Research-Based Instructional Strategies (RBIS) & Look Fors

What are the RBIS?

As part of a broader strategy to significantly increase the number of students in Texas who have access to High-Quality Instructional Materials (HQIM), TEA (Texas Education Agency) has developed a set of Research-Based Instructional Strategies (RBIS) to articulate the key instructional shifts that are necessary to bring rigorous instruction to life for students.

RBIS are:

- A set of **research-based practices** that highlights common misconceptions in the field.
- Topics that require **conceptual or philosophical changes** in approach to instruction.
- A set of **practices that are supported by research** and should be present in classrooms, regardless of instructional materials.
- The **science of how students best learn** math and reading in K-12.

The RBIS also demonstrate why HQIM is important and what is required to implement HQIM well.

What are High-Quality Instructional Materials (HQIM)?

- Ensure full coverage of the **Texas Essential Knowledge and Skills** (TEKS).
- Are **aligned to evidence-based best practices** in the relevant content area. This varies by content area and should align directly with the RBIS for a particular content area. Quality materials should be designed to directly support teachers in implementing the RBIS.
- **Support all learners**, including students with disabilities, emergent bilingual students, and students identified as gifted and talented.
- Enables **frequent progress monitoring** through embedded and aligned assessments.
- Includes **implementation supports** including teacher and student-facing lesson level materials.

HQIM provides equitable access of strong instruction to all students through:

- Providing **consistent and daily exposure** to rigorous, grade-level content to all students.
- Allowing **all students** to access the same materials across classrooms in an LEA.
- **Streamlining data collected** from formative and summative assessments to better understand where students are at.

Why are the RBIS and HQIM important?

RBIS and HQIM are one lever that LEAs can use to ensure that all students receive high-quality grade-level instruction. We believe that all students, including emergent bilingual students and students with learning differences, can access grade level learning, and deserve:

- Consistent opportunities to work on **grade-appropriate assignments.**
- **Strong instruction** where students do the majority of the thinking in a lesson.
- **Deep engagement** in what they're learning.
- Teachers who hold **high expectations** for students and believe they can meet grade-level standards.

TNTP. (2018). The Opportunity Myth: What Students Can Show Us About How School Is Letting Them Down—and How to Fix It.

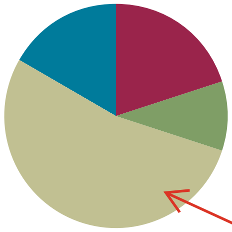
RBIS 1 & 4

Lesson 11

Objective: Compare unit fractions by reasoning about their size using fraction strips.

Suggested Lesson Structure

Fluency Practice	(12 minutes)
Application Problem	(6 minutes)
Concept Development	(32 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



including Problem Set
(10 minutes)

Fluency Practice (12 minutes)

- Sprint: Multiply and Divide by Eight **3.4F** (9 minutes)
- Skip-Count by Fourths on the Clock **3.3C, 3.7C** (2 minutes)
- Greater or Less Than 1 Whole **3.3B, 3.3C** (1 minute)

Sprint: Multiply and Divide by Eight (9 minutes)

Materials: (S) Multiply and Divide by Eight Sprint

Note: This Sprint supports fluency with multiplication and division using units of 8.

Skip-Count by Fourths on the Clock (2 minutes)

Materials: (T) Clock

Note: This activity reviews counting by fourths on the clock from Module 2.

T: (Hold or project a clock.) Let's skip-count by fourths on the clock starting with 1 o'clock.

S: 1, 1:15, 1:30, 1:45, 2, 2:15, 2:30, 2:45, 3.

Continue with the following possible sequences:

- 1, 1:15, half past 1, 1:45, 2, 2:15, half past 2, 2:45, 3.
- 1, quarter past 1, half past 1, quarter 'til 2, 2, quarter past 2, half past 2, quarter 'til 3, 3.

RBIS 1 & 4

Greater or Less Than 1 Whole (1 minute)

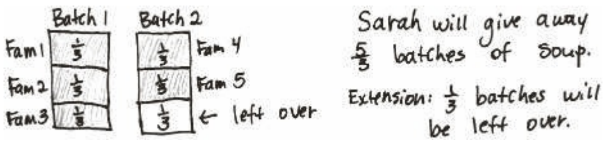
Note: This activity reviews identifying fractions greater and less than 1 whole.

T: (Write $\frac{1}{2}$.) Greater or less than 1 whole?
S: Less!

Continue with the following possible sequence: $\frac{3}{2}$, $\frac{5}{4}$, $\frac{3}{4}$, $\frac{3}{7}$, $\frac{5}{3}$, and $\frac{5}{2}$. It may be appropriate for some classes to draw responses on personal white boards for extra support.

Application Problem (6 minutes)

Sarah makes soup. She divides each batch equally into thirds to give away. Each family that she makes soup for gets 1 third of a batch. Sarah needs to make enough soup for 5 families. How much soup does Sarah give away? Write your answer in terms of batches.



Extension: What fraction will be left over for Sarah?

Note: This problem reviews writing fractions greater than 1 whole from Lesson 10.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Scaffold solving the Application Problem for students working below grade level with step-by-step questioning. For example, ask the following:

- “How much soup does 1 family receive?” (1 third of the batch of soup.)
- “2 families?” (2 thirds.)
- “3 families?” (3 thirds or 1 whole batch of soup.)
- “Does Sarah have to make more than 1 batch?” (Yes.)
- “How much of the second batch will she give away?” (2 thirds.)
- “How much will remain?” (1 third.)

Concept Development (32 minutes)

Materials: (S) Folded fraction strips (halves, thirds, fourths, sixths, and eighths) from Lesson 10, personal white board, 1 set of <, >, = cards per pair

T: Take out the fraction strips you folded yesterday.
S: (Take out strips folded into halves, thirds, fourths, sixths, and eighths.)
T: Look at the different units. Take a minute to arrange the strips in order from the largest to the smallest unit.
S: (Place the fraction strips in order: halves, thirds, fourths, sixths, and eighths.)
T: Turn and talk to your partner about what you notice.
S: Eighths are the smallest even though the number 8 is the biggest. → When the whole is folded into more units, each unit is smaller. I only folded once to get halves, and they’re the biggest.
T: Look at 1 half and 1 third. Which unit fraction is larger?
S: 1 half.

RBIS 1 & 4

T: Explain to your partner how you know.

S: I can just see 1 half is larger on the strip. → When you split it between 2 people, the pieces are larger than if you split it between 3 people. → There are fewer pieces, so the pieces are larger.

Continue with other examples using the fraction strips as necessary.

T: What happens when we aren't using fraction strips? What if we're talking about something round, like a pizza? Is 1 half still larger than 1 third? Turn and talk to your partner about why or why not.

S: I'm not sure. → Sharing a pizza among 3 people is not as good as sharing it between 2 people. I think pieces that are halves are still larger. → I agree because the number of parts doesn't change even if the shape of the whole changes.

T: Let's make a model and see what happens. Draw 5 circles that are the same size to represent pizzas on your personal white board.

S: (Draw.)

T: Estimate to partition the first circle into halves. Label the unit fraction.

S: (Draw and label.)

T: Estimate to partition the second circle into thirds. (Model if necessary.) Label the unit fraction.

S: (Draw and label.)

T: The more we cut, what's happening to our pieces?

S: They're getting smaller!

T: So, is 1 third still smaller than 1 half?

S: Yes!

T: Partition your remaining circles into fourths, sixths, and eighths. Label the unit fraction in each one.

S: (Draw and label.)

T: Compare your drawings to your fraction strips. Talk to a partner: Do you notice the same pattern as with your fraction strips?

S: (Discuss.)

Continue with other real world examples if necessary.

T: Let's compare unit fractions. For each turn, you and your partner will each choose any single fraction strip. Choose now.

S: (Choose a strip to play.)

T: Now, compare unit fractions by folding to show only the unit fraction. Then, place the appropriate symbol card (<, >, or =) on the table between your strips.

S: (Fold, compare, and place symbol cards.)

T: (Hold symbol cards face down.) I will flip one of my symbol cards to see if the unit fraction that is *greater than* or *less than* wins this round. If I flip *equals*, it's a tie. (Flip a card.)

Continue at a rapid pace for a few rounds.

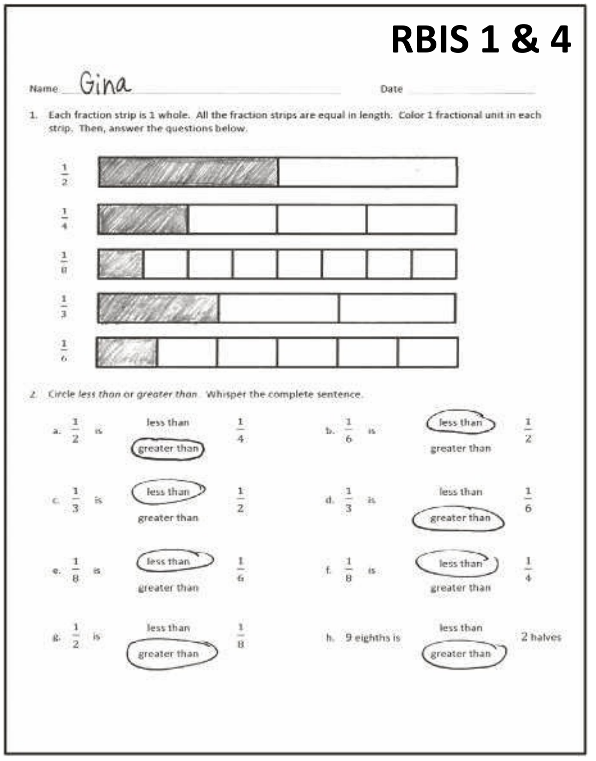
NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

This partner activity benefits English language learners as it includes repeated use of math language in a reliable structure (e.g., "__ is greater than __"). It also offers the English language learner an opportunity to discuss the math with a peer, which may be more comfortable than speaking in front of the class or to the teacher.

Concept Development (32 minutes)

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.



RBIS 1 & 4

Name Gina Date

1. Each fraction strip is 1 whole. All the fraction strips are equal in length. Color 1 fractional unit in each strip. Then, answer the questions below.

$\frac{1}{2}$

$\frac{1}{4}$

$\frac{1}{8}$

$\frac{1}{3}$

$\frac{1}{6}$

2. Circle *less than* or *greater than*. Whisper the complete sentence.

a. $\frac{1}{2}$ is less than / greater than $\frac{1}{4}$

b. $\frac{1}{6}$ is less than / greater than $\frac{1}{2}$

c. $\frac{1}{3}$ is less than / greater than $\frac{1}{2}$

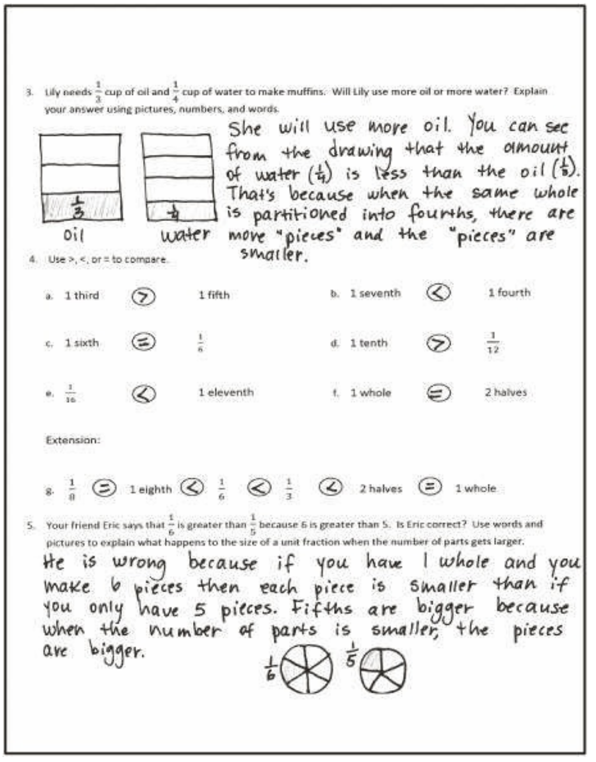
d. $\frac{1}{3}$ is less than / greater than $\frac{1}{6}$

e. $\frac{1}{8}$ is less than / greater than $\frac{1}{6}$

f. $\frac{1}{8}$ is less than / greater than $\frac{1}{4}$

g. $\frac{1}{2}$ is less than / greater than $\frac{1}{8}$

h. 9 eighths is less than / greater than 2 halves



3. Lily needs $\frac{1}{3}$ cup of oil and $\frac{1}{4}$ cup of water to make muffins. Will Lily use more oil or more water? Explain your answer using pictures, numbers, and words.

$\frac{1}{3}$ oil

$\frac{1}{4}$ water

She will use more oil. You can see from the drawing that the amount of water ($\frac{1}{4}$) is less than the oil ($\frac{1}{3}$). That's because when the same whole is partitioned into fourths, there are more "pieces" and the "pieces" are smaller.

4. Use >, <, or = to compare.

a. 1 third $>$ 1 fifth

b. 1 seventh $<$ 1 fourth

c. 1 sixth $=$ $\frac{1}{6}$

d. 1 tenth $>$ $\frac{1}{12}$

e. $\frac{1}{16}$ $<$ 1 eleventh

f. 1 whole $=$ 2 halves

Extension:

g. $\frac{1}{8}$ $=$ 1 eighth $<$ $\frac{1}{6}$ $<$ $\frac{1}{3}$ $<$ 2 halves $=$ 1 whole

5. Your friend Eric says that $\frac{1}{6}$ is greater than $\frac{1}{5}$ because 6 is greater than 5. Is Eric correct? Use words and pictures to explain what happens to the size of a unit fraction when the number of parts gets larger.

He is wrong because if you have 1 whole and you make 6 pieces then each piece is smaller than if you only have 5 pieces. Fifths are bigger because when the number of parts is smaller, the pieces are bigger.

$\frac{1}{6}$ $\frac{1}{5}$

Student Debrief (10 minutes)

Lesson Objective: Compare unit fractions by reasoning about their size using fraction strips.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- How did Problem 3 help you answer Problem 5?
- Compare Problems 3 and 5. How are they the same? Different?
- Lesson 11 builds understanding that unit fractions can only be compared when they refer to the same whole. In this Debrief, consider laying the foundation for that work by drawing students' attention to the models they drew for Problems 3 and 5. Discussion might include reasoning about why the models they drew facilitated the process of comparison within each problem.

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

A

Number Correct: _______

Multiply and Divide by Eight

1.	2 × 8 =		23.	___ × 8 = 80	
2.	3 × 8 =		24.	___ × 8 = 16	
3.	4 × 8 =		25.	___ × 8 = 24	
4.	5 × 8 =		26.	80 ÷ 8 =	
5.	1 × 8 =		27.	40 ÷ 8 =	
6.	16 ÷ 8 =		28.	8 ÷ 8 =	
7.	24 ÷ 8 =		29.	16 ÷ 8 =	
8.	40 ÷ 8 =		30.	24 ÷ 8 =	
9.	8 ÷ 8 =		31.	___ × 8 = 48	
10.	32 ÷ 8 =		32.	___ × 8 = 56	
11.	6 × 8 =		33.	___ × 8 = 72	
12.	7 × 8 =		34.	___ × 8 = 64	
13.	8 × 8 =		35.	56 ÷ 8 =	
14.	9 × 8 =		36.	72 ÷ 8 =	
15.	10 × 8 =		37.	48 ÷ 8 =	
16.	64 ÷ 8 =		38.	64 ÷ 8 =	
17.	56 ÷ 8 =		39.	11 × 8 =	
18.	72 ÷ 8 =		40.	88 ÷ 8 =	
19.	48 ÷ 8 =		41.	12 × 8 =	
20.	80 ÷ 8 =		42.	96 ÷ 8 =	
21.	___ × 8 = 40		43.	14 × 8 =	
22.	___ × 8 = 8		44.	112 ÷ 8 =	

A STORY OF UNITS – TEKS EDITION Lesson 11 Sprint 3 • 5

B

Number Correct: _______

Improvement: _______

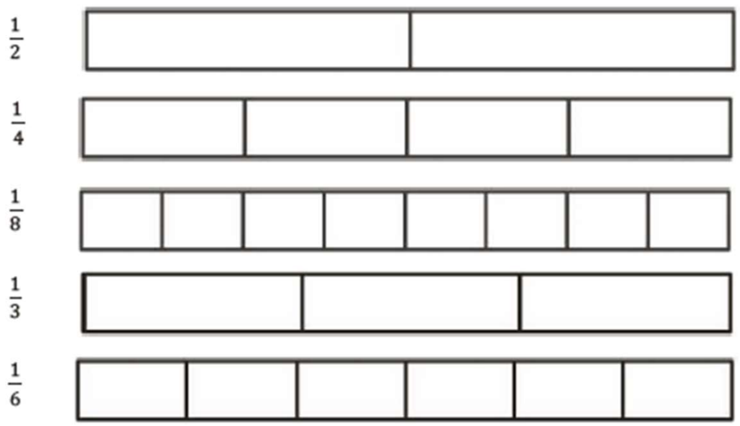
Multiply and Divide by Eight

1.	1 × 8 =		23.	___ × 8 = 16	
2.	2 × 8 =		24.	___ × 8 = 80	
3.	3 × 8 =		25.	___ × 8 = 24	
4.	4 × 8 =		26.	16 ÷ 8 =	
5.	5 × 8 =		27.	8 ÷ 8 =	
6.	24 ÷ 8 =		28.	80 ÷ 8 =	
7.	16 ÷ 8 =		29.	40 ÷ 8 =	
8.	32 ÷ 8 =		30.	24 ÷ 8 =	
9.	8 ÷ 8 =		31.	___ × 8 = 24	
10.	40 ÷ 8 =		32.	___ × 8 = 32	
11.	10 × 8 =		33.	___ × 8 = 72	
12.	6 × 8 =		34.	___ × 8 = 56	
13.	7 × 8 =		35.	64 ÷ 8 =	
14.	8 × 8 =		36.	72 ÷ 8 =	
15.	9 × 8 =		37.	48 ÷ 8 =	
16.	56 ÷ 8 =		38.	56 ÷ 8 =	
17.	48 ÷ 8 =		39.	11 × 8 =	
18.	64 ÷ 8 =		40.	88 ÷ 8 =	
19.	80 ÷ 8 =		41.	12 × 8 =	
20.	72 ÷ 8 =		42.	96 ÷ 8 =	
21.	___ × 8 = 8		43.	13 × 8 =	
22.	___ × 8 = 40		44.	104 ÷ 8 =	

RBIS 1 & 4

Name ____________________ Date __________

1. Each fraction strip is 1 whole. All the fraction strips are equal in length. Color 1 fractional unit in each strip.



2. Circle *less than* or *greater than*. Whisper the complete sentence.

a. $\frac{1}{2}$ is less than / greater than $\frac{1}{4}$

b. $\frac{1}{6}$ is less than / greater than $\frac{1}{2}$

c. $\frac{1}{3}$ is less than / greater than $\frac{1}{2}$

d. $\frac{1}{3}$ is less than / greater than $\frac{1}{6}$

e. $\frac{1}{8}$ is less than / greater than $\frac{1}{6}$

f. $\frac{1}{8}$ is less than / greater than $\frac{1}{4}$

g. $\frac{1}{2}$ is less than / greater than $\frac{1}{8}$

h. 9 eighths is less than / greater than 2 halves

3. Lily needs $\frac{1}{3}$ cup of oil and $\frac{1}{4}$ cup of water to make muffins. Will Lily use more oil or more water? Explain your answer using pictures, numbers, and words.

4. Use >, <, or = to compare.

a. 1 third ◯ 1 fifth

b. 1 seventh ◯ 1 fourth

c. 1 sixth ◯ $\frac{1}{6}$

d. 1 tenth ◯ $\frac{1}{12}$

e. $\frac{1}{16}$ ◯ 1 eleventh

f. 1 whole ◯ 2 halves

Extension:

g. $\frac{1}{8}$ ◯ 1 eighth ◯ $\frac{1}{6}$ ◯ $\frac{1}{3}$ ◯ 2 halves ◯ 1 whole

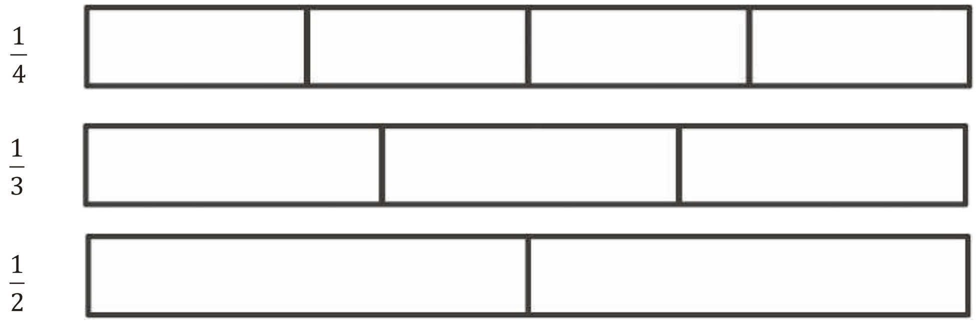
5. Your friend Eric says that $\frac{1}{6}$ is greater than $\frac{1}{5}$ because 6 is greater than 5. Is Eric correct? Use words and pictures to explain what happens to the size of a unit fraction when the number of parts gets larger.

RBIS 1 & 4

RBIS 1 & 4

Name ______________________________ Date ______________

1. Each fraction strip is 1 whole. All the fraction strips are equal in length. Color 1 fractional unit in each strip. Then, circle the largest fraction and draw a star to the right of the smallest fraction.



2. Use >, <, or = to compare.

a. 1 eighth ◯ 1 tenth

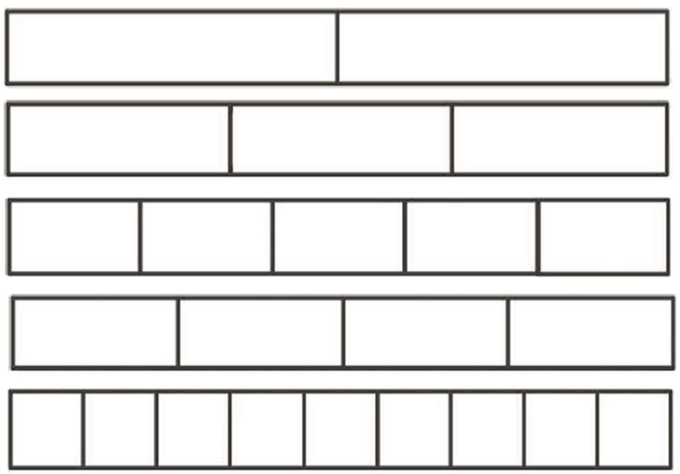
b. 1 whole ◯ 5 fifths

c. $\frac{1}{7}$ ◯ $\frac{1}{6}$

Name ______________________ Date ____________

1. Each fraction strip is 1 whole. All the fraction strips are equal in length. Color 1 fractional unit in each strip. Then, answer the questions below.

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{9}$



2. Circle *less than* or *greater than*. Whisper the complete sentence.

a. $\frac{1}{2}$ is less than / greater than $\frac{1}{3}$

b. $\frac{1}{9}$ is less than / greater than $\frac{1}{2}$

c. $\frac{1}{4}$ is less than / greater than $\frac{1}{2}$

d. $\frac{1}{4}$ is less than / greater than $\frac{1}{9}$

e. $\frac{1}{5}$ is less than / greater than $\frac{1}{3}$

f. $\frac{1}{5}$ is less than / greater than $\frac{1}{4}$

g. $\frac{1}{2}$ is less than / greater than $\frac{1}{5}$

h. 6 fifths is less than / greater than 3 thirds

9

3. After his football game, Malik drinks $\frac{1}{2}$ liter of water and $\frac{1}{3}$ liter of juice. Did Malik drink more water or juice? Draw and estimate to partition. Explain your answer.

4. Use >, <, or = to compare.

a. 1 fourth ◯ 1 eighth

b. 1 seventh ◯ 1 fifth

c. 1 eighth ◯ $\frac{1}{8}$

d. 1 twelfth ◯ $\frac{1}{10}$

e. $\frac{1}{15}$ ◯ 1 thirteenth

f. 3 thirds ◯ 1 whole

5. Write a word problem about comparing fractions for your friends to solve. Be sure to show the solution so that your friends can check their work.

RBIS 1 & 4

RBIS 2

Eureka Math TEKS Edition
Grade 3 Module 5 Topic C

Students practiced identifying and labeling unit and non-unit fractions in Topic B. Now, in Topic C, they begin by comparing unit fractions. Using fraction strips, students recognize that, when the same whole is folded into more equal parts, each part is smaller. Next, using real-life examples and area models, students understand that, when comparing fractions, the whole must be the same size. Next, students create corresponding wholes based on a given unit fraction using similar materials to those in Lesson 4's exploration: clay, yarn, two rectangles, and a square. They conduct a *museum walk* to study the wholes, identifying the unit fractions and observing part–whole relationships. Finally, students learn that redefining the whole can change the unit fraction that describes the shaded part.

A Teaching Sequence Toward Mastery of Comparing Unit Fractions and Specifying the Whole	
Objective 1:	**Compare unit fractions by reasoning about their size using fraction strips. (Lesson 11)**
Objective 2:	**Compare unit fractions with different-sized models representing the whole. (Lesson 12)**
Objective 3:	**Specify the corresponding whole when presented with one equal part. (Lesson 13)**
Objective 4:	**Identify a shaded fractional part in different ways depending on the designation of the whole. (Lesson 14)**

Carnegie Learning Texas Math Solution Grade 6

How does a student demonstrate understanding?

Students will demonstrate understanding of the standards in this topic if they can:

- Identify independent and dependent quantities.
- Recognize that not all relationships between quantities are linear.
- Define variables to represent two quantities in a real-world problem that vary in relationship to one another.
- Write an equation to the relationship between independent and dependent quantities.

Carnegie Learning Texas Math Solution Algebra 1

How does a student demonstrate understanding?

Students will demonstrate understanding of the standards in *Introduction to Exponential Functions* if they can:

- Use the rules of integer exponents to simplify numeric and algebraic expressions.
- Justify the exponent rules, including Product of Powers, Quotient of Powers, Power of a Power, and Zero and Negative Exponent rules.
- Write an equation in function notation for an exponential function represented as a table, graph, set of ordered pairs, or scenario.
- Evaluate an exponential function for any unknown value.

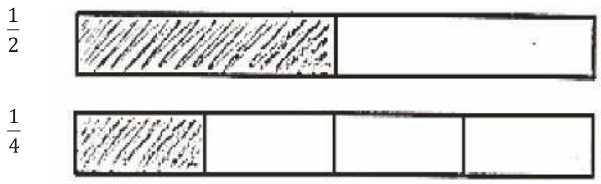
Grade 3 • Module 5

RBIS 3

Fractions as Numbers on the Number Line

OVERVIEW

In this 35-day module, students extend and deepen Grade 2 practice with equal shares to understanding fractions as equal partitions of a whole (**2.3B**). Their knowledge becomes more formal as they work with area models and the number line. Throughout the module, students have multiple experiences working with the Grade 3 specified fractional units of halves, thirds, fourths, sixths, and eighths. To build flexible thinking about fractions, students are exposed to additional fractional units such as fifths, ninths, and tenths.



Compare unit fractions using fraction strips.

Module 4 Overview
Determining Unknown Quantities

Why is this Module named Determining Unknown Quantities?

This module introduces students to the formal study of algebra, which is the study of patterns and generalizing those patterns with symbols. Algebra is often seen as a set of rules and procedures to follow; instead, it should be viewed in terms of patterns and sense-making. The focus of this module is making sense of and reasoning about variables, expressions, and equations.

How is Determining Unknown Quantities connected to prior learning?

This module builds on student knowledge of numeric expressions, patterns, and numeric operations developed throughout elementary school. In this course, students formalize the Order of Operations and

6th Grade

properties of operations and apply these skills to the entire set of rational numbers. Students then build from their understanding of numeric expressions to algebraic expressions. Although students have been using symbols to represent and solve for unknowns in equations since elementary school, the terms *variable*, *solution*, and *equation* are formally defined.

When will students use knowledge from Determining Unknown Quantities in future learning?

This module establishes a strong foundation of reasoning to determine unknown values. Instruction on formal algorithms is delayed until students have had ample opportunity to reason about one-step equations. Connecting reasoning with formal algorithms for solving equations helps students see mathematics as a web of interconnected topics. As students continue in their

Module 3 Overview

Investigating Growth and Decay

RBIS 3

Algebra 1

Why is this module named Investigating Growth and Decay?

Students are familiar with constant differences—where the ratio of output values to input values is the same across the domain of the function. In this module, however, the functions model constant growth or decay, meaning that the amount that the output changes within each interval increases or decreases by a constant multiplier. All of the functions in this module, from geometric sequences through data regressions, share this key characteristic of exponential functions.

How is Investigating Growth and Decay connected to prior learning?

Students enter this module with an understanding of geometric sequences. In **Searching for Patterns**, students wrote explicit formulas for sequences with a common ratio. The first topic of this module builds upon where students left off with geometric sequences. They are reminded of the characteristics of these sequences through an exploration of their graphs. Using the rules of integer exponents that they learned at the start of this topic, students rewrite explicit formulas as exponential functions of the form $f(x) = a \cdot b^x$.

When will students use the knowledge from Investigating Growth and Decay in future learning?

Exponential functions are the first nonlinear functions that students have studied in depth. Throughout this module, students recognize the characteristics that exponential functions and linear functions share (e.g., one x-intercept and one y-intercept, and output values that either increase or decrease across the entire domain). However, they also start to differentiate functions by recognizing that an exponential function grows or decays at a rate much faster than a linear function, that the average rate of change between two points in an exponential function is not constant, and that the range of an exponential function is a subset of the real numbers.