A Correlation of

to the

Arizona

Mathematics Standard Articulated by Grade Level

Grades K–5

M/M-118

Introduction

This document demonstrates how ***Investigations in Number, Data, and Space®*** supports the Arizona Mathematics Standard Articulated by Grade Level. The citations within this correlation provide Investigation Curriculum Unit titles, followed by the Investigation number and Session number or Focus Time/Choice Time title. Additional citations to Classroom Routines may be included.

Investigations in Number, Data, and Space® is a Kindergarten through Grade 5 curriculum. ***Investigations*** offers a complete and flexible curriculum that aligns with the NCTM principles and Standards for School Mathematics. The main teaching tool is a single resource book, called the *teacher book,* for each unit in a grade level. Students explore the central topics in depth through a series of investigations, gradually encountering and using many important mathematical ideas. ***Investigations*** offers activity-based mathematics that encourage students to think creatively, develop their own strategies, and work together. Students practice skills through games, daily routines, activities, and practice pages.

The program blends concrete materials with appropriate technology. The software provided with several ***Investigations*** units harnesses the power of computers to help students explore mathematical ideas and relationships that cannot be explored in the same way with physical materials. A balanced approach to calculator use is found in the program.

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 learning styles, students from different cultures, and students of different 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.

Every unit in the Investigations curriculum offers a list of related children's literature that can be used to support the mathematical ideas presented in the unit. This list of books is found in the materials list located in the front of each unit.

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. Further information can be found on the internet at www.scottforesman.com/investigations.

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to the
Arizona Mathematics Standard Articulated by Grade Level
Kindergarten

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Make a model to represent a given whole number 0 through 20.

Mathematical Thinking in Kindergarten
- Investigation 1: Focus Time: Attendance
- Investigation 2
- Investigation 3: Focus Time: Calendar
- Investigation 4

Collecting, Counting, and Measuring
- Investigations 1, 2, 6

Counting Ourselves and Others
- Investigations 1, 3, 4

How Many In All?
- Investigations 2, 3, 4

Classroom Routines: Attendance, Calendar

PO 2. Identify orally a whole number represented by a model with a word name and symbol 0 through 20. (Say 3 and write number 3 when presented with three objects.)

Mathematical Thinking in Kindergarten
- Investigation 1: Focus Time: Attendance
- Investigation 2
- Investigation 3: Focus Time: Calendar
- Investigation 4

Collecting, Counting, and Measuring
- Investigations 1, 2, 6

Counting Ourselves and Others
- Investigations 1, 3, 4

How Many In All?
- Investigations 2, 3, 4

Classroom Routines: Attendance, Calendar

PO 3. Count aloud, forward to 20 or backward from 10, in consecutive order (0 through 20).

Mathematical Thinking in Kindergarten
- Investigation 1: Focus Time: Attendance
- Investigations 2, 3, 4

Collecting, Counting, and Measuring
- Investigations 1, 2, 4, 5, 6

Counting Ourselves and Others
- Investigations 1, 3, 4

PO 4. Identify whole numbers through 20 in or out of order.

Mathematical Thinking in Kindergarten
- Investigations 2, 3, 4

Counting Ourselves and Others
- Investigation 1

How Many in All?
- Investigation 2
- Investigation 3: Choice Time: Counters in a Cup
- Investigation 4: Choice Time: Six Crayons in All

Collecting, Counting, and Measuring
- Investigation 1
- Investigation 2: Focus Time: Taking Inventory

PO 5. Write whole numbers through 20 in or out of order.

Mathematical Thinking in Kindergarten
- Investigations 2, 3, 4

Counting Ourselves and Others
- Investigation 1

How Many in All?
- Investigation 2
- Investigation 3: Choice Time: Counters in a Cup
- Investigation 4: Choice Time: Six Crayons in All

Collecting, Counting, and Measuring
- Investigation 1
- Investigation 2: Focus Time: Taking Inventory

PO 6. Construct equivalent forms of whole numbers, using manipulatives, through 10 (e.g., □□+□□ =□□□+□).

Collecting, Counting, and Measuring
- Investigation 5: Choice Time
- Investigation 6: Choice Time

PO 7. Compare two whole numbers through 20.

Mathematical Thinking in Kindergarten
- Investigation 1: Focus Time: Attendance
- Investigations 2, 3, 4

Patterns, Trains, and Hopscotch Paths
- Investigation 4: Choice Time: 12 Chips; Choice Time: Staircase Patterns

Counting Ourselves and Others
- Investigations 3, 4

How Many In All?
- Investigation 2: Choice Time: Grab Two Handfuls
- Investigation 3: Choice Time: Double Compare
- Investigation 4: Focus Time: Blue and Red Crayons

Collecting, Counting, and Measuring
- Investigations 3, 4, 5, 6

PO 8. Recognize the ordinal numbers through fifth (e.g., first, second, third).

Mathematical Thinking in Kindergarten
- Investigation 3: Focus Time: Calendar

PO 9. Order three or more whole numbers through 20 (least to greatest or greatest to least).

Collecting, Counting, and Measuring
- Investigation 5: Focus Time, Choice Time
- Investigation 6: Focus Time, Choice Time

PO 10. Identify penny, nickel, dime, quarter, and dollar by using manipulatives or pictures.

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

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Model addition through sums of 10 using manipulatives.

How Many in All?
- Investigation 1: Choice Time: Collect 15 Together, Inventory Bags
- Investigations 2, 3, 4

Collecting, Counting, and Measuring
- Investigation 4: Choice Time: Collect 10 Together
- Investigation 5: Choice Time: Racing Bears
- Investigation 6

PO 2. Model subtraction with minuends of 10 using manipulatives.

How Many in All?
Investigation 3
Counting Ourselves and Others
Investigation 4

PO 3. Select the operation to solve word problems using numbers 0 through 9.

How Many in All?
Investigations 3, 4

PO 4. Solve word problems presented orally using addition or subtraction with numbers through 9.

These are some of the many examples.
Mathematical Thinking in Kindergarten
Investigation 2
Pattern Trains and Hopscotch Paths
Investigation 1
Collecting, Counting, and Measuring
Investigation 2
Counting Ourselves and Others
Investigations 1, 4
Making Shapes and Building Blocks:
Investigation 3
How Many In All?
Investigations 1, 3

PO 5. Identify the symbols: +, -, =.

How Many in All?
Investigation 4: Choice Time: Total of Six

PO 6. Use grade-level appropriate mathematical terminology.

How Many in All?
Investigation 3: Focus Time: Story Problems
Investigation 4

Concept 3: Estimation
Use estimation strategies reasonably and fluently.

PO 1. Solve problems using a variety of mental computations and reasonable estimations.

Collecting, Counting, and Measuring
- Investigation 4: Choice Time: Collect 10 Together
- Investigation 5: Choice Time: Racing Bears
- Investigation 6: Arrangements of Six

How Many in All?
- Investigation 1: Choice Time: Collect 15 Together
- Investigation 2: Focus Time: Six Tiles
- Investigation 3: Choice Time: Racing Bears

Classroom Routines: The Counting Jar

STRAND 2: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)
Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

Mathematical Thinking in Kindergarten
- Investigation 1: Focus time: Attendance
- Investigations 2, 4

Collecting, Counting, and Measuring
- Investigation 2

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

Classroom Routines: Attendance; Today's Question

PO 2. Interpret a pictograph.

Counting Ourselves and Others
- Investigation 2: Focus Time: What Did You Eat for Lunch?

Related content:

Counting Ourselves and Others
- Investigation 3

See also, Teacher Note, p. 54.

PO 3. Answer questions about a pictograph.
Counting Ourselves and Others
Investigation 2: Focus Time: What Did You Eat for Lunch?
Related content:
Counting Ourselves and Others
Investigation 3
See also, Teacher Note, p. 54.

PO 4. Formulate questions based on data displayed in graphs, charts, and tables.
Counting Ourselves and Others
Investigations 1, 2, 3, 4
Classroom Routines: Attendance; Today's Question

PO 5. Solve problems based on simple graphs, charts, and tables.
Counting Ourselves and Others
Investigation 2: Focus Time: What Did You Eat for Lunch?; Choice Time: Boxes, Bottles, and Cans; Clothing Sort
Investigation 3

Concept 2: Probability
Understand and apply the basic concepts of probability.
(Grades 2-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g., How many outfits can one make with 2 different color shirts and 2 different pairs of pants?).
Related content:
Collecting, Counting, and Comparing
Investigation 6: Focus Time; Choice Time
Combinations are formally introduced in Grade 1.

Concept 4: Vertex-Edge Graphs
Understand and apply vertex–edge graphs.

PO 1. Color pictures with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in these investigations.
Pattern Trains and Hopscotch Paths
Investigation 3: Focus Time: Hopscotch Paths

STRAND 3: PATTERNS, ALGEBRA, AND FUNCTIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate orally a grade-level appropriate pattern.
Mathematical Thinking in Kindergarten
Investigation 1: Choice Time
Pattern Trains and Hopscotch Paths
Investigation 1: Focus Time, Choice Time
Investigation 2: Choice Time
Investigation 3: Focus Time, Choice Time
Investigation 4: Focus Time, Choice Time

PO 2. Extend simple repetitive patterns using manipulatives.
Mathematical Thinking in Kindergarten
Investigation 1: Choice Time
Pattern Trains and Hopscotch Paths
Investigation 1: Focus Time, Choice Time
Investigation 2: Choice Time
Investigation 3: Focus Time, Choice Time
Investigation 4: Focus Time, Choice Time

PO 3. Create grade-level appropriate patterns.

Mathematical Thinking in Kindergarten
- Investigation 1: Choice Time

Pattern Trains and Hopscotch Paths
- Investigation 1: Focus Time, Choice Time
- Investigation 2: Choice Time
- Investigation 3: Focus Time, Choice Time
- Investigation 4: Focus Time, Choice Time

Concept 2: Functions And Relationships

Describe and model functions and their relationships.

(Grades 2-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations.

(Grades 1-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 4: Analysis of Change

Analyze change in a variable over time and in various contexts.

(Grades 1-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

STRAND 4: GEOMETRY AND MEASUREMENT

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties

Analyze the attributes and properties of 2– and 3–dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Identify 2-dimensional shapes by attribute (size, shape, number of sides).

Mathematical Thinking in Kindergarten

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

Making Shapes and Building Blocks

Investigations 1, 2

PO 2. Identify concepts and terms of position and size in contextual situations:

- **Inside/outside,**
- **Above/below/between,**
- **Smaller/larger, and**
- **Longer/shorter.**

Making Shapes and Building Blocks

Investigations 2. 3, 4

Patterns, Trains, and Hopscotch Paths

Investigation 4: Choice Time: Staircase Patterns

PO 3. Identify shapes in different environments (e.g., nature, buildings, classroom).

Mathematical Thinking in Kindergarten

Investigation 1: Choice Time: Exploring Pattern Blocks

Investigation 1: Choice Time: Exploring Geoblocks

Making Shapes and Building Blocks

Investigations 1, 2, 3, 4, 5

Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

(Grades 1-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 3: Coordinate Geometry

Specify and describe spatial relationships using coordinate geometry and other representational systems.

(Grades 3-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 4: Measurement - Units of Measure
- Geometric Objects

Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. Verbally compare objects according to observable and measurable attributes.

Mathematical Thinking in Kindergarten
- Investigation 1: Choice Time: Exploring Color Tiles, Exploring Pattern Blocks, Exploring Geoblocks
- Investigation 3: Choice Time: Exploring Interlocking Cubes

Patterns, Trains and Hopscotch Paths
- Investigation 1: Focus Time: Cubes What Do You Notice?

Collecting, Counting, and Measuring
- Investigations 3, 4, 5

Counting Ourselves and Others
- Investigation 2

How Many In All?
- Investigation 1

Making Shapes and Building Blocks:
- Investigations 4, 5

PO 2. Communicate orally how different attributes of an object can be measured.

Mathematical Thinking in Kindergarten
- Investigation 1: Choice Time: Exploring Color Tiles, Exploring Pattern Blocks, Exploring Geoblocks
- Investigation 3: Choice Time: Exploring Interlocking Cubes

Patterns, Trains and Hopscotch Paths
- Investigation 1: Focus Time: Cubes What Do You Notice?

Collecting, Counting, and Measuring
- Investigations 3, 4, 5

Counting Ourselves and Others
- Investigation 2

How Many In All?
- Investigation 1

Making Shapes and Building Blocks:
- Investigations 4, 5

PO 3. Order objects according to observable and measurable attributes.

Collecting, Counting, and Measuring
- Investigation 3: Focus Time, Choice Time

Counting Ourselves and Others
- Investigation 1: Focus Time, Choice Time
- Investigation 3: Focus Time, Choice Time

STRAND 5: STRUCTURE AND LOGIC

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

(Grades 1-HS) Arizona has no performance objectives for this concept at the Kindergarten Level.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. Sort objects according to observable attributes.

Counting Ourselves and Others

Investigation 1: Focus Time, Choice Time
Investigation 2: Focus Time, Choice Time
Investigation 3: Focus Time, Choice Time

PO 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, weight, etc.).

Counting Ourselves and Others

Investigation 1: Focus Time, Choice Time
Investigation 2: Focus Time, Choice Time
Investigation 3: Focus Time, Choice Time

Investigations in Number, Data, & Space
to the
Arizona Mathematics Standard Articulated by Grade Level
Grade One

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Make a model to represent a given whole number 0 through 100.

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

Building Number Sense
- Investigation 1: Sessions 7–9
- Investigation 2: Sessions 1–2, 9
- Investigation 3: Session 9
- Investigation 4: Sessions 1–5, 7–10

PO 2. Identify a whole number represented by a model with a word name and symbol 0 through 100.

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

PO 3. Count aloud, forward or backward, in consecutive order (0 through 100).

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

Building Number Sense
- Investigation 1: Sessions 1–8
- Investigation 2: Sessions 1–6, 8–9
- Investigation 3: Session 1–7, 9
- Investigation 4: Sessions 1–10

Classroom Routines: Counting

PO 4. Identify whole numbers through 100 in or out of order.

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

Building Number Sense
- Investigation 1: Sessions 1–8
- Investigation 2: Sessions 1–6, 8–9
- Investigation 3: Sessions 1–7, 9
- Investigation 4: Sessions 1–10

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

Bigger, Taller, Heavier, Smaller
- Investigation 2: Sessions 1–7

Classroom Routines: Counting

PO 5. Write whole numbers through 100 in or out of order.

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

Building Number Sense
- Investigation 1: Sessions 1–8
- Investigation 2: Sessions 1–6, 8–9
- Investigation 3: Sessions 1–7, 9
- Investigation 4: Sessions 1–10

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

Bigger, Taller, Heavier, Smaller
- Investigation 2: Sessions 1–7

Classroom Routines: Counting

PO 6. Construct equivalent forms of whole numbers, using manipulatives or symbols, through 99 (e.g., 15 + 5 = 10 + 10).

Number Games and Story Problems
- Investigation 1: Sessions 1–3, 4–5, 7–9, 10
- Investigation 2: Sessions 3–8, 10–12
- Investigation 3: Sessions 3–8, 10–12

PO 7. State verbally whole numbers, through 100, using correct place value (e.g., A student will read 84 as eight tens and four ones.).

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

PO 8. Construct models to represent place value concepts for the one's and ten's places.

Building Number Sense
- Investigation 1: Sessions 7–8
- Investigation 2: Sessions 1–2, 4–9
- Investigation 4: Sessions 1–10

PO 9. Apply expanded notation to model place value through 99 (e.g., 37 = 3 groups of ten + 7 units).

Related content:

Building Number Sense
- Investigation 3: Sessions 1–7, 9

PO 10. Identify odd and even whole numbers through 100.

These investigations provide opportunities to introduce this standard.

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

Building Number Sense
- Investigation 1: Sessions 1–9
- Investigation 2 : Sessions 1–8
- Investigation 3 : Sessions 1–2

Number Games and Story Problems
- Investigation 1 : Sessions 1–9

Classroom Routines : Counting

PO 11. Compare two whole numbers through 100.

Mathematical Thinking at Grade 1
Investigation 2: Sessions 2, 3, 5–6
Number Games and Story Problems
Investigation 1: Sessions 7–9
Building Number Sense
Investigation 3: Sessions 1–2

PO 12. Use ordinal numbers through tenth.

Several investigations provide opportunities for practice with ordinal numbers. Teacher Notes point out these opportunities.
Mathematical Thinking at Grade 1
Investigation 2: Sessions 2 and 3 (see p. 37)
Building Number Sense
Investigation 3: Sessions 1–2

PO 13. Order three or more whole numbers through 100 (least to greatest or greatest to least).

Mathematical Thinking at Grade 1
Investigation 2: Sessions 2, 3, 5–6
Number Games and Story Problems
Investigation 1: Sessions 7–9
Building Number Sense
Investigation 3: Sessions 1–2

PO 14. Make models that represent given fractions (halves).

Related content:
Mathematical Thinking in Grade 1
Investigation 5: Sessions 2–4
Number Games and Story Problems
Investigation 1: Sessions 7–9
About Classroom Routines: Counting
See also, Grade 2.

PO 15. Identify in symbols and in words a model that is divided into equal fractional parts (halves).

Fractions are formally introduced in Grade 2.

PO 16. Identify money by name and value: penny, nickel, dime, quarter, and one dollar.

Number Games and Story Problems
Investigation 2: Sessions 2–8
See also, Grade 2.

PO 17. Count money through $1.00 using coins.

Number Games and Story Problems
Investigation 2: Sessions 2–8
See also, Grade 2.

PO 18. Identify the value of a collection of coins using the symbols ¢ and $.

Number Games and Story Problems
Investigation 2: Sessions 4–5
See also, Grade 2.

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Demonstrate the process of addition through sums of 20 using manipulatives.

Mathematical Thinking at Grade 1
Investigation 1: Sessions 1–4
Investigation 4: Sessions 1–4, 6
Investigation 5: Sessions 2–4
Building Number Sense
Investigation 1: Sessions 1–9
Investigation 2: Sessions 1–9
Investigation 4: Sessions 1–10
Number Games and Story Problems
Investigation 1: Sessions 1–10
Investigation 2: Sessions 1–8, 10–12
Investigation 3: Sessions 1–8, 10–13

PO 2. Demonstrate the process of subtraction with minuends of 20 using manipulatives.

Building Number Sense
Investigation 4: Sessions 1–5, 7–10
Number Games and Story Problems
Investigation 3: Sessions 1–8, 10–13

PO 3. State addition facts for sums through 18 and subtraction for differences with minuends through 9 or less.

Mathematical Thinking at Grade 1
Investigation 2: Sessions 4–6
Investigation: Session 4
Building Number Sense
Investigation 1: Sessions 1–9
Investigation 2: Sessions 1–9
Investigation 4: Sessions 1–10

Number Games and Story Problems
- Investigation 1: Sessions 1–10
- Investigation 2: Sessions 1–8, 10–12
- Investigation 3: Sessions 1–8

PO 4. Add one- and two-digit whole numbers without regrouping.

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 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, 3–8, 10–13

PO 5. Subtract one- and two-digit whole numbers without regrouping.

Mathematical Thinking at Grade 1
- Investigation 2: Session 4

Building Number Sense
- Investigation 4: Sessions 2, 7–10

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

PO 6. Select the grade-level appropriate operation to solve word problems.

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

PO 7. Solve word problems using addition and subtraction of 2-digit numbers without regrouping.

Number Games and Story Problems
- Investigation 2: Session 13

PO 8. Count by multiples to show the process of multiplication (10s, 5s, or 2s).

Number Games and Story Problems
- Investigation 2: Sessions 1–8, 10–12

PO 9. Demonstrate families of equations for addition and subtraction through 18.

These investigations involving equivalent forms of the same number can be adapted to show fact families.

Building Number Sense
- Investigation 1: Sessions 1–9
- Investigation 2: Sessions 1, 4–8

Number Games and Story Problems
- Investigation 1: Sessions 4–5, 7–9
- Investigation 3: Sessions 3–8, 10–12

PO 10 Demonstrate the identity and commutative properties of addition through 18.

Related content:

Building Number Sense
- Investigation 1: Sessions 7–8 (See p. 27)
- Investigation 2: Sessions 4–5, 6–8 (See pp. 65, 71)

PO 11. Identify addition and subtraction as inverse operations.

These investigations provide opportunities to introduce this standard.

Number Games and Story Problems
- Investigation 3: Sessions 1–5

Building Number Sense
- Teacher Note, p. 45.

See also, Grade 2.

PO 12. Apply the symbols: +, -, =.

Building Number Sense
- Investigation 2: Sessions 1–2, 6–9
- Investigation 4: Sessions 1–5, 7–10

Number Games and Story Problems
- Investigation 1: Sessions 1–10

PO 13. Use grade-level appropriate mathematical terminology.

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

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

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

PO 14. Demonstrate addition of fractions with like denominators (halves) using models.

This standard is investigated in Grade 3.

PO 15. Demonstrate subtraction of fractions with like denominators (halves) using models.

This standard is investigated in Grade 3.

PO 16. Add and subtract money without regrouping using manipulatives and paper and pencil, through 99¢.

Related content:

Number Games and Story Problems

Investigation 2: Sessions 3–8

Investigation 3: Session 9

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve problems using a variety of mental computations and reasonable estimation.

Building Number Sense

Investigation 3: Sessions 3–7, 9

PO 2. Estimate the measurement of an object using U.S. customary standard and non-standard units of measurement.

Bigger, Taller, Heavier, Smaller

Investigation 2: Session 1

STRAND 2: Data Analysis, Probability, and Discrete Mathematics

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

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

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

Classroom Routines: Exploring Data; Understanding Time and Changes

PO 2. Make a simple pictograph or tally chart with appropriate labels from organized data.

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

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

PO 3. Interpret pictographs using terms such as most, least, equal, more than, less than, and greatest.

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

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

PO 4. Answer questions about pictographs using terms such as most, least, equal, more than, less than, and greatest.

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

PO 5. Formulate questions based on graphs, charts, and tables.

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

PO 6. Solve problems using graphs, charts, and tables.

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

Concept 2: Probability
Understand and apply the basic concepts of probability.
(Grades 2-HS) Arizona has no performance objectives for this concept at the Grade One Level.

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g., How many ice cream cones can one make with 2 different types of ice cream and 2 different types of cones?).
Related content:
Building Number Sense
Investigation 1: Sessions 3–9

Concept 4: Vertex-Edge Graphs
Understand and apply vertex–edge graphs.

PO 1. Color pictures with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in these investigations.
Quilt Squares and Block Towns
Investigation 3: Sessions 6–7

Strand 3: Patterns, Algebra, and Functions
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate pattern (e.g., ♦,∇,♥ Repeat this complete pattern.)
Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Sessions 2–3

Building Number Sense
Investigation 3: Session 8
Investigation 4: Session 10
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Number Games and Story Problems
Investigation 2: Session 9

PO 2. Extend a simple grade-level appropriate repetitive pattern (e.g., ↑, ↓, ↑, ↓, ↑, ___, ___, ___).

Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Session 2–3, 4–6
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Building Number Sense
Investigation 3: Sessions 1–8
Investigation 4: Session 10
Number Games and Story Problems
Investigation 2: Sessions 1–12

PO 3. Create grade-level appropriate patterns.

Mathematical Thinking at Grade 1
Investigation 3: Sessions 1–6
Investigation 4: Sessions 2–3
Building Number Sense
Investigation 3: Session 8
Investigation 4: Session 10
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15
Number Games and Story Problems
Investigation 2: Session 9

Concept 2: Functions and Relationships

Describe and model functions and their relationships.
(Grades 2-HS) Arizona has no performance objectives for this concept at the Grade One Level.

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Use variables in contextual situations.
Related content:
Building Number Sense
Investigation 2: Sessions 1–2, 6–9
Investigation 4: Sessions 1–5, 7–10
Number Games and Story Problems
Investigation 1: Sessions 1–10

PO 2. Find the missing sum or difference in number sentences for sums and minuends through 9 (e.g., 2 + 5 = _).
Number Games and Story Problems
Investigation 1: Sessions 1–3

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier, etc.).
Quilt Squares and Block Towns
Investigation 1: Sessions 13–15

PO 2. Make simple predictions based on a variable (e.g., select next stage of plant growth).
Related content:
Mathematical Thinking at Grade 1
Investigation 4: Session 5

STRAND 4: GEOMETRY AND MEASUREMENT
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties
Analyze the attributes and properties of 2– and 3–dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Use the words vertex and side when describing simple 2-dimensional geometric shapes.

Quilt Squares and Block Towns
Investigation 1: Sessions 1, 3–6, 8–15

PO 2. Identify 2-dimensional shapes by attribute (size, shape, number of sides, vertices).

Quilt Squares and Block Towns
Investigation 1: Sessions 1–15

PO 3. Use concepts and terms of position and size in contextual situations:

- **Inside/outside,**
- **Left/right,**
- **Above/below/between,**
- **Smaller/larger, and**
- **Longer/shorter.**

Quilt Squares and Block Towns
Investigation 3: Sessions 6–7

PO 4. Name common 2-dimensional shapes (square, rectangle, triangle, circle).

Mathematical Thinking at Grade 1
Investigation 1: Sessions 1–4
Quilt Squares and Block Towns
Investigation 1: Sessions 1, 3–6, 8–15
Investigation 3: Sessions 3–4

PO 5. Draw 2-dimensional shapes (square, rectangle, triangle, circle).

Quilt Squares and Block Towns
Investigation 1: Sessions 1, 3–6, 8–10

PO 6. Recognize where a line of symmetry divides a 2-dimensional shape into mirror images.

Symmetry is introduced in Grade 2 in *Shapes, Halves, and Symmetry*.

Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Recognize same shape in different positions (slide/translations).

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

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.
(Grades 3-HS) Arizona has no performance objectives for this concept at the Grade One Level.

Concept 4: Measurement - Units Of Measure
- Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. Compare the measurable characteristics of two objects (e.g., length, weight, size).
Bigger, Taller, Heavier, Smaller
Investigation 1: Sessions 1–7
Investigation 2: Sessions 1–7

PO 2. Select the appropriate measure of accuracy:

- **length – inches, feet,**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 3: Sessions 1–6

- **capacity/volume – cups, gallons, and**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 2: Sessions 1–7

- **mass/weight – pounds**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 3: Sessions 1–6

PO 3. Tell time to the hour using analog and digital clocks.
Clock time is formally introduced in Grade 3.
Related content:
Classroom Routines: Understanding Time and Changes

PO 4. Name the days of the week for yesterday, today, and tomorrow (e.g., If today is Wednesday, what day will it be tomorrow?).
This standard can be introduced in this investigation and during these routines.
Survey Questions and Secret Rules
Investigation 3: Sessions 1–3
Classroom Routines: Counting; Understanding Time and Changes

PO 5. Name the 12 months of the year in proper order, starting with January.
This standard can be introduced in this investigation and during these routines.
Survey Questions and Secret Rules
Investigation 3: Sessions 1–3
Classroom Routines: Counting; Understanding Time and Changes

PO 6. Name the 7 days of the week in proper order, starting with Sunday.
This standard can be introduced in this investigation and during these routines.
Survey Questions and Secret Rules
Investigation 3: Sessions 1–3
Classroom Routines: Counting; Understanding Time and Changes

PO 7. Measure a given object using the appropriate unit of measure:

- **length – inches, feet and yards,**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 3: Sessions 1–6

- **capacity/volume – cups, gallons, and**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 2: Sessions 1–7

- **mass/weight – pounds.**
  Non-standard units are used in these investigations.
  Bigger, Taller, Heavier, Smaller
  Investigation 2: Sessions 1–6

STRAND 5: STRUCTURE AND LOGIC

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Create problems based on contextual situations (addition facts up to 18 and subtraction from 9).
Mathematical Thinking at Grade 1
Investigation 2: Sessions 4–6
Investigation 4: Sessions 4–6

Building Number Sense
Investigation 4: Sessions 1–5, 7–10
Number Games and Story Problems
Investigation 3: Sessions 1–13

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof
Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. List the quantitative components found in word problems.
Mathematical Thinking at Grade 1
Investigation 2: Sessions 4–6
Investigation 4: Sessions 4–6
Number Games and Story Problems
Investigation 3: Sessions 1–13
Building Number Sense
Investigation 4: Sessions 1–5, 7–10

PO 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, weight, etc.).
Quilt Squares and Block Towns
Investigation 1: Sessions 11–12
Investigation 2: Sessions 1–3, 4–10

Investigations in Number, Data, and Space
to the
Arizona Mathematics Standard Articulated by Grade Level
Grade Two

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Make a model to represent a given whole number 0 through 999.

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

PO 2. Identify a whole number represented by a model with a word name and symbol 0 through 999.

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

Coins, Coupons, and Combinations
- Investigation 1: Sessions 1, 6, 10
- Investigation 2: Sessions 1, 4–6

PO 3. Count aloud, forward or backward, in consecutive order (0 through 999).

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

Coins, Coupons, and Combinations
- Investigation 2: Sessions 1–5
- Investigation 3: Session 3
- Investigation 4: Sessions 1–4

Putting Together and Taking Apart
- Investigation 2: Sessions 3–7
- Investigation 4: Session 1

PO 4. Identify whole numbers through 999 in or out of order.

Mathematical Thinking at Grade 2
- Investigation 1: Session 1
- Investigation 2: Sessions 1–7

Coins, Coupons, and Combinations
- Investigation 4: Session 1

Putting Together and Taking Apart:
- Investigation 2: Session 1

Classroom Routines: Today's Number, How Many Pockets?

PO 5. Write whole numbers through 999 in or out of order.

Mathematical Thinking at Grade 2
- Investigation 1: Session 1
- Investigation 2: Sessions 1–7

Coins, Coupons, and Combinations
- Investigation 4: Session 1

Putting Together and Taking Apart:
- Investigation 2: Session 1

Classroom Routines: Today's Number, How Many Pockets?

PO 6. State equivalent forms of whole numbers using multiples of 10 through 1,000 (430 + 200 = 600 + 30).

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

Putting Together and Taking Apart
- Investigation 2: Sessions 1–4
- Investigation 4: Sessions 1–6

PO 7. State verbally whole numbers, through 999, using correct place value (e.g., A student will read <u>528</u> as five hundreds, two tens, and eight ones.).

Related content:

Coins, Coupons, and Combinations
- Investigation 4: Sessions 2–4

PO 8. Construct models to represent place value concepts for the one's, ten's, and hundred's places.

Related content:

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

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

PO 9. Apply expanded notation to model place value through 999 (e.g., 378 = 3 hundreds + 7 tens + 8 ones).

Related content:

Coins, Coupons, and Combinations
- Investigation 1: Sessions 1, 6, 10
- Investigation 2: Sessions 1, 4–6

PO 10. Identify odd and even (including 0) whole numbers through 999.

Although students do not use the terms odd and even, they gain experience with even numbers as they count by twos in these investigations.

Mathematical Thinking at Grade 2
- Investigation 4: Session 2: Teacher Note, p. 91

Coins, Coupons, and Combinations
- Investigation 2: Sessions 1–5

See also, Grade 3.

PO 11. Compare two whole numbers through 999.

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

Putting Together and Taking Apart
- Investigation 2: Sessions 3–7
- Investigation 4: Session 1

PO 12. Use ordinal numbers.

Several investigations provide opportunities for practice with ordinal numbers. Notes to the teacher highlight these opportunities.

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

PO 13. Order three or more whole numbers through 999 (least to greatest or greatest to least).

Coins, Coupons, and Combinations
- Investigation 4: Sessions 2–4

PO 14. Make models that represent given fractions (halves and fourths).

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

PO 15. Identify in symbols and words a model that is divided into equal fractional parts (halves and fourths).

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

PO 16. Count money through $5.00 using manipulatives and pictures of bills and coins.

Mathematical Thinking at Grade 2
Investigation 4: Sessions 2–4
Coins, Coupons, and Combinations
Investigation 2: Sessions 2–5, 6–9, 10
Putting Together and Taking Apart
Investigation 2: Sessions 5–6
Investigation 4: Sessions 3–4

PO 17. Identify the value of a collection of money using the symbols ¢ and $ through $5.00.

Mathematical Thinking at Grade 2
Investigation 4: Sessions 2–4
Coins, Coupons, and Combinations
Investigation 2: Sessions 2–5, 6–9, 10
Putting Together and Taking Apart
Investigation 2: Sessions 5–6
Investigation 4: Sessions 3–4

PO 18. Use decimals through hundredths in contextual situations with money.

This standard is introduced and investigated in Grade 3.

PO 19. Compare two decimals using money, through hundredths, using models, illustrations, or symbols.

This standard is introduced and investigated in Grade 4.

PO 20. Distinguish the equivalency among decimals, fractions and percents (e.g., half-dollar = 50¢ = 50%).

This standard is introduced and investigated in Grade 3.

Concept 2: Numerical Operations
Understand and apply numerical operations and their relationship to one another.

PO 1. Demonstrate the process of addition through two three-digit whole numbers, using manipulatives.

Coins, Coupons, and Combinations
- Investigation 2: Sessions 7–9
- Investigation 3: Sessions 1–5
- Investigation 4: Sessions 2–4, 5

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

PO 2. Demonstrate the process of subtraction using manipulatives with two-digit whole numbers.

Coins, Coupons, and Combinations
- Investigation 3: Sessions 1–5
- Investigation 4: Sessions 2–4

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

PO 3. State addition and subtraction facts.

Mathematical Thinking at Grade 2
- Investigation 1: Session 1
- Investigation 2: Sessions 2–3, 6, 8

Coins, Coupons, and Combinations
- Investigation 1: Sessions 1–6, 8–9

PO 4. Add one- and two-digit whole numbers with regrouping.

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

Coins, Coupons, and Combinations
- Investigation 1: Sessions 1–3, 10
- Investigation 2: Session 7–9
- Investigation 3: Sessions 1–2
- Investigation 4: Sessions 2–4, 5

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

PO 5. Subtract one- and two-digit whole numbers with regrouping.

Coins, Coupons, and Combinations
- Investigation 3: Sessions 1–5
- Investigation 4: Sessions 2–4

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

PO 6. Add 3 one- or two-digit addends.

Putting Together and taking Apart
- Investigation 4: Sessions 1, 2, 3–4

Coins Coupons, Combinations
- Investigation 4: Session 5

PO 7. Select the grade-level appropriate operation to solve word problems.

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

Coins, Coupons, and Combinations
- Investigation 3: Sessions 2, 4–5
- Investigation 4: Sessions 2–4

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

PO 8. Solve word problems using addition and subtraction of two 2-digit numbers, with regrouping AND two 3-digit numbers without regrouping.

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

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

PO 9. Count by multiples of three.

Mathematical Thinking at Grade 2
- Investigation 4: Session 1

PO 10. State multiplication facts: 2s, 5s and 10s.

Related content:

Mathematical Thinking at Grade 2
- Investigation 4: Session 1

Coins, Coupons, and Combinations
- Investigation 2: Sessions 2–5

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

See also, Grade 3.

PO 11. Demonstrate the associative property of addition [e.g., (3 + 5) + 4 = 3 + (5 + 4)].

Coins, Coupons, and Combinations
- Investigation 1: Sessions 6, 10
- Investigation 4: Session 5

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

PO 12. Apply grade-level appropriate properties to assist in computation.

Coins, Coupons, and Combinations
- Investigation 1: Sessions 6, 10
- Investigation 4: Session 5

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

PO 13. Apply the symbols: +, -, x, ÷, =, ≠, <, >, %.

Mathematical Thinking at Grade 2
- Investigation 1: Session 1
- Investigation 2: Session 6

Coin, Coupons, and Combinations
- Investigation 1: Sessions 1–3, 6, 10–11
- Investigation 2: Session 1
- Investigation 3: Session 2

Putting Together and Taking Apart
- Investigation 1: Sessions 1–6
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 1–5 (see Teacher Note, p. 85)
- Investigation 4: Sessions 1–4
- Investigation 5: Sessions 1–8

PO 14. Use grade-level appropriate mathematical terminology.

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

Coins, Coupons, and Combinations
- Investigation 1: Sessions 2–11
- Investigation 2: Session 7–9
- Investigation 3: Sessions 1–5
- Investigation 4: Sessions 2–5

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

How Long? How Far?
- Investigation 1: Sessions 5–7

Classroom Routines: Today's Number

PO 15. Demonstrate addition of fractions with like denominators (halves and fourths) using models.

This standard is investigated in Grade 3.

Related content:

Shapes, Halves, and Symmetry
- Investigation 3: Sessions 1–2, 7–8

PO 16. Demonstrate subtraction of fractions with like denominators (halves and fourths) using models.

This standard is investigated in Grade 3.

Related content:

Shapes, Halves, and Symmetry
- Investigation 3: Sessions 1–2, 7–8

PO 17. Add and subtract money without regrouping using manipulatives and paper and pencil, through $5.00.

Mathematical Thinking at Grade 2
- Investigation 4: Session 2

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

Coins, Coupons, and Combinations
- Investigation 4: Session 5

Concept 3: Estimation
Use estimation strategies reasonably and fluently.

PO 1. Solve problems using a variety of mental computations and reasonable estimation.
Coins, Coupons, and Combinations
Investigation 1: Sessions 8–9
Investigation 2: Session 10
Classroom Routine: How Many Pockets?

PO 2. Estimate the measurement of an object using U.S. customary standard and non-standard units of measurement.
How Long? How Far?
Investigation 1: Sessions 1, 2–4, 5–7

PO 3. Compare an estimate to the actual measure.
How Long? How Far?
Investigation 1: Sessions 5–7

PO 4. Evaluate the reasonableness of an estimate.
How Long? How Far?
Investigation 1: Sessions 1–7

STRAND 2: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)
Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 5: Sessions 1–6
Does It Walk, Crawl, or Swim?
Investigation 1: Sessions 1–3
Investigation 2: Sessions 3–4
Investigation 3: Sessions 1–3

PO 2. Make a simple pictograph or tally chart with appropriate labels from organized data.

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

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

How Many Pockets? How Many Teeth?
- Investigation 1: Sessions 1–5
- Investigation 2: Sessions 1–6
- Investigation 3: Sessions 1–4

Classroom Routines: How Many Pockets?

PO 3. Interpret pictographs using terms such as most, least, equal, more than, less than, and greatest.

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

How Many Pockets? How Many Teeth?
- Investigation 1: Sessions 1, 4–5
- Investigation 2: Sessions 1–2, 4–6

PO 4. Answer questions about a pictograph using terms such as most, least, equal, more than, less than, and greatest.

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

How Many Pockets? How Many Teeth?
- Investigation 1: Sessions 1, 4–5
- Investigation 2: Sessions 1–2, 4–6

PO 5. Formulate questions based on graphs, charts, and tables.

How Many Pockets? How Many Teeth?
- Investigation 1: Sessions 4–5
- Investigation 2: Sessions 3–6

PO 6. Solve problems using graphs, charts, and tables.

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

How Many Pocket? How Many Teeth?
- Investigation 1: Sessions 1–5
- Investigation 2: Sessions 1–2, 4–6

Concept 2: Probability
Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.
This standard is investigated in Grade 4.

PO 2. Predict the most likely or least likely outcome in probability experiments (e.g., Predict the chance of spinning one of the 2 colors on a 2-colored spinner.).
This standard is investigated in Grade 3.

PO 3. Predict the outcome of a grade-level appropriate probability experiment.
This standard is investigated in Grade 4.

PO 4. Record the data from performing a grade-level appropriate probability experiment.
This standard is investigated in Grade 4.

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.
This standard is investigated in Grade 4.

PO 6. Compare the results of two repetitions of the same grade-level appropriate probability experiment.
This standard is investigated in Grade 4.

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g., How many types of sandwiches can one make with 3 different types of fillings and 2 types of bread if only one type of bread and 1 kind of filling is used for each sandwich?).
Related content:
Mathematical Thinking at Grade 2
Investigation 3: Sessions 3–4, 6

Concept 4: Vertex-Edge Graphs

PO 1. Color pictures with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in these investigations.
How Long? How Far?
Investigation 2: Sessions 1, 2–3, 4–5

STRAND 3: PATTERNS, ALGEBRA, AND FUNCTIONS
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate pattern, using symbols or numbers (e.g., ∇, O, Δ, ∇, O, Δ, ∇, ___, ___, ___).
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 4: Sessions 1–4
Investigation 5: Sessions 4–5
Coins, Coupons, and Combinations
Investigation 2: Sessions 1–5
Timelines and Rhythm Patterns
Investigation 2: Sessions 1–5

PO 2. Extend a grade-level appropriate repetitive pattern (e.g., 12, 22, 32, ___, ___, ___).
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 4: Sessions 1–4
Investigation 5: Sessions 4–5
Coins, Coupons, and Combinations
Investigation 2: Sessions 1–5

PO 3. Create grade-level appropriate patterns.
Mathematical Thinking at Grade 2
Investigation 2: Session 6
Investigation 4: Sessions 1–4
Investigation 5: Sessions 4–5

Coins, Coupons, and Combinations
Investigation 2: Sessions 1–5

Concept 2: Functions and Relationships
Describe and model functions and their relationships.

PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model, and frames and arrows).
Coins, Coupons, and Combinations
Investigation 2: Sessions 1, 4–5
Timelines and Rhythm Patterns
Investigation 2: Sessions 1–5

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Use variables in contextual situations.
Putting Together and Taking Apart
Investigation 1: Sessions 1–2, 5–6
Investigation 3: Sessions 2–5
Investigation 4: Sessions 2–4
Investigation 5: 1–3
Classroom Routines: Today's Number

PO 2. Find the missing element (addend, subtrahend, minuend, sum, and difference) in addition and subtraction number sentences for sums through 18 and minuends through 9 (e.g., 13 - _ = 8).
Coins, Coupons, and Combinations
Investigation 2: Session 3
Investigation 3: Sessions 1–5
Investigation 4: Sessions 2–4
Putting Together and Taking Apart
Investigation 3: Sessions 2, 3–5
Investigation 5: Sessions 1–3

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier).
How Long? How Far?
Investigation 1: Sessions 2–4, 5–7

PO 2. Make simple predictions based on a variable (e.g., a child's height from year to year).
How Many Teeth? How Many Pockets?
Investigation 2: Sessions 3, 6

STRAND 4: GEOMETRY AND MEASUREMENT
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties
Analyze the attributes and properties of 2– and 3–dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Compare attributes of 2-dimensional shapes (square, rectangle, triangle, and circle).
Mathematical Thinking at Grade 2
Investigation 3: Sessions 1–5
Shapes, Halves, and Symmetry
Investigation 1: Session 1
Investigation 2: Session 2
Investigation 4: Sessions 1–7

PO 2. Recognize congruent shapes.
Shapes, Halves, and Symmetry
Investigation 3: Sessions 1–8
Investigation 4: Sessions 5–6

PO 3. Recognize line(s) of symmetry for a 2-dimensional shape.
Shapes, Halves, and Symmetry
Investigation 4: Sessions 1–7

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Recognize same shape in different positions (flip/reflection).
Shapes, Halves, and Symmetry
Investigation 1: Sessions 4–8
Investigation 4: Sessions 1–6

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.
(Grades 3-HS) Arizona has no performance objectives for this concept at the Grade Two Level.

Concept 4: Measurement - Units of Measure
- Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. Identify the type of measure (e.g., weight, height, and time) for each attribute of an object.
How Long? How Far?
Investigation 1: Sessions 2–4, 5–7

PO 2. Select the appropriate U.S. customary measure of accuracy:

- **length – inches, feet, yards, miles,**
  Bigger, Taller, Heavier, Smaller
  Investigation 3: Sessions 1–5

- **capacity/volume – pints, quarts, and**
  This standard is investigated in Grade 5.

- **mass/weight – ounces.**
  Weight is introduced in Grade 3, using a pan balance. Standard units are introduced in Grade 5.

PO 3. Tell time to the quarter hour using analog and digital clocks.
This standard is introduced in Grade 3.

PO 4. Determine the passage of time using units of days and weeks within a month using a calendar.

Timelines and Rhythm Patterns

Investigation 1: Sessions 1–4

Investigation 2: Sessions 1–4

PO 5. Select the appropriate tool to measure the given characteristic of an object.

How Long? How Far?

Investigation 1: Session 8

PO 6. Measure a given object using the appropriate unit of measure:

length – inches, miles,

Bigger, Taller, Heavier, Smaller

Investigation 3: Sessions 1–5

capacity/volume – pints, quarts, and

This standard is introduced in Grade 5.

mass/weight – ounces.

Weight is introduced in Grade 3, using a pan balance. Standard units are introduced in Grade 5.

PO 7. State equivalent relationships:

- **12 inches = 1 foot,**

  This standard is introduced in Grade 3.

- **60 minutes = 1 hour,**

  Related content:
  Classroom Routines: Time and Time Again
  See also, Grade 3.

- **24 hours = 1 day,**

  Related content:
  Classroom Routines: Time and Time Again
  See also, Grade 3.

- **7 days = 1 week,**

  Related content:
  Classroom Routines: Time and Time Again
  See also, Grade 3.

- **12 months = 1 year,**

  Related content:
  Classroom Routines: Time and Time Again
  See also, Grade 3.

- **100 pennies = 1 dollar,**
  Coins, Coupons, and Combinations
  Investigation 4: Session 5
  Putting Together and Taking Apart
  Investigation 2: Sessions 5–6
  These investigations can be adapted to include one dollar.
  Coins, Coupons, and Combinations
  Investigation 2: Sessions 6–9
  Mathematical Thinking at Grade 2
  Investigation 4: Session 2

- **10 dimes = 1 dollar, and**
  Coins, Coupons, and Combinations
  Investigation 4: Session 5
  Putting Together and Taking Apart
  Investigation 2: Sessions 5–6
  These investigations can be adapted to include one dollar.
  Coins, Coupons, and Combinations
  Investigation 2: Sessions 6–9
  Mathematical Thinking at Grade 2
  Investigation 4: Session 2

- **4 quarters = 1 dollar.**
  Coins, Coupons, and Combinations
  Investigation 4: Session 5
  Putting Together and Taking Apart
  Investigation 2: Sessions 5–6
  These investigations can be adapted to include one dollar.
  Coins, Coupons, and Combinations
  Investigation 2: Sessions 6–9
  Mathematical Thinking at Grade 2
  Investigation 4: Session 2

STRAND 5: STRUCTURE AND LOGIC

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Create contextual problems that require addition or subtraction with one- or two-digit numbers.

Putting Together and Taking Apart
- investigation 3: Sessions 3–5
- Investigation 4: Sessions 2, 3–4
- Investigation 5: Sessions 4–5

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

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. Identify the concepts *some, every*, and *many* within the context of logical reasoning.

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

Does It Walk, Crawl or Swim?
- Investigation 1: Sessions 1–2, 3, 4–5, 6
- Investigation 2: Sessions 1–2, 3–4
- Investigation 3: Sessions 1, 2–3

PO 2. Identify the concepts *all* and *none* within the context of logical reasoning.

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

Does It Walk, Crawl or Swim?
- Investigation 1: Sessions 1–2, 3, 4–5, 6
- Investigation 2: Sessions 1–2, 3–4
- Investigation 3: Sessions 1, 2–3

Investigations in Number, Data, & Space
to the
Arizona Mathematics Standard Articulated by Grade Level
Grade Three

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Read whole numbers in contextual situations (through six-digit numbers).

Landmarks in the Hundreds
- Investigation 1: Sessions 3–4, 6–7
- Investigation 3: Sessions 1, 2–3

Up and Down the Number Line
- Investigation 1: Sessions 1,2, 5, 8
- Investigation 2: Sessions 1, 2, 3, 4
- Investigation 3: Sessions 1, 2

Combining and Comparing
- Investigation 4: Sessions 3–4

PO 2. Identify six-digit whole numbers in or out of order.

Landmarks in the Hundreds
- Investigation 1: Sessions 3–4, 6–7
- Investigation 3: Sessions 1, 2–3

Up and Down the Number Line
- Investigation 1: Sessions 1,2, 5, 8
- Investigation 2: Sessions 1, 2, 3, 4
- Investigation 3: Sessions 1, 2

Combining and Comparing
- Investigation 4: Sessions 3–4

PO 3. Write whole numbers through six-digits in or out of order.

Landmarks in the Hundreds
- Investigation 1: Sessions 3–4, 6–7
- Investigation 3: Sessions 1, 2–3

Up and Down the Number Line
- Investigation 1: Sessions 1,2, 5, 8
- Investigation 2: Sessions 1, 2, 3, 4
- Investigation 3: Sessions 1, 2

Combining and Comparing
- Investigation 4: Sessions 3–4

PO 4. State whole numbers, through six-digits, with correct place value, by using models, illustrations, symbols, or expanded notation (e.g., 53,941 = 50,000 + 3,000 + 900 + 40 +1).

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

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

Combining and Comparing
- Investigation 4: Sessions 3–4

PO 5. Construct models to represent place value concepts for the one's, ten's, and hundred's places.

Mathematical Thinking at Grade 3
- Investigation 1: Session 1
- Investigation 2: Sessions 2, 5–7
- Investigation 3: Sessions 3–4
- Investigation 4: Session 1

Combining and Comparing
- Investigation 1: Sessions 1, 2
- Investigation 2: Session 2
- Investigation 3: Session 1
- Investigation 4: Sessions 2, 3–4

PO 6. Apply expanded notation to model place value through 9,999 (e.g., 5,378 = 5,000 + 300 + 70 + 8).

Related content:

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

PO 7. Sort whole numbers into sets containing only odd numbers or only even numbers.

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

PO 8. Compare two whole numbers, through six-digits.

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

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

Fair Shares
- Investigation 2: Session 3

PO 9. Order three or more whole numbers through six-digit numbers (least to greatest, or greatest to least).

Mathematical Thinking at Grade 3
- Investigation 2: Sessions 2, 5–7
- Investigation 3: Sessions 3–4
- Investigation 4: Session 1

Combining and Comparing
- Investigation 1: Sessions 1, 2
- Investigation 2: Sessions 1–2
- Investigation 3: Session 1
- Investigation 4: Sessions 2, 3–4

PO 10. Make models that represent proper fractions (halves, thirds, fourths, eighths, and tenths).

Flips, Turns, and Area
- Investigation 2: Sessions 2–3, 4–5

Fair Shares
- Investigation 1: Sessions 1, 2, 3, 4
- Investigation 2: Sessions 1–2, 4, 5–6, 7

PO 11. Identify symbols, words, or models that represent proper fractions (halves, thirds, fourths, eighths and tenths).

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

Flips, Turns, and Areas
- Investigation 2: Sessions 1–5

Fair Shares
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 1–3

PO 12. Use proper fractions in contextual situations.

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

Flips, Turns, and Areas
- Investigation 2: Sessions 1–5

Fair Shares
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 1–7
- Investigation 3: Sessions 1–3

PO 13. Compare two proper fractions with like denominators.

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

PO 14. Order three or more proper fractions with like denominators (halves, thirds, fourths, eighths, and tenths).

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

PO 15. Count amounts of money through $20.00 using pictures or actual bills and coins.

Mathematical Thinking at Grade 3
- Investigation 2: Sessions 5–7

Landmarks in the Hundreds
- Investigation 1: Sessions 6–7
- Investigation 2: Session 4

Combining and Comparing
- Investigation 3: Sessions 1–2

PO 16. Use decimals through hundredths in contextual situations.

Fair Shares
- Investigation 3: Sessions 1–2

Combining and Comparing
- Investigation 3: Sessions 1–2

PO 17. Compare two decimals, through hundredths, using models, illustrations, or symbols.

This standard is investigated in Grade 4.

PO 18. Order three or more decimals, through hundredths, using models, illustrations, or symbols.

This standard is investigated in Grade 4.

PO 19. Determine the equivalency among decimals, fractions, and percents (e.g., half-dollar = 50¢ = 50% and 1/4 = 0.25 = 25%).

These investigations explore the relationship among fractions, decimals, and money.

Fair Shares

Investigation 3: Sessions 1–3

PO 20. Identify whole-number factors and/or pairs of factors for a given whole number through 24.

Things That Come in Groups

Investigation 3: Sessions 2, 3

PO 21. Determine multiples of a given whole number with products through 24 (skip counting).

Things That Come in Groups

Investigation 2: Sessions 1, 2, 3–4

Investigation 5: Session 3

Landmarks in the Hundreds

Investigation 1: Sessions 6–7

Investigation 2: Sessions 5–6

Things That Come in Groups

Investigation 2: Sessions 1, 2, 3–4, 5–6

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Demonstrate the process of subtraction using manipulatives through three-digit whole numbers.

Combining and Comparing

Investigation 1: Sessions 1, 2

Investigation 2: Session 2

Investigation 3: Sessions 1–2

Investigation 4: Sessions 3–4

PO 2. Add two three-digit whole numbers.

Combining and Comparing

Investigation 1: Session 2

Investigation 2: Session 2

Investigation 3: Sessions 1–2, 3

Investigation 4: Sessions 3–4

PO 3. Subtract two three-digit whole numbers.

Combining and Comparing
- Investigation 1: Sessions 1, 2
- Investigation 2: Session 2
- Investigation 4: Sessions 3–4

PO 4. Add a column of numbers.

Combining and Comparing
- Investigation 3: Sessions 1–2, 3

PO 5. Select the grade-level appropriate operation to solve word problems.

Things That Come in Groups
- Investigation 4: Sessions 1, 3–4

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

PO 6. Solve word problems using grade-level appropriate operations and numbers.

Things That Come in Groups
- Investigation 4: Sessions 1, 3–4

From Paces to Feet
- Ten-Minute Math

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

PO 7. Demonstrate the process of multiplication as repeatedly adding the same number, counting by multiples, combining equal sets, and making arrays.

Things That Come in Groups
- Investigation 1: Sessions 1, 2, 3, 4
- Investigation 2: Sessions 3–4
- Investigation 3: Sessions 1, 2, 3

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

PO 8. Demonstrate the process of division with one-digit divisors (separating elements of a set into smaller equal sets, sharing equally, or repeatedly subtracting the same number).

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

Things That Come in Groups
- Investigation 3: Sessions 3–5
- Investigation 4: Sessions 1–2

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

PO 9. Demonstrate families of equations for multiplication and division through 9s.

Things That Come in Groups
- Investigation 4: Sessions 1–2, 3–4

PO 10. State multiplication and division facts through 9s.

Things That Come in Groups
- Investigation 1: Session 4

Investigation 2: Sessions 1, 2, 3–4, 5–6
- Investigation 5: Sessions 1, 3

PO 11. Demonstrate the commutative and identity properties of multiplication.

Things That Come in Groups
- Investigation 3: Sessions 1–2, 3–4

PO 12. Identify multiplication and division as inverse operations.

Things That Come in Groups
- Investigation 1: Session 3 (The Relationship Between Multiplication and Division)
- Investigation 3: Sessions 3, 4
- Investigation 4: Session 1
- Investigation 5: Session 4

PO 13. Apply grade-level appropriate properties to assist in computation.

Things That Come in Groups
- Investigation 3: Sessions 1–2, 3–4

PO 14. Apply the symbols: ×, ÷, /, ∗, %, and the grouping symbols ( ) and ",".

In these investigations, students use symbols to write number sentences.

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

Up and Down the Number Line
- Investigation 1: Sessions 6–7

PO 15. Use grade-level appropriate mathematical terminology.

Mathematical Thinking at Grade 3
- Investigation 2: Session 1 (See Teacher Note, p. 21)

Things That Come in Groups
- Investigation 2: Sessions 3–4 (See Teacher Note, p. 32)

PO 16. Add or subtract fractions with like denominators (halves, thirds, fourths, eighths, and tenths) appropriate to grade level.

Flips, Turns, and Areas
- Investigation 2: Sessions 2–3

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

PO 17. Apply addition and subtraction in contextual situations, through $20.00.

Mathematical Thinking at Grade 3
- Investigation 2: Sessions 5–7
- Ten-Minute Math

Combining and Comparing
- Investigation 3: Session 2
- Investigation 5: Sessions 1, 2–3

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve grade-level appropriate problems using estimation.

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

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

Turtle Paths
- Investigation 2: Sessions 1–2

PO 2. Estimate length and weight using U.S. customary units.

Related content:
From Paces to Feet
Investigation 1: Sessions 1, 2, 3–4
Related content:
Combining and Comparing
Investigation 2: Sessions 1–2

PO 3. Record estimated and actual linear measurements for real-life objects (e.g., length of fingernail; height of desk).

From Paces to Feet
Investigation 2: Sessions 1–7
Investigation 3: Sessions 1–3
Investigation 4: Sessions 1–3

PO 4. Compare estimations of appropriate measures to the actual measures.

From Paces to Feet
Investigation 1: Sessions 1, 2, 3–4
Turtle Paths
Investigation 2: Sessions 1–2

PO 5. Evaluate the reasonableness of estimated measures.

From Paces to Feet
Investigation 1: Sessions 1, 2, 3–4

STRAND 2: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

Mathematical Thinking at Grade 3
Investigation 3: Sessions 3–4
Combining and Comparing
Investigation 5: Sessions 2–3
Ten-Minute Math

PO 2. Construct a horizontal bar, vertical bar, pictograph, or tally chart with appropriate labels and title from organized data.

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

Things That Come in Groups
- Investigation 5: Sessions 1, 3

Up and Down the Number Line
- Investigation 2: Sessions 1, 2, 3

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

PO 3. Interpret data found in line plots, pictographs, and single-bar graphs (horizontal and vertical).

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

Things That Come in Groups
- Investigation 5: Sessions 1,3

From Paces to Feet
- Investigation 1: Sessions 1–2, 5–6
- Investigation 2: Sessions 2–4
- Investigation 3: Sessions 1–3

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

PO 4. Answer questions based on data found in line plots, pictographs, and single-bar graphs (horizontal and vertical).

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

Things That Come in Groups
- Investigation 5: Sessions 1,3

From Paces to Feet
- Investigation 1: Sessions 1–2, 5–6
- Investigation 2: Sessions 2–4
- Investigation 3: Sessions 1–3

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

PO 5. Formulate questions based on graphs, charts, and tables to solve problems.

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

Things That Come in Groups
- Investigation 5: Sessions 1, 3

From Paces to Feet
- Investigation 1: Session 2

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

PO 6. Solve problems using graphs, charts and tables.

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

Things That Come in Groups
- Investigation 5: Sessions 1, 3

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

Concept 2: Probability

Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.

Related content:

Things That Come In Groups
- Ten-Minute Math: Likely or Unlikely

Exploring Solids and Boxes
- Ten-Minute Math: Likely or Unlikely

PO 2. Make predictions about the probability of events being more likely, less likely, equally likely or unlikely.

Things That Come In Groups
- Ten-Minute Math: Likely or Unlikely

Exploring Solids and Boxes
- Ten-Minute Math: Likely or Unlikely

PO 3. Predict the outcome of a grade-level appropriate probability experiment.
Related content:
Things That Come In Groups
Ten-Minute Math: Likely or Unlikely
Exploring Solids and Boxes
Ten-Minute Math: Likely or Unlikely

PO 4. Record the data from performing a grade-level appropriate probability experiment.
Related content:
Things That Come In Groups
Ten-Minute Math: Likely or Unlikely
Exploring Solids and Boxes
Ten-Minute Math: Likely or Unlikely

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.
Related content:
Things That Come In Groups
Ten-Minute Math: Likely or Unlikely
Exploring Solids and Boxes
Ten-Minute Math: Likely or Unlikely

PO 6. Compare the results of two repetitions of the same grade-level appropriate probability experiment.
Related content:
Things That Come In Groups
Ten-Minute Math: Likely or Unlikely
Exploring Solids and Boxes
Ten-Minute Math: Likely or Unlikely

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Make a diagram to represent the number of combinations available when 1 item is selected from each of 3 sets of 2 items (e.g., 2 different shirts, 2 different hats, 2 different belts).
Flips, Turns, and Area
Investigation 1: Session 1

Concept 4: Vertex-Edge Graphs
Understand and apply vertex–edge graphs.

PO 1. Color maps with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in these investigations.
Turtle Paths
Investigation 1: Session 1
Investigation 3: Sessions 1–2

STRAND 3: PATTERNS, ALGEBRA, AND FUNCTIONS
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate iterative pattern, using symbols or numbers.
Mathematical Thinking at Grade 3
Investigation 1: Sessions 2–3
Things That Come in Groups
Investigation 2: Sessions 2, 3–4
Ten-Minute Math

PO 2. Extend a grade-level appropriate repetitive pattern (e.g., 5, 10, 15, 20, . . . rule: add five or count by five's).
Mathematical Thinking at Grade 3
Investigation 1: Sessions 2–3
Things That Come in Groups
Investigation 2: Sessions 2, 3–4
Ten-Minute Math

PO 3. Solve grade-level appropriate pattern problems.
Mathematical Thinking at Grade 3
Investigation 1: Sessions 2–3
Things That Come in Groups
Investigation 2: Sessions 1–6
Investigation 3: Session 3
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
Ten-Minute Math: Counting Around the Class
Fair Shares
Investigation 2: Sessions 5–6

Concept 2: Functions and Relationships
Describe and model functions and their relationships.

PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model, and frames and arrows).
Things That Come in Groups
Investigation 4: Sessions 1–2
Investigation 5: Sessions 1, 2, 3

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Use variables in contextual situations.
Things That Come in Groups
Investigation 1: Sessions 2–4
Investigation 4: Sessions 1–4
Up and Down the Number Line
Investigation 1: Sessions 6–7

PO 2. Solve equations with one variable using missing addends to sums of 18 (e.g., □ + 9 = 18, 9 + □ = 18); and using minuend through 18 (e.g., 18 - □ = 9, 18 - 9 = □).
Related content:
Combining and Comparing
Investigation 3: Sessions 1–2
Investigation 4: Session 2

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier).
See Grade 4, *Changes Over Time.*

PO 2. Make simple predictions based on a variable (e.g., increases in allowance as you get older).
See Grade 4, *Changes Over Time.*

STRAND 4: GEOMETRY AND MEASUREMENT
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties
Analyze the attributes and properties of 2– and 3–dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Build geometric figures with other common shapes (e.g., tangrams, pattern blocks, geoboards).
Flips, Turn, and Area
Investigation 1: Session 1
Investigation 2: Sessions 2–3, 4–5
Exploring Solids and Boxes
Investigation 1: Sessions 1, 2
Investigation 3: Sessions 1, 2

PO 2. Name concrete objects and pictures of 3-dimensional solids (cones, spheres, and cubes).
Exploring Solids and Boxes
Investigation 1: Sessions 1, 2
Investigation 2: Sessions 1, 2, 3, 4, 5
Investigation 3: Session 1

PO 3. Describe relationships between 2-dimensional and 3-dimensional objects (squares/cubes, circles/spheres, triangles/cones).
Exploring Solids and Boxes
Investigation 3: Sessions 1, 2
See also, Grade 4.

PO 4. Recognize similar shapes.
Flips, Turns, and Area
Investigation 1: Session 1
Investigation 2: Sessions 2–3, 4–5
Turtle Paths
Investigation 3: Sessions 1–2, 3–5

PO 5. Identify a line of symmetry in a 2-dimensional shape.
Symmetry is covered in detail in Grade 2.

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Recognize same shape in different positions (turn/rotation).
Flip, Turns, and Area
Investigation 1: Sessions 1, 2–3, 5
Investigation 2: Sessions 2–3
Turtle Paths
Investigation 1: Sessions 1, 3–4
Investigation 2: Sessions 1–2

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.

PO 1. Identify points in the first quadrant of a grid using ordered pairs.
Turtle Paths
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–6
Investigation 3: Sessions 1–7

Concept 4: Measurement - Units of Measure
- Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. Select the appropriate measure of accuracy:
- **length – centimeters, meters, kilometers,**

From Paces to Feet
Investigation 1: Sessions 5–6
Investigation 2: Sessions 1, 2, 3–4, 5, 6–7
Investigation 4: Sessions 1–3

- **capacity/volume – liters, and**
  Related content:
  Combining and Comparing
  Investigation 4: Session 1

- **mass/weight – grams.**
  Combining and Comparing
  Investigation 2: Sessions 1, 2

PO 2. Tell time with one-minute precision (analog).
Combining and Comparing
Investigation 3: Session 2
Investigation 5: Sessions 1, 2–3

PO 3. Determine the passage of time across months (units of days, weeks, months) using a calendar.
Combining and Comparing
Investigation 5: Session 1

PO 4. Measure a given object using the appropriate unit of measure:

- **length – centimeters, millimeters, meters, kilometers,**
  From Paces to Feet
  Investigation 1: Sessions 5–6
  Investigation 2: Sessions 1, 2, 3–4, 5, 6–7
  Investigation 4: Sessions 1–3

- **capacity/volume – liters, and**
  Related content:
  Combining and Comparing
  Investigation 4: Session 1

- **mass/weight – grams.**
  Combining and Comparing
  Investigation 2: Sessions 1, 2

PO 5. Record temperatures to the nearest degree in degrees Fahrenheit and degrees Celsius as shown on a thermometer.
Related content:
Up and Down the Number Line
Investigation 1: Session 1–2, 8

PO 6. Compare units of measure to determine more or less relationships for:

- **length – inches to feet; centimeters to meters,**

  From Paces to Feet
  Investigation 2: Sessions 1, 2, 3–4
  Investigation 4: Sessions 1–3

- **time – minutes to hours; hours to days; days to weeks; months to years, and**

  Combining and Comparing
  Investigation 5: Session 1

- **money – pennies, nickels, dimes, quarters, and dollars.**

  Mathematical Thinking at Grade 3
  Investigation 2: Sessions 5–7
  Ten-Minute Math
  Combining and Comparing
  Investigation 3: Session 2
  Investigation 5: Sessions 1, 2–3

PO 7. Determine relationships for:

- **volume – cups and gallons,**

  These units are introduced in Grade 5. This investigation deals with the concept of volume.
  Exploring Solids and Boxes
  Investigation 4: Sessions 1–3
  Investigation 5: Sessions 1–4

- **weight – ounces and pounds, and**

  Pounds and ounces are introduced in grade 5. This investigation explores the concept of weight with a pan balance.
  Combining and Comparing
  Investigation 2: Sessions 1, 2

- **money – extend to amounts greater than one dollar.**

  Mathematical Thinking at Grade 3
  Investigation 2: Sessions 5–7
  Combining and Comparing
  Investigation 3: Sessions 1–2, 3

PO 8. Compare the length of two objects using U.S. customary or metric units.

From Paces to Feet
Investigation 3: Sessions 1, 2–3

PO 9. Determine the perimeter using a rectangular array.

Turtle Paths

Investigation 3: Sessions 1–2, 6–7

Ten-Minute Math: Lengths and Perimeters

PO 10. Represent area using a rectangular array.

Flips, Turns, and Area

Investigation 1: Sessions 1, 2–3, 4–5

Investigation 2: Sessions 2–3, 4–5

STRAND 5: STRUCTURE AND LOGIC

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.

Up and Down the Number Line

Investigation 1: Sessions 3, 4, 6, 7

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. Draw conclusions based on existing information (e.g., All students in Ms. Dean's 1st grade class are less than 7 years old. Rafael is in Ms. Dean's class. Conclusion: Rafael is less than 7 years old.).

Mathematical thinking at Grade 3

Investigation 3: Sessions 1–2

From Paces to Feet

Investigation 3: Sessions 1, 2–3

Investigations in Number, Data, & Space
to the
Arizona Mathematics Standard Articulated by Grade Level
Grade Four

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Read whole numbers in contextual situations.

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

Sunken Ships and Grid Patterns
- Investigation 2: Session 5

Three Out of Four Like Spaghetti
- Investigation 1: Sessions 1–4

Landmarks in the Thousands
- Investigation 3: Session 1
- Investigation 4: Session 1

PO 2. Identify whole numbers in or out of order.

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

Landmarks in the Thousand
- Investigation 1: Session1
- Investigation 3: Sessions 1, 2
- Investigation 4: Sessions 1–3

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

PO 3. Write whole numbers in or out of order.

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

Landmarks in the Thousand
- Investigation 1: Session1
- Investigation 3: Sessions 1, 2
- Investigation 4: Sessions 1–3

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

PO 4. State place values for whole numbers (e.g., In the number 203,495 what is the value of the 2?).

Mathematical Thinking at Grade 4
Investigation 1: Sessions 1, 4
Landmarks in the Thousand
Investigation 1: Session1
Investigation 3: Sessions 1, 2
Investigation 4: Sessions 1–3
The Shape of the Data
Investigation 1: Sessions: 2–3
Investigation 2: Sessions 2–3

PO 5. Construct models to represent place value concepts for the one's, ten's, hundred's, and thousand's places.

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

PO 6. Apply expanded notation to model place value (e.g., 203,495 = 200,000 + 3,000 + 400 + 90 + 5).

Related content:
Money, Miles and Large Numbers
Investigation 3: Sessions 2, 3, 4

PO 7. Compare two whole numbers.

Landmarks in the Thousands
Investigation 4: Sessions 1–3
Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2, 3, 4–5, 6, 7–8
Investigation 3: Sessions 1, 2–4

PO 8. Order three or more whole numbers.

These investigations provide opportunities for students to compare and order whole numbers.
Landmarks in the Thousands
Investigation 3: Sessions 1, 2
Investigation 4: Sessions 1–3

PO 9. Make models that represent mixed numbers.
Different Shapes, Equal Pieces
Investigation 3: Sessions 1–2

PO 10. Identify symbols, words, or models that represent mixed numbers.
Different Shapes, Equal Pieces
Investigation 3: Sessions 1–2

PO 11. Use mixed numbers in contextual situations.
Different Shapes, Equal Pieces
Investigation 3: Sessions 1–2

PO 12. Compare two unit fractions (e.g., ½ to 1/5) or proper or mixed numbers with like denominators.
Different Shapes, Equal Pieces
Investigation 1: Sessions 2–4
Investigation 2: Sessions 1–2
Investigation 3: Session 3
Three Out of Four Like Spaghetti
Investigation 1: Session 3
Investigation 2: Sessions 5–7

PO 13. Order three or more unit fractions or proper or improper fractions with like denominators.
Different Shapes, Equal Pieces
Investigation 1: Sessions 2–4
Investigation 2: Sessions 1–2
Investigation 3: Session 3
Three Out of Four Like Spaghetti
Investigation 1: Session 3
Investigation 2: Sessions 5–7

PO 14. Use decimals in contextual situations.
Money, Miles, and Large Numbers
Investigation 1: Sessions 6, 7–8
Investigation 2: Sessions 1–2, 4

PO 15. Compare two decimals.
Money, Miles, and Large Numbers
Investigation 1: Sessions 6, 7–8
Investigation 2: Sessions 1–2, 4

PO 16. Order three or more decimals.

Money, Miles, and Large Numbers
- Investigation 1: Sessions 6, 7–8
- Investigation 2: Sessions 1–2, 4

PO 17. Determine the equivalency among decimals, fractions, and percents (e.g., 49/100 = 0.49 = 49%).

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

PO 18. Identify all whole number factors and pairs of factors for a given whole number through 144.

Arrays and Shares
- Investigation 2: Sessions 2–3

Landmarks in the Thousands
- Investigation 1: Session 1
- Investigation 2: Sessions 2–4

PO 19. Determine multiples of a given whole number with products through 144.

Landmarks in the Thousands
- Investigation 2: Session 1

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

PO 1. Add whole numbers.

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

Landmarks in the Thousands
- Investigation 1: Session 3
- Investigation 2: Sessions 2–4
- Investigation 3: Sessions 3–5
- Investigation 4: Sessions 1–3

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

PO 2. Subtract whole numbers.

Mathematical Thinking at Grade 4
- Investigation 3: Sessions 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

PO 3. Select the grade-level appropriate operation to solve word problems.

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

Arrays and Shares
- Investigation 3: Sessions 2–4

Landmarks in the Thousands
- Investigation2: Sessions 2–4
- Investigation 3: Sessions 3–5

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

The Shape of the Data
- Ten Minute Math: Broken Calculator

Money, Miles, and Large Numbers
- Investigation 1: Sessions 1–2, 7–8

Changes Over Time
- Investigation 1: Sessions 4–5
- Ten Minute Math: Broken Calculator

Packages and Groups
- Investigation 3: Sessions 1–2, 4–6, 10
- Ten Minute Math: Guess My Number

PO 4. Solve word problems using grade-level appropriate operations and numbers.

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

Arrays and Shares
- Investigation 3: Sessions 2–4

Landmarks in the Thousands
- Investigation2: Sessions 2–4
- Investigation 3: Sessions 3–5

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

The Shape of the Data
- Ten Minute Math: Broken Calculator

Money, Miles, and Large Numbers
Investigation 1: Sessions 1–2, 7–8
Changes Over Time
Investigation 1: Sessions 4–5
Ten Minute Math: Broken Calculator
Packages and Groups
Investigation 3: Sessions 1–2, 4–6, 10
Ten Minute Math: Guess My Number

PO 5. Multiply multi-digit numbers by two-digit numbers.
Mathematical Thinking at Grade 4
Investigation 3: Sessions 4–5
Arrays and Shares
Investigation 1: Sessions 1–4
Investigation 2: Session 2–6
Investigation 3: Session 2–4
Landmarks in the Thousands
Investigation 2: Session 1
Packages and Groups
Investigation 2: Session 1–3
Investigation 3: Session 4–6

PO 6. Divide with one-digit divisors.
Packages and Groups
Investigation 3: Sessions 3, 4–6, 10

PO 7. State multiplication and division facts through 12s.
Arrays and Shares
Investigation 1: Sessions 1–3
Investigation 2: Sessions 1–6
Ten-Minute Math: Counting Around the Class
Ten-Minute Math: Multiplication Bingo
Landmarks in the Thousands
Investigation 1: Session 1
Investigation 2: Session 1
Packages and Groups
Investigation 1: Sessions 1–3

PO 8. Demonstrate the associative property of multiplication.
Related content:
Arrays and Shares
Investigation 2: Sessions 5–6 (see p. 33)
Money, Miles and Large Numbers
Investigation 1: Sessions 1–2 (see p. 10)

PO 9. Apply grade-level appropriate properties to assist in computation.

Mathematical Thinking at Grade 4
- Ten-Minute Math: Estimation and Number Sense

Arrays and Shares
- Investigation 2: Sessions 2–6
- Investigation 3: Sessions 1–5

Changes Over Time
- Investigation 1: Sessions 5–6

Packages and Groups
- Investigation 2: Sessions 1–3
- Investigation 3: Sessions 3–8

PO 10. Apply the symbol: • and ( ) for multiplication, and ≤, ≥ .

Parentheses can be introduced during these investigations.

Arrays and Shares
- Investigation 2: Sessions 5–6 (see p. 33)

Money, Miles and Large Numbers
- Investigation 1: Sessions 1–2 (see p. 10)

These investigations provide opportunities to introduce using symbols to compare numbers.

Landmarks in the Thousands
- Investigation 3: Sessions 1, 2
- Investigation 4: Sessions 1–3

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

PO 11. Use grade-level appropriate mathematical terminology.

These are a few of the many examples of this standard.

Mathematical Thinking at Grade 4
- Investigation 2: Session 1

Packages and Groups
- Investigation 1: Sessions 4–5
- Investigation 3: Sessions 4–6

Different Shapes, Equal Pieces
- Investigation 3: Session 1–2

Arrays and Shares
- Investigation 2: Sessions 2–3

PO 12. Add or subtract fractions with like denominators, no regrouping.

Different Shapes, Equal Pieces
- Investigation 1: Session 1–5
- Investigation 2: Session 1–4

PO 13. Simplify numerical expressions using the order of operations with grade-appropriate operations on number sets.

This standard can be introduced in these investigations.

Arrays and Shares
- Investigation 2: Sessions 5–6

Packages and Groups
- Investigation 2: Session 1

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve grade-level appropriate problems using estimation.

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

Landmarks in the Thousands
- Investigation 3: Sessions 3–5

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

Packages and Groups
- Investigation 2: Sessions 2–3
- Investigation 3: Sessions 4–6

PO 2. Use estimation to verify the reasonableness of a calculation (e.g., Is 3284 x 343 = 1200 reasonable?).

Landmarks in the Thousands
- Investigation 3: Sessions 3–5

Money, Miles, and Large Numbers
- Investigation 3: Session 1

PO 3. Estimate length and weight using both U.S. customary and metric units.

Estimation can be introduced in these investigations.

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

Changes Over Time
- Unit Preparation: Preparation Session 3

PO 4. Estimate and measure for distance.

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

STRAND 2: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

The Shape of the Data
- Investigation 2: Sessions 1, 3, 5–6

PO 2. Construct a single-bar graph, line graph or two-set Venn diagram with appropriate labels and title from organized data.

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

Changes Over Time
- Investigation 1: Sessions 1–2
- Investigation 2: Session 1–2
- Investigation 3: Sessions 1, 2, 3, 4, 6–7

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

PO 3. Interpret graphical representations and data displays including single-bar graphs, circle graphs, two-set Venn diagrams, and line graphs that display continuous data.

The Shape of the Data
- Investigation 1: Sessions 1, 2–3
- Investigation 2: Session 1
- Investigation 3: Session 1

Changes Over Time
- Investigation 1: Sessions 1–2
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1, 2, 6–7

Three Out of Four Like Spaghetti
- Investigation 1: Session 3
- Investigation 2: Sessions 1, 2, 3, 5–7

PO 4. Answer questions based on graphical representations and data displays including single-bar graphs, circle graphs, two-set Venn diagrams, and line graphs that display continuous data.

The Shape of the Data
- Investigation 1: Sessions 1, 2–3
- Investigation 2: Session 1
- Investigation 3: Session 1

Changes Over Time
- Investigation 1: Sessions 1–2
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1, 2, 6–7

Three Out of Four Like Spaghetti
- Investigation 1: Session 3
- Investigation 2: Sessions 1, 2, 3, 5–7

PO 5. Identify the mode(s) of given data.

Mode can be introduced in these investigations.

The Shape of the Data
- Investigation 2: Sessions 4, 6–7

PO 6. Formulate predictions from a given set of data.

The Shape of the Data
- Investigation 1: Sessions 2–3
- Investigation 2: Sessions 2–3, 4

PO 7. Solve contextual problems using graphs, charts, and tables.

The Shape of Data
- Investigation 1: Sessions 1, 2–3
- Investigation 2: Sessions 1, 2–3, 4, 5, 6–7
- Investigation 3: Sessions 1–2, 3–5

Changes Over Time
- Investigation 1: Sessions 1–2, 3–4
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1–2, 3, 4, 5, 6, 7–8

Three Out of Four Like Spaghetti
- Investigation 2: Sessions 4, 5–7

Concept 2: Probability
Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.
Landmarks in the Thousands
Ten-Minute Math: What Is Likely?
Money, Miles, and Large Numbers
Ten-Minute Math: Likely or Unlikely?
Three Out of Four Like Spaghetti
Ten-Minute Math: What Is Likely?
There are additional probability experiments in Grade 5.

PO 2. Describe the probability of events as being more likely, less likely, equally likely, unlikely, certain, impossible, fair or unfair.
Landmarks in the Thousands
Ten-Minute Math: What Is Likely?
Money, Miles, and Large Numbers
Ten-Minute Math: Likely or Unlikely?
Three Out of Four Like Spaghetti
Ten-Minute Math: What Is Likely?
There are additional probability experiments in Grade 5.

PO 3. Predict the outcome of a grade-level appropriate probability experiment.
Landmarks in the Thousands
Ten-Minute Math: What Is Likely?
Money, Miles, and Large Numbers
Ten-Minute Math: Likely or Unlikely?
Three Out of Four Like Spaghetti
Ten-Minute Math: What Is Likely?
There are additional probability experiments in Grade 5.

PO 4. Record the data from performing a grade-level appropriate probability experiment.
Related content:
Landmarks in the Thousands
Ten-Minute Math: What Is Likely?
Money, Miles, and Large Numbers
Ten-Minute Math: Likely or Unlikely?
Three Out of Four Like Spaghetti
Ten-Minute Math: What Is Likely?
There are additional probability experiments in Grade 5.

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.

Related content:

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

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

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

There are additional probability experiments in Grade 5.

PO 6. Make predictions from the results of student-generated experiments using objects (e.g., coins, spinners, number cubes).

Related content:

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

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

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

There are additional probability experiments in Grade 5.

PO 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment.

Related content:

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

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

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

There are additional probability experiments in Grade 5.

Concept 3: Discrete Mathematics – Systematic Listing and Counting

Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Find all possible combinations when one item is selected from each of two sets containing up to three objects (e.g., How many outfits can be made with 3 pants and 2 tee shirts?).

Related content:

Three Out of Four Like Spaghetti
- Investigation 1: Session 4
- Investigation 2: Sessions 1, 2, 5–7

Concept 4: Vertex-Edge Graphs
Understand and apply vertex–edge graphs.

PO 1. Color maps with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in these investigations.
Sunken Ships and Grid Paths
Investigation 1: Sessions 5–6
Money, Miles, and Large Numbers
Investigation 2: Session 4

STRAND 3: PATTERNS, ALGEBRA, AND FUNCTIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate iterative pattern, using symbols or numbers.
Arrays and Shares
Investigation 1: Sessions 1–2, 3
Investigation 3: Sessions 2–4
Ten-Minute Math
Packages and Groups
Investigation 1: Sessions 1–2
Investigation 3: Sessions 4–6
Sunken Ships and Grid Patterns
Investigation 1: Sessions 3–4, 5–6

PO 2. Extend a grade-level appropriate iterative pattern.
Arrays and Shares
Investigation 1: Sessions 1–2, 3
Investigation 3: Sessions 2–4
Ten-Minute Math
Packages and Groups
Investigation 1: Sessions 1–2
Investigation 3: Sessions 4–6
Sunken Ships and Grid Patterns
Investigation 1: Sessions 3–4, 5–6

PO 3. Create grade-level appropriate iterative patterns.

Sunken Ships and Grid Patterns
- Investigation 1: Sessions 3–4, 5–6
- Investigation 2: Session 4

Concept 2: Functions and Relationships

Describe and model functions and their relationships.

PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model).

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

Packages and Groups
- Investigation 1: Sessions 1–2
- Investigation 3: Sessions 4–6

Sunken Ships and Grid Patterns
- Investigation 1: Sessions 3–4, 5–6
- Investigation 2: Sessions 2–3, 8–9

Changes Over Time
- Investigation 1: Sessions 5–6

Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Evaluate expressions involving the four basic operations by substituting given whole numbers for the variable.

Changes Over Time
- Investigation 1: Sessions 5–6

PO 2. Use variables in contextual situations.

Changes Over Time
- Investigation 1: Sessions 5–6

PO 3. Solve one-step equations with one variable represented by a letter or symbol using multiplication of whole numbers (e.g., 12 = *n* x 4).

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

Changes Over Time
- Investigation 1: Sessions 5–6

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier).
Changes Over Time
Investigation 1: Sessions 1–2, 3–4
Investigation 3: Sessions 1–2, 6–7

PO 2. Make simple predictions based on a variable (e.g., increase homework time as you progress through the grades).
Changes Over Time
Investigation 3: Sessions 1–2

STRAND 4: GEOMETRY AND MEASUREMENT
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Geometric Properties
Analyze the attributes and properties of 2- and 3-dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Identify the properties of 2-dimensional figures using appropriate terminology.
Sunken Ships and Grid Patterns
Investigation 2: Sessions 1, 6–7

PO 2. Identify models or illustrations of prisms, pyramids, cones, cylinders, and spheres.
Seeing Solids and Silhouettes
Investigation 1: Sessions 1, 2
Investigation 2: Sessions 1–2, 3–4, 5
Investigation 3: Session 1

PO 3. Draw points, lines, line segments (open or closed endpoints), rays, or angles.
Sunken Ships and Grid Patterns
Investigation 1: Sessions 3–4, 5–6
Investigation 2: Sessions 1, 2–3, 5, 6–7

PO 4. Classify angles (e.g., right, acute, obtuse, straight).
These classifications can be introduced during this investigation.
Sunken Ships and Grid patterns
Investigation 2: Session 5

PO 5. Classify triangles as right, acute, or obtuse.
Related content:
Sunken Ships and Grid Patterns
Investigation 2: Sessions 1, 2, 5, 6–7

PO 6. Identify congruent geometric shapes.
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4
Investigation 2: Sessions 1–2

PO 7. Identify similar shapes.
Different Shapes, Equal Pieces
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2
Sunken Ships and Grid Patterns
Investigation 2: Sessions 6–7

PO 8. Draw a 2-dimensional shape that has line symmetry.
Mathematical Thinking at Grade 4
Investigation 4: Sessions 1, 2, 3–4, 5–6
Sunken Ships and Grid Patterns
Investigation 2: Sessions 2–3, 6–7, 8–9

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Demonstrate translation using geometric figures.
Related content:
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4

PO 2. Identify a tessellation.
Related content:
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.

PO 1. Name the coordinates of a point plotted in the first quadrant.
Sunken Ships and Grid Patterns
Investigation 1: Sessions 1–6
Investigation 2: Sessions 1–9
Ten-Minute Math: Lengths and Perimeters

Concept 4: Measurement - Units of Measure
- Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. Identify the appropriate measure of accuracy for the area of an object (e.g., sq. feet or sq. miles).
The Shape of Data
Investigation 2: Sessions 2–3
Changes Over Time
Unit Preparation: Preparation Session 3
Related content:
Different Shapes and Equal Pieces
Investigation 2: Sessions 1–2

PO 2. Compute elapsed time using a clock (e.g., hours and minutes since or until…) or a calendar (e.g., days, weeks, years since or until…).
The Shape of the Data
Investigation 3: Sessions 1–2
See also, Grade 5.

PO 3. Select an appropriate tool to use in a particular measurement situation.
Money, Miles, and Large Numbers
Investigation 2: Sessions 1–2, 3

PO 4. Approximate measurements to the appropriate degree of accuracy.
Related content:
Money, Miles, and Large Numbers
Investigation 2: Sessions 1–2, 3

PO 5. Compare units of measure to determine *more* or *less* relationships including:

- **length - yards and miles, meters and kilometers, and**
- **weight - pounds and tons, grams and kilograms.**

Related content:
Money, Miles, and Large Numbers
Investigation 2: Sessions 1–2, 3

PO 6. State equivalent relationships (e.g., 3 teaspoons = 1 tablespoon, 16 cups = 1 gallon, 2000 pounds = 1 ton).
Equivalent relationships are investigated in Grade 5.

PO 7. Compare the weight of two objects using both U.S. customary and metric units.
Weight is investigated in Grades 3 and 5.

PO 8. Determine the perimeter of simple polygons (e.g., square, rectangle, triangle).
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4
Sunken Ships and Grid Patterns
Investigation 1: Sessions 5–6
Investigation 2: Session 4
Ten-Minute Math

PO 9. Determine the area of squares and rectangles.
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4

PO 10. Differentiate between perimeter and area of quadrilaterals.
Different Shapes, Equal Pieces
Investigation 1: Sessions 1, 2–4
Sunken Ships and Grid Patterns
Investigation 1: Sessions 5–6
Investigation 2: Session 4
Ten-Minute Math

STRAND 5: STRUCTURE AND LOGIC

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.

These investigations give students the opportunity to identify relevant information when solving a problem.

Mathematical Thinking in Grade 4
- Investigation 3: Session 3

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

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

Changes Over Time
- Investigation 1: Sessions 1–2, 3–4, 5–6
- Investigation 2: Sessions 1–2
- Investigation 3: Session 4

PO 2. Develop an algorithm to calculate the perimeter of simple polygons.

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

Sunken Ships and Grid Patterns
- Investigation 1: Sessions 5–6
- Investigation 2: Session 4
- Ten-Minute Math

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. Draw a conclusion from a Venn diagram.

Venn diagrams are investigated in Grade 2.

PO 2. Identify simple valid arguments using *if…then* statements based on graphic organizers (e.g., 2-set Venn diagrams and pictures).

Related content:

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

Landmarks in the Thousands
- Investigation 4: Sessions 1–3

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

Packages and Groups
- Investigation 3: Sessions 1–2, 3, 4–6, 10

Investigations in Number, Data, & Space
to the
Arizona Mathematics Standard Articulated by Grade Level
Grade Five

STRAND 1: NUMBER SENSE AND OPERATIONS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1. Make models that represent improper fractions.

Related content:

Name That Portion

Investigation 2: Session 6

PO 2. Identify symbols, words, or models that represent improper fractions.

Related content:

Name That Portion

Investigation 2: Session 6

PO 3. Use improper fractions in contextual situations.

Related content:

Name That Portion

Investigation 2: Session 6

PO 4. Compare two proper fractions or improper fractions with like denominators.

Name That Portion

Investigation 1: Sessions 2–7
Investigation 2: Sessions 1–9
Investigation 3: Sessions 1–8
Investigation 4: Sessions 1–7

PO 5. Order three or more unit fractions, proper or improper fractions with like denominators, or mixed numbers with like denominators.

Name That Portion
- Investigation 1: Sessions 2–7
- Investigation 2: Sessions 1–9
- Investigation 3: Sessions 1–8
- Investigation 4: Sessions 1–7

PO 6. Compare two whole numbers, fractions, and decimals (e.g., 1/2 to 0.6).

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

Name that Portion
- Investigation 1: Session 7
- Investigation 2: Session 3–9
- Investigation 3: Sessions 2–6, 7–8

Building on Number You Know
- Investigation 1: Sessions 1–2, 5
- Investigation 5: Sessions 4–6

Patterns of Change
- Ten-Minute Math: Nearest Answer

Data; Kids, Cats, and Ads
- Investigation 1: Session 1–3
- Investigation 3: Session 1–3
- Investigation 4: Session 1, 3
- Investigation 5: Session 3–5

PO 7. Order whole numbers, fractions, and decimals.

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

Name that Portion
- Investigation 1: Session 7
- Investigation 2: Session 3–9
- Investigation 3: Sessions 2–6, 7–8

Building on Number You Know
- Investigation 1: Sessions 1–2, 5
- Investigation 5: Sessions 4–6

Patterns of Change
- Ten-Minute Math: Nearest Answer

Data; Kids, Cats, and Ads
Investigation 1: Session 1–3
Investigation 3: Session 1–3
Investigation 4: Session 1, 3
Investigation 5: Session 3–5

PO 8. Determine the equivalency between and among fractions, decimals, and percents in contextual situations.
Name That Portion
Investigation 1: Sessions 1, 3–4
Investigation 2: Sessions 4–5

PO 9. Identify all whole number factors and pairs of factors for a number.
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1–3, 4–6

PO 10. Recognize that 1 is neither a prime nor a composite number.
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1–3, 4–6

PO 11. Sort whole numbers (through 50) into sets containing only prime numbers or only composite numbers.
Mathematical Thinking at Grade 5
Investigation 1: Sessions 1–3, 4–6

Concept 2: Numerical Operations
Understand and apply numerical operations and their relationship to one another.

PO 1. Select the grade-level appropriate operation to solve word problems.
There are many investigations that require students to select the operation in order to solve a problem. These are some of the many examples.
Building on Numbers You Know
Investigation 3: Sessions 1–10
Investigation 5: Sessions 4–6
Measurement Benchmarks
Investigation 3: Sessions 2, 3
Name That Portion
Investigation 1: Session 7
Investigation 2: Sessions 6, 7–8
Investigation 3: Sessions 5–6, 7
Investigation 4: Session 7

PO 2. Solve word problems using grade-level appropriate operations and numbers.

There are many investigations that require students to solve word problems, including those that students encounter in their lives. These are some of the many examples.

Mathematical Thinking at Grade 5
- Investigation 2: Sessions 2–5

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

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

Measurement Benchmarks
- Investigation 1: Sessions 7–8
- Ten-Minute Math: Estimation and Number Sense

Data: Kids, Cats and Ads
- Ten-Minute Math: The Digits Game

PO 3. Multiply whole numbers.

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

Building on Numbers You Know
- Investigation 2: Sessions 1–2
- Investigation 3: Sessions 1–3, 7–9, 10

PO 4. Divide with whole numbers.

Building on Numbers You Know
- Investigation 2: Sessions 1–2, 3, 4
- Investigation 3: Sessions 4–6, 7–9, 10

PO 5. Demonstrate the distributive property of multiplication over addition.

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

Building on Numbers You Know
- Investigation 1: Sessions 3–4 (See Teacher Note pages.)
- Investigation 3: Sessions 1–3

PO 6. Demonstrate the addition and multiplication properties of equality.

This standard is investigated in Grade 4.

PO 7. Apply grade-level appropriate properties to assist in computation.

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

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

Measurement Benchmarks
- Ten-Minute Math: Estimation and Number Sense

PO 8. Apply the symbol "[ ]" to represent grouping.

Building on Numbers You Know
- Investigation 1: Sessions 3–4 (See Teacher Note, p. 23)

This standard can also be introduced in this investigation.

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

PO 9. Use grade-level appropriate mathematical terminology.

Mathematical Thinking at Grade 5
- Investigation 1: Sessions 1–3, 4–6
- See also, Teacher Note p. 14.

PO 10. Simplify fractions to lowest terms.

Name That Portion
- Investigation 2: Session 3

PO 11. Add or subtract proper fractions and mixed numbers with like denominators with regrouping.

Name That Portion
- Investigation 2: Sessions 1–2, 3, 6, 7, 9
- Investigation 3: Session 7

PO 12. Add or subtract decimals.

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

Measurement Benchmarks
- Investigation 1: Sessions 5–6

Data: Kids, Cats and Ads
- Ten-Minute Math: The Digits Game

PO 13. Multiply decimals.

Name That Portion

Investigation 3: Session 7

PO 14. Divide decimals.

Name That Portion

Investigation 3: Session 7

PO 15. Simplify numerical expressions using the order of operations with grade-appropriate operations on number sets.

Building on Numbers You Know

Investigation 5: Sessions 4–6

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

PO 1. Solve grade-level appropriate problems using estimation.

Mathematical Thinking at Grade 5

Investigation 3: Sessions 2–4

Investigation 4: Sessions 1, 2, 3, 4

Building on Numbers You Know

Investigation 1: Sessions 2–8

Investigation 2: Sessions 1–7

Investigation 3: Sessions 1–10

Investigation 4: Sessions 1–2

Investigation 5: Sessions 1–8

Measurement Benchmarks

Investigation 2: Session 3

Ten-Minute Math: Estimation and Number Sense

Between Never and Always

Ten-Minute Math: Nearest Answer

Patterns of Change

Ten-Minute Math: Nearest Answer

PO 2. Use estimation to verify the reasonableness of a calculation (e.g., Is 4.1 x 2.7 about 12?).

Name That Portion

Investigation 3: Sessions 2, 3–4, 7

Building on Numbers You Know

Investigation 5: Sessions 1–2

PO 3. Round to estimate quantities.

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

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

Building on Numbers You Know
- Investigation 1: Session 2
- Investigation 2: Session 4

Patterns of Change
- Ten-Minute Math: Nearest Answer

PO 4. Estimate and measure for area and perimeter.

Related content:

Picturing Polygons
- Investigation 3: Sessions 4–6

PO 5. Compare estimated measurements between U.S. customary and metric systems (e.g., A yard is about a meter.).

Measurement Benchmarks
- Investigation 1: Sessions 1, 2
- Investigation 2: Sessions 1–2

STRAND 2: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

PO 1. Formulate questions to collect data in contextual situations.

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

PO 2. Construct a double-bar graph, line plot, frequency table, or three-set Venn diagram with appropriate labels and title from organized data.

Name That Portion
- Investigation 1: Sessions 1, 2
- Ten-Minute Math: Exploring Data

Between Never and Always
- Investigation 1: Sessions 3–4, 5, 6

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

Related content:

Patterns of Change
- Investigation 2: Sessions 2–5
- Investigation 3: Sessions 1, 2–6
- Ten-Minute Math

PO 3. Interpret graphical representations and data displays including bar graphs (including double-bar), circle graphs, frequency tables, three-set Venn diagrams, and line graphs that display continuous data.

Name That Portion
- Investigation 3: Sessions 2, 5–6
- Investigation 4: Sessions 1–7
- Ten-Minute Math

Between Never and Always
- Investigation 2: Session 3

Patterns of Change
- Investigation 2: Sessions 2–5
- Investigation 3: Sessions 2–6

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

PO 4. Answer questions based on graphical representations, and data displays including bar graphs (including double-bar), circle graphs, frequency tables, three-set Venn diagrams, and line graphs that display continuous data.

Name That Portion
- Investigation 3: Sessions 2, 5–6
- Investigation 4: Sessions 1–7
- Ten-Minute Math

Between Never and Always
- Investigation 2: Session 3

Patterns of Change
- Investigation 2: Sessions 2–5
- Investigation 3: Sessions 2–6

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

PO 5. Identify the mode(s) and mean (average) of given data.

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

PO 6. Formulate reasonable predictions from a given set of data.

Between Never and Always
- Investigation 1: Sessions 3–4, 5, 6
- Investigation 2: Session 3

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

PO 7. Compare two sets of data related to the same investigation.

Between Never and Always
- Investigation 2: Sessions 1–2

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

PO 8. Solve contextual problems using graphs, charts, and tables.

Patterns of Change
- Investigation 1: Sessions 1–4
- Investigation 2: Sessions 1–5
- Investigation 3: Sessions 1–7

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

Concept 2: Probability
Understand and apply the basic concepts of probability.

PO 1. Name the possible outcomes for a probability experiment.
Between Never and Always
Investigation 1: Sessions 1–2, 3–4, 5, 6, 7, 8
Investigation 2: Sessions 1–2, 3, 4–5

PO 2. Describe the probability of events as being: certain (represented by "1"), impossible, (represented by "0"), or neither certain nor impossible (represented by a fraction less than 1).
Between Never and Always
Investigation 1: Sessions 1–2

PO 3. Predict the outcome of a grade-level appropriate probability experiment.
Between Never and Always
Investigation 1: Sessions 3–4, 5

PO 4. Record the data from performing a grade-level appropriate probability experiment.
Between Never and Always
Investigation 1: Sessions 3–4, 5

PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.
Between Never and Always
Investigation 1: Sessions 3–4, 5
Investigation 2: Sessions 1–2

PO 6. Make predictions from the results of student-generated experiments using objects (e.g., coins, spinners, number cubes).
Between Never and Always
Investigation 1: Sessions 3–4, 5, 7

PO 7. Compare the results of two repetitions of the same grade-level appropriate probability experiment.
Between Never and Always
Investigations 3–4, 5, 7

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.

PO 1. Find all possible combinations when one item is selected from each of two sets of different items, using a systematic approach. (e.g., shirts: tee shirt, tank top, sweatshirt; pants: shorts, jeans).
Between Never and Always
Investigation 1: Session 7
Investigation 2: Sessions 1–2

Concept 4: Vertex-Edge Graphs
Understand and apply vertex–edge graphs.

PO 1. Color maps with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).
Vertex-edge graphs and networks can be introduced in this investigation.
Picturing Polygons
Investigation 2: Session 8

STRAND 3: PATTERNS, ALGEBRA, AND FUNCTIONS
Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate iterative pattern, using symbols or numbers.
Mathematical Thinking at Grade 5
Investigation 2: Sessions 1, 2–4
Investigation 3: Session 1
Investigation 4: Sessions 5–6
Picturing Polygons
Investigation 3: Sessions 1–7
Name That Portion
Investigation 2: Sessions 4–5
Investigation 3: Sessions 5–6
Patterns of Change
Investigation 1: Sessions 1–4

PO 2. Extend a grade-level appropriate iterative pattern.

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

Picturing Polygons
- Investigation 3: Sessions 1–7

Name That Portion
- Investigation 2: Sessions 4–5
- Investigation 3: Sessions 5–6

Patterns of Change
- Investigation 1: Sessions 1–4

PO 3. Solve grade-level appropriate iterative pattern problems.

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

Picturing Polygons
- Investigation 3: Sessions 1–7

Name That Portion
- Investigation 2: Sessions 4–5
- Investigation 3: Sessions 5–6

Patterns of Change
- Investigation 1: Sessions 1–4

Concept 2: Functions and Relationships

Describe and model functions and their relationships.

PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model).

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

Patterns of Change
- Investigation 2: Session 2
- Investigation 3: Session 1
- Ten-Minute Math

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Evaluate expressions involving the four basic operations by substituting given decimals for the variable.
Patterns of Change
Investigation 1: Sessions 3–4 (See Teacher Note pages)

PO 2. Use variables in contextual situations.
Building on Numbers You Know
Investigation 1: Sessions 3–4
Patterns of Change
Investigation 1: Sessions 3–4 (See Teacher Note pages)

PO 3. Solve one-step equations with one variable represented by a letter or symbol (e.g., 15 = 45 ÷ *n*).
Name That Portion
Investigation 1: Sessions 3–4
Investigation 2: Sessions 3, 6
Ten-Minute Math
Building on Numbers You Know
Investigation 1: Sessions 1–8
Investigation 2: Sessions 1–3, 5–6
Investigation 3: Sessions 4–10
Investigation 4: Sessions 1–2
Investigation 5: Sessions 1–8

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1. Describe patterns of change:
- **constant rate (speed of movement of the hands on a clock), and**

Patterns of Change
Investigation 3: Sessions 1–7

- **increasing or decreasing rate (rate of plant growth).**

Patterns of Change
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–5
Investigation 3: Sessions 1–7

STRAND 4: GEOMETRY AND MEASUREMENT

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Concept 1: Geometric Properties

Analyze the attributes and properties of 2– and 3–dimensional shapes and develop mathematical arguments about their relationships.

PO 1. Recognize regular polygons.

Picturing Polygons
Investigation 1: Session 1

PO 2. Draw 2-dimensional figures by applying significant properties of each (e.g., Draw a quadrilateral with two sets of parallel sides and four right angles.).

Picturing Polygons
Investigation 1: Sessions 3–4
Investigation 2: Sessions 4–7
Investigation 3: Sessions 1–2, 4–7

PO 3. Sketch prisms, pyramids, cones, and cylinders.

Students can be asked to sketch prisms, pyramids, cones, and cylinders as part of these investigation.

Containers and Cubes
Investigation 4: Sessions 1, 2–3, 6

PO 4. Identify the properties of 2- and 3-dimensional geometric figures using appropriate terminology and vocabulary.

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

PO 5. Draw points, lines, line segments, rays, and angles with appropriate labels.

Picturing Polygons
Investigation 2: Sessions 1–3, 4–5, 6–7, 8, 9
Investigation 3: Sessions 1–2, 4
Containers and Cubes
Investigation 4: Sessions 2–3
See also, Teacher Note, pp.71–72

PO 6. Recognize that all pairs of vertical angles are congruent.
This standard can be introduced during this investigation.
Picturing Polygons
Investigation 2: Sessions 6–7

PO 7. Classify triangles as scalene, isosceles, or equilateral.
Picturing Polygons
Investigation 3: Sessions 1–3

PO 8. Recognize that a circle is a 360º rotation about a point.
Picturing Polygons
Investigation 2: Session 8

PO 9. Identify the diameter, radius, and circumference of a circle.
Related content:
Name That Portion
Investigation 4: Session 7 (Circle Graphs)
Picturing Polygons
Investigation 2: Sessions 6–7

PO 10. Understand that the sum of the angles of a triangle is 180°.
Picturing Polygons
Investigation 2 Sessions 6–7
See also, Teacher Note, p. 68

PO 11. Draw two congruent geometric figures.
Students can be asked to draw two congruent figures as part of these investigations.
Picturing Polygons
Investigation 2 Sessions 1–3, 4–5, 6–7
Investigation 3: Sessions 5–6

PO 12. Draw two similar geometric figures.
Picturing Polygons
Investigation 2 Sessions 4–5, 6–7
Investigation 3: Sessions 5–6

PO 13. Identify the lines of symmetry in a 2-dimensional shape.
Symmetry is investigated in Grade 4.
See *Mathematical Thinking at Grade 4* and *Sunken Ships and Grid Patterns.*

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1. Demonstrate reflections using geometric figures.
Picturing Polygons
Investigation 2: Sessions 6–7, 9
Investigation 3: Sessions 1–3

PO 2. Describe the transformations that created a tessellation.
Picturing Polygons
Investigation 2: Sessions 6–7, 9
Investigation 3: Sessions 1–3, 5–6

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.

PO 1. Graph points in the first quadrant on a grid using ordered pairs.
Picturing Polygons
Investigation 1: Sessions 3, 4
Patterns of Change
Investigation 2: Session 2 (Follow–Up), 3, 4, 5
Investigation 3: Sessions 1, 2, 3, 5–6

Concept 4: Measurement - Units of Measure
- Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

PO 1. State an appropriate measure of accuracy for a contextual situation (e.g., What unit of measurement would you use to measure the top of your desk?).
Measurement Benchmarks
Investigation 1: Sessions 1, 3, 4, 5–6, 7
Investigation 2: Sessions 3, 4
Investigation 3: Session 1

PO 2. Draw 2-dimensional figures to specifications using the appropriate tools (e.g., Draw a circle with a 2-inch radius.).
Picturing Polygons
Investigation 2 Sessions 4–5, 6–7
Investigation 3: Sessions 5–6

PO 3. Determine relationships including volume (e.g., pints and quarts, milliliters and liters).

Measurement Benchmarks
- Investigation 1: Sessions 4, 5–6
- Investigation 2: Sessions 1–8

Containers and Cubes
- Investigation 3: Sessions 1–2
- Investigation 4: Sessions 2–3

PO 4. Convert measurement units to equivalent units within a given system (U.S. customary and metric) (e.g., 12 inches = 1 foot; 10 decimeters = 1 meter).

Measurement Benchmarks
- Investigation 1: Sessions 4, 5–6
- Investigation 2: Sessions 1–8

PO 5. Solve problems involving the perimeter of convex polygons.

Picturing Polygons
- Investigation 3: Sessions 4–6

PO 6. Determine the area of figures composed of two or more rectangles on a grid.

Related content:

Picturing Polygons
- Investigation 3: Sessions 4–6

PO 7. Solve problems involving the area of simple polygons.

Picturing Polygons
- Investigation 3: Sessions 4–6

PO 8. Describe the change in perimeter or area when one attribute (length, width) of a rectangle is altered.

Picturing Polygons
- Investigation 3: Sessions 4–6

STRAND 5: STRUCTURE AND LOGIC

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem–solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.

These investigations give students the opportunity to identify relevant information when solving a problem.

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

Picturing Polygons
- Investigation 1: Session 1
- Investigation 3: Session 4

Between Never and Always
- Investigation 1: Sessions 1–2, 3–4, 5, 6, 7, 8
- Investigation 2: Sessions 1–2,

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

PO 2. Design simple algorithms using whole numbers.

Mathematical Thinking at Grade 5
Investigation 1: Sessions 2, 5–7
- Investigation 3: Sessions 2–4, 5
- Investigation 4: Session 1

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

Measurement Benchmarks
- Investigation 1: Sessions 2, 5–6
- Ten-Minute Math

Data: Kids, Cats, and Ads
- Investigation 1: Sessions 2–3
- Investigation 2: Session 2
- Ten-Minute Math

PO 3. Develop an algorithm or formula to calculate areas of simple polygons.
Picturing Polygons
Investigation 3: Sessions 4–6

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof
Evaluate situations, select problem–solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. Construct *if…then* statements.
Related content:
Name That Portion
Investigation 3: Sessions 2, 5–6
Ten-Minute Math
Between Never and Always
Investigation 1: Sessions 3–4, 5, 6
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2
Investigation 3: Sessions 2–4
Investigation 4: Session 3
Investigation 5: Sessions 1, 3–5

PO 2. Identify simple valid arguments using *if* … *then* statements based on graphic organizers (e.g., 3-set Venn diagrams and pictures).
Related content:
Name That Portion
Investigation 3: Sessions 2, 5–6
Ten-Minute Math
Between Never and Always
Investigation 1: Sessions 3–4, 5, 6
Data: Kids, Cats, and Ads
Investigation 1: Sessions 1–4
Investigation 2: Sessions 1–2
Investigation 3: Sessions 2–4
Investigation 4: Session 3
Investigation 5: Sessions 1, 3–5