Sample Completed Unit-Planning Template for Grade 5 Mathematics

Unit Title: *Fraction Operations* **Subject Area:** *Mathematics* **Grade Level:** *5*

Identified Standards and Benchmarks (CUES):

The following appear in Common Core State Standards for Mathematics (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

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. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$.
(In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.)

5.NF.A.2: Solve word problems involving addition and subtraction of fractions referring to the same whole, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$, by observing that $\frac{3}{7} < \frac{1}{2}$.

5.NF.B.3: Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$).

5.NF.B.4: Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product $(\frac{a}{b}) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(\frac{2}{3}) \times 4 = \frac{8}{3}$, and create a story context for this equation. Do the same with $(\frac{2}{3}) \times (\frac{4}{5}) = \frac{8}{15}$.
(In general, $(\frac{a}{b}) \times (\frac{c}{d}) = \frac{ac}{bd}$.)

b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.B.5: Interpret multiplication as scaling (resizing) by —

a. 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.

b. 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 $\frac{a}{b} = \frac{(n \times a)}{(n \times a)}$ to the effect of multiplying $\frac{a}{b}$ 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.

5.NF.7: Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(\frac{1}{3}) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(\frac{1}{3}) \div 4 = \frac{1}{12}$ because $(\frac{1}{12}) \times 4 = \frac{1}{3}$.

b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \div (\frac{1}{5})$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (\frac{1}{5}) = 20$ because $20 \times (\frac{1}{5}) = 4$.

c. 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 $\frac{1}{2}$ lb. of chocolate equally? How many $\frac{1}{3}$-cup servings are in 2 cups of raisins?

Suggested Time Frame (Grading Period)

☐ Q1 ☐ Q2 ☐ Q3 ☒ Q4

Priority Standards

- ☐ *Represent fractions with various models.*
- ☐ *Interpret fractions as division.*
- ☐ *Add and subtract fractions with like and unlike denominators.*
- ☐ *Multiply fractions and a whole number by a fraction.*
- ☐ *Divide a whole number by a unit fraction and a unit fraction by a whole number.*
- ☐ *Solve real-world problems involving fractions and all operations.*

Unit Topic and Universal Theme

Describe what this unit is about. What are the big ideas and skills that students will develop in the unit?

This unit is a culmination of smaller fraction units throughout the year. It focuses on solidifying fraction concepts, representation, and operations.

Understandings

List the essential understandings for your unit. Students will understand that . . .

- ☐ *Fractions always show a part-to-whole relationship.*
- ☐ *Many representations can be used to model, make sense of, and solve fractional situations.*
- ☐ *Any value can be represented in infinite equivalent ways. Most algorithms for operations with rational numbers use equivalence to transform calculations into simpler ones.*
- ☐ *Only things that are alike can be added and subtracted.*
- ☐ *Multiplication can be considered repeated addition, groups with same quantities, and the creation of area. However, only the creation of area is applicable with multiplication of fractions.*
- ☐ *Many situations in the world do not involve whole numbers and are represented and solved with fractions.*

Essential Questions

- ☐ *How do fractions model relationships?*
- ☐ *What is the best representation to use to solve or make sense with fractions?*
- ☐ *What is the role of equivalency when working with fractions? How does equivalency affect operating with fractions?*
- ☐ *What determines alike with fractions? Why is it important?*
- ☐ *How does area model multiplication? Why is this the only interpretation of multiplication when working with a fraction times a fraction?*
- ☐ *How can fractions model and solve real-world situations?*

Know

List Knows for your unit, including essential vocabulary.

- ☐ *Review vocabulary terms: fraction, numerator, denominator, whole, part, mixed number, equivalent fraction, common multiple, least common multiple, denominator*
- ☐ *New vocabulary terms: unit fraction, benchmark fractions, improper fractions*
- ☐ *How to model fractions concretely and visually*
- ☐ *Numerators always represent the number of parts of a whole that are selected, and denominators represent the number of total parts in the whole.*
- ☐ *Methods for finding common denominator*
- ☐ *Estimation techniques, especially with benchmark fractions*
- ☐ *Fractions are another way to represent division.*
- ☐ *How to convert between mixed numbers and improper fractions*
- ☐ *Strategies to add, subtract, multiply and divide with fractions and mixed numbers*

REPRODUCIBLE

Bloom's Taxonomy Integration

Creating: *Design landscaping project*

Evaluating: *Evaluate strategies*

Analyzing: *Venn diagrams*

Applying: *Real-world problems*

Understanding: *Explanations of understandings*

Remembering: *Processes and strategies for computations*

Technology Integration

- ☐ *Calculators for checking answers*
- ☐ *Online fraction manipulatives: http://nlvm.usu.edu/en/nav/vlibrary.html*
- ☐ *Online fraction games such as those at www.adaptedmind.com/Math-Worksheets.html?gclid=CLrLOd7IqdECFRlMDQod1CUJ5g*

Applications (Do)

List the Do for your unit, including possible applications.

- ☐ *Model fractions and operations with fractions in multiple and various ways.*
- ☐ *Add, subtract, and multiply fractions and mixed numbers.*
- ☐ *Divide with whole numbers and unit fractions.*
- ☐ *Describe why a common denominator is needed to add and subtract fractions but not to multiply or divide fractions.*
- ☐ *Convert between fractions and mixed numbers.*
- ☐ *Find and use equivalent values when needed to perform operations with fractions.*
- ☐ *Explain the role of equivalency in operations with fractions and mixed numbers.*
- ☐ *Solve real-world problems involving fractions and mixed numbers.*
- ☐ *Explain how fractions, mixed numbers, and whole numbers work together to problem solve.*
- ☐ *Evaluate strategies and models for effectiveness, errors, and usefulness.*

Prior Knowledge Needed

- ☐ *Factoring*
- ☐ *Multiplication facts*
- ☐ *Adding fractions with like denominators*
- ☐ *Models and representations for mathematical operations*

Formative and Summative Assessments

- ☐ *Determine the perimeter and area of shapes with fractional or mixed number dimensions, and create shapes given perimeter or area.*
- ☐ *Homework, quizzes, unit test*
- ☐ *Equivalency project*
- ☐ *Exit slips*
- ☐ *Landscaping project with rational measurements*
- ☐ *Venn diagrams to compare operations (add/subtract with multiply/divide)*

Resources and Materials

- ☐ *Class text*
- ☐ *Fraction manipulatives (strips and circles)*
- ☐ *Fraction cards*
- ☐ *Fraction dice*
- ☐ *Grid paper*

Common Student Misconceptions in the Unit

- ☐ *You can learn to do fractions but not understand fractions*
- ☐ *Add and subtract numerators and denominators*
- ☐ *Mistakes in converting fractions and mixed numbers*
- ☐ *A fraction is always less than 1*
- ☐ *The whole is always 1 when working with fractions*

Differentiation and Interventions

- ☐ *Small group reteaching*
- ☐ *Flexible grouping for differentiated tasks (see instructional strategies)*

Reflection

- ☐ *Students will complete exit tickets with "what I know" and "what I don't know."*
- ☐ *Students will reflect on how they performed against the content standards and learning targets.*

Example Activities and Instructional Strategies

- ☐ *Think Dots*
- ☐ *Math games to practice operations on fractions and other skills*
- ☐ *Flexible grouping*
- ☐ *Summarizing activities*
- ☐ *Cornell notes (modified)*
- ☐ *Concrete, pictorial, and abstract processes*
- ☐ *Tiered practice sheets*
- ☐ *Learning profile options for explaining concepts*

References

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for mathematics*. Washington, DC: Authors. Accessed at www.corestandards.org/assets/CCSSI_Math%20Standards.pdf on November 21, 2016.