Claim 1: Concepts and Procedures
Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content Domain: **Numbers and Operations—Fractions**

Target G [m]: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. (DOK 1, 2)

Tasks for this target will ask students to identify and generate equivalent forms of a fraction a/b with $a>1$, including mixed numbers with like denominators. Some tasks should incorporate unit fractions and the operations addition and subtraction to express equivalent forms. Other tasks should represent a/b as multiplication of a whole number and unit fraction, with a/b sometimes expressed as the product of a whole number and fraction (e.g., $3 \times \left(\frac{2}{5}\right) = 6 \times \left(\frac{\square}{5}\right)$).

One-step, contextual word problems involving addition and subtraction of fractions referring to the same whole and having like denominators and those involving multiplication of a fraction by a whole number should also be included in this target.

Standards: 4.NF.B, 4.NF.B.3, 4.NF.B.4	**4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** **4.NF.B.3** Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. **a.** Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. **b.** Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ;* *3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* **c.** Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. **d.** Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. **4.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. **a.** Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* **b.** Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* **c.** Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party*

	will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?
Related Below-Grade and Above-Grade Standards for Purposes of Planning for Vertical Scaling: 3.NF.A, 3.NF.A.1, 3.NF.A.2 5.NF.A, 5.NF.A.1, 5.NF.A.2, 5.NF.B, 5.NF.B.4, 5.NF.B.6	**Related Grade 3 Standards** **3.NF.A Develop understanding of fractions as numbers.** **3.NF.A.1** Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by *a* parts of size 1/*b*. **3.NF.A.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram. **a.** Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. **b.** Represent a fraction *a/b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line. **Related Grade 5 Standards** **5.NF.A Use equivalent fractions as a strategy to add and subtract fractions.** **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, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* **5.NF.A.2** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, 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 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.* **5.NF.B Apply and extend previous understandings of multiplication and division to multiply and divide fractions.** **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 (*a/b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*. **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.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.
DOK Levels:	1, 2

Achievement Level Descriptors:

RANGE Achievement Level Descriptor (Range ALD): Target G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	**Level 1** Students should be able to understand that a fraction a/b with $a > 1$ is the sum of its unit fractional parts by extending previous understandings of addition on whole numbers. They should be able to identify fractions using visual models.
	Level 2 Students should be able to understand that a fraction a/b is a multiple of $1/b$ by extending previous understanding of multiplication on whole numbers; solve one-step problems involving addition and subtraction of fractions referring to the same whole with like denominators; and use visual fraction models and/or equations to represent the problem.
	Level 3 Students should be able to identify and generate equivalent forms of a fraction including mixed numbers with like denominators and solve one-step problems involving multiplication of a fraction by a whole number.
	Level 4 No Descriptor

Evidence Required:	1. The student adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole. 2. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator. 3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem. 4. The student represents a fraction a/b as a multiple of $1/b$. 5. The student multiplies a fraction by a whole number. 6. The student solves contextual problems involving the multiplication of a fraction by a whole number by using visual fraction models and equations to represent the problem.
Allowable Response Types:	Multiple Choice, single correct response; Equation/Numeric; Matching Tables; Drag and Drop; Hot Spot
Allowable Stimulus Materials:	number lines, parts of whole visual models, parts of set visual models, equations, expressions
Construct-Relevant Vocabulary:	equation, expression, equal, fraction, model, product, numerator
Allowable Tools:	none

Target-Specific Attributes:	• Unless otherwise specified, no distinction is made between proper and improper fractions. • Unless otherwise specified, improper fractions and mixed numbers do not get special treatment. • The majority of items in this target should follow the CCSS limitations on denominators allowed at 4th grade (2, 3, 4, 5, 6, 8, 10, 12, and 100). For the purposes of adaptive testing, however, some items will use denominators appropriate to 5th grade (includes all denominators).
Non-Targeted Constructs:	none
Accessibility Guidance:	Item writers should consider the following Language and Visual Element/Design guidelines[1] when developing items. Language Key Considerations: • Use simple, clear, and easy-to-understand language needed to assess the construct or aid in the understanding of the context • Avoid sentences with multiple clauses • Use vocabulary that is at or below grade level • Avoid ambiguous or obscure words, idioms, jargon, unusual names and references Visual Elements/Design Key Considerations: • Include visual elements only if the graphic is needed to assess the construct or it aids in the understanding of the context • Use the simplest graphic possible with the greatest degree of contrast, and include clear, concise labels where necessary • Avoid crowding of details and graphics Items are selected for a student's test according to the blueprint, which selects items based on Claims and targets, not task models. As such, careful consideration is given to making sure fully accessible items are available to cover the content of every Claim and target, even if some item formats are not fully accessible using current technology.[2]
Development Notes:	Representing contextual problems with equations will be assessed in Claim 4. Multi-step items combining addition/subtraction and multiplication will be assessed in Claim 2. Determining between which two whole numbers the product of a whole number and a fraction lies will be assessed in Claim 2.

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[1] For more information, refer to the General Accessibility Guidelines at:
http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/Guidelines/AccessibilityandAccommodations/GeneralAccessibilityGuidelines.pdf
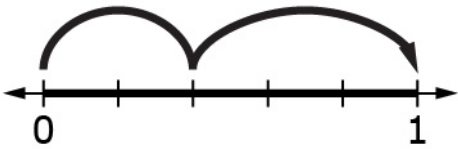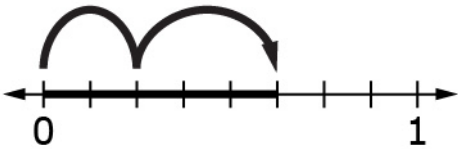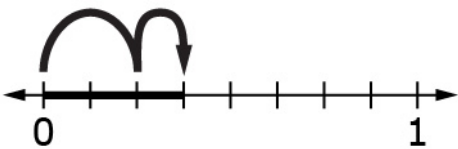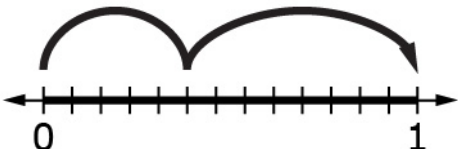[2] For more information about student accessibility resources and policies, refer to
http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf

| Task Model 1a

Response Type:
Equation/Numeric

DOK Level 1

4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.

Evidence Required:
1. The student adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole.

Tools: None | **Prompt Features:** The student is prompted to solve an addition or subtraction fraction problem.

Stimulus Guidelines:
• The student is presented with either an addition or subtraction fraction equation with a box for an unknown number.
• In addition problems, the unknown will be the sum.
• In subtraction problems, the unknown will be the difference.
• Item difficulty can be adjusted via these example methods:
 ○ The location of the unknown in the equation (on the left or right side of the equal sign)
 ○ How "friendly" the numbers are to work with
 ○ Using mixed numbers that have to be broken into parts prior to doing an operation (e.g., $1\frac{2}{5} - \frac{4}{5} = \frac{5}{5} + \frac{2}{5} - \frac{4}{5} = \frac{7}{5} - \frac{4}{5} = \frac{3}{5}$) |
| | **TM1a**
Stimulus: The student is presented with a fraction addition or subtraction equation with a box to represent an unknown result.

Example Stem 1: Enter the unknown number that makes the equation true.

$$\frac{1}{8} + \frac{4}{8} = \square$$

Example Stem 2: Enter the unknown number that makes the equation true.

$$\square = \frac{4}{8} - \frac{1}{8}$$

Rubric: (1 point) The student shows understanding of addition and subtraction of fractions by entering the correct sum or difference of two fractions with like denominators (e.g., $\frac{5}{8}$; $\frac{3}{8}$).

Response Type: Equation/Numeric |

Task Model 1b	Prompt Features: The student is prompted to solve an addition or subtraction fraction problem.

Response Type: Equation/Numeric
 	
DOK Level 2
 	
4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.
 	
Evidence Required:
1. The student adds and subtracts fractions with like denominators by joining and separating parts referring to the same whole.
 	
Tools: None
	Stimulus Guidelines:
	• The student is presented with either an addition or subtraction fraction equation with a box for an unknown number.
	• In addition problems, the unknown will be an addend.
	• In subtraction problems, the unknown will be the minuend or subtrahend.
	• Item difficulty can be adjusted via these example methods:
	  o The location of the unknown in the equation
	    ▪ In addition problems, the first or second addend
	    ▪ In subtraction problems, the minuend or subtrahend
	  o The location of the result in the equation (on the left or right side of the equal sign)
	  o How "friendly" the numbers are to work with
	  o Using mixed numbers that have to be broken into parts prior to doing an operation (e.g., $1\frac{2}{5} - \frac{4}{5} = \frac{5}{5} + \frac{2}{5} - \frac{4}{5} = \frac{7}{5} - \frac{4}{5} = \frac{3}{5}$)
	
	TM1b
	Stimulus: The student is presented with a fraction addition or subtraction equation with a box for an unknown number.
	
	Example Stem 1: Enter the unknown number that makes the equation true.
	
	$$\frac{7}{5} - \square = \frac{4}{5}$$
	
	Example Stem 2: Enter the unknown number that makes the equation true.
	
	$$\frac{4}{5} = \square + \frac{2}{5}$$
	
	Rubric: (1 point) The student shows understanding of addition and subtraction of fractions by entering the correct sum or difference of two fractions with like denominators (e.g., $\frac{3}{5}$; $\frac{2}{5}$).
	
	Response Type: Equation/Numeric

Task Model 2a	**Prompt Feature:** The student is prompted to select an expression that represents a decomposition of a fraction into a sum of fractions with the same denominator.

Task Model 2a

**Response Type:
Matching Tables**

DOK Level 2

4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.

Evidence Required:
2. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator.

Tools: None

Prompt Feature: The student is prompted to select an expression that represents a decomposition of a fraction into a sum of fractions with the same denominator.

Stimulus Guidelines:
- The table will contain addition expressions with two or more fractions each that have the same denominator.
- Item difficulty can be adjusted via these example methods:
  - Presenting a proper fraction, improper fraction, or mixed number as the given fraction
  - Decomposing the given fraction into a greater or lesser number of terms
  - Ordering the addends in the expression by value or not (e.g., putting it as a middle or end term instead of the initial term in the expression)

TM2a
Stimulus: The student is presented with a fraction and three fraction addition expressions. The number 1 may be used in place of a fraction with like denominator.

Example Stem: Decide whether each expression is equal to $1\frac{5}{8}$. Click in the table to respond.

	Equal to $1\frac{5}{8}$	Not Equal to $1\frac{5}{8}$
$1 + \frac{5}{8}$		
$\frac{8}{8} + \frac{3}{8} + \frac{2}{8}$		
$1 + \frac{3}{8} + \frac{1}{8} + \frac{2}{8}$		

Rubric: (1 point) The student correctly identifies all three expressions as either equal or not equal to the given fraction (e.g., Equal, Equal, Not Equal).

Response Type: Matching Tables

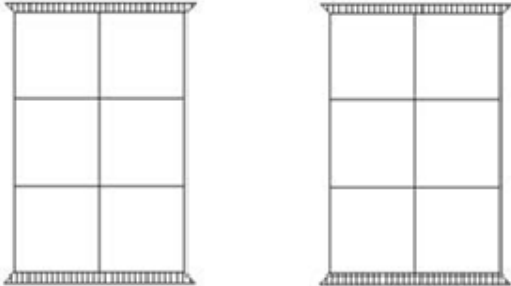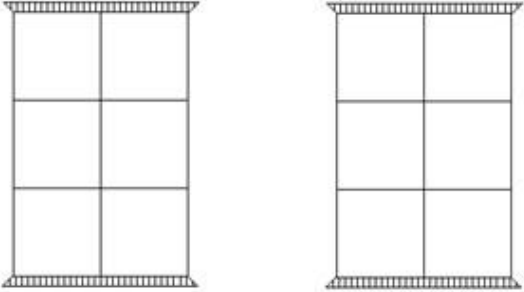| Task Model 2b

Response Type:
Drag and Drop

DOK Level 2

4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.

Evidence Required:
2. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator.

Tools: None

Accessibility Note:
Drag and Drop items are not currently able to be Brailled. Minimize the number of items developed to this TM. | **Prompt Features:** The student is prompted to enter two different ways to decompose a fraction into a sum of fractions with the same denominator.

Stimulus Guidelines:
• Item difficulty can be adjusted via these example methods:
    o The number of addends that the given fraction is decomposed into
    o The number of numerators the student must provide

TM2b
Stimulus: The student is presented with two equations representing the decomposition of a fraction or mixed number.

Example Stem: Drag numbers to the numerators of the fractions to show **two different** correct equations.

$$\frac{7}{8} = \frac{\square}{8} + \frac{\square}{8} + \frac{\square}{8} \qquad \frac{7}{8} = \frac{\square}{8} + \frac{\square}{8} + \frac{\square}{8}$$

Rubric: (1 point) The student correctly completes the equations provided (e.g., 2, 1, 4 and 4, 3, 0).

Response Type: Drag and Drop |

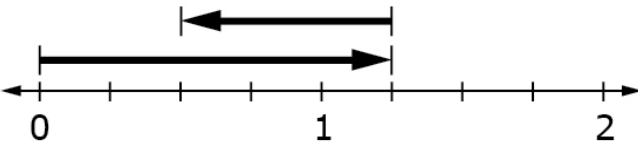| Task Model 2c

Response Type:
Multiple Choice, single
correct response

DOK Level 2

4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.

Evidence Required:
2. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator.

Tools: None | **Prompt Features:** The student is prompted to identify the decomposition of a fraction represented by a visual fraction model.

Stimulus Guidelines:
• The answer choices should be in the form of one of these types of visual fraction models:
    o Parts of a whole
    o Parts of a set
    o Intervals on a number line diagram
• Item difficulty can be adjusted via this example method:
    o Number of addends/jumps used in each equation/model

TM2c
Stimulus: The student is presented with an addition equation representing the decomposition of a fraction.

Example Stem: Select the model that matches this equation.
$$\frac{5}{8} = \frac{2}{8} + \frac{3}{8}$$

A.

B.

C.

D.

Rubric: (1 point) The student selects the correct visual representation of the decomposition of a fraction (e.g., B).

Response Type: Multiple Choice, single correct response |

Task Model 2d	Prompt Features: The student is prompted to express the sum of unit fractions with the same denominator as a fraction or mixed number.
Response Type: Equation/Numeric	
DOK Level 2	**Stimulus Guidelines:** • All addends in the expression are unit fractions. • Item difficulty can be adjusted via this example method: o Number of addends in the expression
4.NF.B.3 Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.	
	TM2d **Stimulus:** The student is presented with an expression representing the decomposition of a fraction into unit fractions.
Evidence Required: 2. The student expresses an equivalent form of a fraction or mixed number by considering each as a sum of fractions with the same denominator.	**Example Stem:** Enter the fraction that is equivalent to the expression: $\frac{1}{8} + \frac{1}{8} + \frac{1}{8}$.
Tools: None	**Rubric:** (1 point) The student enters the correct fraction (e.g., $\frac{3}{8}$).
	Response Type: Equation/Numeric

Task Model 3a	**Prompt Features:** The student is prompted to solve a contextual problem involving the addition and subtraction of fractions.
Response Type: Equation/Numeric **DOK Level 1** **4.NF.B.3** Understand a fraction a/b with $a > 1$ as a sum of fraction $1/b$. **Evidence Required:** 3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem. **Tools:** None	**Stimulus Guidelines:** • The wording of the item provides a clue to the type of operation needed to solve the problem (e.g., item may use words like "combine," "separate," "altogether," "more than," "less than," etc.). • Items may reflect Add To/Take From, Put Together/Take Apart, or Compare situations (refer to Operations and Algebraic Thinking Progression document, Table 1, pg. 7). • Item difficulty can be adjusted via this example method: ◦ Using mixed numbers that have to be broken into parts prior to doing an operation (e.g., $1\frac{2}{5} - \frac{4}{5} = \frac{5}{5} + \frac{2}{5} - \frac{4}{5} = \frac{7}{5} - \frac{4}{5} = \frac{3}{5}$) **TM3a** **Stimulus:** The student is presented with a contextual problem involving the addition or subtraction of fractions referring to the same whole and having like denominators. **Example Stem 1:** John has $\frac{5}{6}$ of a liter of juice. Jill has $\frac{3}{6}$ of a liter of juice. How many liters of juice do John and Jill have together? Enter the number. **Example Stem 2:** Eric has $\frac{7}{8}$ of a pound of nuts. Jill has $\frac{2}{8}$ of a pound of nuts. How many more pounds of nuts does Eric have than Jill? Enter the number. **Rubric:** (1 point) The student enters the correct fraction (e.g, $\frac{8}{6}$ or $\frac{4}{3}$ or $1\frac{2}{6}$ or $1\frac{1}{3}$; $\frac{5}{8}$). **Response Type:** Equation/Numeric

| Task Model 3b

Response Type:
Equation/Numeric

DOK Level 2

4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*.

Evidence Required:
3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem.

Tools: None | **Prompt Features:** The student is prompted to solve a contextual problem involving the addition and subtraction of fractions.

Stimulus Guidelines:
• The wording of the item does not provide a clue to the type of operation needed to solve the problem (e.g., item does not use words such as "combines," "altogether," etc.).
• Items may reflect Add To/Take From, Put Together/Take Apart, or Compare situations (refer to Operations and Algebraic Thinking Progression document, Table 1, pg. 7).
• Item difficulty can be adjusted via this example method:
  ○ using mixed numbers that have to be broken into parts prior to doing an operation (e.g., $1\frac{2}{5} - \frac{4}{5} = \frac{5}{5} + \frac{2}{5} - \frac{4}{5} = \frac{7}{5} - \frac{4}{5} = \frac{3}{5}$).

TM3b
Stimulus: The student is presented with a contextual problem involving the addition or subtraction of fractions referring to the same whole and having like denominators.

Example Stem 1: Jack has $2\frac{3}{4}$ feet of rope. Together, Jack and Diane have $4\frac{1}{4}$ feet of rope. How many feet of rope does Diane have? Enter your answer in the response box.

Example Stem 2: A baker has $3\frac{3}{4}$ cups of sugar. She has $2\frac{1}{4}$ more cups of sugar than cups of flour. How many cups of flour does she have? Enter your answer in the response box.

Rubric: (1 point) The student enters the correct fraction (e.g, $1\frac{2}{4}$, $1\frac{2}{4}$).

Response Type: Equation/Numeric |

Task Model 3c	**Prompt Features:** The student is prompted to manipulate a model representing the addition or subtraction of fractions.
Response Type: Hot Spot	
	Stimulus Guidelines:
DOK Level 1	• Items may reflect Add To/Take From, Put Together/Take Apart, or Compare situations (refer to Operations and Algebraic Thinking Progression document, Table 1, pg. 7).
4.NF.B.3 Understand a fraction a/b with $a > 1$ as a sum of fraction $1/b$.	• Item difficulty can be adjusted via this example method:
	o Using mixed numbers that have to be broken into parts prior to doing an operation (e.g., $1\frac{2}{5} - \frac{4}{5} = \frac{5}{5} + \frac{2}{5} - \frac{4}{5} = \frac{7}{5} - \frac{4}{5} = \frac{3}{5}$)
Evidence Required: 3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem.	**TM3c** **Stimulus:** The student is presented with a contextual problem involving the addition or subtraction of fractions.

Example Stem 1: Michael eats $\dfrac{4}{6}$ of a bar of chocolate. Erin eats $\dfrac{5}{6}$ of a bar of chocolate. |
| **Tools:** None | represents one bar of chocolate |
| **Accessibility Note:** Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM. | **Part A:** Shade the model to show how many bars of chocolate Michael and Erin eat together.

Part B: Click on the total number of bars of chocolate Michael and Erin eat together. |
| | |

Task Model 3c	TM3c (continued)
Response Type: **Hot Spot** **DOK Level 1** **4.NF.3** Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*. **Evidence Required:** 3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem. **Tools:** None **Accessibility Note:** Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.	**Rubric:** **Part A:** (1 point) The student builds a model that correctly represents a fraction addition or subtraction problem (e.g., $1\frac{3}{6}$). **Part B:** (1 point) The student selects the correct number (e.g., $1\frac{3}{6}$). **Response Type:** Hot Spot **Example Stem 2:** Michael and Erin have 2 bars of chocolate. Together they eat $1\frac{1}{6}$ bars of chocolate. represents one bar of chocolate **Part A:** Shade the model to show the amount of chocolate they did **not** eat. **Part B:** Click on the fraction that shows the amount of chocolate they did **not** eat. **Rubric:** **Part A:** (1 point) The student builds a model that correctly represents a fraction addition or subtraction problem (e.g., $\frac{5}{6}$). **Part B:** (1 point) The student selects the correct number (e.g., $\frac{5}{6}$). **Response Type:** Hot Spot

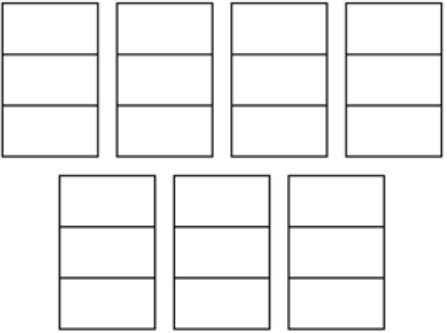|	
Task Model 3d **Response Type: Equation/Numeric** **DOK Level 1** **4.NF.B.3** Understand a fraction *a/b* with *a* > 1 as a sum of fraction *1/b*. **Evidence Required:** 3. The student solves contextual problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem. **Tools:** None **Version 3 Update:** Added new TM3d.	**Prompt Features:** The student is prompted to solve a contextual problem involving the addition and subtraction of fractions. **Stimulus Guidelines:** same as TM3a,b,c **TM3d** **Stimulus:** The student is presented with a model of a contextual problem involving the addition or subtraction of fractions. **Example stem:** José has $1\frac{1}{4}$ cups of a sports drink. He gives $\frac{3}{4}$ cup of his drink to his sister. How much sports drink, in cups, does José has left? **Cups of Sports Drink** **Rubric:** (1 point) The student enters the correct amount (e.g., $\frac{2}{4}$ or $\frac{1}{2}$ or equivalent). **Response Type:** Equation/Numeric

Task Model 4a	Prompt Features: The student is prompted to enter the value of an unknown number in a fraction multiplication equation.
Response Type: Equation/Numeric	**Stimulus Guidelines:**
	• Item difficulty can be adjusted via this example method:
DOK Level 1	○ The product is a whole number or a fraction.
4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	**TM4a** **Stimulus:** The student is presented with a multiplication equation of the form $\square = a \times \frac{1}{b}$.
Evidence Required: 4. The student understands that a fraction *a/b* is a multiple of 1/*b*.	**Example Stem:** Enter the unknown number that makes the equation true. $$\square = 4 \times \frac{1}{12}$$
Tools: None	**Rubric:** (1 point) The student identifies the equivalent fraction or whole number which will make the equation true (e.g., $\frac{4}{12}$).
	Response Type: Equation/Numeric

Task Model 4b	Prompt Features: The student is prompted to enter the value of an unknown number in a fraction multiplication equation.
Response Type: Equation/Numeric **DOK Level 2** **4.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. **Evidence Required:** 4. The student understands that a fraction *a/b* is a multiple of 1/*b*. **Tools:** None	**Stimulus Guidelines:** - The unknown number is one of the factors. - Item difficulty can be adjusted via these example methods: - The product is a whole number or a fraction. - The whole number factor (*a*) is replaced with a box (□). - The fractional factor ($\frac{1}{b}$) is replaced with a box (□). **TM4b** **Stimulus:** The student is presented with a multiplication equation of the form $\frac{a}{b} = a \times \frac{1}{b}$ with an unknown value. **Example Stem:** Enter the unknown number that makes the equation true. $$\frac{4}{12} = \square \times \frac{1}{12}$$ **Rubric:** (1 point) The student identifies the equivalent fraction or whole number which will make the equation true (e.g., 4). **Response Type:** Equation/Numeric

| Task Model 4c

Response Types:
Matching Tables

DOK Level 2

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

Evidence Required:
4. The student understands that a fraction *a/b* is a multiple of 1/*b*.

Tools: None | **Prompt Features:** The student is prompted to identify expressions that are equivalent to an expression of the form $c \times \frac{a}{b}$.

Stimulus Guidelines:
• Fractions presented in stem should have a denominator of 2, 3, 4, 5, 6, 8, 10, 12, or 100.
• Item difficulty may be adjusted via these example methods:
  o Use of fractions with denominators that are multiples of 2, 3, 4, 5, 6, 8, 10, 12, or 100
  o Use of an expression in the numerator or denominator

TM4c
Stimulus: The student is presented with a fraction multiplication expression of the form $c \times \frac{a}{b}$. |

Example Stem 1: Decide whether each expression is equal to $5 \times \frac{2}{4}$. Click in the table to respond.

	Equal to $5 \times \frac{2}{4}$	**Not Equal to** $5 \times \frac{2}{4}$
$2 \times \dfrac{1}{20}$		
$4 \times \dfrac{2}{5}$		
$10 \times \dfrac{1}{4}$		

Example Stem 2: Decide whether each expression is equal to $5 \times \frac{2}{4}$. Click in the table to respond.

	Equal to $5 \times \frac{2}{4}$	**Not Equal to** $5 \times \frac{2}{4}$
$2 \times \dfrac{1}{20}$		
$2 \times \dfrac{5}{4}$		
$\dfrac{5 \times 2}{10}$		

Rubric: (1 point) The student correctly identifies the expressions as Equal or Not Equal (e.g., Not Equal, Not Equal, Equal; Not Equal, Equal, Not Equal).

Response Type: Matching Tables

Task Model 5	Prompt Features: The student is prompted to write the correct product of a fraction and a whole number.
Response Type: Equation/Numeric	**Stimulus Guidelines:**
DOK Level 1	• All items have an unknown product ($c \times \frac{a}{b} = \square$).

4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	• Items may present proper or improper fractions, but not mixed numbers.
	 • Item difficulty may be adjusted via these example methods:
	     o Unit fraction times a whole number, product is a whole number
	     o Unit fraction times a whole number, product is not a whole number
	     o Non-unit fraction times a whole number, product is a whole number
	     o Non-unit fraction times a whole number, product is not a whole number

Evidence Required: 5. The student multiplies a fraction by a whole number.	
Tools: None	**TM5** **Stimulus:** The student is presented with a fraction multiplication equation with an unknown product. **Example Stem:** Enter the unknown number that makes the equation true. $6 \times \frac{5}{8} = \square$ **Rubric:** (1 point) The student multiplies a fraction and a whole number and enters the correct product (e.g., $\frac{30}{8}$ or $3\frac{6}{8}$ or $3\frac{3}{4}$ or equivalent). **Response Type:** Equation/Numeric

| Task Model 6a

Response Type:
Equation/Numeric

DOK Level 2

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

Evidence Required:
6. The student solves contextual problems involving the multiplication of a fraction by a whole number by using visual fraction models and equations to represent the problem.

Tools: None | **Prompt Features:** The student is prompted to solve contextual problems involving the multiplication of a fraction by a whole number.

Stimulus Guidelines:
All items have an unknown product ($c \times \frac{a}{b} = \square$).
Items may present proper or improper fractions, but not mixed numbers.
Item difficulty can be adjusted via these example methods:
Unit fraction times a whole number, product is a whole number
Unit fraction times a whole number, product is not a whole number
Non-unit fraction times a whole number, product is a whole number
Non-unit fraction times a whole number, product is not a whole number
TM6a
Stimulus: The student is presented with a contextual problem involving the multiplication of a fraction by a whole number.

Example Stem: A bottle holds $\frac{3}{5}$ liter of water. Sam needs 8 bottles of water to fill his fish tank. How many liters of water does Sam need to fill the fish tank? Enter the number of liters.

Rubric: (1 point) The student enters the correct product (e.g., $\frac{24}{5}$ or $4\frac{4}{5}$).

Response Type: Equation/Numeric |

Task Model 6b	**Prompt Features:** The student is prompted to solve contextual problems involving the multiplication of a fraction by a whole number using visual fraction models to solve the problem.
Response Type: Hot Spot	
DOK Level 2	**Stimulus guidelines:** Same as for TM6a.
4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	**TM6b** **Stimulus:** The student is presented with a contextual problem involving the multiplication of a fraction by a whole number.
	Example Stem: There are 7 people at a picnic. Each person drinks $\frac{2}{3}$ of a liter of lemonade.
Evidence Required: 6. The student solves contextual problems involving the multiplication of a fraction by a whole number by using visual fraction models and equations to represent the problem.	**Part A:** Each pitcher holds 1 liter. Click on the pitchers to shade the amount of lemonade needed for the picnic. Use the fewest number of pitchers possible.
	Part B: Click the total amount of lemonade that is needed.
Tools: None	
Accessibility Note: Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.	**Part A:** (grid of pitchers) **Part B:** $\frac{14}{3}$ L $\frac{9}{3}$ L $\frac{8}{3}$ L $\frac{10}{3}$ L
	Rubric: **Part A:** (1 point) The student correctly shades the model to represent the product (e.g., $4\frac{2}{3}$). **Part B:** (1 point) The student selects the correct product (e.g., $\frac{14}{3}$).
	Response Type: Hot Spot