday objects and geometric figures according to attributes such as: shape, color, size**
Mathematical Thinking in Kindergarten
Investigation 1: Choice Time: Exploring Color Tiles, Exploring Pattern Blocks, Exploring Geoblocks
Investigation 3: Choice Time: Exploring Interlocking Cubes
Making Shapes and Building Blocks
Investigations 1-3, 5
- **Describe plane figures and their attributes such as: shape, color, size**
Making Shapes and Building Blocks
Investigations 1-2
- **Identify triangles, circles, squares, and rectangles**
Making Shapes and Building Blocks
Investigations 1-2
- **Compare, trace, and reproduce triangles, circles, squares, and rectangles**
Making Shapes and Building Blocks
Investigations 1-2, 4

SOLID GEOMETRIC FIGURES**Indicator Statement:**

Recognize, describe, and use the attributes of solid geometric figures

Objectives(s):

- **Match, sort, and regroup objects according to attributes**
Making Shapes and Building Blocks
Investigations 2-3, 5
Investigation 4: Choice Time: Build a Block
- **Describe solid figures**
Making Shapes and Building Blocks
Investigations 2-5
- **Identify solid geometric figures in the environment**
Making Shapes and Building Blocks
Investigations 2-5

CONGRUENCE***Indicator Statement:*****Recognize congruent objects*****Objectives(s):***

- **Identify everyday objects which have the same size and shape**
Making Shapes and Building Blocks
Investigations 1-5

TRANSFORMATIONS***Indicator Statement:*****Begin to recognize a transformation*****Objectives(s):***

- **Use position words such as: over, under, above, on, next to, below, beside, behind**
Pattern Trains and Hopscotch Paths
Investigation 4: Choice Time: Staircase Patterns
Making Shapes and Building Blocks
Investigations 2-3, 5
- **Use spatial reasoning to solve simple puzzles**
Making Shapes and Building Blocks
Investigations 1-5
- **Demonstrate slides using simple objects**
Making Shapes and Building Blocks
Investigations 1-5

Indicator Statement:**Recognize symmetry*****Objectives(s):***

- **Recognize the concept of symmetry using pictures**
Making Shapes and Building Blocks
Investigations 1-5

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES

Indicator Statement:

Explore measurement scales

Objectives(s):

- **Order, compare, and describe objects by attributes such as: length/height, weight, capacity**
How Many in All?
Investigation 1
Collecting, Counting and Measuring
Investigation 3
- **Recognize time by identifying days of the week and by using terms such as: yesterday, today, tomorrow, morning, afternoon, night, before, after**
Mathematical Thinking in Kindergarten
Investigation 3
- **Compare and describe temperature such as: temperature in January as compared to temperature in July**
Can be developed from Mathematical Thinking in Kindergarten
Investigation 3

MEASUREMENT TOOLS

Indicator Statement:

Measure in non-standard units

Objectives(s):

- **Measure length of objects and pictures of objects**
How Many in All?
Investigation 1
Collecting, Counting and Measuring
Investigation 3
- **Explore and compare the capacity of containers**
How Many in All?
Investigation 1
Collecting, Counting and Measuring
Investigation 3

- **Explore and compare objects according to their weight using a two-pan balance**
How Many in All?
Investigation 1
Collecting, Counting and Measuring
Investigation 3

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS***Indicator Statement:***

Collect, organize, and display data

Objectives(s):

- **Collect data by answering a question**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigation 4
Counting Ourselves and Others
Investigations 1-4
- **Organize and display data to make real graphs**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigation 2
Counting Ourselves and Others
Investigation 1-4
- **Organize and display data to make picture graphs**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigation 2
Counting Ourselves and Others
Investigations 1-4

DATA ANALYSIS***Indicator Statement:*****Analyze data*****Objectives(s):***

- **Compare and describe data from real graphs to answer a question**

Mathematical Thinking in Kindergarten

Investigation 1: Focus Time: Attendance

Investigations 2, 4

Collecting, Counting and Measuring

Investigation 2

Counting Ourselves and Others

Investigations 1-4

Compare and describe data from a picture graph to answer a question

Mathematical Thinking in Kindergarten

Investigation 1: Focus Time: Attendance

Investigations 2, 4

Collecting, Counting and Measuring

Investigation 2

Counting Ourselves and Others

Investigations 1-4

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR COMPUTATION:

Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE***Indicator Statement:*****Apply knowledge of whole numbers and place value*****Objectives(s):***

- **Extend concept of number**

Mathematical Thinking in Kindergarten

Investigation 1: Focus Time: Attendance

Investigation 2

Investigation 3: Focus Time: Calendar

Collecting, Counting and Measuring

Investigations 1-2

- **Construct relationships between and among quantities using language such as: more than, less than, fewer than, as many as, one more, one less**
Collecting, Counting and Measuring
Investigations 3-6
- **Demonstrate cardinality by answer of how many**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 1-2, 4-5
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring
- **Build meaningful relationships by using 5 and 10 frames**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2-4
Collecting, Counting and Measuring
Investigations 1-2, 4-5
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring
- **Use concrete materials to build sets 0 to 10**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2-4
Collecting, Counting and Measuring
Investigations 1-2, 4-5
Counting Ourselves and Others
Investigation 1:
How Many in All?
Investigation 1: Focus Time: Counting and Measuring
- **Use concrete materials to compose and decompose quantities up to 10**
Collecting, Counting and Measuring
Investigations 4, 6
How Many in All?
Investigations 2-4

- **Match a numeral to a set**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 1-5
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring

- **Count to 31**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 1-5
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring

- **Count backward from 10**
Mathematical Thinking in Kindergarten
Investigation 1: Focus Time: Attendance
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 1-5
Counting Ourselves and Others
Investigation 1
How Many in All?
Investigation 1: Focus Time: Counting and Measuring

- **Use ordinal numbers to indicate position such as: first, second, third, fourth, fifth**
Mathematical Thinking in Kindergarten
Investigation 3

Indicator Statement:
Recognize fractions

Objectives(s):

- **Show initial awareness of fractional parts (halves) using concrete materials**
Making Shapes and Building Blocks
Investigation 4: Choice Time: Fill the Hexagons

Indicator Statement:
Recognize and use money

Objectives(s):

- **Identify and name the value of pennies, nickels, and dimes**
Counting Ourselves and Others
Investigation 3: Choice Time: The Grocery Store
- **Choose the coin named from a given set of mixed coins**
Counting Ourselves and Others
Investigation 3: Choice Time: The Grocery Store

Use money in real-world situations such as a classroom store
Counting Ourselves and Others
Investigation 3: Choice Time: The Grocery Store

NUMBER COMPUTATION

Indicator Statement:
Analyze number relations and compute

Objectives(s):

- **Model addition by combining sets of concrete objects and describe the results using words and pictures**
How Many in All?
Investigations 2-4
- **Model subtraction by separating sets of concrete objects and describe the results using words and pictures**
How Many in All?
Investigations 2-4

- **Solve a given story problem cooperatively that is based on the combining and separating of models**
Counting Ourselves and Others
Investigation 4: Focus Time: Who's Here? Who's Not?
How Many in All?
Investigation 3

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING***Indicator Statement:***

Apply a variety of concepts, processes, and skills to solve problems

Objectives(s):

- **Identify the question in the problem**
Mathematical Thinking in Kindergarten
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 4, 6
Counting Ourselves and Others
Investigations 1-2, 4
How Many in All?
Investigations 2-4
Pattern Trains and Hopscotch Paths
Investigations 2, 4
- **Decide if enough information is present to solve the problem**
Mathematical Thinking in Kindergarten
Investigation 3
Pattern Trains and Hopscotch Paths
Investigation 3
Collecting, Counting and Measuring
Investigation 4
Counting Ourselves and Others
Investigation 1
Making Shapes and Building Blocks
Investigation 2
How Many in All?
Investigation 3

- **Make a plan to solve a problem**
Mathematical Thinking in Kindergarten
Investigations 2, 4
Collecting, Counting and Measuring
Investigations 4, 6
Counting Ourselves and Others
Investigations 1-2, 4
How Many in All?
Investigations 2-4
Pattern Trains and Hopscotch Paths
Investigations 2-4

- **Apply a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Select a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Identify alternative ways to solve a problem**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Show that a problem might have multiple solutions or no solution**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Extend the solution of a problem to a new problem situation**
Can be developed from Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4, 6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

REASONING***Indicator Statement:*****Justify ideas or solutions with mathematical concepts or proofs*****Objectives(s):***

- **Use inductive or deductive reasoning**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Make or test generalizations**
Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Support or refute mathematical statements or solutions**
Can be developed from Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2

Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

- **Use methods of proof, i.e., direct, indirect, paragraph, or contradiction**
Can be developed from Mathematical Thinking in Kindergarten
Investigation 4
Pattern Trains and Hopscotch Paths
Investigation 4
Collecting, Counting and Measuring
Investigations 1-2, 4-6
Counting Ourselves and Others
Investigations 1-2, 4
Making Shapes and Building Blocks
Investigation 4
How Many in All:
Investigations 2-4

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Objectives(s):

- **Use multiple representations to express concepts or solutions**
Mathematical Thinking in Kindergarten
Investigations 1-4
Pattern Trains and Hopscotch Paths
Investigations 1-4
Collecting, Counting and Measuring
Investigations 1-6
Counting Ourselves and Others
Investigations 1-4
Making Shapes and Building Blocks
Investigations 1-5
How Many in All?
Investigations 1-4

- **Express mathematical ideas orally**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Explain mathematically ideas in written form**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Express solutions using concrete materials**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Explain solutions in written form**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Ask questions about mathematical ideas or problems**
 - Mathematical Thinking in Kindergarten
 - Investigations 1-4
 - Pattern Trains and Hopscotch Paths
 - Investigations 1-4
 - Collecting, Counting and Measuring
 - Investigations 1-6
 - Counting Ourselves and Others
 - Investigations 1-4
 - Making Shapes and Building Blocks
 - Investigations 1-5
 - How Many in All?
 - Investigations 1-4

- **Give or use feedback to revise mathematical thinking**

Mathematical Thinking in Kindergarten

Investigations 1-4

Pattern Trains and Hopscotch Paths

Investigations 1-4

Collecting, Counting and Measuring

Investigations 1-6

Counting Ourselves and Others

Investigations 1-4

Making Shapes and Building Blocks

Investigations 1-5

How Many in All?

Investigations 1-4

CONNECTIONS

Indicator Statement:

Relate or apply mathematics within the discipline, to other disciplines, and to life

Objectives(s):

- **Identify mathematical concepts in relationship to other mathematical concepts**

Mathematical Thinking in Kindergarten

Investigations 1-4

Pattern Trains and Hopscotch Paths

Investigations 1- 4

Collecting, Counting and Measuring

Investigations 1-6

Counting Ourselves and Others

Investigations 1-4

Making Shapes and Building Blocks

Investigations 1-5

How Many in All?

Investigations 1-4

- **Identify mathematical concepts in relationship to other disciplines**

Pattern Trains and Hopscotch Paths

Investigation 1: Focus Time: Watching and Looking

Investigation 2: Choice Time: Pattern Block Snakes

Collecting, Counting and Measuring

Investigation 1: Focus Time: Seasons, Time, Forming a Community

Making Shapes and Building Blocks

Investigation 1: Focus Time: Looking at 2-D Shapes

Investigation 2

Investigation 3: Focus Time 3-D Shapes in the Classroom

- **Identify mathematical concepts in relationship to life**

Mathematical Thinking in Kindergarten

Investigation 1: Focus Time: Attendance

Investigation 3

Investigation 4: Focus Time: Today's Question

Pattern Trains and Hopscotch Paths

Investigation 1: Focus Time: Watching and Looking

Investigation 3: Choice Time: Hopscotch Paths

Collecting, Counting and Measuring

Investigation 1: Focus Time: Seasons, Time, Family Connection

Investigation 2: Focus Time: Taking Inventory

Investigation 3: Focus Time: Measurement Towers

Counting Ourselves and Others

Investigation 1: Focus Time: How Many Are We?

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

Choice Time: The Grocery Store

Investigations 3-4

Making Shapes and Building Blocks

Investigation 1: Focus Time: Looking at 2-D Shapes

Investigation 3: Focus Time: 3-D Shapes in the Classroom

Choice Time: Shape Hunt

How Many in All?

Investigation 1

- **Use the relationship among mathematical concepts to learn other mathematical concepts**

Mathematical Thinking in Kindergarten

Investigations 1-4

Pattern Trains and Hopscotch Paths

Investigations 1-4

Collecting, Counting and Measuring

Investigations 1-6

Counting Ourselves and Others

Investigations 1-4

Making Shapes and Building Blocks

Investigations 1-5

How Many in All?

Investigations 1-4

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum**

Grade One

STANDARD 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify, describe, extend, and create numeric patterns/

Objectives(s):

- **Represent and analyze numeric patterns using skip counting by multiples of 2 and 10 starting with any whole number, and using manipulatives and the 100 chart**

Building Number Sense

Investigation 3: Sessions 1-8

Number Games and Story Problems

Investigation 2: Sessions 1-2, 6-9

- **Represent and analyze numeric patterns using skip counting backward by 10s starting with a multiple of 10, and using manipulatives**

Building Number Sense

Investigation 3: Sessions 1-8

Number Games and Story Problems

Investigation 2: Sessions 1-2, 6-9

Indicator Statement:

Identify, copy, describe, create and extend non-numeric patterns

Objectives(s):

- **Represent and analyze growing patterns kinesthetically such as: clap/snap, clap/snap/snap, clap/snap/snap/snap, ...**

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Investigation 4: Sessions 2-3, 5

Building Number Sense

Investigation 3: Session 8

Investigation 4: Session 10

Number Games and Story Problems
Investigation 2: Session 9

- **Represent and analyze repeating patterns using no more than 3 different objects in the core of the pattern**

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Investigation 4: Sessions 2-3, 5

Building Number Sense

Investigation 3: Session 8

Investigation 4: Session 10

Number Games and Story Problems

Investigation 2: Session 9

- **Transfer a repeating pattern from one medium to a different medium using no more than 3 different objects in the core of the pattern**

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-6

Investigation 4: Sessions 2-3, 5

Building Number Sense

Investigation 3: Session 8

Investigation 4: Session 10

Number Games and Story Problems

Investigation 2: Session 9

- **Identify patterns in real-world situations**

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, 9

EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Indicator Statement:

Write and identify expressions

Objectives(s):

- **Represent numeric quantities using concrete and pictorial representations and operational symbols (+, -) with whole numbers to 20**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-4, 6

Building Number Sense
Investigation 2: Sessions 1-9
Investigation 4: Sessions 1-10
Number Games and Story Problems
Investigation 1: Sessions 1-10
Investigation 2: Sessions 2, 10-13
Investigation 3: Sessions 1-13

Indicator Statement:

Identify, write, and solve equations and inequalities

Objectives(s):

- **Represent relationships using the terms greater than, less than, and equal to for quantities up to 100**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-3, 5-6

Investigation 4: Sessions 1-4

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 2-6

Investigation 2: Sessions 3-5

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 2: Sessions 6-9

- **Find the missing number (unknown) in a number sentence using operational symbols (+, -) with whole numbers to 20 using pictures and manipulatives**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 4-6

Investigation 4: Sessions 2-4

Building Number Sense

Investigation 2: Sessions 1-2, 4-9

Number Games and Story Problems

Investigation 3: Session 9

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS***Indicator Statement:*****Locate points on a number line*****Objectives(s):***

- **Identify and represent whole numbers up to 50 on a number line using manipulatives and symbols**

Mathematical Thinking at Grade 1

Investigation 4: Sessions 1-4

Building Number Sense

Investigation 1: Sessions 1-8

Investigation 3: Sessions 1-2, 9

Number Games and Story Problems

Investigation 2: Sessions 6-8

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES***Indicator Statement:*****Recognize and apply the properties/attributes of plane geometric figures*****Objectives(s):***

- **Identify, name, and compare triangles, circles, squares, rectangles, and rhombi by their attributes**

Mathematical Thinking at Grade 1

Investigation 1: Sessions 1-4

Survey Questions and Secret Rules

Investigation 1: Sessions 1-2

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

- **Create models of triangles, circles, squares, and rectangles with varied materials**

Mathematical Thinking at Grade 1

Investigation 1: Session 1

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

- **Combine and subdivide squares and triangles**

Mathematical Thinking at Grade 1

Investigation 1: Sessions 1-4

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

SOLID GEOMETRIC FIGURES

Indicator Statement:

Recognize and use the attributes of solid geometric figures

Objectives(s):

- **Identify and compare cubes, spheres, cylinders, pyramids, cones, and rectangular prisms**

Mathematical Thinking at Grade 1

Investigation 1: Sessions 1-4

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Investigation 3: Sessions 1-5

CONGRUENCE

Indicator Statement:

Identify congruent figures

Objectives(s):

- **Match congruent figures**

Mathematical Thinking at Grade 1

Investigation 1: Session 1

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

Investigation 2: Sessions 1-10

TRANSFORMATIONS

Indicator Statement:

Recognize a transformation

Objectives(s):

- **Use the direction, location, and position words right and left**

Quilt Squares and Block Towns

Investigation 3: Sessions 6-7

- **Apply spatial reasoning in activities such as: pattern block**
Mathematical Thinking at Grade 1
Investigation 1: Sessions 1-4
Building Number Sense
Investigation 1: Sessions 1-8
Quilt Squares and Block Towns
Investigation 1: Sessions 1-10, 13-15
Investigation 2: Sessions 1-10
Investigation 3: Sessions 1-7
Number Games and Story Problems
Investigation 1: Session 1
- **Identify and demonstrate slides and flips using manipulatives**
Mathematical Thinking at Grade 1
Investigation 1: Session 1
Quilt Squares and Block Towns
Investigation 1: Sessions 3-10

Indicator Statement:**Recognize and demonstrate symmetry*****Objectives(s):***

- **Demonstrate symmetry in basic shapes and pictures by paper folding and drawing a line of symmetry**
Mathematical Thinking at Grade 1
Investigation 1: Session 1
Quilt Squares and Block Towns
Investigation 1: Sessions 1, 13-15

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES***Indicator Statement:*****Read measurement scales*****Objectives(s):***

- **Read a calendar to identify days of the week and months of the year**
Survey Questions and Secret Rules
Investigation 3: Sessions 1-3

- **Tell time in intervals of hours and half-hours using an analog clock**
In an appendix at the end of each text is Classroom Routines – Time and Change, consisting of activities in which students explore units of time, relationships among them, daily schedules and weather.
- **Compare the same time on analog and digital clocks**
In an appendix at the end of each text is Classroom Routines – Time and Change, consisting of activities in which students explore units of time, relationships among them, daily schedules and weather.
- **Read a thermometer to tell temperature to the nearest 10° F**
In an appendix at the end of each text is Classroom Routines – Time and Change, consisting of activities in which students explore units of time, relationships among them, daily schedules and weather.
- **Compare and order objects by weight on a two-pan balance**
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1-6

MEASUREMENT TOOLS

Indicator Statement:

Measure in customary units

Objectives(s):

- **Measure length of objects and pictures of objects to the nearest inch using a ruler**
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5
- **Identify and compare units of capacity using cups and gallons**
Bigger, Taller, Heavier, Smaller
Investigation 2: Sessions 1-7
- **Compare and order objects by weight in pounds, using a spring scale**
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1-6
- **Describe the attributes of length, weight, and capacity**
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1-6
Investigation 2: Sessions 1-7
Investigation 3: Sessions 1-5

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS***Indicator Statement:***

Collect, organize, and display data

Objectives(s):

- **Collect data by conducting surveys**
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

- **Collect data on tally charts**
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

- **Organize and display data to make picture graphs**
Mathematical Thinking at Grade 1
Investigation 5: Sessions 3-6
Survey Questions and Secret Rules
Investigation 2: Sessions 5-6
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-5

- **Organize and display data to make single bar graphs**
Mathematical Thinking at Grade 1
Investigation 5: Sessions 3-6
Survey Questions and Secret Rules
Investigation 2: Sessions 5-6
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-5

DATA ANALYSIS***Indicator Statement:*****Analyze data*****Objectives(s):***

- **Interpret data contained in tables**
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
- **Interpret data contained in picture graphs using a variety of categories with 1:1 intervals**
Mathematical Thinking at Grade 1
Investigation 5: Sessions 3-6
Survey Questions and Secret Rules
Investigation 2: Sessions 5-6
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-5
- **Interpret data contained in single bar graphs**
Mathematical Thinking at Grade 1
Investigation 5: Sessions 3-6
Survey Questions and Secret Rules
Investigation 2: Sessions 5-6
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-5

STANDARD 5.0—KNOWLEDGE OF PROBABILITY:

Students will use experimental methods or theoretical reasoning to determine probabilities to make predictions or solve problems about events whose outcomes involve random variation.

SAMPLE SPACE***Indicator Statement:*****Identify possible outcomes**

Objectives(s):

- **Recognize that a real life situation may have more than one outcome such as a coin having heads or tails**

Survey Questions and Secret Rules

Investigation 4: Sessions 4-5

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR

COMPUTATION: Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE**Indicator Statement:**

Apply knowledge of whole numbers and place value

Objectives(s):

- **Use concrete materials to compose and decompose quantities up to 20**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 1: Sessions 1-9

Investigation 2: Sessions 1-9

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-8

Investigation 3: Sessions 1-13

- **Identify multiple representations for a number, such as: 12, $6 + 6$, dozen**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 1: Sessions 1-9

Investigation 2: Sessions 1-9

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-8

Investigation 3: Sessions 1-13

- **Demonstrate instant recognition of quantities in patterned sets**
Building Number Sense
Investigation 3: Sessions 1-2, 5-9
Number Games and Story Problems
Investigation 2: Sessions 2, 6-12
- **Use the numbers of 5 and 10 as anchors in relationship to other numbers**
Number Games and Story Problems
Investigation 1: Session 10
Investigation 2: Sessions 9-12
- **Read, write, and represent whole numbers up to 100 and beyond using models, symbols, and words**
Mathematical Thinking at Grade 1
Investigation 2: Sessions 1-6
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 1: Sessions 1-9
Investigation 2: Sessions 1-9
Investigation 3: Sessions 1-2, 5-7
Number Games and Story Problems
Investigation 1: Sessions 1-10
Investigation 2: Sessions 1-13
- **Express whole numbers up to 99 using expanded form**
Mathematical Thinking at Grade 1
Investigation 2: Sessions 1-6
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 1: Sessions 1-9
Investigation 2: Sessions 1-9
Investigation 3: Sessions 1-2, 5-7
Number Games and Story Problems
Investigation 1: Sessions 1-10
Investigation 2: Sessions 1-13
- **Identify the place value of a digit in a whole number up to 99**
Mathematical Thinking at Grade 1
Investigation 2: Sessions 1-6
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 1: Sessions 1-8
Investigation 2: Sessions 1-9
Investigation 3: Sessions 1-9
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

- **Compare and order whole numbers up to 99 using terms such as: greater than, less than, equal to**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-3, 5-6

Investigation 4: Sessions 2-3

Building Number Sense

Investigation 2: Session 3

Investigation 3: Sessions 3-7

- **Estimate quantities up to 50 and use the term "about"**

Building Number Sense

Investigation 3: Session 9

Quilt Squares and Block Towns

Investigation 3: Sessions 6-7

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

- **Count to 100**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 1: Sessions 1-9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1-2, 5-7

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-13

- **Count forward and backward starting with numbers other than one**

Number Games and Story Problems

Investigation 2: Sessions 1-2, 9-13

- **Use ordinal numbers to indicate position: first through tenth**

Building Number Sense

Investigation 3, Sessions 5-7, 9

Number Games and Story Problems

Investigation 2: Sessions 4-8

Indicator Statement:
Apply knowledge of fractions

Objectives(s):

- **Read, write, and represent fractions as parts of a single region using symbols and models with denominators of 2 or 4**

Grade 2: Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

Read, write, and represent halves as parts of a set using pictures and models

Grade 2: Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

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Indicator Statement:
Apply knowledge of money

Objectives(s):

- **Determine the value of a given set of mixed currency up to \$1**

Number Games and Story Problems

Investigation 2: Session 3

- **Demonstrate monetary value using real or play coins**

Number Games and Story Problems

Investigation 2: Session 3

- **Compare the value of 2 sets of mixed currency up to \$1.00**

Number Games and Story Problems

Investigation 2: Session 3

NUMBER COMPUTATION

Indicator Statement:
Analyze number relations and compute

Objectives(s):

- **Develop strategies for addition and subtraction basic facts such as: counting on, counting back, making ten, doubles, and doubles plus one**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 2: Sessions 1-9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-8, 10-12

Investigation 3: Sessions 1-13

- **Solve a given word problem based on addition or subtraction situation**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 2: Sessions 1-9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-8, 10-12

Investigation 3: Sessions 1-13

- **Identify the concept of inverse operation to addition and subtraction**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 2: Sessions 1-9

Investigation 4: Sessions 1-10

Number Games and Story Problems

Investigation 1: Sessions 1-10

Investigation 2: Sessions 1-8, 10-12

Investigation 3: Sessions 1-13

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING

Students gain experience in choosing and applying appropriate problem-solving strategies throughout each course. The fundamental emphases of the curriculum is for students to participate in and conduct investigations.

Indicator Statement:

Apply a variety of concepts, processes, and skills to solve problems

Objectives(s):

- **Identify the question in the problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Decide if enough information is present to solve the problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

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- **Make a plan to solve a problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Apply a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Select a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Identify alternative ways to solve a problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Show that a problem might have multiple solutions or no solution**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

- **Extend the solution of a problem to a new problem situation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 2: Sessions 1-10

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

REASONING***Indicator Statement:***

Justify ideas or solutions with mathematical concepts or proofs

Objectives(s):

- **Use inductive or deductive reasoning**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-4, 6

Investigation 5: Sessions 2-4

Building Number Sense

Investigation 1: Sessions 1-9

Investigation 2: Sessions 1-9

Investigation 3: Sessions 5-7

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 4: Sessions 4-5

Quilt Squares and Block Towns

Investigation 1: Sessions 3-6

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

- **Make or test generalizations**

Mathematical Thinking at Grade 1

Investigation 5: Sessions 3-4

Building Number Sense

Investigation 4: Session 10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 3: Sessions 1-2

Bigger, Taller, Heavier, Smaller

Investigation 2: Sessions 5-7

- **Support or refute mathematical statements or solutions**
 - Mathematical Thinking at Grade 1
 - Investigation 5: Sessions 3-4
 - Building Number Sense
 - Investigation 4: Session 10
 - Survey Questions and Secret Rules
 - Investigation 2: Sessions 1-6
 - Quilt Squares and Block Towns
 - Investigation 3: Sessions 1-7
 - Number Games and Story Problems
 - Investigation 3: Sessions 1-2
 - Bigger, Taller, Heavier, Smaller
 - Investigation 2: Sessions 5-7

- **Use methods of proof, i.e., direct, indirect, paragraph, or contradiction**
 - Mathematical Thinking at Grade 1
 - Investigation 2: Sessions 1-6
 - Investigation 4: Sessions 2-4, 6
 - Investigation 5: Sessions 2-4
 - Building Number Sense
 - Investigation 1: Sessions 1-9
 - Investigation 2: Sessions 1-9
 - Investigation 3: Sessions 5-7
 - Investigation 4: Sessions 1-10
 - Survey Questions and Secret Rules
 - Investigation 4: Sessions 4-5
 - Quilt Squares and Block Towns
 - Investigation 1: Sessions 3-6
 - 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

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Students use appropriate mathematical terms, vocabulary, symbols and models to explain clearly and logically solutions to problems throughout the course.

Objectives(s):

- **Use multiple representations to express concepts or solutions**

Representative Pages:

Mathematical Thinking at Grade 1

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 1-5

- **Express mathematical ideas orally**

Representative Pages:

Mathematical Thinking at Grade 1

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules

Investigation 2: Sessions 1-6

Quilt Squares and Block Towns

Investigation 1: Sessions 1-15

Number Games and Story Problems

Investigation 3: Sessions 1-13

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 1-5

- **Explain mathematically ideas in written form**

Representative Pages:

Mathematical Thinking at Grade 1

Investigation 4: Sessions 1-6

Building Number Sense

Investigation 4: Sessions 1-10

Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

- **Express solutions using concrete materials**

Representative Pages:

Mathematical Thinking at Grade 1
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 4: Sessions 1-10
Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**

Representative Pages:

Mathematical Thinking at Grade 1
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 4: Sessions 1-10
Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

- **Explain solutions in written form**

Representative Pages:

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

Building Number Sense
Investigation 4: Sessions 1-10
Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

- **Ask questions about mathematical ideas or problems**

Representative Pages:

Mathematical Thinking at Grade 1
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 4: Sessions 1-10
Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

- **Give or use feedback to revise mathematical thinking**

Representative Pages:

Mathematical Thinking at Grade 1
Investigation 4: Sessions 1-6
Building Number Sense
Investigation 4: Sessions 1-10
Survey Questions and Secret Rules
Investigation 2: Sessions 1-6
Quilt Squares and Block Towns
Investigation 1: Sessions 1-15
Number Games and Story Problems
Investigation 3: Sessions 1-13
Bigger, Taller, Heavier, Smaller
Investigation 3: Sessions 1-5

CONNECTIONS

Indicator Statement:

Relate or apply mathematics within the discipline, to other disciplines, and to life

Objectives(s):

- **Identify mathematical concepts in relationship to other mathematical concepts**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-6

Building Number Sense

Investigation 1: Sessions 5-6, 9

Investigation 2: Sessions 1-8

Investigation 3: Sessions 5-7

Investigation 4: Sessions 1-9

Number Games and Story Problems

Investigation 2: Sessions 1-2, 9-12

Investigation 3: Sessions 1-13

- **Identify mathematical concepts in relationship to other disciplines**

Survey Questions and Secret Rules

Investigation 3: Sessions 1-3

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-4

Investigation 2: Sessions 5-7

- **Identify mathematical concepts in relationship to life**

Mathematical Thinking at Grade 1

Investigation 3: Sessions 1-4

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

Quilt Squares and Block Towns

Investigation 2: Sessions 3-6

Investigation 3: Sessions 1-7

Number Games and Story Problems

Investigation 2: Session 3

Bigger, Taller, Heavier, Smaller

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

- **Use the relationship among mathematical concepts to learn other mathematical concepts**

Mathematical Thinking at Grade 1

Investigation 2: Sessions 1-6

Investigation 4: Sessions 2-6

Building Number Sense

Investigation 1: Sessions 5-6, 9

Investigation 2: Sessions 1-8

Investigation 3: Sessions 5-7

Investigation 4: Sessions 1-9

Number Games and Story Problems

Investigation 2: Sessions 1-2, 9-12

Investigation 3: Sessions 1-13

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum**

Grade Two

Standard 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify, describe, extend, and create numeric patterns

Objectives(s):

- **Represent and analyze numeric patterns using skip counting by 2, 5, and 10 starting with any whole number and using whole numbers to 100**
Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons and Combinations
Investigation 2: Sessions 1-5, 10
Putting Together and Taking Apart
Investigation 2: Sessions 1-2
- **Represent and analyze numeric patterns using skip counting backward by 10s starting with any 2-digit whole number**
Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons and Combinations
Investigation 2: Sessions 1-5, 10
Putting Together and Taking Apart
Investigation 2: Sessions 1-2
- **Recognize a function table as a relationship between numbers**
Mathematical Thinking at Grade 2
Investigation 2: Session 2
Putting Together and Taking Apart
Investigation 2: Session 2

- **Complete a function table with a given one-operation rule (+, -) using whole numbers**

Mathematical Thinking at Grade 2
Investigation 2: Session 6
Putting Together and Taking Apart
Investigation 2: Session 2

Indicator Statement:

Identify, copy, describe, create, and extend nonnumeric patterns

Objectives(s):

- **Represent and analyze growing patterns that start at the beginning and show no more than 3 levels, and ask for the next level, using symbols, shapes, designs, and pictures**
Mathematical Thinking at Grade 2
Investigation 3: Sessions 1-6
Timelines and Rhythm Patterns
Investigation 2: Sessions 1-5
- **Represent and analyze repeating patterns using 3 different objects in the core of the pattern**
Mathematical Thinking at Grade 2
Investigation 3: Sessions 1-6
Timelines and Rhythm Patterns
Investigation 2: Sessions 1-5
- **Transfer a repeating pattern from one medium to 2 different media using no more than 3 different objects in the core of the pattern such as: red, green, red, green, ... A, B, A, B, ... \triangle , \square , \triangle , \square , ...**
Mathematical Thinking at Grade 2
Investigation 3: Sessions 1-6
Timelines and Rhythm Patterns
Investigation 2: Sessions 1-5

EXPRESSIONS, EQUATIONS, AND INEQUALITIES***Indicator Statement:*****Write and identify expressions*****Objectives(s):***

- **Represent numeric quantities using operational symbols (+, -) and whole numbers to 25**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-3, 6, 8

Investigation 5: Session 3

Coins, Coupons and Combinations

Investigation 1: Sessions 1-3, 6, 10

Putting Together and Taking Apart

Investigation 2: Session 1

Investigation 3: Sessions 1-5

Indicator Statement:**Identify, write, and solve equations and inequalities*****Objectives(s):***

- **Represent relationships using appropriate relational symbols (>, <, =) and operational symbols (+, -) with whole numbers to 100**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 5: Sessions 1-3

Coins, Coupons and Combinations

Investigation 1: Sessions 1-10

Investigation 2: Session 10

Investigation 3: Sessions 1-5

Investigation 4: Session 2-4

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-8

- **Find the missing number (unknown) in a number sentence using operational symbols (+, -) with whole numbers up to 50**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-3, 6, 8

Investigation 5: Session 3

Coins, Coupons and Combinations
Investigation 1: Sessions 8-9
Putting Together and Taking Apart
Investigation 3: Sessions 1-5

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS

Indicator Statement:

Locate points on a number line

Objectives(s):

- **Represent whole numbers up to 100 on a number line**
Mathematical Thinking at Grade 2
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-4

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES

Indicator Statement:

Recognize and apply the properties/attributes of plane geometric figures

Objectives(s):

- **Identify and describe sides and corners**
Mathematical Thinking at Grade 2
Investigation 3: Sessions 1-2
Shapes, Halves and Symmetry
Investigation 1: Sessions 1-3
- **Identify and describe quadrilaterals such as: squares, rectangles, rhombi**
Shapes, Halves and Symmetry
Investigation 2: Sessions 1-6
Investigation 3: Sessions 1-2
- **Identify and describe polygons by the number of sides such as: triangles, squares, rectangles, hexagons, octagons**
Shapes, Halves and Symmetry
Investigation 1: Sessions 2-3
Investigation 2: Sessions 1-6
Investigation 3: Sessions 1-2

- **Combine and subdivide squares, triangles, and rectangles to identify a new shape**

Shapes, Halves and Symmetry

Investigation 1: Sessions 2-3

Investigation 2: Sessions 1-6

SOLID GEOMETRIC FIGURES

Indicator Statement:

Analyze the properties of solid geometric figures

Objectives(s):

- **Compare two- and three-dimensional shapes such as: square to a cube, square and rectangle to a rectangular prism.**

Mathematical Thinking at Grade 2

Investigation 3: Sessions 1-2

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

CONGRUENCE

Indicator Statement:

Compare congruent figures

Objectives(s):

- **Describe congruent figures as having the same size and shape**

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

Investigation 3: Sessions 3-5

TRANSFORMATIONS

Indicator Statement:

Recognize a transformation

Objectives(s):

- **Apply visualization and spatial reasoning in activities such as: tangrams**

Mathematical Thinking at Grade 2

Investigation 3: Sessions 1-4, 6

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

- **Identify and demonstrate slides, flips, and turns**

Mathematical Thinking at Grade 2

Investigation 3: Sessions 1-4, 6

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-6

Indicator Statement:

Demonstrate symmetry

Objectives(s):

- **Recognize that basic shapes have several lines of symmetry**

Shapes, Halves and Symmetry

Investigation 4: Sessions 1-7

- **Demonstrate symmetry in basic shapes and pictures by drawing 2 lines of symmetry**

Shapes, Halves and Symmetry

Investigation 4: Sessions 1-7

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES

Indicator Statement:

Read customary and metric measurement scales

Objectives(s):

- **Read the scale on a ruler to identify length, in inches**

How Long? How Far?

Can be developed from

Investigation 1: Sessions 1-8

Investigation 2: Sessions 4-5

- **Tell time in intervals of 5 minutes using an analog clock**

Each text has an Appendix; About Classroom Routines which includes a feature entitled Time and Time Again. This section describes time-related activities and schedules.

- **Compare the same time on analog and digital clocks**
Each text has an Appendix; About Classroom Routines which includes a feature entitled Time and Time Again. This section describes time-related activities and schedules.
- **Read a thermometer to the nearest 5° (°F and °C) on a thermometer with a scale of 10° intervals**
In an appendix at the end of each text in Grade 1 is Classroom Routines – Time and Change, consisting of activities in which students explore units of time, relationships among them, daily schedules and weather.
- **Identify and compare the weight of objects, to the nearest pound, on a standard scale**
Grade 1 Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1-6

MEASUREMENT TOOLS

Indicator Statement:

Measure in customary and metric units

Objectives(s):

- **Measure length of objects and pictures of objects using a ruler or tape measure to the nearest inch, centimeter, and foot**
How Long? How Far?
Investigation 1: Sessions 1-8
Investigation 2: Sessions 4-5
- **Measure capacity of objects using cup, pint, quart, liter, and gallon**
Grade 1 Bigger, Taller, Heavier, Smaller
Investigation 2: Sessions 1-7
- **Measure objects to the nearest pound and kilogram using a variety of scales**
Grade 1 Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1-6
- **Select and use appropriate units of measure for length/height, weight, and capacity**
How Long? How Far?
Investigation 1: Sessions 1-8
Investigation 2: Sessions 4-5

APPLICATIONS IN MEASUREMENT***Indicator Statement:*****Apply measurement concepts*****Objectives(s):***

- **Develop the concept of perimeter by counting units around a picture or geometric shape**
Shapes, Halves and Symmetry
Investigation 1: Sessions 2-5
Investigation 2: Sessions 2-6
- **Develop the concept of area by counting square units within a picture or geometric shape**
Shapes, Halves and Symmetry
Investigation 1: Sessions 2-5
Investigation 2: Sessions 2-6

Indicator Statement:**Calculate to determine equivalent units*****Objectives(s):***

- **Recognize equivalent units of 12 inches = 1 foot**
Can be developed from:
How Long? How Far?
Investigation 1: Sessions 1-8
Investigation 2: Sessions 4-5

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS***Indicator Statement:*****Collect, organize, and display data*****Objectives(s):***

- **Collect data by conducting surveys**
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 5: Sessions 1-6

Coins, Coupons and Combinations

Investigation 1: Session 11

Investigation 2: Session 10

Does It Walk, Crawl or Swim?

Investigation 1: Sessions 1-6

Investigation 4: Sessions 1-3

How Many Pockets? How Many Teeth:

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-2, 4-5

Investigation 3: Session 1

- **Collect data in tables**

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Investigation 6: Sessions 1-6

Coins, Coupons and Combinations

Investigation 1: Session 11

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 1-4

- **Organize and display data to make pictographs using scales of 1:1 and 2:1**

Mathematical Thinking at Grade 2

Investigation 5: Sessions 1-2, 6

Does It Walk, Crawl or Swim?

Investigation 1: Sessions 1-2

Investigation 2: Sessions 3-4

Investigation 3: Sessions 2-3

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

- **Organize and display data to make single bar graphs**

Mathematical Thinking at Grade 2

Investigation 5: Sessions 1-2, 6

Does It Walk, Crawl or Swim?

Investigation 1: Sessions 1-2

Investigation 2: Sessions 3-4

Investigation 3: Sessions 2-3

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

DATA ANALYSIS

Indicator Statement:

Analyze data

Objectives(s):

- **Interpret data contained in tables**

Mathematical Thinking at Grade 2

Investigation 2: Session 6

Investigation 6: Sessions 1-6

Coins, Coupons and Combinations

Investigation 1: Session 11

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 1-4

- **Interpret data contained in pictographs using scales of 1:1 and 2:1**

Mathematical Thinking at Grade 2

Investigation 5: Sessions 1-2, 6

Does It Walk, Crawl or Swim?

Investigation 1: Sessions 1-2

Investigation 2: Sessions 3-4

Investigation 3: Sessions 2-3

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

- **Interpret data contained in single bar graphs using a variety of categories and intervals of 1, 2, 5, and 10**

Mathematical Thinking at Grade 2

Investigation 5: Sessions 1-2, 6

Does It Walk, Crawl or Swim?

Investigation 1: Sessions 1-2

Investigation 2: Sessions 3-4

Investigation 3: Sessions 2-3

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

STANDARD 5.0—KNOWLEDGE OF PROBABILITY:

Students will use experimental methods or theoretical reasoning to determine probabilities to make predictions or solve problems about events whose outcomes involve random variation.

SAMPLE SPACE

Indicator Statement:

Identify possible outcomes

Objectives(s):

- **Identify some possible outcomes that make up the sample space such as on a number cube rolling a 2**

The concept of probability is introduced in Grade 3. Students in Grade 2 may predict future events based on collected data.

Does It Walk, Crawl, or Swim?

Investigation 2: Sessions 3-4

How Many Pockets? How Many Teeth?

Investigation 2: Sessions 3, 6

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR COMPUTATION: Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE

Indicator Statement:

Apply knowledge of whole numbers and place value

Objectives(s):

- **Use concrete materials to compose and decompose quantities up to 100**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 4: Sessions 1-2

Coins, Coupons and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Sessions 3, 6-9

Investigation 4: Sessions 1-4

Putting Together and Taking Apart

Investigation 1: Sessions 1-2, 5-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

- **List multiple representations for a number**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 4: Sessions 1-2

Coins, Coupons and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Sessions 3, 6-9

Investigation 4: Sessions 1-4

Putting Together and Taking Apart

Investigation 1: Sessions 1-2, 5-6

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

- **Develop a sense of the size of a number in relation to other numbers**
Mathematical Thinking at Grade 2
Investigation 2: Sessions 2-3
Investigation 4: Sessions 1-2, 5
Coins, Coupons and Combinations
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 5: Session 1
- **Use the numbers of 10, 50, and 100 as anchors in relationship to other numbers**
Coins, Coupons and Combinations
Investigation 2: Sessions 4-5, 10
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-6
Investigation 5: Sessions 2-3, 8
- **Read, write, and represent whole numbers using models, symbols, and words through 1000**
Mathematical Thinking at Grade 2
Investigation 1: Session 1
Investigation 2: Sessions 1-3, 6, 8
Investigation 4: Sessions 1-4
Coins, Coupons and Combinations
Investigation 1: Sessions 1-11
Investigation 2: Sessions 3, 6-9
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-7
- **Express whole numbers up to 999 using expanded form**
Mathematical Thinking at Grade 2
Investigation 1: Session 1
Investigation 2: Sessions 1-3, 6, 8
Investigation 4: Sessions 1-4
Coins, Coupons and Combinations
Investigation 1: Sessions 1-11
Investigation 2: Sessions 3, 6-9
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-7

- **Identify the place value of a digit in whole numbers up to 999**
Mathematical Thinking at Grade 2
Investigation 2: Sessions 6, 8
Investigation 4: Sessions 1-5
Coins, Coupons and Combinations
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-10
Investigation 3: Sessions 1-5
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-7
Investigation 4: Sessions 1-4
Investigation 5: Sessions 2-3, 6

- **Compare and order whole numbers up to 999 using words and relational symbols ($>$, $<$, $=$)**
Mathematical Thinking at Grade 2
Investigation 1: Session 1
Investigation 2: Sessions 1-3, 6, 8
Investigation 5: Sessions 1-3
Coins, Coupons and Combinations
Investigation 1: Sessions 1-10
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 3: Sessions 1-5
Investigation 4: Sessions 1-4
Investigation 5: Sessions 1-8

- **Estimate quantities up to 100 using a reference point such as 10 and the terminology "about"**
Coins, Coupons and Combinations
Investigation 1: Sessions 8-9
Shapes, Halves and Symmetry
Investigation 1: Sessions 2-5

- **Count forward by 2s, 5s, and 10s starting with numbers other than one**
Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons and Combinations
Investigation 2: Sessions 1-5, 10
Putting Together and Taking Apart
Investigation 2: Sessions 1-2

- **Count backward by 2s, 5s, and 10s from a multiple of that number**
Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons and Combinations
Investigation 2: Sessions 1-5, 10
Putting Together and Taking Apart
Investigation 2: Sessions 1-2
- **Use ordinal numbers to indicate position up to thirty-first**
Mathematical Thinking at Grade 2
Investigation 4: Sessions 1-4
Coins, Coupons and Combinations
Investigation 2: Sessions 3, 10
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Session 1
Timelines and Rhythm Patterns
Investigation 1: Sessions 1-3

Indicator Statement:**Apply knowledge of fractions****Objectives(s):**

- **Read, write, and represent fractions as parts of a single region using symbols or models with denominators of 2, 3, or 4**
Shapes, Halves and Symmetry
Investigation 3: Sessions 1-8
- **Read, write, and represent halves or fourths as parts of a set using symbols, words, and models**
Shapes, Halves and Symmetry
Investigation 3: Sessions 1-8

Indicator Statement:**Apply knowledge of money****Objectives(s):**

- **Determine the value of a given set of mixed currency up to \$10**
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

- **Represent money amounts up to \$10**
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
- **Compare the value of 2 sets of mixed currency up to \$10**
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

NUMBER THEORY

Indicator Statement:

Apply number relationships

Objectives(s):

- **Build and describe models of even and odd numbers using concrete materials, and discuss the models**
Coins, Coupons and Combinations
Investigation 2: Sessions 1-10
Investigation 4: Sessions 1-4
Putting Together and Taking Apart
Investigation 2: Sessions 1-4

NUMBER COMPUTATION***Indicator Statement:*****Analyze number relations and compute*****Objectives(s):***

- **Demonstrate proficiency with addition and subtraction basic facts using a variety of strategies**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 4: Sessions 1-5

Investigation 5: Session 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 no more than 3 whole number addends with no more than 2 digits in each addend and a sum of no more than 100**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 4: Sessions 1-5

Investigation 5: Session 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

- **Subtract whole numbers with no more than 2 digits in the minuend or the subtrahend**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 6, 8

Investigation 4: Sessions 1-5

Investigation 5: Session 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

- **Solve word problems based on addition or subtraction situations**

Coins, Coupons and Combinations

Investigation 1: Sessions 10-11

Investigation 3: Sessions 4-5

Investigation 4: Session 5

Putting Together and Taking Apart

Investigation 1: Sessions 3-6

Investigation 2: Session 7

Investigation 3: Sessions 2-5

Investigation 4: Sessions 3-4

Investigation 5: Sessions 1-8

- **Write word problems for addition and subtraction situations**

Coins, Coupons and Combinations

Investigation 1: Sessions 10-11

Investigation 3: Sessions 4-5

Investigation 4: Session 5

Putting Together and Taking Apart

Investigation 1: Sessions 3-6

Investigation 2: Session 7

Investigation 3: Sessions 2-5

Investigation 4: Sessions 3-4

Investigation 5: Sessions 1-8

- **Add and subtract money amounts up to \$1**
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
- **Apply the concept of inverse operations to addition and subtraction**
Coins, Coupons and Combinations
Investigation 3: Sessions 4-5
Putting Together and Taking Apart
Investigation 1: Sessions 1-4
Investigation 3: Session 2
- **Build equal groups to model multiplication**
Students are gradually and progressively introduced to multiplication over grades K-2. In Grade 2, students practice skip counting by 2's, 5's and 10's.
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 4: Sessions 1-2
Shapes, Halves and Symmetry
Investigation 2: Session 3
Coins, Coupons and Combinations
Investigation 2: Sessions 1-5, 10
- **Build groups that share equally for division**
Students are gradually and progressively introduced to division in grades K-2. In grade 2, students explore the relationship between skip counting and grouping and apply these concepts to problem situations.
Mathematical Thinking at Grade 2
Investigation 4: Session 1
Coins, Coupons and Combinations
Investigation 2: Sessions 1, 3-5, 10

Indicator Statement:
Estimation**Objectives(s):**

- **Determine the reasonableness of sums and differences**

Coins, Coupons and Combinations

Investigation 1: Sessions 7-9

Investigation 2: Session 10

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING**Indicator Statement:****Apply a variety of concepts, processes, and skills to solve problems**

Students gain experience in choosing and applying appropriate problem-solving strategies throughout each book in the series. The curriculum emphasizes student participation and investigation in each unit of study.

Objectives(s):

- **Identify the question in the problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Decide if enough information is present to solve the problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Make a plan to solve a problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Apply a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Select a strategy, i.e., draw a picture, guess and check, finding a pattern, writing an equation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Identify alternative ways to solve a problem**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Show that a problem might have multiple solutions or no solution**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Extend the solution of a problem to a new problem situation**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

REASONING

Students use inductive as they generalize solution processes and draw conclusions.

They apply inductive reasoning as they sort and classify objects, identify similar attributes and extend patterns.

Students reason deductively as they use models, known facts and properties to draw conclusions.

Indicator Statement:

Justify ideas or solutions with mathematical concepts or proofs

Objectives(s):

- **Use inductive or deductive reasoning**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

How Long? How Far?

Investigation 1: Session 1

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Make or test generalizations**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

How Long? How Far?

Investigation 1: Session 1

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Support or refute mathematical statements or solutions**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 4: Sessions 1-4

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-8

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-4

- **Use methods of proof, i.e., direct, indirect, paragraph, or contradiction**

Representative Pages:

Mathematical Thinking at Grade 2

Investigation 4: Sessions 1-4

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-8

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-4

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Students show and communicate ideas in a variety of ways, including words, symbols, pictures, charts, tables and models throughout the course. The following are

Representative Pages:

Objectives(s):

- **Use multiple representations to express concepts or solutions**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 5: Sessions 1-8

How Long? How Far?

Investigation 1: Sessions 1-4

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

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

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

- **Express solutions using concrete materials**
 - Mathematical Thinking at Grade 2
 - Investigation 2: Sessions 1-8
 - Coins, Coupons and Combinations
 - Investigation 3: Sessions 1-5
 - Does It Walk, Crawl or Swim?
 - Investigation 2: Sessions 1-4
 - Shapes, Halves and Symmetry
 - Investigation 1: Sessions 1-8

Putting Together and Taking Apart
Investigation 1: Sessions 1-6
How Long? How Far?
Investigation 1: Session 1
How Many Pockets? How Many Teeth?
Investigation 3: Sessions 1-5
Timelines and Rhythm Patterns
Investigation 1: Sessions 1-6

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**

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

- **Explain solutions in written form**

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

- **Ask questions about mathematical ideas or problems**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

How Long? How Far?

Investigation 1: Session 1

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Give or use feedback to revise mathematical thinking**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1-8

Coins, Coupons and Combinations

Investigation 3: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 1: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 1-6

How Long? How Far?

Investigation 1: Session 1

How Many Pockets? How Many Teeth?

Investigation 3: Sessions 1-5

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

CONNECTIONS

Indicator Statement:

Relate or apply mathematics within the discipline, to other disciplines, and to life

Objectives(s):

- **Identify mathematical concepts in relationship to other mathematical concepts**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 4: Session 1

Investigation 5: Sessions 1-6

Coins, Coupons and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Sessions 1-10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 2-4, 6-8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 1-5

Investigation 3: Sessions 1-5

- **Identify mathematical concepts in relationship to other disciplines**

Coins, Coupons and Combinations

Investigation 1: Sessions 4-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 3-4

Investigation 3: Session 1

Investigation 4: Session 1

Putting Together and Taking Apart

Investigation 1: Sessions 1, 3-4

Timelines and Rhythm Patterns

Investigation 1: Sessions 1-6

- **Identify mathematical concepts in relationship to life**

Mathematical Thinking at Grade 2

Investigation 2: Sessions 1, 7

Investigation 4: Session 2

Investigation 5: Sessions 1-5

Coins, Coupons and Combinations

Investigation 1: Sessions 2-3, 7

Investigation 2: Sessions 6-9

Shapes, Halves and Symmetry

Investigation 4: Sessions 5-7

How Long? How Far?

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-8

Timelines and Rhythm Patterns

Investigation 2: Sessions 1-5

- **Use the relationship among mathematical concepts to learn other mathematical concepts**

Mathematical Thinking at Grade 2

Investigation 1: Session 1

Investigation 4: Session 1

Investigation 5: Sessions 1-6

Coins, Coupons and Combinations

Investigation 1: Sessions 1-11

Investigation 2: Sessions 1-10

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-5

Does It Walk, Crawl or Swim?

Investigation 2: Sessions 1-4

Shapes, Halves and Symmetry

Investigation 3: Sessions 1-8

Putting Together and Taking Apart

Investigation 1: Sessions 2-4, 6-8

How Many Pockets? How Many Teeth?

Investigation 1: Sessions 1-5

Investigation 3: Sessions 1-5

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum**

Grade Three

STANDARD 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify, describe, extend, and create numeric patterns and functions

Objectives(s):

- **Represent and analyze numeric patterns using skip counting**
Assessment Limits:
Use 2, 5, 10, or 100 starting with any whole number (0 – 1000)
Mathematical Thinking at Grade 3
Investigation 1: Sessions 1-3
Things That Come in Groups
Investigation 2: Sessions 1-6
Investigation 3: Sessions 3-4
Investigation 5: Session 1
Landmarks in the Hundreds
Investigation 1: Sessions 4-5

- **Represent and analyze numeric patterns using skip counting**
Assessment Limits:
Use 3 or 4 starting with 0, 1, 2, 3, or 4 (0 – 30)
Things That Come in Groups
Investigation 2: Sessions 1-6
Investigation 3: Sessions 3-4
Landmarks in the Hundreds
Investigation 1: Sessions 4-5

- **Represent and analyze numeric patterns using skip counting backward**
Assessment Limits:
Use 10 or 100 starting with any whole number (0 – 1000)
Things That Come in Groups
Investigation 1: Sessions 3-4

- **Complete a function table using a given addition or subtraction rule**
Things That Come in Groups
Investigation 5: Sessions 1-4
Fair Shares
Investigation 2: Sessions 5-6

Indicator Statement:

Identify, describe, extend, and create non-numeric patterns

Objectives(s):

- **Represent and analyze growing patterns using symbols, shapes, designs, or pictures**
Assessment Limits:
Start at the beginning, show at least 3 levels but no more than 5 levels, and ask for the next level
Mathematical Thinking at Grade 3
Investigation 1: Sessions 2-3
Things That Come in Groups
Investigation 2: Sessions 1-6
Investigation 3: Sessions 3-4
Investigation 5: Sessions 1, 4
Flips, Turns and Area
Investigation 1: Sessions 1-3
From Paces to Feet
Investigation 1: Session 2
Landmarks in the Hundreds
Investigation 1: Sessions 4-5
Fair Shares
Investigation 2: Sessions 5-6
- **Represent and analyze repeating patterns using symbols, shapes, designs, or pictures**
Assessment Limits:
Use no more than 4 objects in the core of the pattern
Mathematical Thinking at Grade 3
Investigation 1: Sessions 2-3
Things That Come in Groups
Investigation 2: Sessions 1-6
Investigation 3: Sessions 3-4
Investigation 5: Sessions 1, 4
Flips, Turns and Area
Investigation 1: Sessions 1-3

From Paces to Feet

Investigation 1: Session 2

Landmarks in the Hundreds

Investigation 1: Sessions 4-5

Fair Shares

Investigation 2: Sessions 5-6

EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Indicator Statement:

Write and identify expressions

Objectives(s):

- **Represent numeric quantities using operational symbols (+, -, ×, ÷)**

Assessment Limits:

Use operational symbols (+ or -) and whole numbers (0 – 50)

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4

Things That Come in Groups

Investigation 1: Sessions 2-4

Investigation 2: Sessions 2-4

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-2

Landmarks in the Hundreds

Investigation 1: Sessions 2-7

Investigation 2: Sessions 1-6

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

Investigation 5: Session 1

Indicator Statement:

Identify, write, solve, and apply equations and inequalities

Objectives(s):

- **Represent relationships using appropriate relational symbols (<, >, or =) and operational symbols (+, -, ×, ÷) on either side**

Assessment Limits:

Use operational symbols (+ or -) and whole numbers (0 – 1000)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Fair Shares

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-2

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-2

Investigation 3: Session 1

Investigation 4: Sessions 1-2

Investigation 5: Sessions 1-3

- **Find the missing number (unknown) in a number sentence (equation) using operational symbols (+, -, ×, ÷)**

Assessment Limits:**Use one operational symbol (+ or -) and whole numbers (0 – 100)**

Things That Come in Groups

Investigation 1: Session 3

Investigation 4: Sessions 1-4

Up and Down the Number Line

Investigation 1: Sessions 6-7

- **Find the missing number(s) (unknown) on one or both sides of a number sentence (equation)**

Things That Come in Groups

Investigation 1: Session 3

Investigation 4: Sessions 1-4

Up and Down the Number Line

Investigation 1: Sessions 6-7

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS**Indicator Statement:****Locate points on a number line****Objectives(s):**

- **Represent whole numbers on a number line**

Assessment Limits:**Use whole numbers (0 - 500)**

From Paces to Feet

Investigation 1: Sessions 1-2

Up and Down the Number Line

Investigation 1: Sessions 1-8

Investigation 2: Session 1

Combining and Comparing

Investigation 4: Session 1

- **Represent proper fractions on a number line**

Assessment Limits:

Use fractions that have denominators of 2, 3, or 4

From Paces to Feet

Investigation 1: Session 2

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES

Indicator Statement:

Analyze the properties of plane geometric figures

Objectives(s):

- **Identify or describe points, lines, line segments, rays, and angles**
Mathematical Thinking at Grade 3
Investigation 2: Session 1
Turtle Paths
Investigation 1: Session 1
Investigation 2: Sessions 1-3
- **Identify or describe polygons**
Assessment Limits:
Use triangles, quadrilaterals, pentagons, hexagons, or octagons and the number of sides or vertices
Flips, Turns and Area
Investigation 2: Sessions 1-3
Exploring Solids and Bones
Investigation 2: Sessions 1-2
- **Identify or describe quadrilaterals**
Assessment Limits:
Use squares, rectangles, rhombi, parallelograms, and trapezoids and the length of sides
Flips, Turns and Area
Investigation 2: Sessions 1-3
Exploring Solids and Bones
Investigation 2: Sessions 1-2

- Identify triangles, rectangles, or squares as part of a composite figure

Assessment Limits:

Use a combination of 2 of the stated polygons

Flips, Turns and Area

Investigation 2: Sessions 1-3

Exploring Solids and Bones

Investigation 2: Sessions 1-2

Indicator Statement:

Analyze geometric relationships

Objectives(s):

- Identify right angles

Turtle Paths

Investigation 1: Session 1

Investigation 2: Sessions 1-3

SOLID GEOMETRIC FIGURES**Indicator Statement:**

Analyze the properties of solid geometric figures

Objectives(s):

- Identify and describe cubes, rectangular prisms, and triangular prisms

Assessment Limits:

Use cubes and the number of edges, faces, vertices, or shape of each face

Exploring Solids and Bones

Investigation 1: Sessions 1-2

Investigation 2: Sessions 3-5

Investigation 3: Sessions 1-2

CONGRUENCE**Indicator Statement:**

Analyze congruent figures

Objectives(s):

- Identify or describe geometric figures as congruent

Assessment Limits:

Use the same shape and same size

Flips, Turns and Area

Investigation 1: Sessions 1, 5

Investigation 2: Sessions 2-3

TRANSFORMATIONS***Indicator Statement:*****Analyze a transformation*****Objectives(s):***

- **Identify and describe the results of a slide, flip, and turn**

Assessment Limits:**Use horizontal slide, flip over a vertical line, or turn of 90° clockwise around a given point of a geometric figure or picture**

Flips, Turns and Area

Investigation 1: Sessions 2-3

Indicator Statement:**Identify and describe symmetry in geometric figures or pictures*****Objectives(s):******Assessment Limits:*****Use no more than 4 lines of symmetry**

Mathematical Thinking at Grade 3

Investigation 2: Session 1

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES***Indicator Statement:*****Read customary and metric measurement scales*****Objectives(s):***

- **Estimate and determine length**

Assessment Limits:**Use the nearest centimeter or $\frac{1}{2}$ inch**

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 3: Sessions 1-2

Turtle Paths

Investigation 2: Sessions 5-6

Investigation 3: Sessions 1-2

Ten-Minute Math: Lengths and Perimeters

- **Tell time in days, hours, minutes, and seconds**

Assessment Limits:

Use the nearest minute using an analog clock

Combining and Comparing

Investigation 3: Session 3

Investigation 5: Sessions 1-3

- **Estimate and read temperature**

Assessment Limits:

Use the nearest degree (°F or °C)

Related Content:

Up and Down the Number Line

Investigation 1: Sessions 1-2, 8

- **Estimate and determine weight of objects**

Assessment Limits:

Use the nearest pound or ounce

Combining and Comparing

Investigation 2: Sessions 1-2

MEASUREMENT TOOLS

Indicator Statement:

Measure in customary and metric units

Objectives(s):

- **Measure length of objects and pictures of objects using a ruler, a tape measure, a yardstick, or a meter stick**

Assessment Limits:

Use a ruler and the nearest centimeter or $\frac{1}{2}$ inch

From Paces to Feet

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-3

Combining and Comparing

Investigation 3: Sessions 1-2

Turtle Paths

Investigation 3: Sessions 1-2

- **Measure capacity of containers to the nearest cup, pint, quart, gallon, milliliter, and liter using graduated containers**
Can be developed from Exploring Solids and Boxes
Investigation 4: Sessions 1-3
Investigation 5: Sessions 1-4
- **Measure weight/mass of objects to the nearest ounce, pound, gram, and kilogram**
Combining and Comparing
Investigation 2: Sessions 1-2

APPLICATIONS IN MEASUREMENT

Indicator Statement:

Apply measurement concepts

Objectives(s):

- **Estimate and determine the perimeter of geometric figures and pictures on a grid**
Assessment Limits:
Use counting and whole numbers (0 – 50)
Turtle Paths
Ten-Minute Math: Lengths and Perimeters
- **Estimate and determine the area of geometric figures and pictures on a grid**
Assessment Limits:
Use counting and whole numbers (0 – 50)
Flips, Turns and Areas
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-5
- **Estimate and determine the volume of rectangular prisms**
Exploring Solids and Boxes
Investigation 4: Sessions 1-3
Investigation 5: Sessions 1-4

Indicator Statement:**Calculate equivalent measurements****Objectives(s):**

- **Determine equivalent units of length**

Assessment Limits:**Use 12 inches = 1 foot and 3 feet = 1 yard and whole numbers (0 – 30)**

From Paces to Feet

Investigation 2: Sessions 2-4, 6, 7

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS**Indicator Statement:****Collect, organize, and display data****Objectives(s):**

- **Collect data by conducting surveys**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

From Paces to Feet

Investigation 2: Session 2

Investigation 3: Sessions 1-3

- **Organize and display data to make tables using a variety of categories and sets of data**

Assessment Limits:**Use no more than 4 categories from one set of data and whole numbers (0 – 1000)**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-4

Things That Come in Groups

Investigation 1: Session 1

Investigation 5: Sessions 1-4

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Up and Down the Number Line

Investigation 1: Sessions 1-2, 8

Combining and Comparing

Investigation 1: Session 3

Investigation 4: Session 1

Fair Shares

Investigation 2: Sessions 5-6

- **Organize and display data to make pictographs using a variety of scales**

Assessment Limits:

Use scales of 2:1, 4:1, or 10:1 and whole numbers (0 – 100)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

- **Organize and display data to make single bar graphs using a variety of categories and intervals**

Assessment Limits:

Use no more than 4 categories of data with intervals of 1, 2, 5, or 10 and whole numbers (0 –100)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

- **Organize and display data to make line plots using a variety of intervals**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Investigation 5: Session 3

From Paces to Feet

Investigation 1: Sessions 1-2, 5-6

Investigation 2: Session 2

Combining and Comparing

Investigation 4: Session 1

Ten-Minute Math: Exploring Data

DATA ANALYSIS

Indicator Statement:

Analyze data

Objectives(s):

- **Interpret data contained in tables using a variety of categories and intervals**

Assessment Limits:

Use no more than 4 categories from one set of data and whole numbers (0 – 1000)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-4

Things That Come in Groups

Investigation 1: Session 1

Investigation 5: Sessions 1-4

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Up and Down the Number Line

Investigation 1: Sessions 1-2, 8

Combining and Comparing

Investigation 1: Session 3

Investigation 4: Session 1

Fair Shares

Investigation 2: Sessions 5-6

- **Interpret data contained in pictographs using a variety of categories and intervals**

Assessment Limits:

Use scales of 2:1, 4:1, or 10:1 and whole numbers (0 – 100)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

- **Interpret data contained in single bar graphs using a variety of categories and intervals**

Assessment Limits:

Use no more than 4 categories of data, intervals of 1, 2, 5, or 10 and whole numbers (0 – 100)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

- **Interpret data contained in line plots using a variety of intervals**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Investigation 5: Session 3

From Paces to Feet

Investigation 1: Sessions 1-2, 5-6

Investigation 2: Session 2

Combining and Comparing

Investigation 4: Session 1

Ten-Minute Math: Exploring Data

STANDARD 5.0—KNOWLEDGE OF PROBABILITY:

Students will use experimental methods or theoretical reasoning to determine probabilities to make predictions or solve problems about events whose outcomes involve random variation.

SAMPLE SPACE***Indicator Statement:***

Identify possible outcomes

Objectives(s):

- **Identify possible outcomes that make up the sample space for a given real life situation**
Things That Come in Groups
Ten-Minute Math: Likely or Unlikely?
Exploring Solids and Boxes
Ten-Minute Math: What is Likely?
- **Identify possible outcomes that make up the sample space for a given experiment such as: flipping a coin, spinning a spinner, and rolling a number cube**
Things That Come in Groups
Ten-Minute Math: Likely or Unlikely?
Exploring Solids and Boxes
Ten-Minute Math: What is Likely?

THEORETICAL PROBABILITY***Indicator Statement:***

Identify the probability of one event

Objectives(s):

- **Describe the probability of an event using words**
Assessment Limits:
Use probability terms of more (or most) likely, less (or least) likely, or equally likely
Things That Come in Groups
Ten-Minute Math: Likely or Unlikely?
Exploring Solids and Boxes
Ten-Minute Math: What is Likely?

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR

COMPUTATION: Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE***Indicator Statement:***

Apply knowledge of whole numbers and place value

Objectives(s):

- **Read, write, and represent whole numbers using symbols, words, and models**

Assessment Limits:

Use whole numbers (0 - 10,000)

Mathematical Thinking at Grade 3

Investigation 1: Sessions 1-3

Investigation 2: Session 1

Things that Come in Groups

Investigation 1: Session 2

Investigation 3: Sessions 1-5

Investigation 4: Sessions 1-2

Flips, Turns and Area

Ten-Minute Math: Broken Calculator

Landmarks in the Hundreds

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-6

Investigation 3: Session 1

Up and Down the Number Line

Investigation 1: Sessions 3-4

- **Express whole numbers using expanded form**

Assessment Limits:

Use whole numbers (0 - 10,000)

Flips, Turns and Area

Ten-Minute Math: Broken Calculator

Combining and Comparing

Investigation 4: Sessions 3-4

- **Identify the place value of a digit in a whole number**

Assessment Limits:

Use whole numbers (0 - 9,999)

Flips, Turns and Area

Ten-Minute Math: Broken Calculator

Combining and Comparing

Investigation 4: Sessions 3-4

- **Compare, order, and describe whole numbers with or without using relational symbols ($<$, $>$, $=$)**

Assessment Limits:

Use no more than four whole numbers (0 - 10,000)

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 4: Sessions 1-2

Investigation 5: Sessions 1-3

Indicator Statement:

Apply knowledge of fractions

Objectives(s):

- **Read, write, and represent fractions as parts of a single region using symbols, words, and models**

Assessment Limits:

Use fractions with denominators of 2, 3, or 4

Fair Shares

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-6

- **Read, write, and represent fractions as parts of a set using symbols, words, and models**

Assessment Limits:

Use fractions with denominators of 2, 3, or 4, and use sets of 2, 3, 4 items, respectively

Mathematical Thinking at Grade 3

Investigation 2: Sessions 3-4

Fair Shares

Investigation 3: Sessions 1-3

Indicator Statement:

Apply knowledge of money

Objectives(s):

- **Represent money amounts in different ways**

Assessment Limits:

Use money amounts (\$0 - \$100)

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 5: Session 1

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Investigation 2: Session 4

- **Determine the value of a given set of mixed currency**

Assessment Limits:

Use coins and bills (\$0 - \$100)

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 5: Session 1

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

- **Compare the value of two sets of mixed currency**

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Things That Come in Groups

Investigation 5: Session 1

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

NUMBER THEORY

Indicator Statement:

Apply number relationships to:

Objectives(s):

- **Identify and describe whole numbers as even or odd**

Assessment Limits:

Use whole numbers (0 – 100)

Mathematical Thinking at Grade 3

Investigation 4: Sessions 1-3

NUMBER COMPUTATION***Indicator Statement:*****Analyze number relations and compute*****Objectives(s):***

- **Add numbers using a variety of strategies**

Assessment Limits:**Use no more than 3 addends, with no more than 3 digits in each addend and whole numbers (0 – 1000)**

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 3: Sessions 1-3

Investigation 4: Sessions 2-4

Investigation 5: Sessions 1-3

- **Subtract numbers using a variety of strategies**

Assessment Limits:**Use no more than 3 digits in the minuend or subtrahend and whole numbers (0 – 999)**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 2: Session 2

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-3

- **Solve addition or subtraction number word problems**

Mathematical Thinking at Grade 3

Investigation 2: Sessions 1-7

Investigation 3: Sessions 3-4

Combining and Comparing

Investigation 1: Sessions 1-3

Investigation 2: Session 2

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-3

- **Add and subtract money amounts**
Mathematical Thinking at Grade 3
Investigation 2: Sessions 5-7
Combining and Comparing
Investigation 3: Sessions 1-3
Investigation 4: Session 1
- **Identify and apply the concept of inverse operations to addition and subtraction**
Up and Down the Number Line
Investigation 1: Sessions 1-4
Combining and Comparing
Investigation 4: Session 2
Turtle Paths
Investigation 1: Sessions 3-4
- **Represent multiplication and division basic facts using number sentences, pictures, and drawings**
Assessment Limits:
Use basic facts of no more than $9 \times 9 = 81$
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3-4
Things That Come in Groups
Investigation 1: Sessions 1-4
Investigation 2: Sessions 2-6
Investigation 3: Sessions 1-5
Investigation 4: Sessions 1-4
Investigation 5: Sessions 1-4
Landmarks in the Hundreds
Investigation 1: Sessions 2-7
Investigation 2: Sessions 4-6
- **Identify and use properties of multiplication**
Assessment Limits:
Use the properties of commutative, identity, or zero and whole numbers (0 – 20)
Things That Come in Groups
Investigation 3: Sessions 1-2
Investigation 5: Session 2
Combining and Comparing
Ten-Minute Math: Estimation and Number Sense

- **Multiply a one-digit factor by a two-digit factor using models, pictures, and drawings**
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3-4
Things That Come in Groups
Investigation 1: Sessions 1-4
Investigation 2: Sessions 2-6
Investigation 3: Sessions 1-5
Investigation 4: Sessions 1-4
Investigation 5: Sessions 1-4
Landmarks in the Hundreds
Investigation 1: Sessions 2-7
Investigation 2: Sessions 4-6

- **Divide a two-digit dividend by a one-digit divisor using models, pictures, and drawings**
Things That Come in Groups
Investigation 3: Sessions 3-4
Investigation 4: Sessions 1-4
Landmarks in the Hundreds
Investigation 2: Sessions 4-6

- **Identify and apply the concept of inverse operations to multiplication and division**
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3-4
Things That Come in Groups
Investigation 1: Session 3
Investigation 3: Sessions 3-4
Investigation 4: Sessions 1-4
Investigation 5: Session 4
Landmarks in the Hundreds
Investigation 1: Sessions 2-7
Investigation 2: Sessions 4-6

- **Write a word problem based on multiplication or division number sentences**
Mathematical Thinking at Grade 3
Investigation 2: Sessions 3-4
Things That Come in Groups
Investigation 1: Sessions 1-4
Investigation 2: Sessions 2-6
Investigation 3: Sessions 1-5
Investigation 4: Sessions 1-4
Investigation 5: Sessions 1-4

Landmarks in the Hundreds

Investigation 1: Sessions 2-7

Investigation 2: Sessions 4-6

Indicator Statement:

Estimation

Objectives(s):

- **Determine the reasonableness of sums and differences**

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

From Paces to Feet

Investigation 1: Sessions 1-4

Ten-Minute Math: Estimation and Number Sense

Landmarks on the Hundreds Chart

Investigation 3: Sessions 2-3

Up and Down the Number Line

Ten-Minute Math: Estimation and Number Sense

Combining and Comparing

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1-4

Investigation 5: Sessions 1-3

Turtle Paths

Investigation 2: Sessions 1-2

Ten-Minute Math: Lengths and Perimeters

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING

Indicator Statement:

Apply a variety of concepts, processes, and skills to solve problems

Objectives(s):

- **Identify the question in the problem**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 1

Flips, Turns and Area

Investigation 1: Sessions 1-5

From Paces to Feet

Investigation 2: Sessions 1-7

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Sessions 1-4

Combining and Comparing

Investigation 1: Sessions 1-3

Turtle Paths

Investigation 3: Sessions 6-7

Fair Shares

Investigation 3: Sessions 1-3

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **Decide if enough information is present to solve the problem**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 1

Flips, Turns and Area

Investigation 1: Sessions 1-5

From Paces to Feet

Investigation 2: Sessions 1-7

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Sessions 1-4

Combining and Comparing

Investigation 1: Sessions 1-3

Turtle Paths

Investigation 3: Sessions 6-7

Fair Shares

Investigation 3: Sessions 1-3

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **Make a plan to solve a problem**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 1

Flips, Turns and Area

Investigation 1: Sessions 1-5

From Paces to Feet

Investigation 2: Sessions 1-7

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Sessions 1-4

Combining and Comparing

Investigation 1: Sessions 1-3

Turtle Paths

Investigation 3: Sessions 6-7

Fair Shares

Investigation 3: Sessions 1-3

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **Apply a strategy, i.e. draw a picture, guess and check, finding a pattern, writing an equation**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

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

- **Select a strategy, i.e.. draw a picture, guess and check, finding a pattern, writing an equation**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

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

Fair Shares

Investigation 3: Sessions 1-3

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **Identify alternative ways to solve a problem**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 1

Flips, Turns and Area

Investigation 1: Sessions 1-5

From Paces to Feet

Investigation 2: Sessions 1-7

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Sessions 1-4

Combining and Comparing

Investigation 1: Sessions 1-3

Turtle Paths

Investigation 3: Sessions 6-7

Fair Shares

Investigation 3: Sessions 1-3

Exploring Solids and Boxes

Investigation 2: Sessions 1-5

- **Show that a problem might have multiple solutions or no solution**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 5: Session 1

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

- **Extend the solution of a problem to a new problem situation**

Students using Investigations in Number, Data, and Space gain experience following and making a plan to solve a problem and choosing and applying appropriate problem-solving strategies throughout the course. In fact, this is the fundamental emphasis of the curriculum as students participate in and conduct the investigations that form the foundation of each unit of study.

Representative Pages:

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

REASONING

Indicator Statement:

Justify ideas or solutions with mathematical concepts or proofs

Objectives(s):

- **Use inductive or deductive reasoning**

Students using Investigations in Number, Data and Space recognize reasoning and proof as fundamental aspects of mathematics 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 apply inductive reasoning as they sort and classify objects, identify similar attributes and identify and extend patterns.

Students 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.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 3: Sessions 3-4

Things That Come in Groups

Investigation 1: Session 1

Flips, Turns and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 3: Sessions 2-3

Landmarks in the Hundreds

Investigation 3: Sessions 2-3

Up and Down the Number Line

Investigation 1: Sessions 6-7

Combining and Comparing

Investigation 2: Session 1

Turtle Paths

Investigation 3: Sessions 1-2, 6-7

Fair Shares

Investigation 2: Session 3

Exploring Solids and Boxes

Investigation 1: Session 1

- **Make or test generalizations**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make or test generalizations and to support or refute mathematical statements or solutions.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 1: Session 1

Things That Come in Groups

Investigation 3: Sessions 3-4

Flips, Turns and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 1: Sessions 1-6

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Session 4

Combining and Comparing

Ten-Minute Math: Estimation and Number Sense

Turtle Paths

Investigation 2: Sessions 1-2, 4

Fair Shares

Investigation 2: Sessions 1-2

Exploring Solids and Boxes

Investigation 4: Session 1

- **Support or refute mathematical statements or solutions**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make or test generalizations and to support or refute mathematical statements or solutions.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 1: Session 1

Things That Come in Groups

Investigation 3: Sessions 3-4

Flips, Turns and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 1: Sessions 1-6

Landmarks in the Hundreds

Investigation 2: Sessions 5-6

Up and Down the Number Line

Investigation 2: Session 4

Combining and Comparing
Ten-Minute Math: Estimation and Number Sense
Turtle Paths
Investigation 2: Sessions 1-2, 4
Fair Shares
Investigation 2: Sessions 1-2
Exploring Solids and Boxes
Investigation 4: Session 1

- **Use methods of proof, i.e.. direct, indirect, paragraph, or contradiction**
Students using Investigations in Number, Data and Space use various methods of proof as they employ mathematical reasoning in a variety of forms and settings.
Representative Pages:
Mathematical Thinking at Grade 3
Investigation 3: Sessions 3-4
Things That Come in Groups
Investigation 1: Session 1
Flips, Turns and Area
Investigation 1: Session 5
From Paces to Feet
Investigation 3: Sessions 2-3
Landmarks in the Hundreds
Investigation 3: Sessions 2-3
Up and Down the Number Line
Investigation 1: Sessions 6-7
Combining and Comparing
Investigation 2: Session 1
Turtle Paths
Investigation 3: Sessions 1-2, 6-7
Fair Shares
Investigation 2: Session 3
Exploring Solids and Boxes
Investigation 1: Session 1

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Objectives(s):

- **Use multiple representations to express concepts or solutions**
Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly

and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express mathematical ideas orally**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Explain mathematically ideas in written form**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express solutions using concrete materials**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Explain solutions in written form**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Ask questions about mathematical ideas or problems**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Give or use feedback to revise mathematical thinking**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

CONNECTIONS

Indicator Statement:

Relate or apply mathematics within the discipline, to other disciplines, and to life

Objectives(s):

- **Identify mathematical concepts in relationship to other mathematical concepts**

Students using Investigations in Number, Data and Space identify mathematical concepts in relationship to other mathematical concepts, problems and circumstances in mathematics throughout the course.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 2: Session 1

Things That Come in Groups

Investigation 1: Session 4

Flips, Turns and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 2: Session 5

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Up and Down the Number Line

Investigation 1: Sessions 3-4

Combining and Comparing

Investigation 4: Session 2

Turtle Paths

Investigation 2: Session 3

Fair Shares

Investigation 2: Sessions 1-2

Exploring Solids and Boxes

Investigation 3: Session 1

- **Identify mathematical concepts in relationship to other disciplines**

Representative Pages:

Mathematical Thinking at Grade 3

Ten-Minute Math: Exploring Data

Things That Come in Groups

Investigation 1: Session 3

Flips, Turns and Area

Investigation 1: Sessions 2-3

From Paces to Feet

Investigation 2: Session 1

Up and Down the Number Line

Investigation 2: Session 1

Investigation 3: Sessions 1-3

Combining and Comparing

Investigation 2: Sessions 1-2

Turtle Paths

Investigation 1: Sessions 2-4

Fair Shares

Investigation 2: Session 3

Exploring Solids and Boxes

Investigation 5: Sessions 1-4

- **Identify mathematical concepts in relationship to life**

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 2: Sessions 5-7

Investigation 3: Sessions 1-2

Things That Come in Groups

Investigation 3: Sessions 1-2

From Paces to Feet

Investigation 2: Sessions 6-7

Investigation 3: Sessions 1-3

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Up and Down the Number Line

Investigation 1: Sessions 1-8

Combining and Comparing

Investigation 1: Sessions 1-2

Investigation 3: Session 3

Fair Shares

Investigation 1: Sessions 1-4

- **Use the relationship among mathematical concepts to learn other mathematical concepts**

Students using Investigations in Number, Data and Space use the relationship among mathematical concepts to learn other mathematical concepts, problems and circumstances in mathematics throughout the course.

Representative Pages:

Mathematical Thinking at Grade 3

Investigation 2: Session 1

Things That Come in Groups

Investigation 1: Session 4

Flips, Turns and Area

Investigation 1: Session 5

From Paces to Feet

Investigation 2: Session 5

Landmarks in the Hundreds

Investigation 1: Sessions 6-7

Up and Down the Number Line

Investigation 1: Sessions 3-4

Combining and Comparing

Investigation 4: Session 2

Turtle Paths

Investigation 2: Session 3

Fair Shares

Investigation 2: Sessions 1-2

Exploring Solids and Boxes

Investigation 3: Session 1

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum**

Grade Four

STANDARD 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify, describe, extend, and create numeric patterns and functions

Objectives(s):

- **Represent or analyze numeric patterns using skip counting**
Assessment Limits:
Use patterns of 3,4,6,7,8, or 9 starting with any whole number (0 – 100)
Mathematical Thinking at Grade 4
Investigation 3: Sessions 1-2
Arrays and Shares
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-6
Ten-Minute Math: Multiple BINGO
Landmarks in the Thousands
Investigation 1: Sessions 1-2
Investigation 2: Sessions 1-4
Packages and Groups
Investigation 1: Sessions 1-2
Investigation 3: Sessions 4-6

- **Create a one operation (+ or -) function table to solve a real world problem**
Arrays and Shares
Investigation 2: Sessions 1-4
Ten-Minute Math: Multiple BINGO
Landmarks in the Thousands
Investigation 2: Session 1
Packages and Groups
Investigation 2: Session 1

- **Complete a function table using a one operation (+, -, \times , \div with no remainders) rule**

Assessment Limits:

Use whole numbers (0 – 50)

Arrays and Shares

Investigation 2: Sessions 1-4

Ten-Minute Math: Multiple BINGO

Landmarks in the Thousands

Investigation 2: Session 1

Packages and Groups

Investigation 2: Session 1

- **Describe the relationship that generates a one operation rule**

Arrays and Shares

Investigation 2: Sessions 1-4

Ten-Minute Math: Multiple BINGO

Landmarks in the Thousands

Investigation 2: Session 1

Packages and Groups

Investigation 2: Session 1

Indicator Statement:

Identify, describe, extend, analyze, or create a non-numeric growing or repeating pattern

Objectives(s):

- **Generate a rule for the next level of the growing pattern**

Assessment Limits:

Use at least 3 levels but no more than 5 levels

Arrays and Shares

Investigation 1: Sessions 1-3

Investigation 3: Session 1

Landmarks in the Thousands

Investigation 2: Session 1

Packages and Groups

Investigation 1: Sessions 1-3

Investigation 3: Sessions 4-6

- **Generate a rule for a repeating pattern**
Assessment Limits:
Use no more than 4 objects in the core of the pattern
Arrays and Shares
Investigation 1: Sessions 1-3
Investigation 3: Session 1
Landmarks in the Thousands
Investigation 2: Session 1
Packages and Groups
Investigation 1: Sessions 1-3
Investigation 3: Sessions 4-6
- **Create a non-numeric growing or repeating pattern**
Mathematical Thinking at Grade 4
Investigation 4: Sessions 1-6
Sunken Ships and Grid Patterns
Investigation 1: Sessions 3-4

EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Indicator Statement:

Write and identify expressions

Objectives(s):

- **Represent numeric quantities using operational symbols (+,-,x,÷ with no remainders)**
Assessment Limits:
Use whole numbers (0 – 100)
Mathematical Thinking at Grade 4
Investigation 3: Session 3
Arrays and Shares
Investigation 2: Sessions 1-3
Landmarks in the Thousands
Investigation 2: Sessions 2-4
Money, Miles and Large Numbers
Investigation 1: Session 3
Packages and Groups
Investigation 3: Sessions 1-2

- **Determine equivalent expressions**

Assessment Limits:**Use whole numbers (0 – 100)**

Mathematical Thinking at Grade 4

Investigation 3: Session 3

Arrays and Shares

Investigation 2: Sessions 1-3

Landmarks in the Thousands

Investigation 2: Sessions 2-4

Money, Miles and Large Numbers

Investigation 1: Session 3

Packages and Groups

Investigation 3: Sessions 1-2

Indicator Statement:**Identify, write, solve, and apply equations and inequalities****Objectives(s):**

- **Represent relationships by using relational symbols ($>$, $<$, $=$) and operational symbols ($+$, $-$, \times , \div) on either side**

Assessment Limits:**Use operational symbols ($+$, $-$, \times) and whole numbers (0 – 200)**

Different Shapes, Equal Pieces

Investigation 1: Session 5

Investigation 2: Sessions 1-4

Investigation 3: Sessions 3-5

- **Find the unknown in an equation with one operation**

Assessment Limits:**Use multiplication (\times) and whole numbers (0-100)**

Arrays and Shares

Investigation 2: Sessions 2-3

Landmarks in the Thousands

Investigation 2: Sessions 2-4

Changes Over Time

Investigation 1: Sessions 5-6

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS***Indicator Statement:***

Locate points on a number line and in a coordinate plane

Objectives(s):

- **Represent mixed numbers and proper fractions on a number line**

Assessment Limits:

Use proper fractions with a denominators of 6, 8, or 10

Different Shapes, Equal Pieces

Investigation 3: Sessions 4-5

Three Out of Four Like Spaghetti

Investigation 1: Session 2

- **Identify positions in a coordinate plane**

Assessment Limits:

Use the first quadrant and ordered pairs of whole numbers (0 - 20)

Sunken Ships and Grid Patterns

Investigation 1: Sessions 1-6

Investigation 2: Sessions 1-9

- **Represent decimals on a number line**

Can be developed from

Different Shapes, Equal Pieces

Investigation 3: Sessions 4-5

Three Out of Four Like Spaghetti

Investigation 1: Session 2

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES***Indicator Statement:***

Analyze the properties of plane geometric figures

Objectives(s):

- **Identify properties of angles using manipulatives and pictures**

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-9

- **Identify and describe angles in relationship to another angle**

Assessment Limits:

Use acute, right, or obtuse angles

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-9

- **Identify parallel and intersecting line segments**

Sunken Ships and Grid Patterns

Investigation 2: Sessions 1-7

Indicator Statement:

Analyze geometric relationships

Objectives(s):

- **Compare and classify angles in geometric figures and pictures**

Assessment Limits:

Use an acute, right, and obtuse angle in relationship to another angle

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-9

SOLID GEOMETRIC FIGURES

Indicator Statement:

Analyze the properties of solid geometric figures

Objectives(s):

- **Identify cones, cylinders, prisms, and pyramids**

Assessment Limits:

Use cones or cylinders

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Changes Over Time

Ten-Minute Math: Quick Images

- **Describe solid geometric figures by the number of edges, faces, or vertices**

Assessment Limits:

Use triangular pyramids, rectangular pyramids, triangular prisms, or rectangular prisms

Seeing Solids and Silhouettes

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Changes Over Time
Ten-Minute Math: Quick Images

Indicator Statement:

Analyze the relationship between plane geometric figures and surfaces of solid geometric figures

Objectives(s):

- Compare a plane figure to surfaces of solid geometric figure

Assessment Limits:

Compare squares to cubes, triangles/rectangles to triangular pyramids/rectangular pyramids

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

TRANSFORMATIONS

Indicator Statement:

Analyze a transformation

Objectives(s):

- Identify and describe the results of translations, reflections, and rotations

Assessment Limits:

Use along a horizontal line translation, reflection over a vertical line, or rotation of 90° clockwise around a given point of a geometric figure or picture

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Different Shapes, Equal Pieces

Investigation 1: Session 1

Sunken Ships and Grid Patterns

Investigation 2: Sessions 1-9

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES

Indicator Statement:

Read customary and metric measurement scales

Objectives(s):

- **Estimate and determine length and height**

Assessment Limits:**Use the nearest centimeter or $\frac{1}{4}$ inch**

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles and Large Numbers

Investigation 2: Sessions 1-3

Changes Over Time

Unit Preparation: Session 3

Sunken Ships and Grid Patterns

Investigation 1: Sessions 1-6

- **Estimate and determine weight/mass**

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles and Large Numbers

Investigation 2: Sessions 1-3

Changes Over Time

Unit Preparation: Session 3

- **Estimate and determine capacity**

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles and Large Numbers

Investigation 2: Sessions 1-3

Changes Over Time

Unit Preparation: Session 3

MEASUREMENT TOOLS**Indicator Statement:****Measure in customary and metric units****Objectives(s):**

- **Select and use appropriate tools and units**

Assessment Limits:**Use the nearest millimeter or $\frac{1}{4}$ inch with a ruler**

The Shape of the Data

Investigation 2: Sessions 1-4

Money, Miles and Large Numbers

Investigation 2: Sessions 1-3

Changes Over Time

Unit Preparation: Session 3

APPLICATIONS IN MEASUREMENT***Indicator Statement:*****Apply measurement concepts*****Objectives(s):***

- **Determine perimeter**

Assessment Limits:**Use polygons with no more than 6 sides given the length of the sides in whole numbers (0 – 100)**

Sunken Ships and Grid Patterns

Ten-Minute Math: Lengths and Perimeters

- **Determine area**

Assessment Limits:**Use rectangles with the length of the sides in whole numbers (0 – 100)**

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-2

- **Determine elapsed time and end time**

Assessment Limits:**Use hour and half hour intervals**

Changes Over Time

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-2

Indicator Statement:**Calculate equivalent measurements*****Objectives(s):***

- **Determine equivalent units of length**

Assessment Limits:**Use 36 inches = 1 yard and whole numbers (0-100)**

The Shape of the Data

Investigation 2: Session 4

Money, Miles and Large Numbers

Investigation 2: Sessions 3-4

Investigation 3: Sessions 2-4

- **Determine equivalent units of time**

Can be developed from

Changes Over Time

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-2

- **Determine equivalent units of capacity and weight within the same system**
The Shape of the Data
Investigation 2: Session 4
Money, Miles and Large Numbers
Investigation 2: Sessions 3-4
Investigation 3: Sessions 2-4

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS***Indicator Statement:***

Collect, organize, and display data

Objectives(s):

- **Collect data by conducting surveys to answer a question**
The Shape of the Data
Investigation 1: Sessions 2-3
Investigation 3: Sessions 1-5
Three Out of Four Like Spaghetti
Investigation 2: Sessions 1-7
- **Organize and display data in line plots and frequency tables using a variety of categories and sets of data**
Assessment Limits:
Use line plots with no more than 20 pieces of data and a range of no more than 10 and whole numbers (0 – 100)
Mathematical Thinking at Grade 4
Ten-Minute Math: Exploring Data
The Shape of the Data
Investigation 1: Sessions 1-3
Investigation 2: Sessions 2-7
Three Out of Four Like Spaghetti
Investigation 2: Sessions 1-2, 5-7

DATA ANALYSIS***Indicator Statement:*****Analyze data*****Objectives(s):***

- **Interpret line plots**

Assessment Limits:**Use no more than 20 pieces of data with a range no more than 10 and whole numbers (0 – 100)**

Mathematical Thinking at Grade 4

Ten-Minute Math: Exploring Data

The Shape of the Data

Investigation 1: Sessions 1-3

Investigation 2: Sessions 2-7

Three Out of Four Like Spaghetti

Investigation 2: Sessions 1-2, 5-7

- **Interpret line graphs**

Assessment Limits:**Use the x-axis representing no more than 6 time intervals, the y-axis consisting of no more than 10 intervals with scales as factors of 100 using whole numbers (0 – 100)**

Changes Over Time

Investigation 1: Sessions 1-2

Investigation 3: Sessions 1-8

Indicator Statement:**Describe a set of data*****Objectives(s):***

- **Determine median, mode, and range**

Assessment Limits:**Use no more than 8 pieces of data using whole numbers (0 – 100)**

The Shape of the Data

Investigation 2: Sessions 4-7

- **Model the mean of a set of data**

Can be developed from

The Shape of the Data

Investigation 2: Sessions 4-7

STANDARD 5.0—KNOWLEDGE OF PROBABILITY:

Students will use experimental methods or theoretical reasoning to determine probabilities to make predictions or solve problems about events whose outcomes involve random variation.

THEORETICAL PROBABILITY***Indicator Statement:***

Determine the probability of one event

Objectives(s):

- **Express the probability as a fraction**

Assessment Limits:

Use a sample space of no more than 6 outcomes

Landmarks in the Thousands

Ten-Minute Math: What is Likely?

Money, Miles and Large Numbers

Ten-Minute Math: What is Likely?

Three Out of Four Like Spaghetti

Investigation 1: Session 3

Investigation 2: Session 2

Ten-Minute Math: What is Likely?

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR

COMPUTATION: Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE***Indicator Statement:***

Apply knowledge of whole numbers and place value

Objectives(s):

- **Read, write, and represent whole numbers using symbols, words, and models**

Assessment Limits:

Use whole numbers (0 - 1,000,000)

Mathematical Thinking at Grade 4

Investigation 1: Sessions 1-3

Arrays and Shares

Investigation 1: Sessions 1-2

Landmarks in the Thousands

Investigation 4: Sessions 1-3

- **Express whole numbers in expanded form**
Assessment Limits:
Use whole numbers (0 - 1,000,000)
Mathematical Thinking at Grade 4
Investigation 1: Sessions 1-3
Arrays and Shares
Investigation 1: Sessions 1-2
Landmarks in the Thousands
Investigation 4: Sessions 1-3
- **Identify the place value of a digit in a number**
Assessment Limits:
Use whole numbers (0 - 1,000,000)
Mathematical Thinking at Grade 4
Investigation 1: Sessions 1-3
Arrays and Shares
Investigation 1: Sessions 1-2
Landmarks in the Thousands
Investigation 4: Sessions 1-3
- **Compare, order, and describe whole numbers**
Assessment Limits:
Use no more than 4 whole numbers with or without using the symbols ($<$, $>$, $=$) and whole numbers (0 - 1,000,000)
Landmarks in the Thousands
Investigation 3: Session 1
Investigation 4: Sessions 1-3

Indicator Statement:

Apply knowledge of fractions and decimals

Objectives(s):

- **Read, write, or represent fractions of a single region using symbols, words, or models**
Assessment Limits:
Use denominators 6, 8, and 10
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
Three Out of Four Like Spaghetti
Investigation 1: Sessions 2-4

- **Read, write, or represent proper fractions of a set which has the same number of items as the denominator using symbols, words, or models**
Assessment Limits:
Use denominators of 6,8, and 10 with sets of 6, 8, and 10, respectively
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
Three Out of Four Like Spaghetti
Investigation 1: Sessions 2-4
- **Read, write, or represent decimals using symbols, words or models**
Assessment Limits:
Use no more than 2 decimal places and numbers (0 – 100)
Money, Miles and Large Numbers
Investigation 1: Sessions 4-5
Investigation 2: Sessions 1-4
- **Express decimals in expanded form**
Assessment Limits:
Use no more than 2 decimal places and numbers (0 - 100)
Can be developed from
Money, Miles and Large Numbers
Investigation 1: Sessions 4-5
Investigation 2: Sessions 1-4
- **compare fractions or mixed numbers with or without using the symbols (<, > or =)**
Assessment Limits:
Use like denominators and no more than 3 numbers (0 - 20)
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 2-4
- **Simplify fractions**
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-4
Investigation 3: Sessions 1-2

- Compare, order, or describe decimals with or without using the symbols ($<$, $>$, or $=$)

Assessment Limits:

Use no more than 3 decimals with no more than 2 decimal places and numbers (0 – 100)

Money, Miles and Large Numbers

Investigation 2: Sessions 1-2, 4

Indicator Statement:

Apply knowledge of money

Objectives(s):

- Compare the value of sets of mixed currency

Assessment Limits:

Use 2 sets of mixed currency and money (\$0 - \$100)

Money, Miles and Large Numbers

Investigation 1: Sessions 1-5

- Determine the change from \$100

Money, Miles and Large Numbers

Investigation 1: Sessions 6-8

NUMBER THEORY

Indicator Statement:

Apply number relationships

Objectives(s):

- Identify and use divisibility rules

Assessment Limits:

Use the rules for 2, 5, or 10 with whole numbers (0 – 1000)

Packages and Groups

Investigation 3: Sessions 1-10

- Identify factors

Assessment Limits:

Use whole numbers (0 – 24)

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Arrays and Shares

Investigation 2: Sessions 2-3

Landmarks in the Thousands
Investigation 1: Sessions 1-2
Investigation 2: Sessions 1-5
Packages and Groups
Investigation 3: Sessions 7-10

- **Identify multiples**

Assessment Limits:

Use the first 5 multiples of any single digit whole number

Mathematical Thinking at Grade 4
Investigation 3: Sessions 1-2, 4-5
Landmarks in the Thousands
Investigation 4: Sessions 1-3
Packages and Groups
Investigation 1: Sessions 3-5
Investigation 3: Sessions 3-8

NUMBER COMPUTATION

Indicator Statement:

Analyze number relations and compute

Objectives(s):

- **Add whole numbers**

Assessment Limits:

Use up to 3 addends with no more 4 digits in each addend and whole numbers (0 - 10,000)

Mathematical Thinking at Grade 4
Investigation 2: Sessions 1-4
Investigation 3: Sessions 3-5
Landmarks in the Thousands
Investigation 1: Session 3
Investigation 2: Sessions 2-4
Investigation 3: Session 3-5
Investigation 4: Sessions 1-3
Money, Miles and Large Numbers
Investigation 1: Sessions 1-5
Investigation 2: Sessions 1-2

- **Subtract whole numbers**

Assessment Limits:

Use a minuend and subtrahend with no more than 4 digits in each and whole numbers (0 – 9999)

Mathematical Thinking at Grade 4

Investigation 2: Sessions 1-2

Investigation 3: Sessions 1-2, 4-5

Landmarks in the Thousands

Investigation 1: Session 3

Investigation 2: Sessions 2-4

Investigation 3: Sessions 2-5

Investigation 4: Sessions 1-3

- **Multiply whole numbers**

Assessment Limits:

Use a one 1-digit factor by up to a 3-digit factor using whole numbers (0 – 1000)

Arrays and Shares

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-6

Investigation 3: Sessions 1-5

Packages and Groups

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-2, 4-6, 9

- **Divide whole numbers**

Assessment Limits:

Use up to a 3-digit dividend by a 1-digit divisor and whole numbers with no remainders (0 - 999)

Arrays and Shares

Investigation 1: Session 3

Investigation 2: Sessions 5-8

Investigation 3: Sessions 2-4

Packages and Groups

Investigation 3: Sessions 1-9

- **Add and subtract proper fractions and mixed numbers**

Assessment Limits:

Use 2 proper fractions with a single digit like denominators, 2 mixed numbers with single digit like denominators, or a whole number and a proper fraction with a single digit denominator and numbers (0 – 20)

Different Shapes, Equal Pieces

Investigation 1: Session 5

Investigation 2: Session 3

- **Add 2 decimals**

Assessment Limits:

Use the same number of decimal places but no more than 2 decimal places and no more than 4 digits including monetary notation and numbers (0 – 100)

Money, Miles and Large Numbers

Investigation 1: Sessions 1-8

Investigation 2: Sessions 1-2, 4

- **Subtract decimals**

Assessment Limits:

Use the same number of decimal places but no more than 2 decimal places and no more than 4 digits including monetary notation and numbers (0 – 100)

Money, Miles and Large Numbers

Investigation 1: Sessions 7-8

Indicator Statement:**Estimation****Objectives(s):**

- **Determine the approximate sum and difference of 2 numbers**

Assessment Limits:

Use no more than 2 decimal places in each and numbers (0 – 100)

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Ten-Minute Math: Estimation and Number Sense

Landmarks in the Thousands

Investigation 1: Session 3

Investigation 2: Sessions 2-4

Investigation 3: Sessions 2-5

Investigation 4: Sessions 1-3

Money, Miles and Large Numbers

Investigation 1: Sessions 1-5, 7-8

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-4

- **Determine the approximate product or quotient of 2 numbers**

Assessment Limits:

Use a 1-digit factor with the other factor having no more than 2-digits or a 1-digit divisor and no more than a 2-digit dividend and whole numbers (0 – 1000)

Arrays and Shares

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-8

Investigation 3: Sessions 1-5

Landmarks in the Thousands

Investigation 1: Sessions 1-2

Investigation 2: Sessions 1-5

Ten-Minute Math: Counting Around the Class

Packages and Groups

Investigation 1: Sessions 1-5

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-10

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING

Indicator Statement:

Apply a variety of concepts, processes, and skills to solve problems

Objectives(s):

- **Identify the question in the problem**

Each unit of study and each investigation in Investigations in Number, Data and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved. In Grade 4, students develop a plan to solve Problems That Look Hard But Aren't. They gather and process information and compare data. They explore and carry out different strategies for solving problems. They write instructions for constructing cube buildings. They present results by Showing Change Over Time.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

The Shape of the Data

Investigation 2: Session 4

Money, Miles and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 2: Sessions 1-2

Packages and Groups

Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three Out of Four Like Spaghetti

Investigation 2: Sessions 4-7

- **Decide if enough information is present to solve the problem**

Each unit of study and each investigation in Investigations in Number, Data and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved. In Grade 4, students develop a plan to solve Problems That Look Hard But Aren't. They gather and process information and compare data. They explore and carry out different strategies for solving problems. They write instructions for constructing cube buildings. They present results by Showing Change Over Time.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

The Shape of the Data
Investigation 2: Session 4
Money, Miles and Large Numbers
Investigation 3: Sessions 2-4
Changes Over Time
Investigation 2: Sessions 1-2
Packages and Groups
Investigation 3: Session 10
Sunken Ships and Grid Patterns
Investigation 2: Sessions 8-9
Three Out of Four Like Spaghetti
Investigation 2: Sessions 4-7

- **Make a plan to solve a problem**

Each unit of study and each investigation in Investigations in Number, Data and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved. In Grade 4, students develop a plan to solve Problems That Look Hard But Aren't. They gather and process information and compare data. They explore and carry out different strategies for solving problems. They write instructions for constructing cube buildings. They present results by Showing Change Over Time.

Representative Pages:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 1-6
Arrays and Shares
Investigation 3: Session 5
Seeing Solids and Silhouettes
Investigation 3: Sessions 1-3
Landmarks in the Thousands
Investigation 3: Sessions 3-5
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
The Shape of the Data
Investigation 2: Session 4
Money, Miles and Large Numbers
Investigation 3: Sessions 2-4
Changes Over Time
Investigation 2: Sessions 1-2
Packages and Groups
Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three Out of Four Like Spaghetti

Investigation 2: Sessions 4-7

- **apply a strategy, i.e. draw a picture, guess and check, finding a pattern, writing an equation**

Each unit of study and each investigation in Investigations in Number, Data and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved. In Grade 4, students develop a plan to solve Problems That Look Hard But Aren't. They gather and process information and compare data. They explore and carry out different strategies for solving problems. They write instructions for constructing cube buildings. They present results by Showing Change Over Time.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

The Shape of the Data

Investigation 2: Session 4

Money, Miles and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 2: Sessions 1-2

Packages and Groups

Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three Out of Four Like Spaghetti

Investigation 2: Sessions 4-7

- **select a strategy, i.e.. draw a picture, guess and check, finding a pattern, writing an equation**

Students using Investigations in Number Data and Space select, use and justify methods, materials and strategies used to solve problems throughout the course. They identify alternative ways to solve a problem, as well as extend the solution of a problem to a new problem situation.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

The Shape of the Data

Investigation 2: Session 4

Money, Miles and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 2: Sessions 1-2

Packages and Groups

Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three Out of Four Like Spaghetti

Investigation 2: Sessions 4-7

- **identify alternative ways to solve a problem**

Students using Investigations in Number Data and Space select, use and justify methods, materials and strategies used to solve problems throughout the course. They identify alternative ways to solve a problem, as well as extend the solution of a problem to a new problem situation.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
The Shape of the Data
Investigation 2: Session 4
Money, Miles and Large Numbers
Investigation 3: Sessions 2-4
Changes Over Time
Investigation 2: Sessions 1-2
Packages and Groups
Investigation 3: Session 10
Sunken Ships and Grid Patterns
Investigation 2: Sessions 8-9
Three Out of Four Like Spaghetti
Investigation 2: Sessions 4-7

- **show that a problem might have multiple solutions or no solution**

Students using Investigations in Number Data and Space select, use and justify methods, materials and strategies used to solve problems throughout the course. They identify alternative ways to solve a problem, as well as extend the solution of a problem to a new problem situation.

Representative Pages:

Mathematical Thinking at Grade 4
Investigation 4: Sessions 1-6
Arrays and Shares
Investigation 3: Session 5
Seeing Solids and Silhouettes
Investigation 3: Sessions 1-3
Landmarks in the Thousands
Investigation 3: Sessions 3-5
Different Shapes, Equal Pieces
Investigation 1: Sessions 1-5
The Shape of the Data
Investigation 2: Session 4
Money, Miles and Large Numbers
Investigation 3: Sessions 2-4
Changes Over Time
Investigation 2: Sessions 1-2
Packages and Groups
Investigation 3: Session 10
Sunken Ships and Grid Patterns
Investigation 2: Sessions 8-9
Three Out of Four Like Spaghetti
Investigation 2: Sessions 4-7

- **extend the solution of a problem to a new problem situation**

Students using Investigations in Number Data and Space select, use and justify methods, materials and strategies used to solve problems throughout the course. They identify alternative ways to solve a problem, as well as extend the solution of a problem to a new problem situation.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 4: Sessions 1-6

Arrays and Shares

Investigation 3: Session 5

Seeing Solids and Silhouettes

Investigation 3: Sessions 1-3

Landmarks in the Thousands

Investigation 3: Sessions 3-5

Different Shapes, Equal Pieces

Investigation 1: Sessions 1-5

The Shape of the Data

Investigation 2: Session 4

Money, Miles and Large Numbers

Investigation 3: Sessions 2-4

Changes Over Time

Investigation 2: Sessions 1-2

Packages and Groups

Investigation 3: Session 10

Sunken Ships and Grid Patterns

Investigation 2: Sessions 8-9

Three Out of Four Like Spaghetti

Investigation 2: Sessions 4-7

REASONING

Indicator Statement:

Justify ideas or solutions with mathematical concepts or proofs

Objectives(s):

- **Use inductive or deductive reasoning**

Students using Investigations in Number, Data and Space recognize reasoning and proof as fundamental aspects of mathematics 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 apply inductive reasoning as they sort and classify objects, identify similar attributes, and identify and extend patterns.

Students 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 geometric transformations and identify shapes and solids from different perspectives.

Representative Pages:

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

- **Make or test generalizations**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make or test generalizations and support or refute mathematical statements or solutions. 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.

Students gain experience with several different types of graphic models, including real graphs, bar graphs, line graphs and line plots. Students frequently construct and complete tables as they analyze patterns and functional relationships and collect, interpret, and make predictions based on data.

Representative Pages:

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

- **Support or refute mathematical statements or solutions**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make or test generalizations and support or refute mathematical statements or solutions. 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. Students gain experience with several different types of graphic models, including real graphs, bar graphs, line graphs and line plots. Students frequently construct and complete tables as they analyze patterns and functional relationships and collect, interpret, and make predictions based on data.

Representative Pages:

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

- **Use methods of proof, i.e.. direct, indirect, paragraph, or contradiction**

Students using Investigations in Number, Data and Space recognize reasoning and proof as fundamental aspects of mathematics as they employ methods of proof in a variety of forms and settings.

Representative Pages:

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

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Objectives(s):

- **Use multiple representations to express concepts or solutions**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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

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

- **Express mathematical ideas orally**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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

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

- **Explain mathematically ideas in written form**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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
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

- **Express solutions using concrete materials**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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
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

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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

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

- **Explain solutions in written form**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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

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

- **Ask questions about mathematical ideas or problems**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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
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

- **Give or use feedback to revise mathematical thinking**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. They express mathematical idea orally, in written form, and using concrete materials. Students use multiple representations to express concepts or solutions. 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 use appropriate mathematical vocabulary and language and to explain clearly and logically solutions to problems.

Representative Pages:

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
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

CONNECTIONS

Indicator Statement:

Relate or apply mathematics within the discipline, to other disciplines, and to life

Objectives(s):

- **identify mathematical concepts in relationship to other mathematical concepts**

Students using Investigations in Number, Data and Space connect, extend and generalize problem solutions and mathematical concepts to other mathematical concepts throughout the course.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Arrays and Shares

Investigation 1: Sessions 1-2

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 2: Session 4

The Shape of the Data

Investigation 3: Sessions 1-2

Money, Miles and Large Numbers

Investigation 1: Session 6

Changes Over Time

Investigation 1: Sessions 1-2

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 3

- **identify mathematical concepts in relationship to other disciplines**

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 3: Sessions 4-5

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

Different Shapes, Equal Pieces

Investigation 2: Session 3

The Shape of the Data

Investigation 1: Sessions 1-3

Investigation 2: Session 5

Changes Over Time

Unit Preparation: Session 1-3

Investigation 3: Session 3

Money, Miles and Large Numbers

Investigation 2: Session 4

Investigation 3: Sessions 2-4

Sunken Ships and Grid Patterns

Investigation 1: Sessions 3-6

- **identify mathematical concepts in relationship to life**

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 1: Session 1

Arrays and Shares

Investigation 2: Session 1

Seeing Solids and Silhouettes

Investigation 2: Session 5

Different Shapes, Equal Pieces

Investigation 1: Sessions 2-4

The Shape of the Data

Investigation 2: Sessions 1-3

Investigation 3: Sessions 1-2

Changes Over Time

Investigation 1: Sessions 1-2

Investigation 3: Sessions 1-2

Money, Miles and Large Numbers

Investigation 1: Sessions 1-2

Packages and Groups

Investigation 3: Session 9

Three Out of Four Like Spaghetti

Investigation 1: Session 3

- **use the relationship among mathematical concepts to learn other mathematical concepts**

Students using Investigations in Number, Data and Space connect, extend and generalize problem solutions using the relationships among mathematical concepts to learn other mathematical concepts throughout the course.

Representative Pages:

Mathematical Thinking at Grade 4

Investigation 1: Session 4

Arrays and Shares

Investigation 1: Sessions 1-2

Seeing Solids and Silhouettes

Investigation 2: Sessions 1-2

Landmarks in the Thousands

Investigation 1: Session 2

Different Shapes, Equal Pieces

Investigation 2: Session 4

The Shape of the Data

Investigation 3: Sessions 1-2

Money, Miles and Large Numbers

Investigation 1: Sessions 1-2

Changes Over Time

Investigation 1: Sessions 1-2

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 3

**Investigations in Number, Data, & Space
to the
Maryland Mathematics Voluntary State Curriculum**

Grade Five

STANDARD 1.0—KNOWLEDGE OF ALGEBRA, PATTERNS, OR FUNCTIONS:

Students will algebraically represent, model, analyze, or solve mathematical or real-world problems involving patterns or functional relationships.

PATTERNS AND FUNCTIONS

Indicator Statement:

Identify, describe, extend, and create numeric patterns and functions

Objective(s):

- **Interpret and write a rule for a one operation (+, -, \times , \div with no remainders) function table**

Assessment Limits:

Use whole numbers or decimals with no more than 2 decimal places (0 – 1000)

Picturing Polygons

Investigation 3: Sessions 1-2, 5-6

Measurement Benchmarks

Investigation 3: Session 3

Patterns of Change

Investigation 1: Sessions 1-4

- **Determine approximate product and quotient of whole numbers**

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-4

Investigation 3: Sessions 1-5

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

- **Complete a one operation (+, -, x, ÷ with no remainders) function table**
Assessment Limits:
Use whole numbers or decimals with no more than two decimal places (0 – 200)
Picturing Polygons
Investigation 3: Sessions 1-2, 5-6
Measurement Benchmarks
Investigation 3: Session 3
Patterns of Change
Investigation 1: Sessions 1-4
- **Apply a given two operation rule for a pattern**
Assessment Limits:
Use two operations (+, -, x) and whole numbers (0 – 100)
Can be developed from
Picturing Polygons
Investigation 3: Sessions 1-2, 5-6
Measurement Benchmarks
Investigation 3: Session 3
Patterns of Change
Investigation 1: Sessions 1-4

EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Indicator Statement:

Write and identify expressions

Objective(s):

- **Represent unknown quantities with one unknown and one operation (+, -, x, ÷ with no remainders)**
Assessment Limits:
Use whole numbers (0 – 100) or money (\$0 - \$100)
Mathematical Thinking at Grade 5
Investigation 3: Sessions 2-4
Picturing Polygons
Picturing Polygons
Investigation 3: Sessions 1-2, 5-6
Measurement Benchmarks
Investigation 3: Session 3
Patterns of Change
Investigation 1: Sessions 1-4 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 1-7

Containers and Cubes

Investigation 4: Sessions 7-9

- **Evaluate algebraic expressions with one unknown, one operation and whole numbers**

Assessment Limits:**Use (+,-) and (0 - 1000) or (\times, \div with no remainders) and a replacement set of whole numbers no more than 9 (0 - 100)**

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Building on Numbers You Know

Investigation 2: Sessions 1-2, 5-7

Investigation 3: Session 10

Investigation 5: Sessions 1-7

- **Use parenthesis to evaluate a numeric expression**

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Building on Numbers You Know

Investigation 2: Sessions 1-2, 5-7

Investigation 3: Session 10

Investigation 5: Sessions 1-7

Indicator Statement:**Identify, write, solve, and apply equations and inequalities****Objective(s):**

- **Represent relationships by using the appropriate relational symbols ($>$, $<$, $=$) and one operational symbol ($+$, $-$, \times , \div with no remainders) on either side**

Assessment Limits:**Use whole numbers (0 – 400)**

Mathematical Thinking at Grade 5

Investigation 2: Session 5

Investigation 4: Sessions 2-4

Name That Portion

Investigation 1: Session 7

Investigation 2: Sessions 3-9

Investigation 3: Sessions 2-6, 7-8

Building on Numbers You Know

Investigation 1: Sessions 1-2, 5

Investigation 5: Sessions 4-6

Data; Kids, Cats and Ads

Investigation 1: Sessions 1-3

Investigation 3: Sessions 1-3

Investigation 4: Sessions 1, 3

Investigation 5: Sessions 3-5

- **Find the unknown in an equation with one operation (+,-,x,÷ with no remainders)**

Assessment Limits:

Use whole numbers (0 – 2000)

Can be developed from

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Building on Numbers You Know

Investigation 2: Sessions 1-2, 5-7

Investigation 3: Session 10

Investigation 5: Sessions 1-7

NUMERIC AND GRAPHIC REPRESENTATIONS OF RELATIONSHIPS

Indicator Statement:

Locate points on a number line and in a coordinate plane

Objective(s):

- **Represent decimals and mixed numbers on a number line**

Assessment Limits:

Use decimals with no more than two decimal places (0 – 100) or mixed numbers with denominators of 2, 3, 4, 5, 6, 8, or 10 (0 - 10)

Name That Portion

Investigation 1: Sessions 5-6

Investigation 2: Sessions 4-6

- **Create a graph in a coordinate plane**

Assessment Limits:

Use the first quadrant and ordered pairs of whole numbers (0 – 50)

Picturing Polygons

Investigation 1: Sessions 3-4

Investigation 2: Sessions 4-7, 9

Investigation 3: Sessions 1-2, 5-6

STANDARD 2.0—KNOWLEDGE OF GEOMETRY:

Students will apply the properties of one-, two-, or three-dimensional geometric figures to describe, reason, or solve problems about shape, size, position, or motion of objects.

PLANE GEOMETRIC FIGURES

Indicator Statement:

Analyze the properties of plane geometric figures

Objective(s):

- **Identify and describe relationships of lines and line segments in geometric figures or pictures**

Assessment Limits:

Use parallel or perpendicular lines and line segments

Picturing Polygons

Investigation 2: Sessions 1-7

Investigation 3: Sessions 4-6

- **Identify polygons within a composite figure**

Assessment Limits:

Use polygons with no more than 8 sides as part of a composite figure comprised of triangles or quadrilaterals

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

- **Identify and describe the radius and diameter of a circle**

Can be developed from

Name That Portion

Investigation 2: Sessions 1-2

Investigation 3: Session 8

Investigation 4: Sessions 2-7

Indicator Statement:

Analyze geometric relationships

Objective(s):

- **Compare or classify quadrilaterals by length of sides and measures of angles (Include the angle symbol $\angle ABC$)**

Assessment Limits:

Use squares, rectangles, rhombi, parallelograms, and trapezoids

Mathematical Thinking at Grade 5

Ten-Minute Math: Quick Images

Picturing Polygons

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-2, 4

- **Compare triangles by sides**

Mathematical Thinking at Grade 5

Ten-Minute Math: Quick Images

Picturing Polygons

Investigation 2: Sessions 1-7

Investigation 3: Sessions 1-2, 4

SOLID GEOMETRIC FIGURES

Indicator Statement:

Analyze the properties of solid geometric figures

Objective(s):

- **Identify and classify pyramids and prisms by the number of edges, faces, or vertices**

Assessment Limits:

Use triangular pyramids, rectangular pyramids, triangular prisms, or rectangular prisms

Containers and Cubes

Investigation 4: Sessions 1-3, 7-9

- Identify and classify pyramids and prisms by the base

Assessment Limits:

Use triangular prisms and pyramids or rectangular prisms and pyramids

Containers and Cubes

Investigation 4: Sessions 1-3, 7-9

Indicator Statement:

Analyze the relationship between plane geometric figures and surfaces of solid geometric figures

Objective(s):

- Compare a plane figure to surfaces of solid geometric figure

Assessment Limits:

Compare rectangles to rectangular prisms, triangles/rectangles to triangular prisms, circles/rectangles to cylinders

Containers and Cubes

Investigation 4: Sessions 1-3, 7-9

REPRESENTATION OF GEOMETRIC FIGURES

Indicator Statement:

Represent plane geometric figures

Objective(s):

- Identify, describe, and draw angles, parallel line segments, and perpendicular line segments

Assessment Limits:

Provide their dimensions as whole numbers (0 - 20) or angle measurements (0° - 179°)

Picturing Polygons

Investigation 2: Sessions 1-7

Investigation 3: Sessions 4-6

CONGRUENCE

Indicator Statement:

Analyze similar figures to

Objective(s):

- Identify or describe geometric figures as similar

Assessment Limits:

Use same shape and different size

Picturing Polygons

Investigation 3: Sessions 4-6

TRANSFORMATIONS

Indicator Statement:

Analyze a transformation

Objective(s):

- Analyze translations, reflections, and rotations of geometric figures

Assessment Limits:

Use translation along a vertical line, reflection over a horizontal line, or rotation 90° or 180° around a given point

Picturing Polygons

Investigation 2: Sessions 4-8

Investigation 3: Sessions 4-6

STANDARD 3.0—KNOWLEDGE OF MEASUREMENT:

Students will identify attributes, units, or systems of measurements or apply a variety of techniques, formulas, tools or technology for determining measurements.

MEASUREMENT SCALES

Indicator Statement:

Read customary and metric measurement scales

Objective(s):

- Estimate and determine weight

Assessment Limits:

Use the nearest ounce or gram

Measurement Benchmarks

Investigation 1: Session 1

Investigation 2: Sessions 1-3, 5-6

- Estimate and determine capacity

Assessment Limits:

Use the nearest ounce

Measurement Benchmarks

Investigation 1: Session 1

Investigation 2: Sessions 1-2, 4, 6

MEASUREMENT TOOLS

Indicator Statement:

Measure in customary and metric units

Objective(s):

- **Select and use appropriate tools and units**

Assessment Limits:

Measure length to $\frac{1}{8}$ inch with a ruler

Measurement Benchmarks

Investigation 3 Sessions 1-3

Indicator Statement:

Measure a single angle and angles in a regular polygon

Objective(s):

- **Use the nearest degree and acute, right, or obtuse angles**

Picturing Polygons

Investigation 2: Sessions 1-3, 6-9

Investigation 3: Sessions 1-3

APPLICATIONS IN MEASUREMENT

Indicator Statement:

Estimate and apply measurement formulas

Objective(s):

- **Determine perimeter**

Assessment Limits:

Use polygons with no more than 8 sides and whole numbers (0 – 500) or a closed figure on a grid (0 – 50)

Picturing Polygons

Investigation 3 Sessions 4-6

- **Determine area**

Assessment Limits:

Use rectangles and whole numbers (0 – 200) or a closed figure on a grid (0 – 50)

Picturing Polygons

Investigation 3 Sessions 4-6

- **Estimate and determine volume by counting**
Containers and Cubes
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-5
Investigation 3: Sessions 1-3
Investigation 4: Sessions 1-9

Indicator Statement:**Calculate equivalent measurements****Objective(s):**

- **Determine start, elapsed, and end time**
Assessment Limits:
Use the nearest minute
Measurement Benchmarks
Investigation 3: Sessions 1-3
Patterns of Change
Investigation 2: Session 2
Investigation 3: Session 2-3, 5-6
- **Determine equivalent units of measurement**
Assessment Limits:
Use equivalent units of seconds, minutes, and hours or pints, quarts, and gallons
Measurement Benchmarks
Investigation 1: Sessions 4, 7-8

STANDARD 4.0—KNOWLEDGE OF STATISTICS:

Students will collect, organize, display, analyze, or interpret data to make decisions or predictions.

DATA DISPLAYS**Indicator Statement:****Collect, organize, and display data****Objective(s):**

- **Collect data by conducting surveys to answer a question**
Name That Portion
Investigation 4: Sessions 1, 5-6
Data: Kids, Cats and Ads
Investigation 3: Sessions 2-4
Investigation 4: Sessions 2-3
Investigation 5: Sessions 1-5

- **Organize and display data in stem leaf plots**
Assessment Limits:
Use no more than 20 data points and whole numbers (0 – 100)
Can be developed from
Between Never and Always
Investigation 1: Sessions 3-6
Investigation 2: Session 3
Measurement Benchmarks
Investigation 2: Sessions 7-8
Data: Kids, Cats and Ads
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-2

- **Organize and display data in line plots**
Assessment Limits:
Use no more than 20 pieces of data with a range of no more than 20 and whole numbers (0 – 200)
Between Never and Always
Investigation 1: Sessions 3-6
Investigation 2: Session 3
Measurement Benchmarks
Investigation 2: Sessions 7-8
Data: Kids, Cats and Ads
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-2

- **Organize and display data in double bar graphs**
Assessment Limits:
Use no more than 4 categories and intervals of 1, 2, 5, or 10 and whole numbers (0 – 100)
Data: Kids, Cats and Ads
Investigation 1: Session 1
Investigation 2: Sessions 1
Investigation 5: Sessions 3-5

- **Organize and display data in line graphs**
Assessment Limits:
Use y-axis with intervals of 1, 2, 4, 5, or 10 and x-axis with no more than 10 time intervals and whole numbers (0 – 100)
Patterns of Change
Investigation 1: Sessions 1-4
Investigation 2: Sessions 3-5
Investigation 3: Sessions 1-6

- **Determine the appropriate type of graph to effectively display data**

Name That Portion

Ten-Minute Math: Exploring Data

Patterns of Change

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-5

Investigation 3: Sessions 3-6

Data: Kids, Cats and Ads

Investigation 2: Session 2

Investigation 5: Sessions 3-5

DATA ANALYSIS

Indicator Statement:

Analyze data

Objective(s):

- **Interpret and compare data in stem & leaf plot**

Assessment Limits:

Use no more than 20 data points and whole numbers (0 – 100)

Can be developed from

Between Never and Always

Investigation 1: Sessions 3-6

Investigation 2: Session 3

Measurement Benchmarks

Investigation 2: Sessions 7-8

Data: Kids, Cats and Ads

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-2

- **Interpret and compare data in line plots**

Assessment Limits:

Use no more than 20 pieces of data with a range of no more than 20 and whole numbers (0 – 100)

Between Never and Always

Investigation 1: Sessions 3-6

Investigation 2: Session 3

Measurement Benchmarks

Investigation 2: Sessions 7-8

Data: Kids, Cats and Ads

Investigation 1: Sessions 1-4

Investigation 2: Sessions 1-2

- **Interpret and compare data in double bar graphs**
Assessment Limits:
Use no more than 4 categories and intervals of 1, 2, 5, or 10 and whole numbers (0 – 1000)
Data: Kids, Cats and Ads
Investigation 1: Session 1
Investigation 2: Sessions 1
Investigation 5: Sessions 3-5
- **Interpret and compare data in double line graphs**
Assessment Limits:
Use y-axis with intervals of 1, 2, 5, or 10 and x-axis with no more than 10 time intervals and whole numbers (0 – 100)
Patterns of Change
Investigation 2: Sessions 3-5
Investigation 3: Sessions 1-6
- **Read circle graphs**
Assessment Limits:
Use no more than 4 categories and data in whole numbers or percents which are multiples of 5 and whole numbers (0 – 100)
Name That Portion
Investigation 4: Sessions 1-7

Indicator Statement:

Describe a set of data (mean, median, mode)

Objective(s):

- **Determine the mean of a given data set or data display**
Assessment Limits:
Use no more than 8 pieces of data and whole numbers (without remainders) (0 – 1000)
Can be developed from
Data: Kids, Cats and Ads
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-4
Investigation 5: Sessions 3-5
- **Apply the range and measures of central tendency to solve a problem or answer a question**
Data: Kids, Cats and Ads
Investigation 1: Sessions 1-4
Investigation 2: Sessions 1-3
Investigation 3: Sessions 1-4
Investigation 5: Sessions 3-5

STANDARD 5.0—KNOWLEDGE OF PROBABILITY:

Students will use experimental methods or theoretical reasoning to determine probabilities to make predictions or solve problems about events whose outcomes involve random variation.

SAMPLE SPACE***Indicator Statement:***

Identify possible outcomes

Objective(s):

- **Determine possible outcomes of independent events**

Assessment Limits:

Use two independent events with no more than 4 outcomes each and an organized list or tree diagram

Between Never and Always

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-5

THEORETICAL PROBABILITY***Indicator Statement:***

Determine the probability of one simple event comprised of equally likely outcomes

Objective(s):

- **Make predictions and express the probability as a fraction**

Assessment Limits:

Use a sample space of no more than 20 outcomes

Between Never and Always

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-5

STANDARD 6.0—KNOWLEDGE OF NUMBER RELATIONSHIPS OR

COMPUTATION: Students will describe, represent, or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

KNOWLEDGE OF NUMBER AND PLACE VALUE***Indicator Statement:***

Apply knowledge of fractions, decimals, and place value

Objective(s):

- **Read, write, or represent fractions or mixed numbers using symbols, models, and words**

Assessment Limits:

Use denominators that are factors of 24 and numbers (0 – 200)

Name That Portion

Investigation 1: Sessions 1-7

Investigation 2: Sessions 1-9

Investigation 3: Sessions 1, 7

- **Read, write, or represent decimals using symbols, words, or models**

Assessment Limits:

Use no more than 3 decimal places or percents (0 – 100)

Name That Portion

Investigation 1: Session 1

Investigation 3: Sessions 1-8

- **Identify or determine equivalent forms of proper fractions**

Assessment Limits:

Use denominators that are factors of 100, decimals, or percents (0 – 200)

Name That Portion

Investigation 1: Sessions 2-6

Investigation 2: Sessions 3-8

- **Compare or order fractions with or without using the symbols (<, >, or =)**

Assessment Limits:

Use no more than 4 fractions or mixed numbers with denominators that are factors of 100 and numbers (0 – 100)

Name That Portion

Investigation 1: Sessions 5-6

Investigation 2: Sessions 3-9

- **Compare, order, or describe decimals with or without using the symbols (<, >, or =)**
Assessment Limits:
Use no more than 4 decimals with no more than 3 decimal places and numbers (0 – 100)
Name That Portion
Investigation 3: Sessions 2-4

NUMBER THEORY

Indicator Statement:
Apply number relationships

Objective(s):

- **Identify or describe numbers as prime or composite**
Assessment Limits:
Use whole numbers (0 – 100)
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-6
- **Identify and use rules of divisibility**
Assessment Limits:
Use rules for 2, 3, 5, 9, or 10 and whole numbers (0 - 10,000)
Can be developed from
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-6
Investigation 2: Sessions 2-5
Investigation 4: Sessions 2-4
- **Identify the greatest common factor**
Assessment Limits:
Use 2 numbers whose GCF is no more than 10 and whole numbers (0 – 100)
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-6
Investigation 2: Sessions 2-5
Investigation 4: Sessions 2-4
Picturing Polygons
Ten-Minute Math: Multiple and Factor Bingo

- **Identify a common multiple and the least common multiple**

Assessment Limits:**Use no more than 4 single digit whole numbers**

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-6

Investigation 2: Sessions 2-5

Investigation 4: Sessions 2-4

Picturing Polygons

Ten-Minute Math: Multiple and Factor Bingo

NUMBER COMPUTATION**Indicator Statement:****Analyze number relations and compute****Objective(s):**

- **Multiply whole numbers**

Assessment Limits:**Use a 3-digit factor by another factor with no more than 2-digits and whole numbers (0 - 10,000)**

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Investigation 2: Sessions 1-4

Investigation 3: Sessions 2-5

Building on Numbers You Know

Investigation 1: Sessions 3-5

Investigation 2: Sessions 1-2, 5-7

Investigation 3: Sessions 1-3, 7-10

Investigation 5: Sessions 1-7

- **Divide whole numbers**

Assessment Limits:**Use a dividend with no more than a 4-digits by a 2-digit divisor and whole numbers (0 - 9,999)**

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2-4

Building on Numbers You Know

Investigation 1: Sessions 3-4

Investigation 2: Sessions 1-7

Investigation 3: Sessions 4-10

Investigation 5: Sessions 1-7

- **Interpret quotients and remainders mathematically and in the context of a problem**
Assessment Limits:
Use dividend with no more than a 3-digits by a 1 or 2 digit divisor and whole numbers (0 – 999)
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1-3
Investigation 2: Sessions 1-4
Investigation 3: Sessions 2-5
Building on Numbers You Know
Investigation 1: Sessions 3-5
Investigation 2: Sessions 1-7
Investigation 3: Sessions 1-10
Investigation 4: Sessions 1-2
Investigation 5: Sessions 1-7
- **Add and subtract proper fractions and mixed numbers with answers in simplest form**
Assessment Limits:
Use denominators as factors of 24 and numbers (0 – 20)
Name That Portion
Investigation 2: Sessions 1-3
Investigation 3: Session 7
Data: Kids, Cats and Ads
Investigation 4: Session 3
- **Add decimals including money**
Assessment Limits:
Use no more than 4 addends and no more than 3 decimal places in each addend and numbers (0 – 1000)
Name That Portion
Investigation 2: Sessions 1-3
- **Subtract decimals including money**
Assessment Limits:
Use a minuend and subtrahend with no more than 3 decimal places and numbers (0 – 1000)
Can be developed from:
Name That Portion
Investigation 2: Sessions 1-3

- **Multiply decimals**

Assessment Limits:

Use a decimal in monetary notation by a single digit whole number and numbers (0 – 100)

Name That Portion

Investigation 2: Sessions 1-3

Indicator Statement:**Estimation****Objective(s):**

- **Determine the approximate sum and difference of decimals**

Assessment Limits:

Use no more than 3 addends with no more than 3 decimal places in each addend or the difference of a minuend and subtrahend with no more than 3 decimal places and numbers (0 – 1000)

Can be developed from

Name That Portion

Investigation 2: Sessions 1-3

- **Determine approximate product and quotient of whole numbers**

Assessment Limits:

Use a 1-digit factor with the other factor having no more than 3 digits or a dividend having no more than 3 digits and a 1-digit divisor and whole numbers (0 – 5000)

Building on Numbers You Know

Investigation 1: Session 2

Investigation 3: Session 1-6

Investigation 5: Session 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

- **Determine the product of a decimal in monetary notation by a single digit whole number (0-100)**

Can be developed from

Name That Portion

Investigation 3: Session 7

- **Determine the approximate product of decimals**

Assessment Limits:

Use a decimal in monetary notation and a single digit whole number and numbers (0 – 100)

Can be developed from

Name That Portion

Investigation 3: Session 7

STANDARD 7.0—PROCESS OF MATHEMATICS:

Students will demonstrate the processes of mathematics by making connections and applying reasoning to solve problems and to communicate their findings.

PROBLEM SOLVING**Indicator Statement:**

Apply a variety of concepts, processes, and skills to solve problems

Objective(s):

- **Identify the question in the problem**

Each unit of study and each investigation in Investigations in Number, Data, and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved. In Grade 5, students develop a plan to measure space inside and outside the classroom. They gather and process information regarding measures of weight and of liquid volume. They conduct and present results of surveys. They evaluate solutions to problems involving similarity of polygons.

Representative Pages:

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

- **Decide if enough information is present to solve the problem**

Each unit of study and each investigation in Investigations in Number, Data, and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved. In Grade 5, students develop a plan to measure space inside and outside the classroom. They gather and process information regarding measures of weight and of liquid volume. They conduct and present results of surveys. They evaluate solutions to problems involving similarity of polygons.

Representative Pages:

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

- **Make a plan to solve a problem**

Each unit of study and each investigation in Investigations in Number, Data, and Space consists of extended mathematics problems to be solved. As students complete the activities which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense,

and explain how the problem was solved. In Grade 5, students develop a plan to measure space inside and outside the classroom. They gather and process information regarding measures of weight and of liquid volume. They conduct and present results of surveys. They evaluate solutions to problems involving similarity of polygons.

Representative Pages:

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

- **apply a strategy, i.e. draw a picture, guess and check, finding a pattern, writing an equation**

Each unit of study and each investigation in Investigations in Number, Data, and Space consists of extended mathematics problems to be solved. As students complete the activities, which comprise each session of each investigation, they must develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved. In Grade 5, students develop a plan to measure space inside and outside the classroom. They gather and process information regarding measures of weight and of liquid volume. They conduct and present results of surveys. They evaluate solutions to problems involving similarity of polygons.

Representative Pages:

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

- **select a strategy, i.e. draw a picture, guess and check, finding a pattern, writing an equation**

Students using Investigations in Number, Data and Space select strategies, identify alternative ways to solve problems and extend the solution of a problem to new problem situations throughout the course. In fact, this is the fundamental emphasis of the series.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 3: Session 4

Name That Portion

Investigation 1: Session 7

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 5: Session 3

Measurement Benchmarks

Investigation 1: Sessions 7-8

Patterns of Change

Investigation 3: Sessions 1-2

Containers and Cubes

Investigation 3: Session 4

Data: Kids, Cats and Ads

Investigation 4: Session 1

- **identify alternative ways to solve a problem**

Students using Investigations in Number, Data and Space select strategies, identify alternative ways to solve problems and extend the solution of a problem to new problem situations throughout the course. In fact, this is the fundamental emphasis of the series.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 3: Session 4

Name That Portion

Investigation 1: Session 7

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 5: Session 3

Measurement Benchmarks

Investigation 1: Sessions 7-8

Patterns of Change

Investigation 3: Sessions 1-2

Containers and Cubes

Investigation 3: Session 4

Data: Kids, Cats and Ads

Investigation 4: Session 1

- **show that a problem might have multiple solutions or no solution**

Students using Investigations in Number, Data and Space select strategies, identify alternative ways to solve problems and extend the solution of a problem to new problem situations throughout the course. In fact, this is the fundamental emphasis of the series.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 3: Session 4

Name That Portion

Investigation 1: Session 7

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 5: Session 3

Measurement Benchmarks

Investigation 1: Sessions 7-8

Patterns of Change
Investigation 3: Sessions 1-2
Containers and Cubes
Investigation 3: Session 4
Data: Kids, Cats and Ads
Investigation 4: Session 1

- **extend the solution of a problem to a new problem situation**

Students using Investigations in Number, Data and Space select strategies, identify alternative ways to solve problems and extend the solution of a problem to new problem situations throughout the course. In fact, this is the fundamental emphasis of the series.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 4-6

Picturing Polygons

Investigation 3: Session 4

Name That Portion

Investigation 1: Session 7

Between Never and Always

Investigation 1: Session 5

Building on Numbers You Know

Investigation 5: Session 3

Measurement Benchmarks

Investigation 1: Sessions 7-8

Patterns of Change

Investigation 3: Sessions 1-2

Containers and Cubes

Investigation 3: Session 4

Data: Kids, Cats and Ads

Investigation 4: Session 1

REASONING

Indicator Statement:

Justify ideas or solutions with mathematical concepts or proofs

Objective(s):

- **Use inductive or deductive reasoning**

Students using Investigations in Number, Data and Space recognize reasoning and proof as fundamental aspects of mathematical 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 apply inductive reasoning as they sort and classify objects, identify similar attributes, and identify and extend patterns.

Students 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 attribute. They use spatial reasoning as they visualize results of geometric transformations and identify shapes and solids from different perspectives.

Representative Pages:

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

- **Make or test generalizations**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make and test generalizations and to support or refute mathematical statements or solutions.

Representative Pages:

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

- **Support or refute mathematical statements or solutions**

Students using Investigations in Number, Data and Space use models, number facts, properties and relationships to make and test generalizations and to support or refute mathematical statements or solutions.

Representative Pages:

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

- **Use methods of proof, i.e. direct, indirect, paragraph, or contradiction**

Students using Investigations in Number, Data and Space use various methods of proof as they employ mathematical reasoning in a variety of forms and settings.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

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

COMMUNICATION

Indicator Statement:

Present mathematical ideas using words, symbols, visual displays, or technology

Objective(s):

- **Use multiple representations to express concepts or solutions**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express mathematical ideas orally**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Explain mathematically ideas in written form**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express solutions using concrete materials**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Express solutions using pictorial, tabular, graphical, or algebraic methods**

Students using Investigations in Number, Data and Space use appropriate mathematical terms, vocabulary, language, symbols and graphs to explain clearly and logically solutions to problems throughout the course. In fact, this is a fundamental emphasis of the series as students participate in a myriad of cooperative learning activities. 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 use appropriate mathematical vocabulary and language to express mathematical ideas.

Representative Pages:

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

- **Explain solutions in written form**

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Investigation 1: Sessions 2-3

- **Ask questions about mathematical ideas or problems**

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Investigation 1: Sessions 2-3

- **Give or use feedback to revise mathematical thinking**

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Investigation 1: Session 1

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Investigation 1: Sessions 3-4

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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

CONNECTIONS

Indicator Statement:

relate or apply mathematics within the discipline, to other disciplines, and to life

Objective(s):

- **identify mathematical concepts in relationship to other mathematical concepts**

Students using Investigations in Number, Data and Space identify mathematical concepts in relationship to other mathematical concepts, problems and circumstances in mathematics throughout the course.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons

Investigation 1: Session 4

Name That Portion

Investigation 4: Session 1

Between Never and Always

Investigation 2: Sessions 1-3

Building on Numbers You Know

Investigation 2: Session 3

Measurement Benchmarks

Investigation 2: Session 3

Patterns of Change

Investigation 3: Session 1

Containers and Cubes

Investigation 2: Session 5

Data: Kids, Cats and Ads

Investigation 5: Sessions 1-5

- **identify mathematical concepts in relationship to other disciplines**

Representative Pages:

Picturing Polygons

Investigation 1: Sessions 1, 4

Investigation 2: Sessions 4-7

Investigation 3: Sessions 1-2

Name That Portion

Investigation 4: Sessions 1, 5-7

Building on Numbers You Know

Investigation 2: Session 7

Measurement Benchmarks

Investigation 1: Sessions 5-8

Investigation 2: Session 5

Patterns of Change

Investigation 2: Session 1-2

Investigation 3: Sessions 1-2, 7

- **identify mathematical concepts in relationship to life**

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 4: Sessions 2-4

Picturing Polygons

Ten-Minute Math: Multiple and Factor Bingo

Name That Portion

Investigation 3: Session 1

Between Never and Always

Investigation 2: Sessions 1-5

Building on Numbers You Know

Investigation 2: Session 7

Measurement Benchmarks

Investigation 3: Session 2

Patterns of Change

Investigation 1: Session 1-4

Containers and Cubes

Investigation 2: Sessions 1-5

- **use the relationship among mathematical concepts to learn other mathematical concepts**

Students using Investigations in Number, Data, and Space use the relationship among mathematical concepts to learn other mathematical concepts, problems and circumstances in mathematics throughout the course.

Representative Pages:

Mathematical Thinking at Grade 5

Investigation 1: Sessions 1-3

Picturing Polygons

Investigation 1: Session 4

Name That Portion

Investigation 4: Session 1

Between Never and Always

Investigation 2: Sessions 1-3

Building on Numbers You Know

Investigation 2: Session 3

Measurement Benchmarks

Investigation 1: Session 3

Patterns of Change

Investigation 3: Session 1

Containers and Cubes

Investigation 2: Session 5

Data: Kids, Cats and Ads

Investigation 5: Sessions 1-5