Putting Fractions in a Box

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This curriculum unit is recommended for:
5th Grade Mathematics

Keywords: Fractions, Problem Solving, Area Model, Rectangle

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: Students often struggle with fractions. A common strategy the teachers will go to for identifying fractions is modeling with visuals until the standards require students to preform operations with fractions. Often students are then required to learn an algorithm for each of the separate operations. This unit extends the visual representations to include operations with fractions. It is meant to be taught as an extension to the 5th grade fractions standards, but the strategies in this unit can also be used to help guide students who need intervention or extra support. The rectangle is the basic model that students can use to visually perform the operations with fractions. Throughout the unit, students are building toward a culminating project. The project requires that students design a layout looking at a rectangle as a whole space. During each phase of the unit, students extend their knowledge of the strategies with their design, until the end of the unit in which they use all of the strategies to build a scale model of their design.

I plan to teach this unit to 22 fifth grade students in the coming year to supplement the Mathematics curriculum.

Putting Fractions in a Box

Michael Butler

Rationale

Many teachers and students are intimidated by fractions. Proficiency in fractions requires learning multiple algorithms, confusing steps, and completely foreign concepts. The idea that a fraction of a whole can be represented by an infinite number of equivalent fractions is often a concept that is taught early in a unit on fractions but is very difficult for students to grasp and fully understand without visual proof. Performing mathematical operations with fractions also seems to necessitate the memorization of a multitude of rules that will sometimes contradict each other. For example, when learning addition, we are taught to create equivalent fractions using a common denominator, add the new numerators, but never add the denominators. However, when learning to multiply two fractions, the addition rules get thrown out the window and students just multiply numerators, multiply denominators and have a solution. This then begs the question: "If multiplication can be represented as repeated addition with whole numbers, then why do our rules and strategies for multiplication of fractions completely contradict the way we perform addition of fractions?" If we can consistently depict fractions using the same visual representation (in this unit it will be the rectangle), then we can help students to overcome the confusion of the procedural, algorithmic ways of problem solving and develop a deeper understanding of how we manipulate fractions while performing mathematical operations.

In Science, we tend to teach concepts and then give students opportunities to apply them to hands on or real world situations. In Social Studies, my students enjoy and develop a depth of understanding of concepts when we role-play historical events. On the other hand, in Math classes we tend to teach a strategy or algorithm and give students opportunities to practice and apply these skills to a word problem. The word problems often involve ideas that students may or may not be familiar with and are sometimes tough to visualize. What average fifth grader is going to accurately visualize 7/8 of a 2 ½ foot length of rope? As teachers this is where we tend to rely heavily on teaching a standard, one size fits all algorithm, forgetting that our goal is to broaden each student's depth of understanding rather than teaching kids to get the right answer. The Common Core Standards for Mathematical Practice includes "Model with Mathematics" (MP.4). This standard is extremely important to remember when teaching fraction arithmetic.

A major goal within this unit will be to encourage students to persevere through difficulties and to teach strategies for "tolerating confusion." This really presents a great opportunity for students to develop a deeper understanding of the content and problem solving strategies. As teachers, we often will run to rescue students who seem confused

or appear to struggle. By avoiding telling students how to quickly find the solution and allowing them time to work through the confusion will give them a deeper understanding of the content and develop authentic problem solving skills.

Introduction

Elon Park Elementary School is located in Charlotte, North Carolina and contains students in kindergarten through fifth grade. The school has a very diverse population with many cultures from around the world represented. Elon Park is also a very large school with as many as nine full classes per grade level. As a result of the large class sizes and diverse student needs grade levels are clustered into mini teams so that students can receive the appropriate support from special education, English as a second language, and talent development teachers without the need to be pulled from the general education classroom.

This mathematics unit will be based on using a rectangle as a tool for problem solving with fractions. Students already have a familiarity with solving area from previous years and have the background knowledge to accurately identify a rectangle. Therefore, the unit will begin by teaching students how to accurately and neatly represent a fraction with the rectangle representing the whole. Once this is established, students can begin using the rectangle to solve comparing, adding, subtracting, multiplying and dividing fractions. It is important to note that the problems that students will work on will be based on the Fifth Grade Common Core Content Standards for Mathematics, so the work with division will only involve unit fractions and whole numbers.

Classroom Background

This mathematics unit will be taught in a fifth grade classroom and will be used to support their learning throughout a comprehensive unit teaching operations with fractions. The students in this class are part of a special education clustered team of classes. A small number of the students in this classroom are working at least one grade level below fifth grade in math, reading or both subjects. Mathematics taught in this classroom follows the Common Core Content Standards and uses the *Investigations* curriculum as a resource for instruction, student practice, and assessment, however most of the materials used for instruction are teacher created. Math is taught in a ninety minute block that includes twenty-five to thirty minutes of whole class direct teacher instruction followed by sixty minutes of Math Workshop. The Math Workshop includes independent student practice, enrichment for students that are above grade level or have mastered specific content and small group intensive instruction or interventions for students that are performing below grade level.

The students in my class that began the fifth grade year performing below grade level in both math and reading often struggle with complex problem solving skills. The struggles are only exacerbated by transitioning from problem solving with positive integers to fractional parts of a whole. Students are usually taught a different algorithm

for each operation with fractions and this can often add to the confusion. This unit will teach students to use a rectangle as a basic tool for problem solving.

At the same time, I also have a few students who consistently show the problem solving skills necessary reach mastery on their own or with little teacher direction. These students often need a small amount of guidance through the unit but can usually work out the grade level material independently. Students in these groups often benefit from being challenged to solve more real world application based problems. Allowing these students to explore using the rectangle with real world problem with little teacher assistance will appropriately challenge them and lead to deeper understanding of the mathematics involved with fractions. Many of the strategies in this unit can be used as both support and intervention for struggling learners and extension activities for those that have mastered the fraction related objectives, depending on how the activities are presented to the students.

Mathematical Content Objectives

Numbers and Operations: Fractions: 5.NF.1 & 5.NF.2

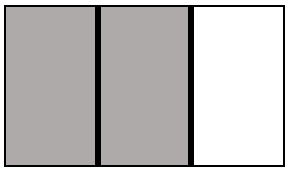
During the first portion of the unit, students will practice manipulating rectangles drawing and by cutting or folding sentence strips to show a variety of fractional parts. Students will also recognize a fraction as a sum of unit fractions. For example:

4/5 = 1/5 + 1/5 + 1/5 +1/5

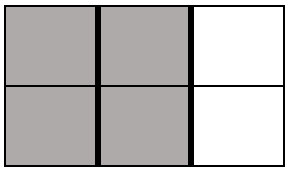
This will be an essential understanding as the unit moves forward.

Within the standard's objectives, students will need to compare two fractions. This will lay the foundation for adding and subtracting later on. Comparing fractions will be taught by creating equivalent fractions within rectangles with common denominators.

2/3

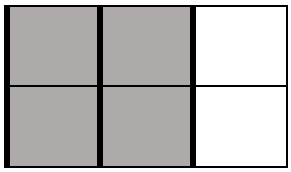


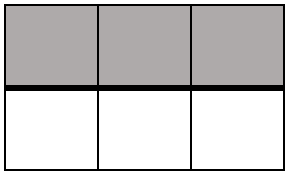
4/6



The bulk of the work in these standards focuses on addition and subtraction of fractions. Once students have mastered using the rectangles to find equivalent fractions, they will be prepared to use the rectangles to add and subtract. In order to add fractions, students will use the above strategy to identify fractions equivalent to the two addends with common denominators. The students can approach the addition by counting the total number of portions between the two rectangles. Each small section of the rectangle represents a unit fraction, so solution to the addition is the sum of all small sections in the rectangle. The example below demonstrates addition.

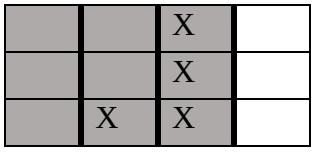
2/3 + 1/2 = 4/6 + 3/6 = 7/6 or 1 1/6

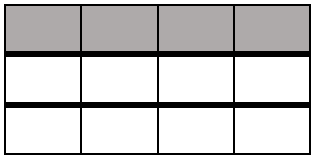




Subtraction can be approached similarly, in that identifying the equivalent fractions with common denominators is necessary. However the subtraction can be shown crossing off the small unit sections of the greater fraction. The difference is shown by the number of unit sections left over.

3/4 - 1/3 = 9/12 – 4/12 = 5/12





Adding and subtracting mixed numbers will also addressed in this phase of the unit. Students will use the same strategies as shown above, but will need to decompose

the mixed numbers into their whole number and fraction parts in order to perform the operations.

The final part of the addition and subtraction standards involves solving real world problems. These will be addressed through project based learning. Students will be given a scenario to work on in which they are to divide a rectangle into smaller portions. Examples of project scenarios include planning a garden, planning a city or small town, and designing a floor plan for a house. Throughout the unit, students will have specific objective based tasks to complete towards a final culminating product based on their assigned task.

The manipulation of the fractional parts of rectangles in this part of the unit will lead students to the understanding of the standard way of adding and subtracting fractions. Students will see why they must first find common denominators before adding or subtracting and why the common denominator ends up as the denominator in the solution. Once students appear to have the understanding of the rectangular models, they should be required to show proficiency with the standard ways of adding and subtracting fractions, as this is an essential part of the standards. The standard addition and subtraction of fractions will also be a prerequisite skill for strategies taught later in the unit.

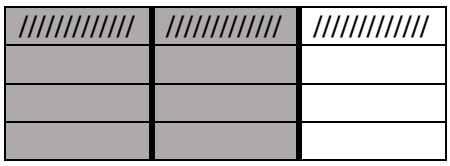
Numbers and Operations: Fractions 5.NF.4 & 5.NF.6

The next unit objectives cover multiplication. In this phase of the unit, students will use a rectangular model to solve problems involving finding fractions of a given area (multiplication of fractions). Students will first explore finding fractions of a whole set and then use similar ideas in the area model to find fractions of a portion of a whole. It is important to note that students will need to have a clear understanding of what quantities or fractions the rectangle and its parts represent. For example in the expression ½ x 8, students will be finding half of eight. This is a great point in the unit to allow students to explore their own ways of using rectangles to solve this type of multiplication. Students can find a number of strategies for solving. One way would be to continue to allow each rectangle to represent one and then distribute them into appropriate groups. This would work best when multiplying with unit fractions. Another strategy would be the use one rectangle to represent the whole number, in this case eight, and cut it in half to determine the value of each piece of the rectangle.

Multiplying two fractions gets trickier but can be done so that it does not look all too different from the addition. Students begin by using the rectangle to show the first factor in the multiplication by drawing vertical lines in the rectangle and shading the appropriate portions. Colored pencils are perfect for shading the fractional parts. They should use one color for each factor. Once the first fraction is shown, represent the second fraction in the expression using horizontal lines and shading the appropriate portions. For the sake of teaching, small regions creating by overlapping the fractions in this model will be called “zones” The product is found in the zones where the two

fractions overlap. The numerator is the number of zones that overlap the two shaded regions and the denominators become the total number of zones made by representing both fractions in the rectangle. During the unit, this will be referred to as multiplying fractions using "Overlapping Fractions." The example below demonstrates this concept.

2/3 x 1/4 = 2/12 or 1/6



The multiplication portion of the unit will conclude with multiplying mixed numbers. Before this is taught, students should already has a proficient understanding of how to multiply whole numbers using the area model by decomposing numbers into their place values. The mixed numbers will be treated as if they are the sum of two place values; the whole number portion plus the fractional part. This idea is also covered in the addition and subtraction phase of the unit.

In order to multiply mixed numbers, students will use the area model for multiplication. The mixed numbers will be decomposed into their whole and fractional parts and written along the length and width of the rectangle. The distributive property is then used and the resulting products are added together to give the product of the original mixed numbers. Students may use standard fraction addition rules to add the products. The model below shows how this will take place.

3 1/2 x 1 1/3 = (3 + 1/2) x (1 + 1/3)

	3	**1/2**
1	**3 x 1 = 3**	**1/2 x 1 = 1/2**
1/3	**3 x 1/3 = 1**	**1/2 x 1/3 = 1/6**

3 + 1 + 1/2 + 1/6 = 4 + 1/2 + 1/6 = 4 + 3/6 + 1/6 = 4 4/6 or 4 2/3

As an extension and enrichment activity for this phase of the unit, students can combine the previously mentioned strategies for multiplying with fractions less than one

and fractions and whole numbers to create a completely visual representation of the product of two mixed numbers. All within the same rectangle students would show the strategies of overlapping fractions to find a product, "splitting" a rectangle that represents a whole number, and show the area model of multiplication as necessary.

Numbers and Operations: Fractions: NF.7

The final instructional objective in this unit will be division with unit fraction and whole numbers. This part of the unit will follow closely the strategies taught in the *Investigations* curriculum because the curriculum ties in nicely with the goal of this unit to use a rectangle as a universal tool for performing operations with fractions. Whole numbers will be divided by fractions by creating a group of rectangles equal to the whole number dividend. Then each rectangle will be divided into unit fractions equal to the unit fraction divisor. The total number of unit fraction pieces becomes the quotient.

3 ÷ 1/4 = 12

1	**2**	**3**	**4**

5	**6**	**7**	**8**

9	**10**	**11**	**12**

The division of unit fractions by whole numbers will be show differently. A single rectangle will be portioned so that the unit fraction can be represented. The unit fraction will then be divided into equivalent smaller portions based on the whole number divisor. The value of one of these new smaller unit fractions is the resulting quotient.

1/4 ÷ 3

1/12											

Standards for Mathematical Practice:

It is important to note that while not taught explicitly the Common Core Standards for Mathematical Practice will be present throughout the entire unit. Many of these standards will be imbedded in the work that students are doing. There is particular focus on the following standards:

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.4 Model with mathematics (This is the primary focus and rationale for the unit.)

MP.5 Use appropriate tools strategically

MP.6 Attend to precision

Teaching Strategies

Whole Group Instruction:

Whole group instruction will be necessary for introducing concepts and teaching students how to use the strategies in this unit. While whole group instruction seems like it should go without saying, I want to mention that is should be kept to a minimum to allow students opportunity for exploration and discovery with the strategies.

Posters:

Students will create posters throughout the unit showing their strategies. Anchor charts are used in the classroom as reminders for students of skills and procedures. These posters will serve as anchor charts during and after the unit. This is normally a Math Workshop activity for higher performing students while interventions and small group instruction is happening for other students. Students will be required to provide definitions, instructions, and detailed examples for objectives that they are instructed to present. Students can extend this activity by using it to teach and review with each other.

Work Pages:

Students will complete some work pages to demonstrate understanding of the content during the unit. Student understanding of objectives is necessary in order to continue on to complete the culminating activity. These pages allow a teacher to quickly see that students have developed mastery of objectives. These work pages can be found in Appendix 2.

Culminating Project:

Beginning with the end of the addition and subtraction phase of the unit, students will be required to complete a series of tasks toward creating a real world representation of a rectangle divided into fractions. For this project, students can design the layout for a rectangular garden, design a rectangular layout for a playground or classroom, or design a city map in a rectangular pattern. Throughout the unit the students will create and solve word problems related to their project. Students will also use the strategies to present their design using fractions to explain dimensions, areas, and distances. Once the unit is complete, students will finish by creating three dimensional representations of their project design.

Classroom Acvtivities

Finding Equivalent Fractions

During this activity, students will explore manipulating rectangles to find equivalent fractions. I will model this using the fraction ¾. Students will see be shown the strategy of dividing each of the fourths into smaller equivalent portions to show the fractions 6/8, 12/16, and 24/32.

Students will practice this activity using fractions of their own choosing. Student will discuss the activity and their strategies for finding the equivalent fractions with their math partner. This will give me a quick assessment of students' understanding of their ability to find equivalent fractions.

Students who have a clear understanding of the rectangle strategy will complete the Fraction City activity (see Appendix 2). This activity will require students to identify fractional pieces of a rectangular city. Each piece represents a neighborhood in the city. The neighborhoods are irregularly shaped and students will need to apply the strategies for equivalent fractions to reportion the neighborhoods to find the space that they represent. The goal will be for the students to break down the city into sixty fourths to find the fractional portions for each neighborhood. Students who struggle with the equivalent fractions strategy during the lesson may require additional teacher support but should be allowed time to attempt to work through the activity.

Adding Fractions within the Rectangle

During this lesson students will use the strategy for finding equivalent fractions to find common denominators for adding fractions. I will model this with adding 1/3 and 1/4. Students will be taught how to create equivalent portions for each fraction and then adding the fractions together.

Students will complete the practice activity, Adding Rectangles (see Appendix 2). This activity will be used as an assessment of students understanding. This will also allow opportunity for reteaching and intervention for students that are struggling with this strategy.

Students will then return to the Fraction City activity and use their strategies to show that the neighborhoods will sum to the "whole city" or 1.

After students have mastered the addition strategy, they will begin their work toward the culminating activity. The students will begin this activity by choosing a variety of fractions that add up to 1. The activity directions will require students to have at least 5 different denominators. Once students have chosen their fractions and proven that they will sum to 1, they will need to draw the fractions in a given rectangle. The goal will be for students to find the common denominator that can be represented in the rectangle so that all of their fractions will fit proportionally in the whole rectangle. The "Fraction City" activity can serve as a model. This activity can be differentiated to fit the needs of each student. Students that need enrichment can be required to use irregular

shapes while students that need more intervention and guidance can use only rectangular shapes or be given their fractions to represent.

Once the fractions have been represented proportionally in the rectangles, students can decide the direction of their projects. Students will be given choice to have their rectangle represent a garden, city, classroom, or playground. They will then label their areas in the rectangle accordingly. For example, if students choose to design a classroom, they would designate areas for reading, student groups, centers, etc. or if students chose to design a garden, they will designate areas for different vegetables. A playground design would include areas for different activities around the playground. A city design would be labeled like the Fraction City activity.

Multiplying Fractions Using Area

This lesson will be presented similar to the way it is shown to students in the *Investigations* curriculum. The following problem will be presented to the students, "In a school playground design, 1/3 of the playground is reserved or playground equipment while the rest is set aside for field spaces. Of the playground equipment space, ¼ of that is set aside for the swings area. How much of the entire playground space is reserved for swings?" Through this problem students will be taught to use the "Overlapping" fractions strategy. It will be modeled for the students by representing the playground equipment area using horizontal lines within the rectangle and then the swing area using vertical lines. The space that overlaps in the rectangle is the resulting area for the swings.

Students will complete the Multiplying Fractions Using Areas page (see Appendix 2). The students will use dice to pick numbers to use a numerators and denominators to find the product of a pair of fractions. This will serve to give the students a frame a reference for how they will apply the strategy to their project. While they are already decided the area that each of their fractions represents in the rectangle for the final project, the students will be required to develop dimensions (length and width) for each of their spaces inside the whole rectangle. This will be done by finding the fraction of the horizontal and vertical lengths of the whole rectangle for each portion of the design. Students that used irregular shapes for their design will need to be reminded of the additive property of area in order to problem solve to find the dimensions that will produce the require areas. Once students have found the dimensions, they will list the dimensions with the resulting area in the provided chart.

Multiplying Mixed Numbers Using the Area Model

In one of the final whole group lessons, the students will learn to apply previous knowledge of the area model for multiplication to mixed numbers. The connection to multiplication 2 digit whole numbers will be made using the numbers 23 x 45. Students will show prior understanding of the area model by finding the product of the two numbers using the model. Once students have completed this, I will then related the

decomposing of whole numbers into their place values to decomposing mixed numbers into their whole number and fractional parts.

Students will practice multiplying mixed numbers using the area model in order to show understanding of the concept. After they show this work, they will be introduced to the final part of the culminating project (see Appendix 2). This portion of the project will require the students to create a scale model of their own design that they have been working on throughout the unit. The project will require students to develop a scale model using a platform of their choosing and show the measure dimensions on their project. This will then be used to find the actual areas of those spaces. Students should measure all dimensions to the nearest 1/16 inch and then calculate the resulting areas to be labeled on their projects. A rubric will be used to assign a final grade to the unit.

Bibliography, Resources, and Reading List

"A Maths Dictionary for Kids 2015 by Jenny Eather." A Maths Dictionary for Kids 2015 by Jenny Eather. Accessed November 12, 2015. http://www.amathsdictionaryforkids.com/dictionary.html.
This is a great website for students to build their understanding of the vocabulary related to fractions as well as other mathematical concepts. The dictionary is interactive and allows students to manipulated visual models of fraction concepts.

Einhorn, Edward. *Fractions in Disguise: A Math Adventure.* Watertown, MA: Charlesbridge, 2014.
While simplifying fractions is not explicitly taught in this unit, this children's book is a great resources for kids that are struggling with simplifying fractions and finding equivalent fractions. This is a fun and entertaining resource for intervention for students that need extra support in this area.

Fosnot, Catherine Twomey, and Maarten Ludovicus Antonius Marie Dolk. *Young Mathematicians at Work: Constructing Fractions, Decimals, and Percents*. Portsmouth, NH: Heinemann, 2002.
This book is a teacher resource that can give teachers a lot of background on teaching students to develop a real idea of "number sense" rather than exclusively teaching students to use an algorithm with fractions. This resource also give a number of alternative strategies to teach students to visually solve problems with fractions.

Investigations in Number, Data, and Space. 2nd ed. Glenview, Ill.: Pearson Scott Foresman, 2008.
This is the curriculum provided to teachers in the Charlotte Mecklenburg School district. The curriculum is referenced in this unit and can be used to build background knowledge necessary for completing the instruction in the unit.

Lamon, Susan J. *Teaching Fractions and Ratios for Understanding Essential Content Knowledge and Instructional Strategies for Teachers*. 3rd ed. New York: Routledge, 2012.
This book provides a great wealth of background knowledge for teachers preparing to teach a unit on fractions. The chapter "Fractions as Operators" is especially helpful for teachers developing understanding of using the teaching students to use the area model with fractions.

"LearnZillion." LearnZillion. Accessed November 22, 2015. http://www.learnzillion.com.
This website has tutorials, lessons, and videos that both teachers and students can use for instruction on operations with fractions, as well as other math and reading content standards.

"Preparing America's Students for Success." Home | Common Core State Standards Initiative. Accessed October 15, 2015. http://www.corestandards.org.
This was used to access the Common Core Content Standards and Standards for Mathematical Practice covered in the unit.

Reiter, Harold. "Understanding Fundamental Ideas in Mathematics at a Deep Level." Harold Reiter's Home Page. Accessed October 31,2015. http://math2.uncc.edu/~hbreiter/CTI2015/.
This page is a good resource for information discussed during the 2015 Understanding Fundamental Ideas in Mathematics CTI Seminar. The page links to various discussions on fractions and problems that can be used for extending students' work with fractions.

Appendix 1: Implementing Teaching Standards

The following standard are used in connection with this mathematics problem solving curriculum unit:

Common Core Mathematics Content Standards

5.NF.A.1: Students will add and subtract fractions with unlike denominators by replacing fractions with equivalent fractions with unlike denominators. This unit teaches students to do this using visual representations.

5.NF.A.2: Student solve word problems with addition and subtraction of fractions. Students will primarily be working toward this goal in planning their culminating project as they will be required to add portions together within a whole area.

5.NF.B.4.B: Student multiply whole numbers by a fraction and a fraction by a fraction by finding the area of a rectangle with fractional side lengths. This standard is addressed during the multiplying fractions part of the unit.

5.NF.B.6: Students multiplying fractions and mixed numbers using visual models or equations. In this unit, students will primarily be using the area model as the visual representation how to use the distributive property to find the products of mixed numbers.

5.NF.B.7: Student divide unit fractions by whole number and whole numbers by unit fractions using visual model. This standard will provide students with another example of how a rectangle can be used to represent operations with fractions.

Common Core Standards for Mathematical Practice

MP.1: Students make sense of problems and persevere in solving them. Throughout the unit, students will be required to apply their understanding of objectives to real world problems and work through tolerating confusion and difficulty that may arise.

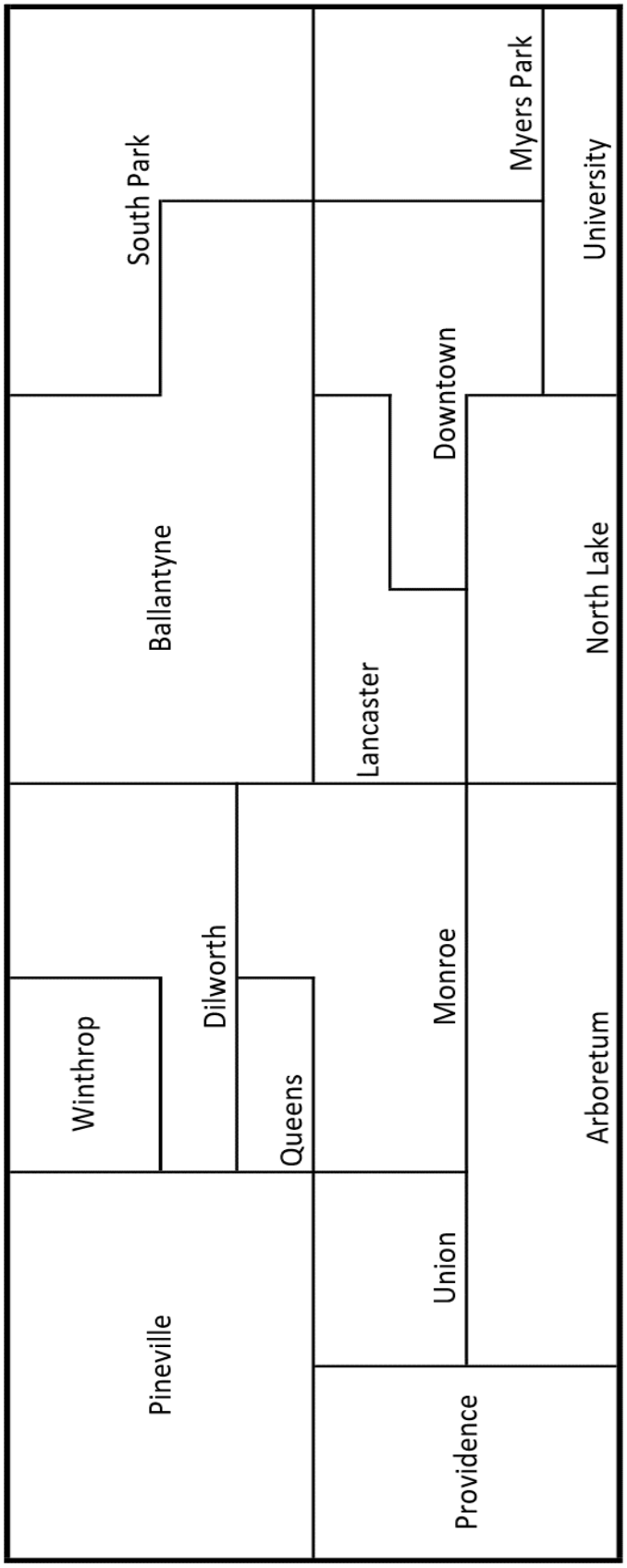
MP.4: Students model with mathematics. This standard is the primary focus of the unit. Students will be required to model all of their work using a rectangle for the visual representation.

MP.5: Students use appropriate tools strategically. During the unit, the rectangle will be the tool that students need to use, however they will be required to determine the appropriate strategy to manipulate the rectangle to reach the intended solution.

MP.6: Students attend to precision. As students work through the problems and activities in this unit, they will be require to find precise areas and create precise representations of problems in order to demonstrate understanding of the content objectives.

Appendix 2: Student Work Pages **Fraction City Activity**

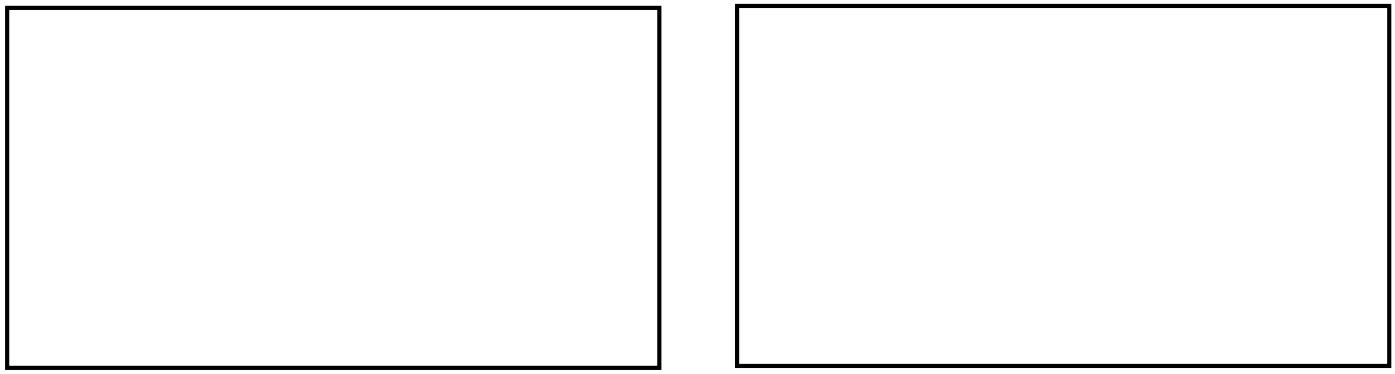
What fraction of Fraction City does each neighborhood represent? Explain your reasoning and how you found the fractions.



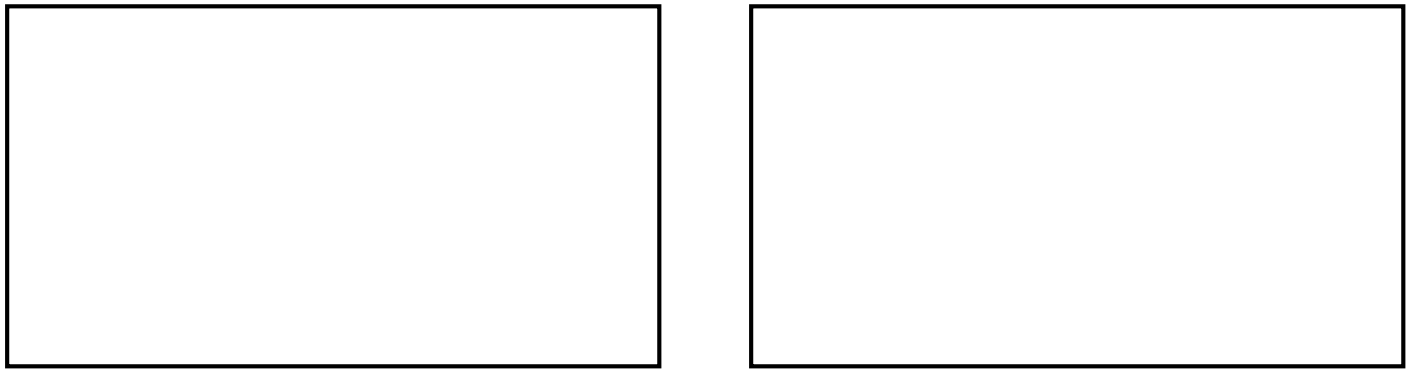
Adding Rectangles

Find the sums below using the rectangle strategy. Write your own word problem for each sum. With a partner, create your own classroom anchor chart for adding fractions with rectangles. You may use one of the examples below.

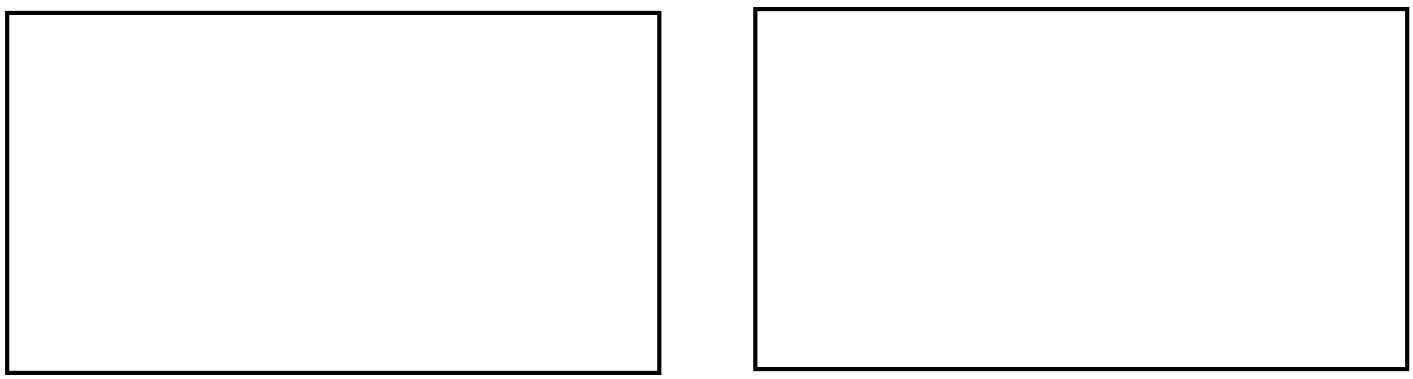
3/4 + 2/5



2/3 + 1/4



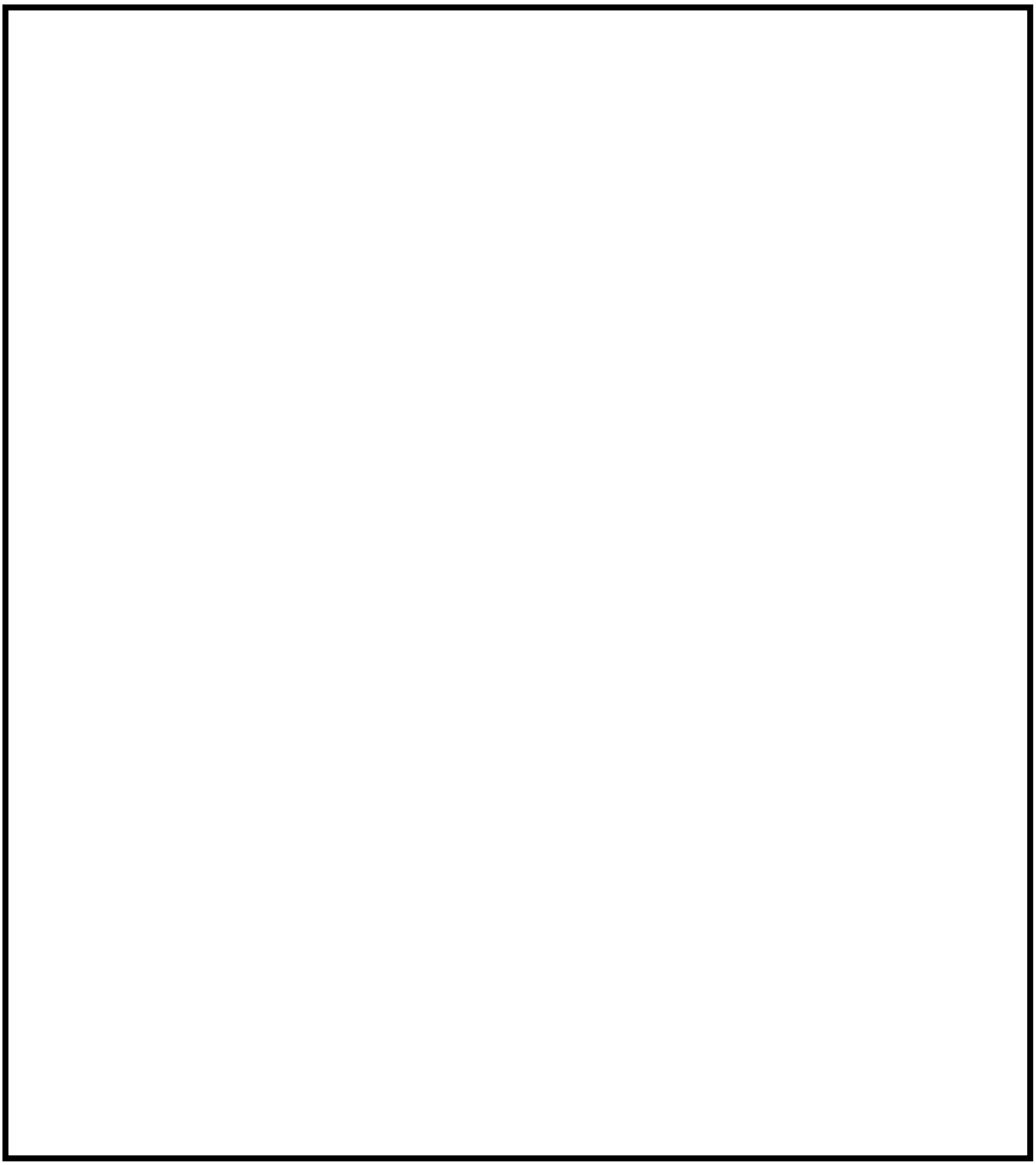
3/5 + 3/8



Create Your Own Design

In the rectangle below, draw out your own design using at least 5 fractions that will add up to 1. Your design must be accurate and each fraction should be clearly represented. Once you've complete the design, label the spaces based on your choice of the following topics: **City, Garden, Playground, Classroom**

Attach a separate sheet of paper that shows the work to prove your fractions will add up to 1.



Multiplying Fractions with Area

Use the Overlapping Area strategy to find product of three pairs of fractions. Roll a ten-sided di 4 times to get the digits for your numerators and denominators. (0 = 10) then use the rectangles to determine the product. Be sure you are not using improper fractions. Write a word problem to match each problem.

Example: I roll the following 4 numbers {3, 5, 0, 7}, so my factors are 3/5 x 7/10.

Design Areas

In the chart below list the dimensions and areas for each of the spaces in your project design.

Space	Dimensions	Area

Culminating Activity – Final Project Plan

Your Task: Your project design is going to leave the paper and be represented in real space! You will need to figure out a way to represent your design!

Here are some suggestions for your projects:

- Shoebox diorama
- Illustrated Map
- Blueprint
- Plant a School Garden Box
- Scale City/Playground/Classroom Model

Requirements:

1. The layout of your project must match your design plan.
2. Fraction areas must be labeled on the project
3. Actual measurements must be labeled
4. Actual areas must be determined using the area model (Attached a separate sheet of paper with work shown.
5. Your project must have a catchy title and be neatly displayed.

Rubric:

	4	3	2	1
Design	Design shows a clear understanding of the fraction concepts, Identified fractions add to 1, Creativity is shown in the arrangement.	Design shows a clear understanding of the fraction concepts, Identified fractions add to 1.	Design has flaws, does not make a rectangle.	Design has major flaws, fractions do not add to 1.
Proportions	All areas in the design are proportionately represented, matches the fractions used in the planning.	Most areas of the design are proportionately represented, matches fractions used in the planning.	The same fractions from the planning are used, many of the areas are not proportional.	Many of the fractions appear to be mislabeled or shown incorrectly.
Areas	All areas are cleared shown, the area of each space is labeled correctly to the nearest $1/16^{th}$ inch.	All areas are clearly shown, the areas of most spaces are labeled correctly.	Many of the areas were not calculated correctly.	Areas were not calculated correctly. Uses only whole numbers.
Organization	Project is neat and tidy. All mathematical work is clearly shown.	Project is neat and tidy. Mathematical work may be slightly unkempt.	Project appears disorganized. Mathematical work is difficult to read.	Project completely lacks organization and is messy.
Presentation	I can clearly explain my project and all of the math work that I did along the way.	I can explain my project and most of the math work that I did along the way.	I have difficulty explaining the work that went into my project.	I cannot explain how I completed my project or any of the math involved.