

**Fraction and Mixed Number Equivalence and Operations**

Guide for using Extending Children’s Mathematics - Fractions and Decimals- Innovations in Cognitively Guided Instruction (Susan B. Empson and Linda Levi) as a resource.

**Why is this book valuable?**

This book is based on research that emphasizes “what children can do when given the chance to *reason things out*

*for themselves* and the kinds of mathematics understanding that emerges”. (page xviii)

**Is this book compatible with Common Core State Standards?**

Yes! See page xxiv for discussion about the CCSS progression of teaching fractions and how this book aligns with that progression and with the Mathematical Practice Standards.

**Helpful Resources for Teacher Learning**

**Reading these sections before beginning instruction and planning for the units will be beneficial for all teachers.**

**Pages xvii - xxvi**

Introduction - Issues in Learning Fractions and Decimals: Rethinking Our Approach

This provides a great justification for why this book is beneficial when trying to help students understand fractions and decimals

**Pages 225 -232**

Chapter 9 – The Long View – Learning to Use Children’s Thinking to Guide Instruction

Though this chapter is at the end of the book, it gives a good overview of how listening to students can guide your instruction. It explains the benefits, as well as challenges, of learning to truly listen to what students understand. For example, “listening with the intention to hear what a student has to say without imposing your own way of thinking is a significant challenge…It can be hard for a teacher to listen without correcting or providing hints to a child who is hesitating or struggling and to know what question to ask next when a child uses an unfamiliar strategy. However, the more you interact with students about their thinking, the more you will learn and the more curious you will likely become…The way you listen and what you do with what you hear are likely to change.” (page 227)

**Helpful Resources for Teacher Learning and Planning for Unit 2**

**Unit 2**: Understanding Multiplication and Division of Fractions (whole number by fraction)

**\*Note** – This document was designed to be a curriculum resource to help you address your grade level standards. However, with this being the first year of CCSS implementation, it is expected and understood that there may be instructional gaps that need to be addressed in order to meet these grade level expectations. If your students are struggling, please refer to our “Grade Level Curriculum Pages” – specifically 3rd grade Unit 6 and/or 4th grade Unit 4.

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| **Fifth Grade Unit 1 and Unit 4 Standards** | **Pages that Align with the Fifth Grade Unit 1 and Unit 4 Standards** |
| * **5.NF.3** Interpret a fraction as division of the numerator by the denominator (*a*/*b* = *a* ÷ *b*). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
 | **Chapter 1: Equal Sharing Problems and Children’s Strategies for Solving Them*** Teacher Learning (Pages 3 - 28)
* Problems to use with students (Pages 29 - 31)
* Instructional Guidelines for Teaching Equal Sharing (Pages 32 - 35)
* The book suggests giving students experience with equal sharing problems before moving to operations with fractions – this is why we listed 5.NF.3 before all other standards in this unit.
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| **Multiplication with Fractions****55.NF.5** Interpret multiplication as scaling (resizing), by: * + **5.NF.5a** Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
* **5.NF.5b** Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence *a*/*b* = (*n* × *a*)/(*n* × *b*) to the effect of multiplying *a*/*b* by 1.
* **5.NF.6** Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
 | **Chapter 3: Multiple Groups Problems and Children’s Strategies for Solving Them** **(whole number of groups with a fractional amount in each group)** * Teacher Learning (Pages 49 – 64)
* Problems to use with students(Pages 65 – 67)

Multiplication ProblemsA, E, F, H, I, L, M* Instructional Guidelines for teaching Multiple Groups Problems (Pages 69 – 71)
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| **Division with Fractions****5.NF.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.) \*\*Unit 2 focuses on dividing whole numbers by unit fractions.* + **5.NF.7b** Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*
* **5.NF.7c** Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins? \*\*Focus in Unit 2 will be division of whole numbers by unit fractions.*
 | **Chapter 3: Multiple Groups Problems and Children’s Strategies for Solving Them** * Teacher Learning (Pages 49 – 64)
* Problems to use with students(Pages 65 – 67)

Measurement Division ProblemsB, C, D, G, J, K, N, O, P, QRemember that you may need to change the numbers in these problems to meet the standards (in 5th grade we are ONLY dividing whole numbers by unit fractions in Unit 1 and unit fractions by whole numbers in Unit 4). These problems have a great structure, but not all of the number choices given will meet 5th grade standards.* Instructional Guidelines for teaching Multiple Groups Problems (Pages 69 – 71)

Third and fourth grade instructional guidelines best meet the 5th grade standards |