IES Institute of Education Sciences

Regional Educational Laboratory Midwest

at American Institutes for Research

Teaching Fractions Toolkit

Professional development for grade 6 teachers: Module 2 workbook

Understanding fraction addition and subtraction

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Contents

Introduction

The Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Toolkit (Teaching Fractions Toolkit) was developed for math teachers, leaders, administrators, and others to support implementation of evidence-based recommendations for increasing student understanding of fractions. This toolkit is based on the recommendations of the What Works Clearinghouse practice guide Developing Effective Fractions Instruction for Kindergarten Through 8th Grade.

The six professional development modules in the Teaching Fractions Toolkit are designed to support grade 6 teachers in understanding and applying evidence-based recommendations to support effective fractions instruction. Four primary areas of focus are fraction computation and ratio, rate, and proportion problem solving; understanding why computational procedures with fractions work; understanding and using visual representations to support fraction computation and ratio, rate, and proportion problem solving; and understanding and overcoming common errors and misunderstandings and potential roadblocks to solving problems involving fractions. Activities in the modules include exploring math tasks, analyzing student work, planning and implementing lessons, using formative assessment resources, and reflecting on classroom practice. Each module includes two synchronous meetings, along with asynchronous activities for teachers to complete between the meetings.

Module 2

Understanding Fraction Addition and Subtraction focuses on Recommendation 3, including a consideration of common mistakes and misunderstandings and the role of visual representations for adding and subtracting fractions.

Meeting 2A ➔ **Module 2 interim activities** ➔ **Meeting 2B**

This workbook includes all of the handouts for Module 2. The materials are included in the order in which they are introduced in the module. Pages with module section information have right-side page edge colors to indicate the section:

- A brown edge indicates **general information**; this section starts on this page.
- A purple edge indicates **Meeting 2A**; this section starts on page 5.
- A green edge indicates the Module 2 **interim activities**; this section starts on page 16.
- A blue edge indicates **Meeting 2B**; this section starts on page 19.

Module 2 overview

Module 2 focuses on representing and understanding addition and subtraction with fractions by creating and using visual representations, such as number lines and area models. It starts with an introduction to Recommendation 3 and explores an online app for estimating fraction sums and differences using a number line. The readings are from Recommendation 3 text in the practice guide.

The module includes content related to learning about and using a formative assessment for eliciting common errors and misunderstandings about adding and subtracting fractions. The formative assessment is implemented with students between Meeting 2A and Meeting 2B. During Meeting 2B, you will analyze student responses to inform your planning about how to address any identified errors and misunderstandings. Meeting 2B also includes using estimation and visual representations–including a written diagram and a model created by an online app–during work on a fraction computation task.

Objectives for Module 2

By the end of Module 2, you will be able to do the following:

- Create and use visual representations to represent and understand computational procedures with fractions.
- Explain how visual representations relate to computations with fractions and why they make sense.
- Explain how to use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.
- Identify and address common errors and misunderstandings related to computational procedures with fractions.

Recommendation focus for Module 2

The Teaching Fractions Toolkit professional development focuses on practice guide Recommendations 2-4 in the context of grade 6 math content. The design of the professional development also is in line with Recommendation 5 and its implementation steps, which relate to professional development programs for teachers of students learning fractions content.

Module 2 specifically focuses on building knowledge related to Recommendation 3 in the context of grade 6 standards and foundational knowledge often taught in grades 4-5.

Recommendation 3: "Help students understand why procedures for computations with fractions make sense."

Schedule and checklist for Module 2

Use the following organizer to keep track of your module schedule and progress. For some modules, including Module 2, interim activities include classroom implementation followed by student work analysis and teacher reflections. Record your plan for completing the Module 2 Interim Activities in this table. All interim activities should be completed before Meeting 2B. Record any relevant guidance in the notes column.

Module 2 organizer

Section details	Notes	Completed
Meeting 2A (60 minutes) Date: Time: Location:		☐
Module 2 interim activities (self-paced; 120 minutes) Plan for completion:		☐
Meeting 2B (60 minutes) Date: Time: Location:		☐

Meeting 2A

During Meeting 2A, you will explore Recommendation 3 in the context of fraction addition and subtraction by engaging with a mathematics task using an online app and then completing a jigsaw activity to share ideas from the text describing Recommendation 3. You will continue your learning through an introduction to a formative assessment that you will use during the interim activities to gather information about students' common errors and misunderstandings related to fraction addition and subtraction in line with Recommendation 3.

The agenda for Meeting 2A is as follows.

Agenda for Meeting 2A

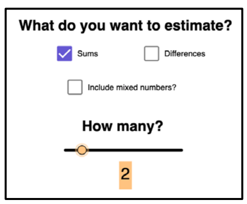
Topic and resources
Introduction
Recommendation 3 exploration • Module 2, Handout 1: Estimating Fraction Sums and Differences online app activity • Estimating Fraction Sums and Differences online app: https://www.geogebra.org/m/aaedp6mg • Module 2, Handout 2: Recommendation 3 jigsaw reading activity
Fraction Addition and Subtraction formative assessment • Module 2, Handout 3: Fraction Addition and Subtraction formative assessment activity
Wrap-up • Instructions for Module 2 interim activities

Module 2, Handout 1: Estimating Fraction Sums and Differences online app activity

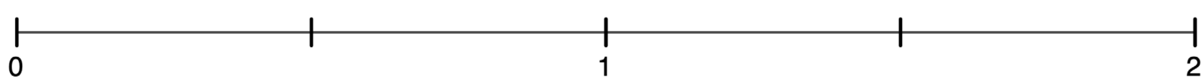
The activity associated with this online app focuses on **Recommendation 3**: Help students understand why procedures for computations with fractions make sense. The activity explores this recommendation through fraction addition and subtraction. The activity addresses **Implementation Step 2:** Provide opportunities for students to use estimation to predict or judge the reasonableness of answers to problems involving computation with fractions.

Use the Estimating Fraction Sums and Differences online app to position sums and differences of fractions on a number line.

1. Review “Example 3. Strategies for estimating with fractions” on page 31 of the practice guide. Consider the “Benchmarks” and “Relative Size of Unit Fractions” strategies.
2. Go to https://www.geogebra.org/m/aaedp6mg.
   - Select the “Sums” check box.
   - Do not check the “Differences” or “Include mixed numbers?” boxes.
   - Under “How many?” drag the slider to select 2 and then click the “Start” button.
   - Click the “Show hash marks for halves” checkbox.



3. Drag the purple circle under the fraction expression to the number line at the location of its sum. Click “Next” to get to the next expression and drag it to the location of its sum.
4. Record your locations on the following number line:

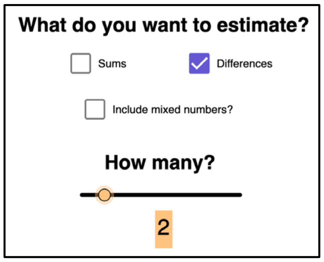


Write each expression for which you estimated a location and describe how you made your estimate.

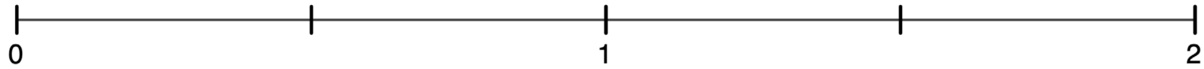
Expression 1:

Expression 2:

5. Click the “Check” button to see the actual location of the sums. A second number line will appear that shows the accurate locations of the sums. Arrows connect your estimated locations to the accurate locations.
6. Repeat the process of estimating. This time, estimate the differences between two fractions
   - Select the “Differences” check box.
   - Do not check the “Sums” or “Include mixed numbers?” boxes.
   - Under “How many?” drag the slider to select 2 and then click the “Start” button.
   - Click the “Show hash marks for halves” checkbox.



7. Drag the purple circle under the fraction expression to the number line at the location of its difference. Click “Next” to get to the next expression and drag it to the location of its difference.
8. Record your locations on the following number line:



Write each expression for which you estimated a location and describe how you made your estimate.

Expression 1:

Expression 2:

9. Click the “Check” button to see the actual location of the differences. A second number line will appear that shows the accurate locations of the differences. Arrows connect your estimated locations to the accurate locations.
10. **Reflect:** In what ways were the “Benchmarks” and “Relative Size of Unit Fractions” strategies relevant for your estimation of the sums and differences?

Module 2, Handout 2: Recommendation 3 jigsaw reading activity

This jigsaw activity involves reviewing and sharing out on a section of the Recommendation 3 overview. A facilitator will assign you a section to review. When reviewing your assigned section, attend to the key points of each implementation step and make connections with previously explored mathematics tasks.

This jigsaw activity supports review and exploration of the implementation steps associated with **Recommendation 3** in the practice guide.

A. Introduction to Recommendation 3

Read the two introductory paragraphs for Recommendation 3 on page 26 of the practice guide.

B. Review assigned implementation step

1. In the table on the next page, circle the implementation step you were assigned.
2. Read the practice guide description of your assigned implementation step.
3. Write notes in the row for your assigned implementation step in response to the questions about key points and connections to work on math tasks.
4. Prepare to share out to the whole group about key points and connections for your assigned implementation step.

Recommendation 3 implementation steps and pages	What are two key points to remember about this implementation step?	What is one connection between this step and the fractions sums and differences on the number line task (or other tasks)?
Implementation Step 1 Pages 28-30		
Implementation Step 2 Pages 30-31		
Implementation Step 3 Pages 31-33		
Implementation Step 4 Pages 33-34		

Module 2, Handout 3: Fraction addition and subtraction formative assessment activity

The formative assessments used in this toolkit elicit research-based misunderstandings, such as errors, conceptual misunderstandings, and overgeneralizations. Each formative assessment focuses on one or two misunderstandings identified in the research base, and each takes approximately 10 minutes to complete. Analysis of student thinking elicited by the formative assessments can inform subsequent instruction.

This formative assessment supports the identification of students who are exhibiting common misunderstandings and errors about fraction addition and subtraction. It is directly linked to the third implementation step for **Recommendation 3** in the practice guide.

A. Consider the following item:

$\frac{1}{3} + \frac{1}{4} =$ a) $\frac{2}{7}$ b) $\frac{7}{12}$ c) $\frac{2}{12}$

1. Which answer is correct?

2. Draw a visual representation that shows which answer is correct.

3. Why might students choose the other two answers?

B. Read and reflect

A foundational understanding of a fraction is that it represents a part of some whole. The numerator represents the number of parts, and the denominator represents the size of the parts. This understanding is developed further as students learn to represent fractions with different visual models and connect aspects of the models with the numerator or the denominator.

Students also need an understanding of a fraction with a numerator larger than 1 as the sum or difference of unit fractions that have the same denominator. For example, $\frac{3}{4}$ is viewed not only as three parts out of four but also as adding three $\frac{1}{4}$s, or $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$. Similarly, $\frac{5}{7}$ could be viewed as $\frac{7}{7}-\frac{1}{7}-\frac{1}{7}$. As students develop their understanding of fraction addition and subtraction, they learn to view each operation as adding or subtracting the numerators (the number of parts), not the denominators (because they represent the size of the parts).

Students can develop flawed understanding leading to misconceptions about the addition and subtraction of fractions. Students may overgeneralize, confuse, or misapply strategies. The formative assessment focuses on two of the common misunderstandings noted in the research on students' mathematical reasoning.

Misunderstanding 1: Adding numerators or adding denominators

Students apply whole-number reasoning by adding either the numerators or the denominators to determine the sum. For example, when adding $\frac{1}{3}+\frac{1}{4}$, a student might determine the sum is $\frac{1+1}{3+4}=\frac{2}{7}$ or possibly $\frac{1}{3+4}=\frac{1}{7}$.

Misunderstanding 2: Common denominators with incorrect numerators

Students apply a partial algorithm approach in which they multiply the denominators but do not change the numerators, so the fractions they create are not equivalent. They might add the numerator values of the given fractions. For example, when adding $\frac{1}{3}+\frac{1}{4}$, a student could compute $\frac{1}{3\cdot 4}+\frac{1}{4\cdot 3}=\frac{1+1}{12}=\frac{2}{12}$

1. How often or when have you seen these misunderstandings with your students?

2. What strategies have you used in the past to support student understanding related to these misunderstandings?

C. Administer the formative assessment

Administer the formative assessment (on the next two pages) to students before Meeting 2B. Bring your student work to the meeting.

- Give your student(s) about 10 minutes to complete.
- Emphasize that the instructions say to "show and explain your work." Encourage students to draw diagrams that help explain how they know one answer is correct.
- Bring copies of student work to Meeting 2B to analyze during the meeting.

Fraction Addition and Subtraction

Name: ____________________________

Directions: Solve each problem. Select your answer from the choices provided.

1. $\frac{1}{3}+\frac{1}{4}=$ ○ $\frac{2}{7}$ ○ $\frac{7}{12}$ ○ $\frac{2}{12}$	Show and explain your work here.
2. $\frac{2}{3}+\frac{1}{4}=$ ○ $\frac{11}{12}$ ○ $\frac{3}{12}$ ○ $\frac{3}{7}$	Show and explain your work here.
3. $\frac{2}{9}+\frac{3}{5}=$ ○ $\frac{5}{45}$ ○ $\frac{5}{14}$ ○ $\frac{37}{45}$	Show and explain your work here.

Fraction Addition and Subtraction (continued)

4. $\frac{3}{4} - \frac{1}{6} =$ ○ $\frac{2}{24}$ ○ $\frac{7}{12}$ ○ $\frac{2}{2}$	Show and explain your work here.
5. $\frac{7}{8} - \frac{1}{4} =$ ○ $\frac{6}{4}$ ○ $\frac{6}{32}$ ○ $\frac{5}{8}$	Show and explain your work here.
6. $\frac{3}{8} - \frac{1}{3} =$ ○ $\frac{1}{24}$ ○ $\frac{2}{5}$ ○ $\frac{2}{24}$	Show and explain your work here.

Module 2 interim activities

Interim activities between Meetings 2A and 2B include reviewing the description of Recommendation 3, reading and reflecting on more background information about formative assessments focused on fraction addition and subtraction errors and misunderstandings, implementing the formative assessment with students, and starting work on a mathematics task that will be discussed in Meeting 2B.

Instructions for Module 2 interim activities

Complete these interim activities before Meeting 2B starts. The activities are designed to be done in the order presented in the following table. Track your progress by marking the checkbox in the rightmost column when you complete an activity.

Activity	Instructions and resources	Completed
Recommendation 3 Reading	Review practice guide pages 26-34. Pages 26-34 explain Recommendation 3 and its associated implementation steps, which were explored in Meeting 2A. Page 34 also explains potential roadblocks and approaches related to Recommendation 3.	☐
Module 2, Handout 3	Read and respond to the reflection question in part B of the handout. (Part A was completed in Meeting 2A.) Follow the directions in part C to administer the Fraction Addition and Subtraction formative assessment with students.	☐
Module 2, Handout 4	Complete only part A of the handout. The rest of the handout will be completed in Meeting 2B	☐

Module 2, Handout 4: Jog-A-Thon task

Alex is training for his school's Jog-A-Thon, and he needs to run at least 1 mile each day. If Alex runs to his grandma's house, which is $\frac{5}{8}$ of a mile away, and then to his friend Justin's house, which is $\frac{1}{2}$ a mile away, will he have trained enough for the day?[1]

This activity focuses on practice guide **Recommendation 3**: "Help students understand why procedures for computations with fractions make sense." It explores this recommendation through fraction addition.

A. Estimate and draw a diagram (complete before Meeting 2B)

1. What is your initial estimate: Did Alex run more or less than 1 mile?

2. Now draw a diagram and use it to help you answer: Did Alex run at least 1 mile during the day?

[1] Adapted from the Jog-A-Thon Task from Illustrative Mathematics, which is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

B. Explore using the online app (complete during Meeting 2B)

Use the Fraction Addition online app (https://www.geogebra.org/m/npx3mctd) to answer whether Alex ran at least 1 mile.

1. Enter the two fractions to be added for the Jog-A-Thon problem in the app and then click Next. (Tip: Enter the denominator before the numerator.) What do you notice about the initial visual representation that shows the addition?

2. Use the Expand + and – buttons to further partition the visual representation showing $\frac{1}{2}$. How does this partitioning help show the addition?

3. Try additional fraction addition problems after clicking the Reset button.

4. How can this app support understanding of common denominators and the addition of fractions?

Optional additional resource: Explore the Fraction Subtraction (https://www.geogebra.org/m/quk6d8gz) app, which is similar to the Fraction Addition app.

Meeting 2B

During Meeting 2B, you will analyze example student work and your students' work collected through the formative assessment focused on fraction addition and subtraction errors and misunderstandings in line with those outlined in Recommendation 3. You also will discuss your work on the Jog-A-Thon task and further engage with the task using an online app to explore understanding of fraction addition.

The agenda for Meeting 2B is as follows.

Agenda for Meeting 2B

Topic and resources
Introduction
Analysis of student thinking and common errors and misunderstandings • Module 2, Handout 5: Analyzing student responses to the Fraction Addition and Subtraction formative assessment
Exploration of online apps in line with Recommendation 3 • Module 2, Handout 4: Jog-A-Thon task (part B) • Fraction Addition online app: https://www.geogebra.org/m/npx3mctd Optional: Fraction Subtraction online app: https://www.geogebra.org/m/quk6d8gz
Wrap-up • Module 2, Handout 6: Module 2 Reflection

Module 2, Handout 5: Analyzing student responses to the formative assessment

Directions for part A

1. Review the two misunderstandings on which the formative assessment focuses.
   - **Misunderstanding 1: Adding numerators and/or adding denominators.** Students apply whole-number reasoning by adding either the denominators or the numerators to determine the sum.
   - **Misunderstanding 2: Common denominators with incorrect numerators.** Students apply a partial algorithm approach in which they multiply the denominators but do not change the numerators, so the fractions they create are not equivalent. They might add the numerator values of the given fractions.
2. Analyze four example student responses to formative assessment items shown in part A on the next two pages. Consider what evidence you see of either of the misunderstandings above or other mathematical understandings.
3. Discuss your analyses of the four example student responses with the group.

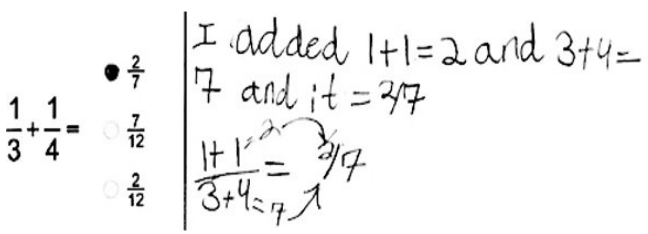
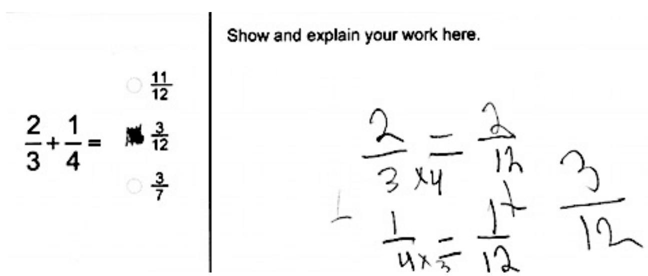
> This analysis can support understanding student thinking and misunderstandings in line with **Recommendation 3, Implementation Step 3**. Separating the evidence you see from inferences about that evidence is at the core of this activity. The protocol shown on the pages that follow is excerpted and adapted from the Visual Access to Mathematics project, © 2018 Education Development Center, Inc.

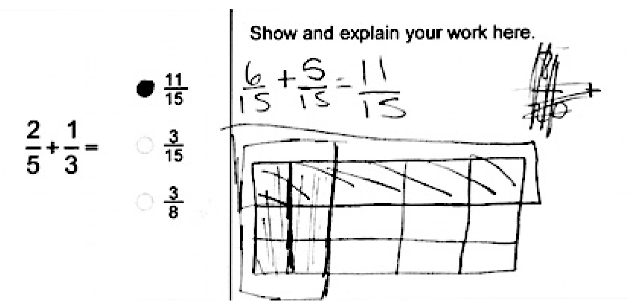
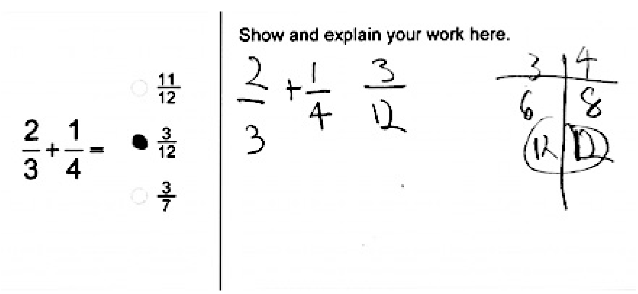
Directions for part B

1. Choose four item responses from the student work you collected and analyze them using the blank protocol in part B. Consider what evidence you see of either the misunderstandings or other mathematical understandings.
2. Share and discuss your analyses of your own students' work on the formative assessment items with the group.

A. Analyses of example work

Examine each student's work and record your ideas in the following table.

Item	**Student potential** **What did students write or draw that is evidence of understanding?**	**Identify any common errors and misunderstandings and describe the evidence** **1. adding numerators or denominators** **2. using common denominators with incorrect numerators**	**Questions and strategies** **What questions do you want to ask the student or what are next steps you want to try with the student?**
A. 			
B. 			

Item	Student potential What did students write or draw that is evidence of understanding?	Identify any common errors and misunderstandings and describe the evidence 1. adding numerators or denominators 2. using common denominators with incorrect numerators	Questions and strategies What questions do you want to ask the student or what are next steps you want to try with the student?
C. 			
D. 			

Discussion questions

1. How do the different approaches by these students compare?

2. What might you ask these students or do next with these students? Why?

3. What else did you notice or wonder?

B. Analyses of work from your classroom

Examine each student's work and record your ideas in the following table below.

Item **Insert screenshot of student response or identify the item number and the piece of student work.**	**Student potential** **What did students write or draw that is evidence of understanding?**	**Identify any misunderstanding and describe the evidence** **1. adding numerators or denominators** **2. common denominators with incorrect numerators**	**Questions and strategies** **What questions do you want to ask the student or what are next steps you want to try with the student?**

Item **Insert screenshot of student response or identify the item number and the piece of student work.**	**Student potential** **What did students write or draw that is evidence of understanding?**	**Identify any misunderstanding and describe the evidence** **1. adding numerators or denominators** **2. common denominators with incorrect numerators**	**Questions and strategies** **What questions do you want to ask the student or what are next steps you want to try with the student?**

Discussion questions

1. How do the different approaches by these students compare?

2. What might you ask these students or do next with these students? Why?

3. What else did you notice or wonder?

Module 2, Handout 6: Module 2 reflection

Consider the activities and tasks from Module 2 as you reflect on your learning related to Recommendation 3.

1. Choose a strategy identified under one of the four implementation steps for Recommendation 3 in the practice guide, and explain how you would use that strategy to support students' conceptual understanding of adding and subtracting fractions.

Module 2 focused on Recommendation 3, particularly a consideration of common errors and misunderstandings and the role of visual representations for adding and subtracting fractions. The handout questions support reflection on implementation steps, roadblocks, and approaches for **Recommendation 3**: "Help students understand why procedures for computations with fractions make sense."

Implementation steps for Recommendation 3

A. "Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures."

B. "Provide opportunities for students to use estimation to predict or judge the reasonableness of answers to problems involving computations with fractions."

C. "Address common [errors and misunderstandings] regarding computational procedures with fractions."

D. "Present real-world contexts with plausible numbers for problems that involve computing with fractions."

How will you use your chosen strategy to support students' conceptual understanding of adding and subtracting fractions?

2. Some representations can lead students to make computational errors. (See Roadblock 3.1 on page 34 of the practice guide for more information.) Others can help support student understanding. (See Recommendation 3, Implementation Step 1 on page 28 of the practice guide for more information.) Explain what representations you would use to support students who are adding and subtracting fractions and why.

Appendix: Student versions of Module 2, Handout 1

The appendix includes three versions of the formative assessment in Module 2, Handout 3. These versions are formatted to be used with students, and they are written in English, Spanish, and Arabic.

Name: ____________________

Class: ____________________

Fraction addition and subtraction

Directions: Solve each problem. Select your answer from the choices provided.

1. $\frac{1}{3}+\frac{1}{4}=$ ○ $\frac{2}{7}$ ○ $\frac{7}{12}$ ○ $\frac{2}{12}$	Show and explain your work here.
2. $\frac{2}{3}+\frac{1}{4}=$ ○ $\frac{11}{12}$ ○ $\frac{3}{12}$ ○ $\frac{3}{7}$	Show and explain your work here.
3. $\frac{2}{9}+\frac{3}{5}=$ ○ $\frac{5}{45}$ ○ $\frac{5}{14}$ ○ $\frac{37}{45}$	Show and explain your work here.

4. $\frac{3}{4} - \frac{1}{6} =$ ○ $\frac{2}{24}$ ○ $\frac{7}{12}$ ○ $\frac{2}{2}$	Show and explain your work here.
5. $\frac{7}{8} - \frac{1}{4} =$ ○ $\frac{6}{4}$ ○ $\frac{6}{32}$ ○ $\frac{5}{8}$	Show and explain your work here.
6. $\frac{3}{8} - \frac{1}{3} =$ ○ $\frac{1}{24}$ ○ $\frac{2}{5}$ ○ $\frac{2}{24}$	Show and explain your work here.

Nombre:____________________

Clase: ____________________

Suma y resta de fracciones

Instrucciones: resuelve cada problema. Selecciona tu respuesta de las opciones proporcionadas.

1. $\frac{1}{3}+\frac{1}{4}=$ ○ $\frac{2}{7}$ ○ $\frac{7}{12}$ ○ $\frac{2}{12}$	Muestra y explica tu trabajo aquí.
2. $\frac{2}{3}+\frac{1}{4}=$ ○ $\frac{11}{12}$ ○ $\frac{3}{12}$ ○ $\frac{3}{7}$	Muestra y explica tu trabajo aquí.
3. $\frac{2}{9}+\frac{3}{5}=$ ○ $\frac{5}{45}$ ○ $\frac{5}{14}$ ○ $\frac{37}{45}$	Muestra y explica tu trabajo aquí.

4. $\frac{3}{4} - \frac{1}{6} =$ ○ $\frac{2}{24}$ ○ $\frac{7}{12}$ ○ $\frac{2}{2}$	Muestra y explica tu trabajo aquí.
5. $\frac{7}{8} - \frac{1}{4} =$ ○ $\frac{6}{4}$ ○ $\frac{6}{32}$ ○ $\frac{5}{8}$	Muestra y explica tu trabajo aquí.
6. $\frac{3}{8} - \frac{1}{3} =$ ○ $\frac{1}{24}$ ○ $\frac{2}{5}$ ○ $\frac{2}{24}$	Muestra y explica tu trabajo aquí.

اسم: ______________________________

فصل: ______________________________

جمع الكسر وطرحه

الاتجاهات: حل كل مشكلة. حدد إجابتك من الخيارات المقدمة.

1. $\frac{1}{3}+\frac{1}{4}=$ ○ $\frac{2}{7}$ ○ $\frac{7}{12}$ ○ $\frac{2}{12}$	اعرض واشرح عملك هنا.
2. $\frac{2}{3}+\frac{1}{4}=$ ○ $\frac{11}{12}$ ○ $\frac{3}{12}$ ○ $\frac{3}{7}$	اعرض واشرح عملك هنا.
3. $\frac{2}{9}+\frac{3}{5}=$ ○ $\frac{5}{45}$ ○ $\frac{5}{14}$ ○ $\frac{37}{45}$	اعرض واشرح عملك هنا.

4. $\frac{3}{4} - \frac{1}{6} =$ ○ $\frac{2}{24}$ ○ $\frac{7}{12}$ ○ $\frac{2}{2}$	اعرض واشرح عملك هنا.
5. $\frac{7}{8} - \frac{1}{4} =$ ○ $\frac{6}{4}$ ○ $\frac{6}{32}$ ○ $\frac{5}{8}$	اعرض واشرح عملك هنا.
6. $\frac{3}{8} - \frac{1}{3} =$ ○ $\frac{1}{24}$ ○ $\frac{2}{5}$ ○ $\frac{2}{24}$	اعرض واشرح عملك هنا.

Credits

Information is provided about photos and other resources used in Module 2.

Photos

Photographic images used by the Regional Educational Laboratory Midwest at American Institutes for Research on the indicated pages (front and back cover) supplied by Getty Images in compliance with REL Midwest's annual license agreement.

Resources

The toolkit is based on the recommendations of the What Works Clearinghouse practice guide Developing Effective Fractions Instruction for Kindergarten Through 8th Grade.

The Estimating Fraction Sums and Differences online app was adapted from an app originally created by John Ulbright using GeoGebra and licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported International License (CC BY-SA 3.0).

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