Grade 4 Fraction Unit of Instruction

This is a progressive unit of instruction beginning with students investigating the concrete area model of fraction equivalence and ordering. Students progress through the concrete, representational and abstract model of understanding within the lessons. The unit progresses to decimal understanding relating to money and fractional representation. Once your students have a solid understanding of fraction and decimal equivalence, they are ready to add, subtract and finally multiply fractions. (whole times a fraction) Those lessons also begin with concrete, move to representational and finally the abstract.

Numbers and Operations – Fractions

Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number. **Cluster 1: Extend understanding of fraction equivalence and ordering** **Cluster 2: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers** **Cluster 3: Understand decimal notation for fractions, and compare decimal fractions**	**A bibliography of children's literature with a focus on fractions is provided, which can be integrated so that students can connect through literature.** 1. Fraction Fun, David Adler 2. Time for Kids, "Get Your Healthy Lunches", Alexandria Sifferlin * 3. Time for Kids, "Obesity Rates Falling", Cameron Keady * 4. Surviving the Applewhites, Stephanie Tolan * 5. What's Smaller Than a Pigmy Shrew?, Robert E. Wells 6. One Riddle One Answer, Lauren Thompson 7. Icebergs and Glaciers, Seymour Simon 8. Pythagoras and the Ratios, Julie Ellis 9. Gator Pie, Louise Mathews 10. Little Numbers and Pictures That Show Just How Little They Are, Edward Packard * Used in a lesson cited below

Parent Resources **Explaining Fraction Equivalence with Pictures** **http://www.cpalms.org/Public/PreviewResourceUpload/Preview/43264** **Fraction Machine** **http://www.cpalms.org/Public/PreviewResourceUrl/Preview/42143** **Listing fractions in increasing size** **http://www.cpalms.org/Public/PreviewResourceUpload/Preview/43254** **Using Benchmarks to Compare Fractions** **http://www.cpalms.org/Public/PreviewResourceUpload/Preview/43242** **Sugar in six cans of soda (visualize multiplication of a fraction)** **http://www.cpalms.org/Public/PreviewResourceUpload/Preview/43243**	

Chocolate Fractions	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/26891 Chocolate bars will be used to introduce equivalent fractions. Students will find patterns for equivalent fractions through the concrete-representational-abstract process. ***Use connecting cubes as the concrete, graph paper to draw the representational beside the abstract numbers.*** **MAFS.4.NF.1.1:** Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Create a Quilt – Equivalent Fractions	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49773 In this lesson, students will work in cooperative pairs to design and construct quilts according to specified instructions. They will obtain the knowledge that fractions can be equivalent even though they may look different and are made up of different numbers. Students develop skills in reasoning as they defend and justify why two fractions are equivalent. ***Graph paper is used to create the quilts – representational model. Save student work for later in the unit to add fractions with like denominators.*** **MAFS.4.NF.1.1:** Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions

	themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Equivalent Fraction Dominoes	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/37667 Students will identify equivalent fractions using an area model. They will reinforce their learning by playing equivalent fraction dominoes. ***Students should use colored tiles at first to model the fractions, and then draw the representation on graph paper.*** **MAFS.4.NF.1.1:** Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Fraction Land	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49482 This lesson is part of a series based on the above standard. All lessons in the series share the Fraction Land title and are available on CPALMS. By the end of the series, students will have created pieces for a game board and other items used to play. ***After the 1st two lessons, students should be able to do this in small groups with teacher facilitation.*** **MAFS.4.NF.1.1:** Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the

	number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Fraction Land II	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49733 This lesson focuses on creating equivalent fractions using the numbers 2, 3, and 4. Students will practice multiplying the numerator and the denominator by 2, 3, or 4 to create equivalent fractions. ***This lesson incorporates the use of circle models as the next step.*** **MAFS.4.NF.1.1:** Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Gardening in Schools	http://www.cpalms.org/Public/PreviewResource/Preview/48158 This Model Eliciting Activity is written at a 4th grade level. In this open-ended problem, students must consider how to rank potting soil based on factors like fraction of ingredients, price, and eco-friendliness. In teams, students determine their procedures and write letters back to the client. ***This lesson incorporates nonfiction reading passages.*** **MAFS.4.NF.1.2:** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or

	numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
Fractions Let's Compare	http://www.cpalms.org/Public/PreviewResource/Preview/34730 In this lesson students use area models, **number lines**, and the benchmark fraction of 1/2 to compare fractions that are less than one and have different numerators and denominators to solve real-world problems. **MAFS.4.NF.1.2:** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
Mrs. Thinkwell's Dilemma	http://www.cpalms.org/Public/PreviewResource/Preview/49568 Mrs. Thinkwell is a 4th grade teacher, but she is having a hard time keeping her students engaged during the science lessons. The science lectures are just not working. Of course, there are a few students who seem to be doing well, but there are so many who are underachieving. She could not figure out the problem. Her principal suggested giving

	the students a multiple intelligence (MI) assessment and possibly utilizing small groups for instruction. She decided to try the MI assessment and received the results; but she still was unsure of what that meant for her classroom. Mrs. Thinkwell wants to utilize small groups in her classroom, but did not know the best way to group the students based primarily on their multiple intelligences. Students will help Mrs. Thinkwell by creating groups of students based on a class data set of MI Assessment results. **MAFS.4.NF.1.2:** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Fraction Line-up!	http://www.cpalms.org/Public/PreviewResource/Preview/29615 In this lesson, students will correctly model and compare fraction pairs and place on the inequality mat attached to this lesson. ***This lesson is a perfect example of representational that can easily be taken to the abstract by having students place the cards on a number line working in small groups. Once they create the number line with the cards, have the students draw a number line, divide it into equal parts and then place the fractions on the number line.*** **MAFS.4.NF.1.2:** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
Dynamic Decimals, Fractions and Money	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/28849 In this lesson, students will realize the connection between fractions, decimals and money through the use of a 100 grid. **MAFS.4.NF.3.6:** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

Decimal Place Value	http://www.cpalms.org/Public/PreviewResourceUrl/Preview/31832 Students learn about decimal place value and the relationship between tenths, hundredths, and thousandths. Students will explore decimal place value, read and write decimals using tenths, hundredths, and thousandths, and compare decimals using greater-than and less-than notation. **MAFS.4.NF.3.7:** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
How Many Tenths and Hundredths?	http://www.cpalms.org/Public/PreviewResource/Preview/43259 The purpose of this task is for students to finish the equations to make true statements. Parts (a) and (b) have the same solution, which emphasizes that the order in which we add doesn't matter (because addition is commutative), while parts (c) and (d) emphasize that the position of a digit in a decimal number is critical. The student must really think to encode the quantity in positional notation. In parts (e), (f), and (g), the base-ten units in 14 hundredths are bundled in different ways. In part (e), "hundredths" are thought of as units: 14 things = 10 things + 4 things. Part (h) addresses the notion of equivalence between hundredths and tenths.

Cookies, Fractions and Decimals, Oh My!	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/72072 This lesson asks students to recommend which cookie the owners of The Cookie Jar should add to their menu. Before they make their decision, the students have to convert decimal notation and fractions with denominators 10 and 100 to fractions with like denominators. Then they will be able to see exactly how many people voted for each cookie and they can factor in that information along with additional cookie facts to make their final recommendation. **MAFS.4.NF.3.6:** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
Equivalency Detectives: Fractions and Decimals	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/29791 This is a lesson intended to reinforce students' ability to find equivalent fractions and decimals. The lesson requires prior essential vocabulary knowledge, and a basic understanding of converting fractions to decimals and decimals to fractions (specifically tenths and hundredths). **MAFS.4.NF.3.6:** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

Cell Phone Inquiry	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/51031 Students will determine what cell phone would be the best phone for their teacher to purchase. Factors to consider are price, touch screen, camera, voice command, weight and size. **MAFS.4.NF.3.7:** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
Amazing Alice Cookies	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/48267 Students will help Amazing Alice Cookies choose the perfect chocolate chip brand to use for their cookies. Students will be given data in the form of fractions and decimals. Fourth grade students will compare decimals and order and compare fractions. Students will write a letter describing their procedure to the client. **MAFS.4.NF.1.2:** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

	MAFS.4.NF.3.7: Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
Comparing and Ordering Decimals	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49356 In this cooperative learning activity, students will have five sets of decimal cards to sort and put in order - least to greatest. The lesson starts with a short whole group activity and then breaks off in to structured groups. The teacher is free to interact with each of the groups and monitor progress, participation, and understanding. ***This lesson has students put the decimals on a number line.*** **MAFS.4.NF.3.7:** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
Marshmallow Math	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46877 In this lesson, students are physically engaged in measuring distances of tossed marshmallows to the nearest 1/2 foot. Using their measurements, they will represent the data on a line plot and then solve word problems involving addition and subtraction of mixed numbers. This is a fun

	lesson that motivates students to become excited about the difficult world of fractions. **MAFS.4.NF.2.3:** Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. **MAFS.4.MD.2.4:** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.

Relay Races	http://www.cpalms.org/Public/PreviewResource/Preview/36378 In this lesson, students solve word problems related to races to determine addends of fractions with like denominators that sum to a fraction that is less than or equal to one and has the same denominator as the addends. The focus is on addition, decomposing a fraction into a sum of fractions in more than one way, drawing linear models, and writing equations to represent the problems. **MAFS.4.NF.2.3:** Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Decomposing Fractions	http://www.cpalms.org/Public/PreviewResource/Preview/49127 Using circle fraction manipulative students will investigate adding fractions by decomposing them into their smallest parts. **MAFS.4.NF.2.3:** Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Learning to Love Like Denominators	http://www.cpalms.org/Public/PreviewResource/Preview/30114 Students engage in problem solving to explore the addition and subtraction of fractions with like denominators. Students make sense of the structure of addition and subtraction equations with like denominators and make generalizations to move from using manipulatives, pictures and number lines to simply adding or subtracting the numerator. **MAFS.4.NF.2.3:** Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

	d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
Adding Tenths and Hundredths	http://www.cpalms.org/Public/PreviewResource/Preview/43270 The purpose of this task is adding fractions being with a focus on tenths and hundredths. Each part of this task emphasizes a unique aspect of 4.NF.5. **MAFS.4.NF.3.5:** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*
Exploring Fraction Multiplication	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/48994 Students will be exploring repeated addition with circle fractions as it pertains to whole numbers times fractions. **MAFS.4.NF.2.4:** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

	b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.
Modeling Multiplication with Fractions	http://www.cpalms.org/Public/PreviewResource/Preview/33128 Students will relate multiplication strategies with fractions through problem solving situations. This lesson connects prior understanding of multiplication and equal groups to multiplication of fractions. **MAFS.4.NF.2.4:** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*

	c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.
Modeling Multiple Groups of Fractions	http://www.cpalms.org/Public/PreviewResourceLesson/Preview/44684 In this inquiry lesson students will use a situational story to explore ways to find the total quantity of a fraction multiplied by a whole number using various models. **MAFS.4.NF.2.4:** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.

Multiple Bake Sale Cookie Recipes with Fractional Ingredients	http://www.cpalms.org/Public/PreviewResource/Preview/45577 In this lesson students will explore ways to find the total quantity of mixed numbers multiplied by a whole number using a real-world situation. **MAFS.4.NF.2.4:** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.

Material Lists

Suggested class materials for each student

Math Notebook/Journal
Math Folder
Scissors
Construction paper
Colored pencils
Pencils
Index cards
Place value charts thru hundredths
Hundreds charts
Number lines (can use string and index cards)
Number strips
Protractors
Rulers

Numbers and Operations – Fractions

(class set) geoboards and rubberbands
(class set) fraction bars
(class set) fraction circles
(class set) pattern blocks
(class set) colored tiles
inch graph paper for class use
cm graph paper
interlocking cubes
dimes, nickels, pennies to relate to decimal value