Suggestions for Planning Instruction

Careful planning and implementation of direct instruction in mathematics can yield huge benefits in terms of student performance. *Total Motivation Math™* provides a wealth of tools for planning, including valuable resources for direct instruction, focused practice, and assessment of student learning. The following suggestions outline one way that *Total Motivation Math* can be used to plan effective lessons. The teacher should:

- review the teacher edition unit in either the print or online component, noting the standards for mathematical content and Standards for Mathematical Practice addressed by the unit.
- carefully read the unpacking of standards to clarify the standard. Note the identified vocabulary terms and the instructional activities that are aligned to the standard.
- review the pages in the corresponding unit of the *Total Motivation Math™ Student Edition*.
- assign the unit Assessment of Prerequisite Skills available in the online component. This pre-assessment indicates if there are any prerequisite skills for the unit that some students may need to review.
- note that the use of activities and practice pages in *Total Motivation Math* is designed to be flexible. For example, one or more pages in the student edition may be assigned as homework (depending on the school policy on homework), or selected pages may be reserved for use as part of a spiraled review. Teachers do not have to use all activities or assign all practice pages to deliver an effective lesson sequence.
- refer to answers to student edition questions on the corresponding teacher edition pages. Teachers should note that coding for Depth of Knowledge (DOK) and Revised Bloom’s Taxonomy (RBT) for each item may be found in Appendix C at the back of this book.

Georgia Standards of Excellence for Mathematical Content

MGSE5.NF.2

Other Standards for Mathematical Content Addressed in this Unit

MGSE5.NF.1, MGSE4.NF.2, MGSE4.NF.3

Standards for Mathematical Practice Addressed in this Unit

SMP.1 Make sense of problems and persevere in solving them.
SMP.2 Reason abstractly and quantitatively.
SMP.3 Construct viable arguments and critique the reasoning of others.
SMP.4 Model with mathematics.
SMP.5 Use appropriate tools strategically.
SMP.6 Attend to precision.
SMP.7 Look for and make use of structure.
SMP.8 Look for and express regularity in repeated reasoning.
Unit 14  MGSE5.NF.2

Unpacking the Standard

In grade 4, students solved addition and subtraction word problems involving fractions with like denominators. In grade 5, students solve word problems involving addition and subtraction of fractions with unlike denominators. Students use number sense, benchmark fractions, and estimation skills to determine the reasonableness of an answer. Students also use visual models to represent the problem and determine the solution. Visual models may include area models (fraction bars or circles), set models (color tiles or cubes), and linear models (number lines).

Reflection Notes:

What materials/activities were effective?

What were the most common errors/misconceptions?

What concepts should be emphasized in instruction?

Key for Recommended Groupings

- Individual
- Partners
- Groups
- Whole Class
Solve Word Problems: Add and Subtract Fractions

Introduction: Unit 14 MGSE5.NF.2

Start Here

1. **Assessment of Prerequisite Skills**
   The teacher may assign the Assessment of Prerequisite Skills for Unit 14 as an online assignment. Students log in to Total Motivation Math™ and complete this pre-assessment. The teacher may access the Reports area to review student performance and use the information to plan additional instruction to help students develop an understanding of the concepts in this unit.

2. **Introduction Activity** *(DOK: 2, RBT: Understand)*
   The teacher gives each student or student pair a cardboard or geared clock. Students use clocks to express fractional parts of one hour. The teacher identifies the passage of one hour as one whole. Students divide the clockface into half hours (30-minute intervals), third hours (20-minute intervals), quarter hours (15-minute intervals), sixth hours (10-minute intervals), and twelfth hours (5-minute intervals). The teacher states a fraction addition or subtraction problem to solve with the clocks. For example, students can find the difference of \( \frac{1}{2} \) and \( \frac{1}{3} \) by setting a clock to 12:30 (minute hand set at the half hour) then moving the minute hand backward 20 minutes (\( \frac{1}{3} \) hour). The clock displays 12:10, which is equivalent to \( \frac{1}{6} \) hour past 12:00. As a follow-up activity, students use a common denominator to express \( \frac{1}{2} \) as \( \frac{3}{6} \) and \( \frac{1}{3} \) as \( \frac{2}{6} \): students then find the difference of \( \frac{3}{6} \) and \( \frac{2}{6} \) to solve the problem.

3. **Formative Assessment** *(DOK: 2, RBT: Apply)*
   Each student creates a fraction with a denominator of 2, 3, 4, 6, or 12. Student pairs work together to find the sum and the difference of the two fractions using a cardboard or geared clock. Students draw pictures and write equations in math journals or notebooks to show their solutions. The teacher reviews student responses for use in planning instructional activities.

4. **Connecting to the Student Edition:** Introduction
   The teacher may wish to work with the students as a whole group or in small groups to complete the Introduction page in the student edition. If desired, this page can be projected from the online component for whole group instruction.

5. **Answers**
   1. \( \frac{5}{6} \) of the page
   2. \( \frac{5}{8} \) of the stick of butter
   3. \( \frac{7}{8} - \frac{3}{4} = \frac{1}{8} \) in
   4. \( \frac{4}{15} \) of the paper
      Explanations will vary.
   5. Answers will vary but should be more than \( \frac{1}{2} \) hour and less than \( \frac{3}{4} \) hour.
      Explanations will vary.
Vocabulary/Journal: Unit 14 MGSE5.NF.2 student page 106

1 Vocabulary Focus
The teacher introduces the essential vocabulary terms for this unit.

- common denominator
- denominator
- equivalent fractions
- estimate
- fraction
- least common denominator (LCD)
- numerator
- reasonable
- unit fraction

2 Vocabulary Activity
(DOK: 1, RBT: Understand)
The teacher gives each student pair a deck of index cards printed with vocabulary terms. Students place the deck facedown. One partner draws a card and gives a hint to allow the other partner to guess the correct term. When the term is correctly guessed, the other partner gives a hint for the next term. If students wish to keep score, they tally the number of hints given for each term. The goal is to guess each term with the least number of hints.

3 Vocabulary Formative Assessment
(DOK: 1, RBT: Understand)
Following the Vocabulary Activity, the teacher provides students with a printed mini-assessment on which they match the vocabulary terms to corresponding examples or definitions. The teacher reviews student responses and adjusts instruction as needed.

4 Connecting to the Student Edition: Vocabulary/Journal
At this point, the teacher may wish to assign the Vocabulary Activity and/or the Journal prompt in the student edition. The Journal prompt may also be reserved as a reflection/closure activity.

5 Answers

Vocabulary Activity

Students may also choose to draw a star beneath \(\frac{3}{8}\) in \(1\frac{3}{8}\).

Journal
Answers will vary. Inches are divided into halves, fourths, and eighths. A ruler can be used as a visual fraction model.
**Partner Practice: Unit 14  MGSE5.NF.2**

1. **Instructional Activities** (Select from the following activities.)

   1. Students work in groups of 3 or 4. The teacher displays an equation showing the addition or subtraction of fractions with unlike denominators. Students use benchmark fractions to discuss whether or not the answer is reasonable. The teacher selects one person from each group to share the group’s reasoning and conclusions, and students critique one another’s comments. Students continue discussions with different problems and answers provided by the teacher. (DOK: 3, RBT: Evaluate)

   2. Students work in pairs to complete a four corners activity. Students create and record, on an index card, a word problem that involves adding fractions with unlike denominators. Next, students fold a sheet of paper into fourths and label the sections as shown. Then, in the designated sections, students write an expression, estimate the solution, sketch a model, and solve the word problem using the standard algorithm. Students complete another four corners activity, but this time students write a word problem that involves subtracting fractions with unlike denominators. (DOK: 3, RBT: Create)

   (Note: Image is available in Appendix D: Resources/Image Bank.)

2. **Formative Assessment**

   Students complete the Motivation Station activity, “Common Ground,” on page 112 in the student edition. The teacher monitors student responses and plans additional instruction or interventions as needed. (DOK: 1, RBT: Apply)

3. **Connecting to the Student Edition: Partner Practice**

   At this point in the lesson, the teacher may wish to have students work with partners to complete the Partner Practice page in the student edition. If desired, this page can be projected from the online component as student pairs debrief the completed work and the class discusses the results of the practice. (DOK: 1, RBT: Apply)

4. **Answers**

   1. D
   2. D
   3. A
   4. B
1. **Instructional Activities** (Select from the following activities.)

   Groups of 3–4 students use fraction bars to play “Race to a Whole.” Each group needs a number cube labeled with the fractions \(\frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{10}, \text{ and } \frac{1}{12}\). Each student in the group uses a fraction bar labeled as 1 whole as the playing board. In turn, each player rolls the number cube and places the indicated piece on the whole fraction bar. If necessary, players trade for equivalent pieces (e.g., If a player rolls \(\frac{1}{3}\), he or she may select 4 of the \(\frac{1}{12}\) pieces.). The first player to cover the whole fraction bar is the winner. In subsequent games, students race to fill 2 or more whole fraction bars. Another variation is to begin with the whole and subtract the rolled amounts, making trades as needed. The winner is the first player with no pieces left. (Fraction circles may be substituted for fraction bars.) After filling 1 whole fraction bar, each student records a picture and an equation to show his or her results. Each student shows all work needed to solve the equation. The teacher evaluates student work for evidence of learning and makes plans for any needed interventions.

   (DOK: 2, RBT: Apply)

2. Working in pairs, students use fraction models to act out solutions to word problems and record the actions with equations.

   (DOK: 2, RBT: Apply)

2. **Formative Assessment**

   Around the classroom, the teacher places or hangs brown envelopes containing copies of word problems (a different problem in each envelope). There should be one envelope for every two students in the class. On the outsides of the envelopes, the teacher writes an answer to one of the problems (but not the problem in that envelope). The teacher also places manipulatives (e.g., pattern blocks, cuisenaire® rods, clocks) and drawing supplies in an area of the classroom accessible to students. The teacher assigns each student pair an envelope as a starting place. Students read the word problem from the assigned envelope, estimate the solution, and solve the problem together, using manipulatives or models as necessary. When they determine a solution, the pair searches the room for the envelope labeled with that answer. The pair moves to that envelope as their next problem. If the pair cannot find the answer on any of the envelopes, they must determine the source of the error and amend their work. Students continue until they return to the original problem. The teacher monitors student progress during the activity and addresses questions and misconceptions as they arise. Students record each solution and submit their answers for further teacher review.

3. **Connecting to the Student Edition:** Independent Practice

   At this point, the teacher may wish to assign the Independent Practice page to be completed independently in the student edition.

4. **Answers**

   1. D
   2. C
   3. A
   4. D
   5. C
Assessment: Unit 14  MGSE5.NF.2

1. Reflection/Closure Activity  
   At the conclusion of instruction, it is recommended that the teacher engage students in an activity that allows them to reflect upon their learning and summarize main concepts.
   Students respond to the Journal prompt on page 106 in the student edition.
   
   Luisa was trying to subtract $\frac{1}{8}$ from $\frac{3}{4}$. Her teacher told her to use a standard inch ruler. How could the ruler help Luisa?

2. Formative Assessment  
   After students complete the Journal prompt, the teacher displays a word problem that can be modeled using an inch ruler (a problem involving halves, fourths, or eighths). Each student pair uses the ruler to assist in solving the problem. The teacher reviews student responses and adjusts instruction or provides interventions as needed.

3. Connecting to the Student Edition: Assessment  
   Following the completion of the Assessment pages, the teacher uses the information to plan additional instruction and/or interventions.

4. Answers  
   1. B  
   2. C  
   3. C  
   4. A  
   5. A

5. Interventions  
   After students complete the Assessment pages, the teacher determines which students are in need of further instruction and selects one or more of the Intervention activities for individual students or small groups of students.
   
   1. The teacher displays word problems that involve addition and subtraction of fractions and the solutions to the problems. Students use estimation and models or equations to check for errors. If they determine a solution to be incorrect, students explain the mistake and solve the problem correctly.  
      
      (DOK: 2, RBT: Analyze)

   2. The teacher provides a set of word problems and fraction circles to each pair of students. They complete a table similar to the one shown. First, students write the expression used to solve the word problem. Then, students use the fraction circles and sketch a model of the problem. Next, students use their knowledge of benchmark fractions to estimate their answer and express the answer as a number or in a sentence. Finally, students solve the problem and give the correct answer. Students show all appropriate work in the table.
      
      (DOK: 2, RBT: Apply)
**Assessment: Unit 14  MGSE5.NF.2**

1. **Connecting to the Student Edition: Assessment**
   The second Assessment page utilizes an open-response format.

2. **Answers**
   6. \( \frac{9}{10} - \frac{2}{3} = \frac{7}{30} \text{ gal} \)

   7. No.
      Explanations will vary. Students might reason that, since \( \frac{2}{3} \) is less than \( \frac{3}{4} \), the sum of \( \frac{3}{4} \) and \( \frac{1}{6} \) is much greater than \( \frac{2}{3} \).
      \( \frac{11}{12} \) hour

   8. Marcom
      \( \frac{1}{24} \) case

3. **Interventions**
   Students work individually or in pairs using Cuisenaire® rods to assist in adding and subtracting fractions with unlike denominators. For example, to find the sum of \( \frac{1}{2} + \frac{1}{3} \), students select a rod that can be divided into both halves and thirds. Students determine that a dark green rod is the same length as 3 red rods or 2 light green rods. Students create a train of 6 white rods to show that the dark green rod can be partitioned into 6 equal units. Therefore, for this example, each dark green rod represents 1 whole. Each red rod represents \( \frac{1}{3} \), each light green rod represents \( \frac{1}{2} \), and each white rod represents \( \frac{1}{6} \).

   Next, students place one light green rod and one red rod end to end to model the sum of \( \frac{1}{2} + \frac{1}{3} \). Students then place a train of 5 white rods beneath the light green and red rods to show that \( \frac{1}{2} + \frac{1}{3} = \frac{5}{6} \). Students record their work using pictures and equations as shown.

   To find the difference of \( \frac{1}{2} - \frac{1}{3} \), students place one red rod above one light green rod as shown. Students then fill in the empty space with 1 white rod. In this example, a dark green rod is assigned a value of 1 whole, and a white rod is assigned a value of \( \frac{1}{6} \). So the difference, represented by the empty space, is 1 white rod or \( \frac{1}{6} \). Students record their work with pictures and equations as shown. The teacher provides additional problems for students to solve. The rod that equals 1 whole varies from problem to problem, depending on the common denominator of the given fractions.  
   (DOK: 2, RBT: Apply)

4. **Formative Assessment**
   Students work in pairs. In turn, one partner talks through the concept of evaluating a fraction addition or subtraction problem for reasonableness. The other partner provides feedback, suggestions, or clarifications. Students then share their mutual understandings with the larger group. The teacher monitors student discussion, providing clarification or feedback as needed.
Critical Thinking: Unit 14  MGSE.5.NF.2  

1. **Connecting to the Student Edition: Critical Thinking**

   Students may work individually, with partners, or in small groups to solve the problems. The teacher may also choose to solve one or both problems as a whole group activity, projecting the Critical Thinking page from the online component. In addition, the teacher may elect to assign the Critical Thinking questions over more than one class period.

2. **Answers**

   1. 

   ![Fraction Circles](image)

   2. 

   \[
   \frac{6}{7} + \frac{4}{5} = \frac{33}{35}
   \]

   Explanations will vary. Creating two fractions closest to one whole yields the greatest sum.

3. **Extending Student Thinking**

   Extending Student Thinking offers suggestions for differentiated instruction for students in need of an additional challenge.

   In groups of 3 or 4, students create a board game or card game. The game should focus on correctly solving student-created addition and subtraction word problems involving fractions. An answer key and instructions should be included with the game.

   Before students begin to develop the games, the teacher and students discuss the characteristics of an excellent math board or card game (e.g., mathematical correctness, creativity, clarity of the instructions and game) and work together to create a rubric for assessing the effectiveness of the games.

   *(DOK: 4, RBT: Create)*

4. **Formative Assessment**

   Formative Assessment

   Upon the completion of the Extending Student Thinking activity, the members of each group play their game. Each group uses the previously-developed rubric to evaluate the effectiveness of the game. The teacher also completes a rubric. Each group compares its rubric to the teacher’s and discusses possible future improvements.

   *(DOK: 3, RBT: Evaluate)*
Connecting to the Student Edition: Motivation Station

The teacher may choose to have students play the Motivation Station game.

Students play “Common Ground” with a partner. Each player needs a different color of crayon or marker. Each pair needs one game board and two number cubes. Player 1 rolls the number cubes to generate two denominators of unit fractions. For example, if the player rolls 3 and 5, the fractions would be $\frac{1}{3}$ and $\frac{1}{5}$. The player looks at the game board and selects a number that could be used as a common denominator for the two fractions. For the fractions generated, the player states the equivalent fractions using the selected common denominator. If the equivalent fractions are correct, the player claims the square by shading it with his or her crayon or marker. If the player’s equivalent fractions are incorrect, the player loses that turn. Note that the common denominator does not have to be the least common denominator in this game. Play then passes to player 2. The number 1 is a “wild card.” If a 1 is rolled, the player selects any number from 2–6 as a denominator. Play continues until all squares on the board are shaded. The player with more shaded squares is the winner.

Answers

Results will vary.

Parent Activities

The teacher reviews the Parent Activities and encourages students to complete these activities at home with a parent or guardian.

Additional Resources

Children’s Literature Connections

The following titles provide additional connections to unit vocabulary concepts. These books may be used as an introduction or extension to unit concepts presented during classroom instruction. Books may also be placed in the classroom library or in a math center for easy student access.

*Apple Fractions* – Jerry Pallotta
*Math Curse* – Jon Scieszka
*The Wishing Club: A Story About Fractions* – Donna Jo Napoli

Vocabulary Cards

Consult the Motivation Math™ Word Play Activities with Teacher Guide that accompanies the Motivation Math™ Vocabulary Card Set (available as a separate purchase) for additional activities to use with content vocabulary terms that have not yet been mastered. Activities include word wall activities as well as additional activities designed for whole group, small group, partners, or individual students.
### Appendix C: Answer Codings

**Unit 14  MGSE5.NF.2**  
**Solve Word Problems: Add and Subtract Fractions**

<table>
<thead>
<tr>
<th>Page</th>
<th>Question</th>
<th>Answer</th>
<th>DOK Level</th>
<th>Revised Bloom's Taxonomy (RBT)</th>
</tr>
</thead>
<tbody>
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<td>105</td>
<td>1</td>
<td>( \frac{5}{6} ) of the page</td>
<td>1</td>
<td>Apply</td>
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<tr>
<td></td>
<td>2</td>
<td>( \frac{5}{8} ) of the stick of butter</td>
<td>1</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>( \frac{7}{8} - \frac{3}{4} = \frac{1}{8} ) in</td>
<td>1</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>( \frac{4}{15} ) of the paper</td>
<td>3</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explanations will vary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Answers will vary but should be more than ( \frac{1}{2} ) hour and less than ( \frac{3}{4} ) hour.</td>
<td>2</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explanations will vary.</td>
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<tr>
<td>106</td>
<td>Vocabulary Activity</td>
<td>![Fraction Shapes]</td>
<td>1</td>
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<td></td>
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<td>Students may also choose to draw a star beneath the ( \frac{3}{8} ) in 1 ( \frac{3}{8} ).</td>
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<td></td>
<td>Journal</td>
<td>Answers will vary. Inches are divided into halves, fourths, and eighths. A ruler can be used as a visual fraction model.</td>
<td>3</td>
<td>Understand</td>
</tr>
<tr>
<td>107</td>
<td>1</td>
<td>D</td>
<td>2</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>D</td>
<td>2</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>A</td>
<td>2</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>B</td>
<td>1</td>
<td>Apply</td>
</tr>
<tr>
<td>108</td>
<td>1</td>
<td>D</td>
<td>2</td>
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<td>C</td>
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<td></td>
<td>5</td>
<td>A</td>
<td>2</td>
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### Appendix C: Answer Codings

#### Unit 14  MGSE5.NF.2

**Solve Word Problems: Add and Subtract Fractions**

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<tbody>
<tr>
<td>110</td>
<td>6</td>
<td>( \frac{9}{10} - \frac{2}{3} = \frac{7}{30} \text{ gal} )</td>
<td>1</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>No Explanations will vary. Students might reason that, since ( \frac{2}{3} ) is less than ( \frac{3}{4} ), the sum of ( \frac{3}{4} ) and ( \frac{1}{6} ) is much greater than ( \frac{2}{3} ).</td>
<td>3</td>
<td>Evaluate</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Marcom ( \frac{1}{24} ) case</td>
<td>2</td>
<td>Apply</td>
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</tbody>
</table>
| 111  | 1        | \[ Less than \( \frac{1}{2} \) \]
        |          | \[ Greater than \( \frac{1}{3} \) \]
        |          | \( \frac{1}{6}, \frac{1}{8}, \frac{5}{24}, \frac{1}{3}, \frac{5}{12}, \frac{9}{24}, \frac{11}{24}, \frac{11}{12}, \frac{17}{24}, \frac{3}{4} \) | 2 | Analyze |
|      | 2        | \( \frac{6}{7} + \frac{4}{5} = \frac{32}{35} \) | 2 | Analyze |
|      | 112      | Motivation Station Results will vary. | 1 | Apply |