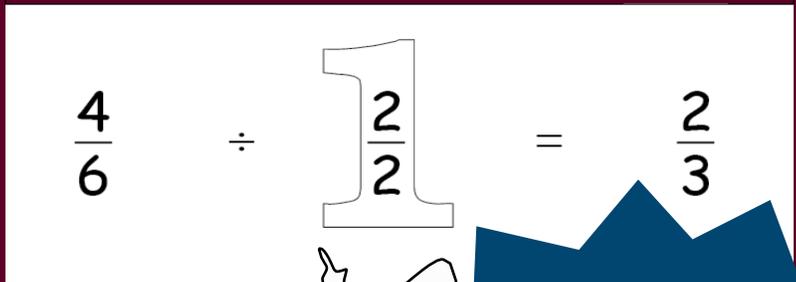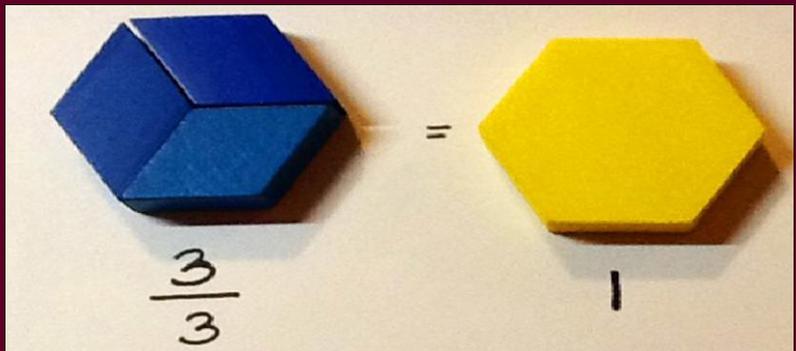# FEARLESS FRACTIONS

The Alignment of the Lessons of Fearless Fractions Teacher Workbook with:

1. College and Career Readiness Standards

2. The National Council of Teachers of Mathematics (NCTM)

3. Common Core Standards (CCSSM)

4. The State of Texas Assessments of Academic Readiness (STAAR)

5. Texas Essential Knowledge and Skills (TEKS)

CROSSWALK COACH FOR TEACHER WORKBOOK

$$\frac{3}{3}$$

1

$$\frac{4}{6} \div \frac{2}{2} = \frac{2}{3}$$

Sneak Peek!!

Fearless Fractions
Crosswalk Coach for
Teacher Workbook

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Introduction

Fearless Fractions consists of an introductory lesson using fraction blocks and representations of the number one in working with fractions. There are 9 lessons that begin with teacher instruction for hands-on activities with pattern blocks to deepen understanding of number concepts involving fractions. Each lesson is followed with traditional practice problems using the concepts from the lesson. The lessons are sequenced as a logical pattern that moves through fraction concepts and skills, each building on prior knowledge. Connections between fractions, decimals, and percents are included. However, the focus of the work is on fractions, the area in which students often experience the most difficulty. An understanding of fractions facilitates the use of fraction representations in decimal and percent forms.

Although the foundations of concepts are laid in early years, the practice in symbolic form focuses on standards primarily for 5th and 6th grade. This book is most appropriate for grades 5 and 6, but can be used with more advanced 4th grade students. The reading level of the student book, as analyzed on the Flesch-Kincaid scale, is grade 4.9.

Table 1 gives a brief description of the content of the lessons and practice sets and outlines the book's alignment with NCTM Focal Points and the Common Core Standards for Mathematics.

Table 1. Fearless Fractions: Alignment to NCTM Focal Points and Common Core Standards

Lesson	Practice	NCTM Focal Points	Common Core Standards
Lesson 1 uses pattern blocks to represent fractions as part of a whole and uses fractions to represent ratios, probabilities, and percents.	**Practice 1:** fractions as part of a whole; ratio is comparison of two numbers; writing ratios from a problem situation; percent as part out of 100; writing percents from a problem situation	**Grade 3 Focal Points:** Students develop an understanding of the meanings and uses of fractions to represent parts of a whole, parts of a set, or points or distances on a number line.	**CCSS.Math.Content.3.NF.A.1:** Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.
Lesson 2 uses pattern blocks to represent equivalent fractions and uses "onesters" to write equivalent fractions.	**Practice 2:** writing equivalent fractions; using equivalent fractions to solve word problems; writing proportions for problem situations and solving them	**Grade 4 Focal Points:** Students connect equivalent fractions and decimals by comparing models to symbols and locating equivalent symbols on the number line.	**CCSS.Math.Content.3.NF.A.3.B:** Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model. **CCSS.Math.Content.4.NF.A.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.

Lesson 3 uses pattern blocks and "onesters" to simplify fractions.	Practice 3: simplifying fractions; solving problems by simplifying fractions; writing fractions to represent ratios	Grade 6 Focal Points: Students use simple reasoning about multiplication and division to solve ratio and rate problems. Students learn to extend whole number multiplication and division to ratios and rates. To do this, students will view equivalent ratios and rates as deriving from and extending pairs of rows or columns in the multiplication table. Thus, they expand the repertoire of problems that they can solve by using multiplication and division, and they build on their understanding of fractions to understand ratios. Students solve a wide variety of problems involving ratios and rates.	CCSS.Math.Content.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. CCSS.Math.Content.6.RP.A.2: Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. CCSS.Math.Content.6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. CCSS.Math.Content.6.RP.A.3a: Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. CCSS.Math.Content.6.RP.A.3b: Solve unit rate problems including those involving unit pricing and constant speed. CCSS.Math.Content.6.RP.A.3c: Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. CCSS.Math.Content.6.RP.A.3d:

		Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
Lesson 4 uses pattern blocks to represent mixed numbers as equivalent improper fractions.	**Practice 4:** writing mixed numbers as improper fractions; writing improper fractions to represent problem situations and solving them; solving problems by multiplying and dividing mixed numbers	**Grade 6 Focal Points:** Students use the meanings of fractions, multiplication and division, and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions and explain why they work. They use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain the procedures for multiplying and dividing decimals. Students use common procedures to multiply and divide fractions and decimals efficiently and accurately. They multiply and divide fractions and decimals to solve problems, including multistep problems and problems involving measurement.	**CCSS.Math.Content.6.NS.A.1:** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. **CCSS.Math.Content.6.NS.A.1:** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
Lesson 5 uses pattern blocks to represent improper fractions as mixed numbers in simplest form.	**Practice 5:** writing improper fractions as simplified mixed numbers; solving problems by multiplying whole number by fractions and simplifying mixed numbers		
Lesson 6 uses pattern blocks to add and subtract fractions with the same denominator.	**Practice 6:** adding and subtracting fractions; solving problems by adding and subtracting fractions	**Grade 5 Focal Points:** Students apply their understandings of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as	**CCSS.Math.Content.4.NF.B.3.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

		equivalent calculations with like denominators. They develop fluency in standard procedures for adding and subtracting fractions and decimals. Students add and subtract fractions and decimals to solve problems, including problems involving measurement.	operations and the relationship between addition and subtraction.
Lesson 7 uses pattern blocks to add and subtract fractions with different denominators.	**Practice 7:** adding and subtracting fractions; solving problems with fractions and percents		**CCSS.Math.Content.5.NF.A.1:** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. **CCSS.Math.Content.5.NF.A.2:** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use number sense fractions to mentally estimate and assess the reasonableness of answers.
Lesson 8 uses pattern blocks to represent addition and subtraction of mixed numbers.	**Practice 8:** adding mixed numbers; solving problems with addition of mixed numbers	**Grade 6 Focal Points:** Students use the meanings of fractions, multiplication and division, and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions and explain why they work. They use the relationship between decimals and fractions, as well as the relationship between finite decimals and	**CCSS.Math.Content.5.NF.A.1:** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.
Lesson 9 uses pattern blocks to represent mixed number subtraction.	**Practice 9:** subtracting mixed numbers; solving problems with		

	subtraction of mixed numbers	whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain the procedures for multiplying and dividing decimals. Students use common procedures to multiply and divide fractions and decimals efficiently and accurately. They multiply and divide fractions and decimals to solve problems, including multistep problems and problems involving measurement.	

The Texas College and Career Readiness Standards (TCCRS)

The Texas Career and College Readiness Standards (TCCRS) apply primarily to work done at the high school level. However, the standards have some connection to mathematics learned at lower grade levels. Working with rational numbers (fractions) is important in mathematics in the workforce, in everyday life, and in mathematics and other STEM courses in college. In regard to fractions, the lessons and practice in *Fearless Fractions* addresses the following TCCRS:

I.B.1 Perform computations with real and complex numbers.
a. Add, subtract, multiply, and divide real numbers accurately, including irrational numbers, numbers with exponents, and absolute values.
b. Transform numerical expressions using field properties (especially the distributive property), order of operations, and properties of exponents.
c. Solve problems involving rational numbers, ratios, percents, and proportions given the problem situation.

Table 2 shows the alignment of the lesson with the TEKS and STAAR Reporting Categories for Texas teachers.

Table 2. Fearless Fractions: Alignment to TEKS and STAAR Reporting Categories

Fearless Fractions Lesson	Texas Essential Knowledge and Skills (TEKS) [STAAR Reporting Category – Type of Standard]
Lesson and Practice 1 - use pattern blocks to represent fractions as part of a whole and use fractions to represent ratios, probabilities, and percents.	3.b.3 Number and operations. The student applies mathematical process standards to represent and explain fractional units. The student is expected to: (A) represent fractions greater than zero and less than or equal to one with denominators of 2, 3, 4, 6, and 8 using concrete objects and pictorial models, including strip diagrams and number lines [**1-Supporting**]; (C) explain that the unit fraction 1/*b* represents the quantity formed by one part of a whole that has been partitioned into *b* equal parts, where *b* is a non-zero whole number [**1-Supporting**]; (D) compose and decompose a fraction *a/b* with a numerator greater than zero and less than or equal to *b* as a sum of parts 1/*b* [**1-Supporting**]; (E) solve problems involving partitioning an object or a set of objects among two or more recipients using pictorial representations of fractions with denominators of 2, 3, 4, 6, and 8 [**1-Supporting**]; (F) represent equivalent fractions with denominators of 2, 3, 4, 6, and 8 using a variety of objects and pictorial models, including number lines [**1-Readiness**]; (G) explain that two fractions are equivalent if and only if they are both represented by the same point on the number line or represent the same portion of a same size whole for an area model [**1-Supporting**]. 6.b.4 Proportionality. The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to: (B) apply qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates [**2-Readiness**]; (C) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute [**1-Supporting**];

	(D) give examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients [**1-Supporting**]; (E) represent ratios and percents with concrete models, fractions, and decimals [**1-Supporting**]; (G) generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money [**1-Readiness**]; and (H) convert units within a measurement system, including the use of proportions and unit rates [**3-Readiness**]. 6.b.5 Proportionality. The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to: (A) represent mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions [**2-Supporting**]; (B) given a part and the percent, solve real-world problems to find the whole, and find the percent given the part and the whole, including the use of concrete and pictorial models [**2-Readiness**]; and (C) use equivalent fractions, decimals, and percents to show equal parts of the same whole [**1-Supporting**].
Lesson and Practice 2 – use pattern blocks to represent equivalent fractions and "onesters" to write equivalent fractions.	3.b.3 Number and operations. The student applies mathematical process standards to represent and explain fractional units. The student is expected to: (F) represent equivalent fractions with denominators of 2, 3, 4, 6, and 8 using a variety of objects and pictorial models, including number lines [**1-Readiness**]; (G) explain that two fractions are equivalent if and only if they are both represented by the same point on the number line or represent the same portion of a same size whole for an area model [**1-Supporting**]. 4.b.3.C Number and operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to determine if two given fractions are equivalent using a variety of methods [**1-Supporting**]. 6.b.4.G The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to

	generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money [**1-Readiness**].
Lesson and Practice 3 – use pattern blocks and "onesters" to simplify fractions.	3.b.3 Number and operations. The student applies mathematical process standards to represent and explain fractional units. The student is expected to: (F) represent equivalent fractions with denominators of 2, 3, 4, 6, and 8 using a variety of objects and pictorial models, including number lines [**1-Readiness**]; (G) explain that two fractions are equivalent if and only if they are both represented by
Lesson and Practice 4 – use pattern blocks to represent mixed numbers as equivalent improper fractions.	the same point on the number line or represent the same portion of a same size whole for an area model [**1-Supporting**]. 4.b.3.C Number and operations. The student applies mathematical process standards to
Lesson and Practice 5 – use pattern blocks to represent improper fractions as mixed numbers in simplest form.	represent and generate fractions to solve problems. The student is expected to determine if two given fractions are equivalent using a variety of methods [**1-Supporting**]. 6.b.4.G The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money [**1-Readiness**].
Lesson and Practice 6 – use pattern blocks to add and subtract fractions with the same denominator.	4.b.3 (3) Number and operations. The student applies mathematical process standards to represent and generate fractions to solve problems. Students are expected to: (E) represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that will improve their understanding of number lines and properties of operations [**2-Readiness**].
Lesson and Practice 7 – use pattern blocks to add and subtract fractions with different denominators.	5.b.3 Number and operations. The student applies mathematical process standards to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy. The student is expected to:

Lesson and Practice 8 – use pattern blocks to represent addition and subtraction of mixed numbers.	(H) represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations [**2-Supporting**].; (K) add and subtract positive rational numbers fluently [**2-Readiness**].
Lesson and Practice 9 – use pattern blocks to represent mixed number subtraction.	

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