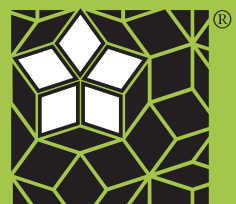


Investigations

In Number, Data, And Space[®]

UNIT GUIDES: GRADE 2



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GRADE

2

Investigations

In Number, Data, And Space®

UNIT GUIDES: Grade 2



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Investigations

in Number, Data, and Space®

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Investigations

in Number, Data, and Space®

Unit Guides: Introduction

Preparation to teach individual units in *Investigations*

The Unit Guides for *Investigations in Number, Data and Space* are designed as study guides to help teachers become familiar and comfortable with the mathematical content, the activities, and the overall structure of each unit. The Unit Guides provide a structure for working through student activities, reading support material, looking at student work that is embedded in the materials, and discussing critical issues about mathematics and pedagogy. The expectation is that groups of teachers will work together on these Guides in preparation to teach a unit in their classroom. Below are some suggestions of how best to incorporate these Unit Guides into your professional development program.

- In order to get the most use from these Guides, it is important that groups of teachers from the same grade level work on a Guide together. This way, teachers can do the activities together and respond to the discussion questions.
- The Unit Guides are written with the assumption that teachers will read the “Mathematics in This Unit” essay before attending the Unit Guide session.
- A list of suggested materials and photocopied handouts for each unit is found at the beginning of each guide and should be prepared before the session begins.
- Unit Guides may be used independently by groups of teachers, with one teacher taking on the lead role, or you may have a Teacher Leader/Coach who can contribute some guidance or experience. The leader’s role during the session is to act as a resource: answering questions, clarifying instructions, and prompting discussion when appropriate.
- In order to gain a real sense of the preparation, effort, and mathematics in the activities, it is imperative that teachers not just read through but actually *do* all of the activities suggested in the Unit Guides.
- As a follow up to a Unit Guide session, it is helpful for teachers to meet periodically while the unit is ongoing in their classrooms to support each other, seek and offer advice, and work together to evaluate sets of student work.

Each Unit Guide is designed to take three hours, but could also be adapted and used flexibly in a variety of different settings.



Investigations

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Unit Guide for Grade 2, Unit 1:
Counting, Coins, and Combinations
Addition, Subtraction, and the Number System 1



Unit Guide for Grade 2, Unit 1

Counting, Coins, and Combinations

Addition, Subtraction, and the Number System 1

Unit Summary:

Students count and compare quantities, compose and decompose numbers, and deepen understandings about the operations of addition and subtraction. They develop strategies for comparing, combining, and doubling quantities, as well as taking one quantity away. Students achieve fluency with three sets of addition combinations (10s, + 1, + 2). During this first unit of the year, students are introduced to several year-long classroom routines that offer regular practice with composing and decomposing numbers; developing visual images of quantities; counting, collecting, and analyzing data; and telling time.

Materials:

Counting, Coins, and Combinations (1 copy per person)

Class number line and 2 clothespins or clips (See Materials to Prepare, p. 25)

Do the following activities from *Counting, Coins, and Combinations*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Guess My Number on the Number Line (Session 1.3)

In Investigation 1, students are introduced to math tools they will be using, and two of the Classroom Routines they will be revisiting, throughout the year. This session focuses on the number line, which students use to play *Guess My Number*.

- Read the Activity, *Guess My Number on the Number Line*, pp. 42-44, including the Teaching Notes, “Using the Number Line” and “Mathematical Symbols” p. 42, and “Guessing the Number,” p. 43.
- Play several rounds of *Guess My Number* with a partner/small group.

Discuss

- What strategies and questions did you use as you played?
- What strategies and questions would you expect of your students?
- How do you anticipate student strategies will change as they become more familiar with the game? How might you adapt this game as the year progresses?

- Read the Teacher Note, *The Number Line and the 100 Chart: Two Models of Our Number System*, pp. 184-185.

Discuss

- How is a number line similar to, and different from, a 100 chart?
- How comfortable are your students with the number line and 100 chart? Do they prefer one to the other? Choose the tool based on the situation or problem? What issues typically arise with each?

3. Enough for the Class? (Session 2.1)

In addition to introducing another Classroom Routine, Investigation 2 focuses on counting and coins. In this session, students solve and discuss the first of several *Enough for the Class?* problems, which involve finding the difference between two quantities.

- Read the Activity, *Enough for the Class*, pp. 65-66. (See Materials to Prepare, p. 59 for a description of Counting Bag A.)
- Read the Dialogue Box, *Are There Enough for the Class?*, pp. 210-211.

Discuss

- Discuss the range of strategies discussed in the Dialogue Box. What tools or representations did students use to solve the problem?
- How did the teacher in the Dialogue Box structure the discussion? What mathematical ideas did (s) he choose to highlight? What tools and representations/?

4. Addition Combinations (Session 3.5)

In Investigation 3, the final *Classroom Routine* is introduced, and students focus in particular on combinations that make 10. In this session, students are introduced to how they will work on the addition combinations this year.

- Read the Discussion, *Addition Combinations*, p. 130; and the activities *Introducing the Addition Cards*, p. 131 and *Which Combinations Do I Know?*, pp. 131-132. Read the Teaching Note “Addition Combinations” p. 132, and the Algebra Note “Remembering the Combinations”, p. 132.

Discuss

- How does this process for learning and practicing “the facts” compare to your experience when you were a student?

- Read the Teacher Note, *Strategies for Learning the Addition Combinations*, pp. 191-192.

Discuss

- What is the benefit to learning the addition combinations in groups?
- As you work with families, what key ideas about the addition combinations would you hope to convey?

5. An Addition Story Problem (Session 4.1)

Investigation 4 focuses on solving addition and subtraction story problems and doubling. In this session, students solve a problem about combining two groups, record their work, and share their strategies.

- Read the first part of the Activity, *An Addition Story Problem*, p. 139 (up to the red line).

Discuss

- How does asking students to imagine what is happening in the problem, retell the story the story in their own words, and think about whether the answer will be more or less than the starting amount, support students in solving story problems? In understanding addition and subtraction?
- How would you expect your students to solve this problem? To show their work?

- Read the rest of the Activity, *Ongoing Assessment: Observing Students at Work and Differentiation: Supporting the Range of Learners*, pp. 139-140.

- Read the Dialogue Box, *An Addition Story Problem*, pp. 218-219.

Discuss

- What strategies are students using to solve the story problem? To show their work?
- How does the teacher in the Dialogue Box help students differentiate between the tools (e.g., the number line, cubes, the 100 chart) and the strategy (e.g., counted all, counting on) used to solve a problem? Why is this differentiation important?
- How does (s) he encourage students to make complete explanations?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Counting, Coins, and Combinations*

- Algebra Connections in This Unit, pp. 16-19
- Classroom Routines in This Unit, p. 20
 - What Time Is It?*
 - Today's Number*
 - Quick Images*
- Assessment
 - Counting Pennies (Introduced in Session 2.2)
 - Resource Master M12, Assessment Checklist
 - Enough for the Class? (Session 2.8)
 - Teacher Note, pp. 193-194
 - How Many Cans? (Session 4.8)
 - Teacher Note, pp. 199-201
 - End-of-Unit Assessment (Session 4.9)
 - Teacher Note, pp. 202-208



Investigations
in Number, Data, and Space®

Unit Guide for Grade 2, Unit 2:
Shapes, Blocks, and Symmetry
2-D and 3-D Geometry



Unit Guide for Grade 2, Unit 2

Shapes, Blocks, and Symmetry

2-D and 3-D Geometry

Unit Summary:

Students identify two- and three-dimensional shapes, focus on the properties of rectangles and rectangular prisms, and identify and create symmetrical designs. Students also achieve fluency with the doubles addition combinations.

The *Shapes* software is introduced as a tool for extending and deepening this work. This tool is designed for K–2 students to explore how different shapes go together, experiment with different sorts of geometric transformations (rotations, translation, reflection), explore patterning, and investigate symmetry.

Materials:

Shapes, Blocks, and Symmetry (1 copy per person)

Geoblocks (1 set per pair/group, see Materials to Prepare, p. 21)

Resource Masters M1-M4, Shape Cards A-X (1 set per pair, see Materials to Prepare, p. 59)

Scissors

Resource Masters M23-M25 Rectangles A-G, Which is Biggest? (1 set per pair, see Materials to Prepare, p. 59)

Color tiles (30 per pair/group)

Student Activity Book p. 17, Which One Has the Most? (1 per person)

Pattern Blocks (1 set per pair/group)

Mirrors, as needed (optional)

Crayons, markers, or colored pencils (as needed)

Do the following activities from *Shapes, Blocks, and Symmetry*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)

- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Looking Closely at Geoblocks (Session 1.1) and Drawing Geoblocks (Sessions 1.1, 1.2)

Investigation 1 focuses on features of 2-D and 3-D shapes, using smaller shapes to construct larger shapes, and the doubles combinations. In this session, students focus on two attributes of 3-D shapes—the number of faces and their shape—as they describe and draw Geoblocks.

- Choose a Geoblock from the set, and describe it as completely as you can. Share your description with a partner/small group.
- Read the Activity, *Looking Closely at Geoblocks*, pp. 27-29, including the Teaching Note, “Names of 3-D Shapes”, p. 29.
- Read the Teacher Note, *Identifying Types of 3-Dimensional Shapes*, pp. 150-151.

Discuss

- What features of the Geoblocks did the people in your group comment on?
 - How does the text help focus students’ attention on specific attributes? What differences are important in a comparison of triangular and rectangular prisms?
 - What geometric vocabulary is introduced in this activity? How will you introduce it?
 - What is the difference between 3-dimensional shapes that are polyhedra and shapes that are **not** polyhedra? Between polyhedra that are *prisms* and polyhedra that are *pyramids*?
- Now try to draw a three-dimensional looking picture of your Geoblock, as described on p. 29. Construct something with several Geoblocks, and draw it, as described on p. 36. Read the Teaching Notes, “Drawing Shapes” p. 29, and “Drawing in 3-D”, p. 36. Examine the sample student work on pp. 36-37.

Discuss

- What was challenging for you about this activity? What did you have to pay attention to in order to draw shapes that look 3-D?
- What attributes of the Geoblocks do you hope students will attend to in these activities?
- What support can you provide to students having difficulty with this task?

3. Creating a Quadrilateral Chart (Session 2.2)

Investigation 2 focuses primarily on properties of rectangles and the concept of area. In this session, students are introduced to *right angles*. They sort four-sided shapes into two categories, and discuss the names of, and the shapes in, those categories—shapes with 4 sides and 4 right angles and shapes with 4 sides and not 4 right angles.

- Sort Shape Cards A, D, E, F, G, H, K, M, N, P, and Q (made from Resource Masters M1-M4, *Shape Cards*) into two categories— shapes with 4 sides and 4 right angles and shapes with 4 sides and not 4 right angles. Think about the names that apply to *all* of the shapes, to the shapes in each category, and to the individual shapes.
- Read the Activity, *Creating a Quadrilateral Chart*, pp. 72-74.

Discuss

- What issues or areas of confusion may arise for students with Shapes, G, M, and Q?
- What vocabulary do you expect to hear students using as they sort and name these shapes and categories?

- Read the Discussion, *What's a Rectangle?*, pp. 74-76, and the Teacher Note, *What's a Rectangle?*, p. 156.

Discuss

- What issues or areas of confusion may students have about calling all of the shapes with “4 sides and 4 right angles” rectangles?

4. Ordering Rectangles and Covering Rectangles (Session 2.3)

In this session, students order a set of rectangles from biggest to smallest, and compare the different orders pairs found. Then, they use color tiles to determine and compare the area of those rectangles.

- Read the Activity, *Ordering Rectangles*, pp. 78-79. With a partner, order Rectangles A-G (the rectangles on Resource Masters M23-M25, *Which is Biggest?*) from biggest to smallest. Compare your order with others.

Discuss

- What strategies did people use to determine the order of the rectangles?
- What attribute(s) did they pay attention to?
- What attribute(s) do you expect students will pay attention to? What order do you think they are likely to come up with?

- Read the Discussion, *Which is Biggest?*, pp. 79-80, and discuss what most students pay attention to as they order the rectangles. Complete Student Activity Book p. 17, *Which One Has the Most?*, using color tiles to measure the area of Rectangles A-G.
- Read the Discussion, *Which Rectangle Has the Biggest Area?*, pp. 81-83.

Discuss

- What mathematical ideas do these activities focus on? What attribute of the rectangles does Covering Rectangles make students attend to? (See the Teacher Note, *Area and Arrays*, pp. 157-158 for more information.)
- How might students' ideas about the relative sizes of the rectangles change after covering them with color tiles?

5. Mirror Designs (Session 3.1) and Introducing Symmetrical Geoblock Buildings (Session 3.1)

In this Investigation, students build symmetrical designs with pattern blocks, Geoblocks, and color tiles, and cut symmetrical shapes from folded paper. This session introduces mirror symmetry and provides practice with symmetry and the Doubles Combinations.

- Read the Activities, *Mirror Designs*, and *Introducing Symmetrical Geoblock Buildings*, pp.121-125. Do the activities (3A and 3B, pp. 124-125), yourself. You can modify them to create an appropriate level of challenge for an adult, for example using more blocks to create more complex designs or buildings. Be sure to record at least one of your symmetrical pattern block designs.

Discuss

- What did you need to pay attention to in order to create symmetrical pattern block designs or Geoblock buildings?
- What ideas about mirror symmetry do students need to understand in order to do these activities?
- How can you support students who are having difficulty with Mirror Designs? With Geoblock Buildings?
- How can you extend these activities for students needing more of a challenge?

- Read the Teacher Note, *Making Symmetrical Designs*, pp.164-165, and the Dialogue Box, *Discussing Symmetry*, p. 177.

Discuss

- What other type of symmetry is described in the Teacher Note? How will you support a student who designs this type of symmetrical pattern rather than one with mirror symmetry?
- How does the first design pictured in the Dialogue Box change when Paige adds two more rhombuses and two more triangles?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Shapes, Blocks, and Symmetry*

- *Shapes* Software
 - Teacher Note, *Introducing and Managing the Shapes Software*, pp. 152-154
 - Teacher Note, *About the Mathematics in the Shapes Software*, p. 155
- Classroom Routines in This Unit, p. 16
 - Today's Number*
 - What Time Is It?*
 - Quick Images*
 - How Many Pockets?*
- Assessment
 - Sorting Shapes by Number of Sides (Introduced in Session 2.1)
 - Resource Master M22, Assessment Checklist
 - Is It a Rectangle? (Session 2.7)
 - Teacher Note, pp. 159-161
 - Faces of a Geoblock (Session 2.9)
 - Teacher Note, pp. 162-163
 - End-of-Unit Assessment (Session 3.5)
 - Resource Master M45, Assessment Checklist: Doubles Combinations
 - Teacher Note, pp. 166-171



Investigations

in Number, Data, and Space®

Unit Guide for Grade 2, Unit 3:
Stickers, Number Strings, and Story Problems
Addition, Subtraction, and the Number System 2



Unit Guide for Grade 2, Unit 3

Stickers, Number Strings, and Story Problems

Addition, Subtraction, and the Number System 2

Unit Summary:

Students solve problems with multiple addends and consider whether order matters in addition. For example, does $7 + 4 + 3 + 6 = 7 + 3 + 4 + 6$? Students revisit addition and subtraction story problems, investigate even and odd numbers, and begin to make sense of counting by groups and place value (tens and ones). Work on addition combinations continues as students achieve fluency with the Near Doubles.

Materials:

Stickers, Number Strings, and Story Problems (1 copy per person)

Calculator (1 per pair)

Resource Master M5, Beat the Calculator (1 per pair)

Resource Masters M6-9, Beat the Calculator Cards (1 deck per pair, see Materials to Prepare, p. 27)

Resource Master M14, Close to 20 (1 per pair)

Resource Master M15, Close to 20 Recording Sheet (1 per person)

Primary Number Cards (1 deck per pair, use manufactured decks or Resource Masters M10-M13, see Materials to Prepare, p. 27)

Student Activity Book p. 29, Balloons and Children, p. 1 of 2 (1 per person)

Student Activity Book p. 42, Partners and Teams (1 per person)

Do the following activities from *Stickers, Number Strings, and Story Problems*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-11, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 12-15. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 17, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Beat the Calculator (Session 1.3) and Close to 20 (Session 1.4)

In Investigation 1, students solve problems with multiple addends, and work on the idea that numbers can be added in any order. *Beat the Calculator* and *Close to 20* are two games student play.

- With a partner, play *Beat the Calculator* using the directions on Resource Master M5. (You will also need a calculator and a deck of cards made from Resource Masters M6-M9.) As you play, discuss which of the problems students are likely to “beat” the calculator.
- Play *Close to 20* with a partner, using the directions on Resource Master M14. (Also see Activity 1, *Introducing Close to 20*, pp. 51-53, as needed. You also need copies of Resource Master M15, *Close to 20 Recording Sheet*, and a deck of Primary Number Cards.

Discuss

- What mathematical ideas do these games focus on? How do they provide practice with the addition combinations?
 - What issues are likely to arise as your students learn and play these games? How do the *Ongoing Assessment*, (pp. 49 and 54) and *Differentiation* (p. 54) sections help you assess and support students as they play?
- Read Teacher Note, *Does the Order Matter?*, p. 205.

Discuss

- The question of whether order matters often seems very simple to students. Why is it important to help them articulate their ideas? Consider both the work they do in Grade 2, and in later years.

3. Problems With Unknown Change (Session 2.4)

In Investigation 2 students develop strategies for solving addition and subtraction story problems and for using standard notation to record

- Read the Teacher Note, *Using Notation to Record Strategies, Part 2*, pp. 214-215. (Note: Part 1 of this Teacher Note appears in Unit 1.)

Discuss

- What’s challenging about introducing notation to students? Why is it important to do so?
- Why is it important to help students see how oral descriptions of their strategies (which may also include representations like the number line or 100 chart) can be represented with numbers, symbols, and equations?

- Solve the problems on Student Activity Book p. 29 p. 1 of 2, *Balloons and Children*. Use the same process that students are asked to do: for each problem, first write an equation that shows what the problem is asking, then solve the problem and show your work.

Discuss

- Compare the equations written for each problem. Think through how different equations for the same problem represent what the problem is asking.
 - Compare the strategies used to solve the problem. Did the way people conceptualized what the problem is asking impact the strategies they used to solve it?
 - How are the problems on the Student Activity Book page related?
 - How do you think your students would approach such problems?
- Read the Activity, *Introducing Problems with Unknown Change*, pp. 96-98. Read the Math Notes “Small Numbers” and “Unknown Change,” p. 96, the Teaching Note “Modeling with Cubes,” p. 96, and the Algebra Note, “Related Problems,” p. 98.
- Read the Ongoing Assessment, p. 99, the Differentiation, p. 100, and examine the sample student work, pp. 100-101.

Discuss

- Second graders tend to find unknown change problems challenging. What is challenging about these problems?
- How does the way these problems are introduced, and the story problem routine in general, (see the Teaching Note “Story Problem Routine”, p. 73) provide support for understanding and solving these problems?
- Why is it important to use and discuss different equations and strategies ($8 + 3 = 11$, $11 - 8 = 3$, $11 - 3 = 8$) for the same problem?
- How might the posing and solving of related problems help students with these types of problems?

4. Partners and Teams (Session 3.1)

In this session, students investigate even and odd numbers using the context of partners and teams. The rest of Investigation 3 focuses on counting by equal groups.

- Complete Student Activity Book p. 42, Partners and Teams. With a partner, discuss what you notice about the table.
- Read the Activity, *Introducing Partners and Teams*, pp. 125-126, and the Discussion, *What We Found Out*, pp. 128-131.

Discuss

- How does the context of teams and partners connect to even and odd numbers?
- What issues do you expect second graders to have as they begin to study odd and even numbers?

- Read the Dialogue Box, *90: Even or Odd?*, pp. 250-251, and the Teacher Note, *Defining Even and Odd*, pp. 223-224.

Discuss

- What strategies and definitions do students use to try to determine whether [90] is even or odd?
- What confusions arise in this Dialogue Box? How does the teacher help students think more deeply about even and odd numbers?
- How do the definitions of even and odd numbers described in the Teacher Note, and developed in this unit, connect to your own personal definitions?

5. Introducing Stickers: Strips and Singles (Session 4.4)

Students are introduced to place value as they investigate numbers grouped into 10s and 1s. In this session, students are introduced to Sticker Station, a context for representing 1s and 10s. (100s are introduced in Unit 6, *How Many Tens? How Many Ones?*)

- Read the Activities, *Introducing Stickers: Strips and Singles*, pp. 188-190 and *How Many Stickers?*, pp. 190-191, including the Teaching Notes, “Saying ‘Strips of 10’”, p. 188, and “Representing 2-Digit Numbers”, p. 190.

Discuss

- What mathematical ideas are students working on in these activities?
- What range of strategies would you expect from your second graders?
- How might you plan for children who you think will need support? Those who will need more challenge?

- Read the Teacher Note, *Stickers: A Context for Place Value*, p. 231.

Discuss

- How does the context of stickers help students develop an understanding of our place value system? How does it support them in learning to count by groups with meaning? To compute fluently?

6. Wrap Up

- Look back at the unit overview, pp. 8-11.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Stickers, Number Strings, and Story Problems*

- Algebra Connections in This Unit, pp. 18-21
- Classroom Routines in This Unit, p. 22
 - Today's Number*
 - Quick Images*
 - How Many Pockets?*
 - What Time Is It?*
- Assessment
 - Number Strings (Session 1.6)
 - Teacher Note, pp. 208-211
 - Story Problems (Session 2.7)
 - Teacher Note, pp. 218-222
 - Even or Odd? (Session 3.3)
 - Teacher Note, pp. 225-228
 - Identifying Coins and Values (Introduced in Session 3.5)
 - Resource Master M26, Assessment Checklist
 - End-of-Unit Assessment (Session 4.6)
 - Teacher Note, pp. 234-240



Investigations

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Unit Guide for Grade 2, Unit 4:
Pockets, Teeth, and Favorite Things
Data Analysis



Unit Guide for Grade 2, Unit 4

Pockets, Teeth, and Favorite Things

Data Analysis

Unit Summary:

Students engage in all the phases of data analysis as they pose questions, collect and sort information, and make representations of data as a way of sharing their findings with others. They work with Venn diagrams and line plots, and they read and interpret a variety of representations of numerical and categorical data. Students are also assessed on fluency with the +10 addition combinations.

Materials:

Pockets, Teeth, and Favorite Things (1 copy per person)

Small Yektti Cards (1 deck per 3-4 people, use manufactured decks or Resource Masters M38-M41, see Materials to Prepare, p. 21)

Yektti Word Cards (1 deck per 3-4 people, use manufactured decks or Resource Master M42, see Materials to Prepare, p. 21)

Yarn (2 loops, see Materials to Prepare, p. 21)

Self-stick notes (25 per pair/group)

Connecting cubes (about 120 per pair/group)

Resource Masters M53-M56, Mystery Teeth Data, Class A – Class D (1 set per 4 people)

Student Activity Book p. 31, Mystery Teeth Data: Which Class Is It? (1 per person)

Student Activity Book p. 32, Mystery Teeth Data: Which Class Is It? Recording Sheet (1 per person)

Do the following activities from *Pockets, Teeth, and Favorite Things*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Guess My Rule with Yekttis (Session 1.2)

In Investigation 1, students identify and sort data by common attributes. They organize and represent data they collect by playing Guess My Rule and taking surveys of their favorite things. In this session, students play *Guess My Rule with Yekttis*, a group of fictional creatures related by common sets of attributes.

- Read the Activities, *Introducing Yekttis*, p. 33-35, and *Guess My Rule with Yekttis*, pp. 35-37, including the Teaching Notes, p. 34, “Yektti Attributes” and “One Attribute at a Time”; and “Encourage Educated Guesses”, p. 36. Play the game with a partner/small group.

Discuss

- What are the three types of attributes you had to attend to as you played this game?
- What understandings will you be looking for as students play this game?
- What difficulties do you anticipate some students may have?
- How can the suggestions listed under Differentiation: Supporting the Range of Learners, p. 37, help you support students and differentiate instruction where needed? What other ideas do you have?

3. Yektti Guess My Rule with Two Rules (Session 1.3)

Students play *Yektti Guess My Rule with Two Rules* as an introduction to Venn Diagrams.

- Read the Activity, *Introducing Venn Diagrams*, pp. 42-43, and the Dialogue Box, *This Yektti Fits in Both Groups*, pp. 135-136.
- Read the Activity, *Yektti Guess My Rule with Two Rules*, pp. 44-45, and play the game with a partner/small group.

Discuss

- How does playing *Yektti Guess My Rule with Two Rules* compare to playing the basic game?
- What understandings will you be looking for as students play this game?
- What difficulties do you anticipate some students may have?
- How can the suggestions listed under Differentiation: Supporting the Range of Learners, p. 45, help you support students and differentiate instruction where needed? What other ideas do you have?

4. Pocket Towers and Pocket Plot (Session 2.2)

In Investigation 2, students organize and represent numerical data. After using cube towers to collect and represent data about the number of pockets they are wearing in Session 2.1, students compare two different representations of pocket-data, finding the same information in each representation. They are introduced to line plots as a way of representing numerical data.

- Read the Activity, *Pocket Towers and Pocket Plot*, pp. 79-81, including the Math Note “Case Value and Frequency”, p. 79, and the Teaching Note “Many-to-One Relationships”, p. 80.
- Read the Activity, *Introducing Line Plots*, pp. 82-83. Use cubes to create a Pocket Tower Representation for the data shown on the line plot on p. 83, and stick-on notes to create a self-stick note graph for the same set of data. (When finished, you will have completed versions of the two data representations pictured on page 80.)

Discuss

- Compare the three representations of this data set. Choose some pieces of data (e.g., 5 people with 4 pockets) and find that data on all three representations.
- How do the questions at the top of p. 80 help students make sense of the self-stick note graph?
- What questions might help students compare the self-stick note graph to the pocket tower representation?

5. Mystery Teeth Data (Session 2.7)

In this session, students use line plots to represent sets of Mystery Teeth Data. They mix up the line plots and try to match them to the unordered Mystery Teeth Data. They make hypotheses about the grade each data set represents.

- Read the Activity, *Mystery Class Data*, pp. 103-105. Follow the directions on p. 104, so that each participant receives one of the Mystery Teeth Data sheets and creates a line plot of that data. (Be sure that at least one line plot gets made for each data set, and that the letter of the class is not recorded.)
- When you have finished, exchange line plots with another person in your group. Match the line plot to one of the sets of data on Student Activity Book p. 31, Mystery Teeth Data: Which Class Is It?. Answer the questions on Student Activity Book p. 32, *Mystery Teeth Data: Which Class Is It? Recording Sheet*. (NOTE: Question 2 should read, “What **grade** do you think the set of Mystery Data represents, and why?”)

Discuss

- What strategy did you use to layout your line plot? Did you determine the greatest and least values in the data before starting?
- How did you keep track of the data to make sure that each piece was represented once and only once on the line plot?
- What will you look for as students do this activity? How will you help those students who are having difficulty getting started?
- What information did you use to help you determine the grades the Mystery Data sets might come from? How do you think students will approach this activity? (See the Dialogue Box, *Discussing Mystery Data*, p. 144 for more information.)

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the overall mathematical storyline of the unit?

Other Key Features of *Pockets, Teeth, and Favorite Things*

- Classroom Routines in This Unit, p. 16
 - Today's Number*
 - What Time Is It?*
 - Quick Images*
- Assessment
 - What's Your Favorite Food? (Session 1.7)
 - Teacher Note, pp. 117-121
 - Plus 10 Combinations (Session 1.7)
 - Resource Master M51, Assessment Checklist
 - Teacher Note, p. 111
 - End-of-Unit Assessment (Session 2.8)
 - Teacher Note, pp. 126-134



Investigations

in Number, Data, and Space®

Unit Guide for Grade 2, Unit 5:
How Many Floors? How Many Rooms?
Patterns, Functions, and Change



Unit Guide for Grade 2, Unit 5

How Many Floors? How Many Rooms?

Patterns, Functions, and Change

Unit Summary:

Students describe and represent ratios, use tables to represent and predict change, and work with numeric sequences as they construct and describe patterns. Students extend repeating patterns and determine which element of the pattern will be in a particular position.

Materials:

How Many Floors? How Many Rooms? (1 copy per person)

Connecting cubes (20 per person)

Student Activity Book p. 1, A Cube Building (1 per person)

Student Activity Book p. 4, Cube Buildings 2 (1 per person)

Pattern blocks (1 set)

Student Activity Book p. 24, Covering Hexagons (1 per person)

Student Activity Book p. 25, Mystery Shape 1 (1 per person)

Student Activity Book pp. 40-41, Cube Train Pattern B (1 per person)

Yellow, red, and blue markers or crayons (per pair/group)

Do the following activities from *How Many Floors? How Many Rooms?*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. How Many Rooms? (Session 1.1)

As an introduction to the work of this unit, students construct cube buildings that have a constant ratio of rooms to floors and begin to consider how to determine the number of rooms when the number of floors is known.

- Read the Activity, *Introducing Cube Building*, pp. 29-31. Use Student Activity Book p. 1, *A Cube Building*, to complete Activity 2, *How Many Rooms?*, pp. 32-33.

Discuss

- What strategies did people use to find the number of rooms in a building with ten floors?
- What kinds of representations did people use to represent solutions?

- Read the Activity, *Sharing Solutions for 10 Floors*, pp. 33-36, including the Teaching Note “Types of Questions” p. 36.
- Examine the “Students might say” section, p. 34, and the Sample Student Work, pp. 34-35.

Discuss

- How are these students understanding and solving this problem?
- Look at the follow-up questions on p. 35. How do these types of questions help students understand the importance of connecting the representations and the math ideas?

3. Cube Outlines and Tables (Session 1.2)

Building on the work they do in Session 1.1, students learn how to use tables to record how the total number of rooms in a cube building changes in relation to the number of floors.

- Read the Activities, *Introducing Tables*, pp. 38-40, and *Cube Outlines and Tables*, pp. 40-41. Complete Student Activity Book p. 4, *Cube Buildings 2*.
- Read Differentiation “English Language Learners,” p. 38, and the Teaching Note, “Sentence Starters” p. 39.

Discuss

- What patterns exist in the rows? In the columns?
- How are people in your group figuring out the number of rooms in 10 floors?
- How do the Differentiation and Teaching Notes help you think about steps you can take to help students who might be particularly challenged by this work?

- Read the Teacher Note, *Using and Interpreting Tables*, pp. 107-108, and the Dialogue Box, “*It’s the Same Thing as up There on the Table*”, pp. 122-123.

Discuss

- What strategies can you use to help students develop a meaningful understanding of how to use and interpret tables?
- How does the teacher in the Dialogue Box help students make sense of and interpret the table? Connect it to the situation it represents?

4. Covering Hexagons (Session 1.5)

Students use tables to represent ratio relationships between pattern block shapes and determine which pattern block relationships are represented by partially completed tables.

- Use Student Activity Book p. 24, *Covering Hexagons*, to do the Activity, *Covering Hexagons*, pp. 62-63.

Discuss

- What patterns do you notice in the column for total number of rhombuses and total number of triangles? Why do the numbers in the column increase in this way?
- What do the numbers in one row of a table mean in terms of the pattern blocks?

- Complete Student Activity Book p. 25, *Mystery Shape 1*. Read the Activity, *Introducing Mystery Shapes*, p. 64.

- Read the Teacher Note, *Students' Difficulties with Mystery Shapes*, pp. 111-112.

Discuss

- What kind of challenges might arise as students work on the Mystery Shapes activity?
- How can you help students better understand this activity?

5. A 3-Element Pattern (Session 2.2)

Students use number sequences to determine what comes in a particular position in a 3-element pattern and then discuss the number sequences associated with each color in this yellow-red-blue cube pattern.

- Use Student Activity Book pp. 40-41, *Cube Train B*, to complete the Activity, *A 3-Element Pattern*, pp. 85-87.

Discuss

- What do you notice about the numbers on your lists? What would the number be for the next blue cube? The next yellow cube? How do you know?
- In thinking about the *How Many Rooms?* and the *Covering Hexagons* activities, what other tables have the same list of numbers (3, 6, 9, 12 . . .) as the list for the yellow-red-blue pattern?

- Read the Dialogue Box, *Counting by 3s*, pp. 128-129.

Discuss

- How does the teacher help students think through what it means to “count by” a number?
- How are the students making sense of this idea?
- Why is this work important?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *How Many Floors? How Many Rooms?*

- Algebra Connections in This Unit, pp. 16-19
- Classroom Routines in This Unit, p. 20
 - Today's Number*
 - Quick Images*
 - What Time Is It?*
 - How Many Pockets?*
- Assessment
 - Understanding Tables (Introduced in Session 1.4)
 - Resource Master M7, Assessment Checklist
 - End-of-Unit Assessment (Session 2.5)
 - Teacher Note, pp. 114-121



Investigations

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Unit Guide for Grade 2, Unit 6:
How Many Tens? How Many Ones?
Addition, Subtraction, and the Number System 3



Unit Guide for Grade 2, Unit 6

How Many Tens? How Many Ones?

Addition, Subtraction, and the Number System 3

Unit Summary:

Students continue to build their understanding of place value (ones, tens, hundreds) as they compose and decompose numbers into tens and ones and work with contexts and models for the base-10 number system. Students apply their work with place value as they play games that involve composing and decomposing 100 and solve addition and subtraction problems to 100. There is continuing work on developing coin equivalencies and combinations, developing visual images of numbers, and telling time.

Materials:

How Many Tens? How Many Ones? (1 copy per person)
Student Activity Book p. 1, Sticker Problems (1 per person)
Student Activity Book pp. 28-29, Sticker Books pp. 2-3 of 4 (1 per person)
Resource Master M23, Get to 100 (1 per person)
Multiple-of-5 number cubes (2 per pair; see Materials to Prepare, p. 97)
Game pieces (2 per pair)
Student Activity Book p. 38, 100 Chart (1 per pair)
Resource Master M24, Get to 100 Recording Sheet (1 per person)
Student Activity Book p. 58, How Many 5s in 100? (1 per person)
Resource Master M30, Blank 100 Chart (1 per person)

Do the following activities from *How Many Tens? How Many Ones?*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, Overview of This Unit. Look at the title of each Investigation and read the summary for each Investigation.
- Review the Mathematics in This Unit essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, Assessing the Benchmarks.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Solving Sticker Problems (Session 1.1)

In this session, students revisit a context for representing place value as they solve problems about stickers that come in strips of 10 and singles. Class discussions for this session and the next session focus on two strategies for solving sticker problems: adding by place value and keeping one number whole.

- Read the Activity, *Revisiting Stickers: Strips and Singles*, p. 25. Complete the problems on Student Activity Book p. 1, Sticker Problems. Be sure to write an equation for each problem.
- Read the Activity, *Solving Sticker Problems*, pp. 25-27.

Discuss

- What equations did people write to show what each problem was asking?
 - What strategies did people use to solve the problem? To show their work?
- Read the Discussion, *Adding Tens and Ones*, pp. 27-29, including the Algebra Note “Does the Order Matter?”, p. 29, and the Math Note “Strategies Other Than Using Tens and Ones”, p. 29.
 - Read the Discussion, *Keeping One Number Whole*, pp. 31-33 in Session 1.2

Discuss

- What strategies did the students in the “Sample Student Work” and “Students might say:” sections (pp. 27-29 and pp. 31-32) use to solve these problems?
- What tools and representations did they use to solve these problems? To record their work?

3. Kira’s Sticker Book (Session 2.4)

This Investigation focuses on working with 100. In this session students are introduced to a way of organizing large amounts of stickers. At the end of the session, the class discusses different strategies for finding the difference between a number and a multiple of 10.

- Use Student Activity Book pp. 28-29, Sticker Books (pp. 2 and 3 of 4) to do the Activity, *Kira’s Sticker Book*, pp. 76-77.

Discuss

- What tools or strategies did you use to solve the problems on Student Activity Book p. 29?
- What tools or strategies do you anticipate your students using to solve these problems?

- Read the Discussion, $46 + \underline{\quad} = 70$, pp. 77-81, including the Math Note “Writing Equations That Represent the Problem” p. 79, and the Algebra Note “The Relationship Between Addition and Subtraction,” p. 80.
- Look at the “Sample Student Work” and “Students Might Say” sections, pp. 78-79.

Discuss

- How are these students making sense of this problem?
- What is the importance of focusing on where the answer is in each representation?

4. Playing Get to 100 (Session 3.1)

Students learn and play *Get to 100*, a game that involves adding multiples of 5 and 10.

- Read the Activity, *Introducing Get to 100*, pp. 101-103. Play *Get to 100* with a partner, using the directions on Resource Master 23, *Get to 100*.

Discuss

- How did you make moves on the 100 Chart? By ones or bigger jumps?
- How did you determine how far you were from 100?
- How did you add the string of numbers at the end of the game?

- Read the Discussion, *Does It Equal 100?*, pp. 113-114, in Session 3.3.
- Read the Dialogue Box, *Keeping Track of Multiple Addends*, pp. 183-184.

Discuss

- During this discussion, why is it important to record each step of the strategy with an equation and to rewrite the original problem for each strategy that is shared?
- How does this work encourage students to add by groups?

5. How Many 5s in 100? (Session 4.1)

For this activity students find the number of 5s and 10s in 100 and fill in these multiples on a blank 100 chart.

- Using Student Activity Book p. 58, *How Many 5s in 100?*, do the Activity, *How Many 5s in 100?*, pp. 131-132.
- Read the Math Note “Multiples and Skip Counting,” p. 131.
- Read the Dialogue Box, *How Many 5s in 100?*, pp. 185-186.

Discuss

- What math ideas are being discussed?
- What moves does the teacher make to guide the conversation?
- What is the purpose of the 100 chart in helping students understand these ideas?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *How Many Tens? How Many Ones?*

- Algebra Connections in This Unit, pp. 16-17
- Classroom Routines in This Unit, p. 18
 - What Time Is It?*
 - Today's Number*
 - How Many Pockets?*
 - Quick Images*
- Assessment
 - How Many More? (Session 2.6)
 - Teacher Note, pp. 161-163
 - Coin Equivalencies (Introduced in Session 3.2)
 - Resource Master M29, Assessment Checklist
 - Skip Counting Strips (Session 4.3)
 - Teacher Note, pp. 164-165
 - End-of-Unit Assessment (Session 4.4)
 - Teacher Note, pp. 166-171



Investigations

in Number, Data, and Space®

Unit Guide for Grade 2, Unit 7:
Parts of a Whole, Parts of a Group
Fractions



Unit Guide for Grade 2, Unit 7

Parts of a Whole, Parts of a Group

Fractions

Unit Summary:

Students investigate what fractions are and the many ways they can be represented and used. They identify fractions of a single object ($\frac{1}{2}$ of a square, $\frac{1}{4}$ of a rectangle, etc.) as well as find fractions of a set ($\frac{1}{2}$ of 12). Students begin to learn how fractions are expressed in words and represented using fraction notation.

Materials:

Parts of a Whole, Parts of a Group (1 copy per person)

Student Activity Book p. 1, Linda and Ebony Share Everything, p. 1 of 5 (1 per person)

Student Activity Book p. 18, Going on a Picnic, p. 2 of 2 (1 per person)

Square pieces of paper, 8.5" x 8.5" (3 per person)

Do the following activities from *Parts of a Whole, Parts of a Group*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-11. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 13, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. What Is a Half? (Session 1.1)

The session begins with a discussion of what *one half* means. Students work on story problems that involve dividing both single objects and sets in half. They share their solutions and discuss how the problems are similar.

- Read p. 21 of the Activity, *What is a Half?*, and the Dialogue Box, *What is One Half?*, pp. 83-84.

Discuss

- What ideas might your students have about what is a half?
- What moves does the teacher make to help the class come to a better understanding about one half?

- Solve the problems on Student Activity Book p. 1, Linda and Ebony Share Everything, and discuss your strategies.
- Read the Discussion, *Half of Objects/Half of Sets*, p. 22-24.

Discuss

- What solutions and strategies are discussed for finding half of an area (i.e. the sandwich)? For finding half of a set (i.e. dog stickers)?

3. Going on a Picnic (Session 1.4)

During this activity, students find halves of sets that result in mixed numbers.

- Solve the problems on Student Activity Book p. 18, Going on a Picnic, p. 2 of 2. Discuss the mathematics of these problems and the strategies you used to solve them.
- Read the Activities, *Introducing One and a Half, Two and a Half*, p. 37, and *Going on a Picnic*, pp. 38-39.

Discuss

- What will you look for as students work on this activity? How might you make this activity more or less challenging for students?

- Read the Teacher Note, *Learning About Fractions*, pp. 77-78.

Discuss

- What is an important concept about fractions that might be new to students? How can you help them keep this in mind?

4. Folding and Folding Again and Same or Different? (Session 2.1)

Students fold a square piece of paper to make halves and fourths. They investigate different ways to fold a square to make fourths and compare differently shaped fourths.

- Take a square piece of paper and fold it in half. Then fold it in half again. Unfold your paper, and compare the results with others. There are three different-shaped fourths that can be made by folding a square in half twice; challenge yourselves to find all three. Then, find a way to prove that the different looking fourths all have the same area.

Discuss

- What mathematics is involved in these activities?
- What strategies did you use to compare fourths?
- How did you prove that different-looking fourths had the same area?

- Read the Activities, *Folding and Folding Again*, pp. 47-50, and *Same or Different?*, pp. 50-51.
- Read the Dialogue Box, *Fourths: Same or Different?*, pp. 85-86.

Discuss

- What vocabulary and notation are used in these activities? How will you introduce and use such vocabulary and notation with your students?
- What might be difficult about discussing a quarter of an hour and a quarter of a dollar (see the Teaching Note “Different Wholes” on p. 49)?
- In the Dialogue Box, what strategies did students use to compare fourths? What other ideas come up during this discussion?

5. Fraction Flags (Session 2.2)

Illustrating fractions with flags from different countries, the teacher defines thirds for the class. The class then creates a fractions chart about fractions they know. Students color in regions of a flag and write what fraction of the flag each color represents.

- Read the Activity, *A Third of a Flag*, pp. 54-55, and the Discussion, *Other Fractions*, pp. 59-62, in Session 2.3.

Discuss

- What mathematical ideas are students working on as they make and discuss fraction flags?
- What issues or areas of confusion may arise for students as they work on these activities?

- Read the Dialogue Box, *Talking About Fraction Flags*, pp. 87-88.

Discuss

- What important ideas about fractions are discussed during this discussion? How does the teacher focus the discussion on these ideas?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Parts of a Whole, Parts of a Group*

- Classroom Routines in This Unit, p. 14
 - Quick Images*
 - Today's Number*
 - What Time Is It?*
 - How Many Pockets?*
- Assessment
 - Assessment: Fractions as Equal Parts (Introduced in Session 1.2)
 - Resource Master M4, Assessment Checklist
 - End-of-Unit Assessment (Session 2.6)
 - Teacher Note, pp. 79-82



Investigations

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Unit Guide for Grade 2, Unit 8:
Partners, Teams, and Paper Clips
Addition, Subtraction, and the Number System 4

Unit Guide for Grade 2, Unit 8

Partners, Teams, and Paper Clips

Addition, Subtraction, and the Number System 4

Unit Summary:

Students refine their strategies for adding and subtracting numbers as they work toward developing fluency with addition and subtraction of two-digit numbers up to 100. They investigate and make generalizations about what happens when you add even and odd numbers. They learn the remaining single-digit addition combinations, achieving fluency with all single-digit addition combinations. Work continues with telling time, place value, and coin combinations.

Materials:

Partners, Teams, and Paper Clips (1 copy per person)

Student Activity Book pp. 9-11, *What Happens When...?* (1 per person)

Cubes (20-30 per person)

Primary Number Cards (1 deck per pair/group, use manufactured decks or Resource Masters M6-M9, see Materials to prepare, p. 51)

Resource Master 10, Plus 9 or 10 BINGO (1 per pair or group)

Student Activity Book p. 17, Plus 9 or 10 BINGO Gameboard (1 per pair or group)

Counters of two types (20 per person)

Student Activity Book p. 35, Pennies and Stickers (1 per person)

Student Activity Book p. 40, Addition Problems, Set 1 (1 per person)

Do the following activities from *Partners, Teams, and Paper Clips*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. Adding Even and Odd Numbers (Session 1.3)

In this Investigation, students revisit and extend the work they did with partners, teams, and defining even and odd numbers in Unit 3. In this session, students make and justify generalizations about what happens when you add even and odd numbers.

- Read Activity 1, *Introducing Adding Even and Odd Numbers*, p. 38. (Review the definitions of even and odd developed by second graders on p. 26, as needed.)
- Do Student Activity Book pp. 9-11, *What Happens When...?*. After you have completed all the questions, focus on question 5. Use cubes or a drawing to explain/show/justify why your answer to question 4 is “always” true.

Discuss

- What kind of reasoning are you using to explain the outcome of different combinations of odd and even numbers?
 - What kinds of representations do you find particularly convincing/powerful?
 - What kind of reasoning would you expect from second graders?
- Read the Discussion, *Adding Two Odd Numbers*, pp. 40-42, including the Teaching Note “Ideas May be Revised,” p. 41; and the Algebra Notes: “Is It True for *All* Numbers?” p. 41, and “Are You Convinced?” p. 42.
 - Read the Dialogue Box, *Adding Two Evens or Two Odds*, pp. 192-193.

Discuss

- What is the role of cubes and drawings in these discussions?
- What type of justifications are students in the Dialogue Box using as they discuss these generalizations?

3. Plus 9 or 10 BINGO (Session 2.1)

In this Investigation, students practice the remaining single-digit addition combinations, with a particular focus on using known combinations to develop fluency with unknown combinations. In this session, students solve related problems (e.g. $4+10$ and $4+9$), learn and play *Plus 9 or 10 Bingo*, and receive and sort the set of Plus 9 Addition Combination Cards.

- Play *Plus 9 or 10 BINGO* using the directions on Resource Master M10.

Discuss

- What strategies did you use as you played?
- What tools or strategies do you anticipate your students using?

- Read the Discussion, *Related Problems*, pp. 53-55, including the Algebra Note “Generalizations about Addition” p. 54.
- Read the Dialogue Box, *Adding Nine*, pp. 194-195.

Discuss

- What connections do students make between related problems (e.g. $4+10$ and $4+9$)? How do they articulate and describe such relationships?
- What is the role of tools and representations (e.g. cubes, drawings, the number line) in these discussions?

4. Story Problems (Session 3.4)

In this Investigation, students refine their strategy for subtracting two-digit numbers. In this session, students solve related problems (e.g. 100-13 and 100-14), participate in a Math Workshop focused on addition and subtraction, and discuss strategies for subtraction.

- Solve problem 1 on Student Activity Book p. 35, Pennies and Stickers. Share your strategy with your partner/group. Read the Activity, *Story Problems*, pp. 99-100.

Discuss

- What strategies did the students in the work samples on p. 100 use?
- What tools and strategies would you expect your students to use to solve Problem 1 (72–58)?

- Read the Discussion, *Subtraction Strategies*, pp. 101-103.

Discuss

- What strategies are the focus of this discussion?
- How are the examples of subtracting the 58 in parts similar to/different from each other? The examples of adding up and subtracting back?
- How do the strategies in this discussion compare to the strategies used by the people in your group?

5. Strategies for Addition (Session 4.1)

In this investigation and Session, students refine, discuss, and practice strategies for adding.

- Solve the problems on Student Activity Book p. 40, Addition Problems, Set 1. Share your strategies with your partner/group. Read the Activity, *An Addition Problem*, pp. 113-114.

Discuss

- What is the purpose of asking students to solve the same problem in two different ways?
- What strategies did the students in the work samples on p. 114 use?
- What tools and strategies would you expect your students to use to solve this problem?

- Read the Discussion, *Strategies for Addition*, pp. 115-119.

Discuss

- What strategies are the focus of this discussion?
- How are the examples of keeping one number whole similar to/different from each other? The examples of adding tens and ones?
- How do the strategies in this discussion compare to the strategies used by the people in your group?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Partners, Teams, and Paper Clips*

- Algebra Connections in This Unit, pp. 16-17
- Classroom Routines, p. 18
 - Today's Number*
 - What Time Is It?*
 - Quick Images: Cover Up with Tens and Ones*
 - How Many Pockets?*
- Assessment
 - Paper Clips and Cherries (Session 3.5)
 - Teacher Note, pp. 168-171
 - End-of-Unit Assessment (Session 4.5)
 - Resource Master M46, Assessment Checklist
 - Teacher Note, pp. 181-189



Investigations

in Number, Data, and Space®

Unit Guide for Grade 2, Unit 9:
Measuring Length and Time
Measurement



Unit Guide for Grade 2, Unit 9

Measuring Length and Time

Measurement

Unit Summary:

Students investigate linear measurement as it applies to length and distance. They work with a variety of linear units, including standard units of inches, feet, yards, centimeters, and meters. Students build on their work with telling time as they measure, record, and calculate duration of events using timelines and schedules.

Materials:

Measuring Length and Time (1 copy per person)

Student Activity Book p. 33, Body Benchmarks (1 per person)

Rulers with inches on one side and centimeters on the other (1 per pair)

Student Activity Book p. 55, Fred & Winnipeg: Chapter 2 (1 per person)

Student Activity Book p. 57, Fred & Winnipeg: Chapter 2 Timeline (1 per person)

Do the following activities from *Measuring Length and Time*:

1. Identify the mathematics in the unit

To get an overview of the mathematics students will be doing in this unit, refer to these sections in the unit front matter. As you look at these sections, begin thinking about the main mathematical ideas students work on in this unit.

- Turn to pp. 8-9, *Overview of This Unit*. Look at the title of each Investigation and read the summary for each Investigation.
- Review the *Mathematics in This Unit* essay, pp. 10-13. Look at the Mathematical Emphases and Math Focus Points. (The emphases are numbered, and can be found above bulleted lists of Math Focus Points.)
- Read the “Benchmarks in This Unit” in the table on p. 15, *Assessing the Benchmarks*.

Discuss

- What mathematical ideas and skills are students working on in this unit?
- What mathematics are students expected to know at the beginning of the unit? At the end?

2. How Far Can You Jump? (Session 1.3) and Comparing Measurements (Session 1.4)

In Investigation 1, students use a variety of nonstandard units to measure and compare lengths, both indirectly and directly. In this session, students use different units to measure the length of several types of jumps. The data provide opportunities to discuss measurement comparisons require the use of the same unit.

- Read the Activities, *Introducing How Far Can You Jump?*, pp. 37-38, and *How Far Can You Jump?*, pp. 39-40, focusing in particular on the Ongoing Assessment: Observing Students at Work, p. 39.

Discuss

- What mathematical ideas are students working on as they do this activity?
- What issues or areas of confusion may arise for students as they work on this activity?

- Read the Discussion, *Comparing Measurements*, pp. 45-46.

Discuss

- What is the mathematical focus of this discussion?
- Look at the table on p. 46. Imagine you have students who say that Holly had the shortest jump. What might these children be thinking? How might others students explain why they disagree?

3. The Land of Inch (Session 2.1)

In this session, students confront the need for a common unit, and use multiple copies of a common unit to measure and to create a 12-inch measuring tool. The rest of the Investigation focuses on using this tool to measure lengths.

- Read the Discussion, *The Land of Inch*, pp. 59-60, and the Activity, *Creating a 12-inch Measuring Tool*, pp. 60-61.

Discuss

- What are the mathematical ideas that underlie these activities?
- What is the benefit of having students measure first with the inch bricks?
- How does an inch-brick measuring tool compare to a ruler? What is the benefit of having students create and use a 12-inch measuring tool before moving to a ruler?
- What issues would you expect students to encounter as they measure with an inch-brick measuring tool? What about when they measure lengths longer than the tool?

4. Body Benchmarks (Session 3.2)

In Investigation 3, students are introduced to U. S. standard and metric measurement units and tools. In this session, they compare their inch-brick tools to rulers and use rulers to find benchmarks on their body for particular lengths.

- Use a ruler to complete Student Activity Book p. 33, *Body Benchmarks*. (Note that you might also want to find benchmarks for centimeters and meters, which students investigate in the Activity *Metric Scavenger Hunt*, pp. 99-100, in Session 3.4.) Compare the benchmarks you discovered with a partner/group.
- Read the two activities in the Math Workshop, *Measuring*, pp. 88-90.
- Read the Teacher Note, *Learning to Use a Ruler*, p. 157.

Discuss

- As students practice measuring with a ruler, what is important to watch for?

5. Daily Schedule: Fred & Winnipeg (Session 4.3)

In this Investigation, students are introduced to timelines as a way to represent time as a horizontal sequence. They use them to determine the time and duration of events. In this session, students use timelines to solve problems about the daily activities of two cats.

- Read the story on Student Activity Book p. 55, *Fred & Winnipeg: Chapter 2*, and represent it on the timeline on Student Activity Book p. 57, *Fred & Winnipeg: Chapter 2 Timeline*.

Discuss

- What mathematical ideas were you working on as you solved these problems?
- What knowledge of time and timelines did you bring to this activity?

- Read the Activity, *Daily Schedule: Fred & Winnipeg*, pp. 122-124.
- Read the Dialogue Box, *Not Even a Second Has Gone By: Calculating Duration*, pp. 170-171.

Discuss

- How would you expect your students to approach these problems?
- What issues or areas of confusion may arise for students as they work on this activity?
- In the Dialogue Box, what is Esteban's idea? What questions does the teacher ask to help the class think about Esteban's idea?

6. Wrap Up

- Look back at the unit overview, pp. 8-9.

Discuss

- How do the activities done during this unit study fit into the mathematics of the rest of the unit?

Other Key Features of *Measuring Length and Time*

- Classroom Routines in This Unit, p. 16
 - Quick Images*
 - How Many Pockets?*
 - Today's Number*
 - What Time Is It?*
- Assessment
 - A Measurement Disagreement (Session 1.6)
 - Teacher Note, pp. 150-152
 - The King's Foot (Session 3.1)
 - Teacher Note, pp. 154-155
 - End-of-Unit Assessment (Session 4.7)
 - Teacher Note, pp. 160-164