Eureka Acceleration Tool: Grade 4
Module 5, Topic A

To become mathematically proficient, students must access on-grade-level content. This document aims to help teachers who use the Eureka curriculum to ensure readiness for students before and during on-grade-level work, creating opportunities for timely support directly connected to the new learning.

About this Topic

Focus Standards:

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

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.*

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).*

Topic Overview per the Eureka Curriculum

Topic A builds on Grade 3 work with unit fractions. Students explore fraction equivalence through the decomposition of non-unit fractions into unit fractions, as well as the decomposition of unit fractions into smaller unit fractions. They represent these decompositions, and prove equivalence, using visual models.
In Lesson 1, students use paper strips to represent the decomposition of a whole into parts. In Lessons 1 and 2, students decompose fractions as unit fractions, drawing tape diagrams to represent them as sums of fractions with the same denominator in different ways, e.g., $\frac{3}{5} = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{1}{5} + \frac{2}{5}$.

In Lesson 3, students see that representing a fraction as the repeated addition of a unit fraction is the same as multiplying that unit fraction by a whole number. This is already a familiar fact in other contexts.
An example is as follows:

3 bananas = 1 banana + 1 banana + 1 banana = 3 × 1 banana

3 twos = 2 + 2 + 2 = 3 × 2

3 fourths = 1 fourth + 1 fourth + 1 fourth = 3 × 1 fourth

$$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 3 \times \frac{1}{4}$$

By introducing multiplication as a record of the decomposition of a fraction early in the module, students are accustomed to the notation by the time they work with more complex problems in Topic G.
Students continue with decomposition in Lesson 4, here hey use tape diagrams to represent fractions, e.g., $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{2}{3}$, as the sum of smaller unit fractions. Students record the results as a number sentence, e.g., $\frac{1}{2} = \frac{1}{4} + \frac{1}{4} = \left(\frac{1}{8} + \frac{1}{8}\right) + \left(\frac{1}{8} + \frac{1}{8}\right) = \frac{4}{8}$.

In Lesson 5, this idea is further investigated as students represent the decomposition of unit fractions in area models. In Lesson 6, students use the area model for a second day, this time to represent fractions with different numerators. They explain why two different fractions represent the same portion of a whole.

Overview

Eureka Acceleration Tools include:

1. a diagnostic assessment to help teachers determine the misunderstandings or gaps in mathematical knowledge related to a specific Topic in the Eureka curriculum
2. guidance for teachers to analyze student work on the diagnostic assessment
3. suggested materials for targeted remedial instruction

Note: The use of this guidance is not intended to delay students' engagement with on-grade-level learning. On-grade-level learning should be the focus of instructional time and be treated as an opportunity for students to "finish" learning previous skills and deepen conceptual understanding.

Diagnostic Assessment

The diagnostic assessment is designed to be administered to targeted students prior to beginning instruction on the given Topic. When appropriate, it is broken into parts (Part A, Part B, and so on); each part addresses a different prerequisite standard and contains three problems. If a student correctly answers at least 2 out of the 3 problems, it can be assumed that he/she is ready to engage with the new content of the Topic with little to no support needed prior to engaging with the Topic. The diagnostic assessment is designed in this way so that teachers can determine the "entry point" to remedial instruction and/or opportunities for unfinished learning within the context of the new learning. The entry points and opportunities for unfinished learning will vary between students.

Guidance for Acceleration

The Acceleration Guidance is designed for teacher use. It is also broken into parts (Part A, Part B, and so on) and correlates to the parts on the diagnostic assessment. Each part contains the following:

1. **The focus standard**: The focus standards are strategically chosen to address prerequisite skills and are purposefully arranged in the order that students typically master the skills and knowledge.
2. **Why this is important for current grade level work**: This section describes how the work of the prerequisite standard relates to the standard(s) addressed in the Topic of instruction.
3. **Using the diagnostic assessment to identify gaps**: This section identifies common errors students make on the diagnostic assessment items.
4. **Acceleration Resources for Targeted Instruction**: The resources pinpoint specific Eureka lessons and parts of lessons for teachers to use to address gaps in mathematical knowledge. Using Eureka materials to address acceleration ensures alignment to the standards, consistency in approach to learning, and similarities in strategies for solving problems.

Part A: 3.NF.A.1

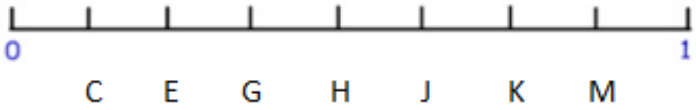
1. The model below is partitioned into equal parts. What fraction of the model is shaded? Explain your thinking.

2. The model below is partitioned into equal parts. What fraction of the model is not shaded? Explain your thinking.

3. Create a model to represent $\frac{2}{6}$.

Part B: 3.NF.A.2a

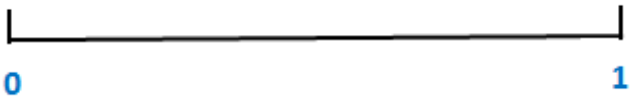
Use the number line diagram below to answer questions 4 and 5.



4. Which fraction would best represent the location of C on the number line? Explain your thinking.

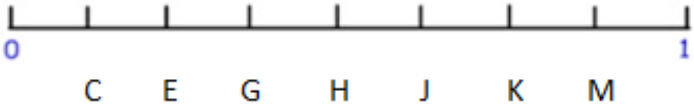
5. What fraction represents the distance from Letter K to Letter M on the number line? Explain your thinking.

6. Represent $\frac{1}{4}$ on the number line below. Explain your thinking.



Part C: 3.NF.A.2b

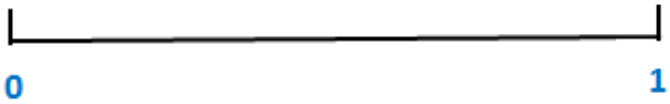
Use the number line diagram below to answer questions 7 and 8.



7. Which fraction would best represent the location of J on the number line? Explain your thinking.

8. What fraction represents the distance from Letter H to Letter K on the number line? Explain your thinking.

9. Represent $\frac{3}{4}$ on the number line below. Explain your thinking.



Solutions:

1. $\frac{1}{3}$; Explanations will vary.
2. $\frac{2}{4}$ is the preferred answer, but $\frac{1}{2}$ is an acceptable answer. Explanations will vary.
3. Accept all models (rectangular, circle, etc.) with 6 equal parts with 2 of the parts shaded
4. C; Explanations will vary.
5. $\frac{1}{8}$; Explanations will vary.
6. Number line should be separated into four equal parts with the first part being labeled $\frac{1}{4}$. Explanations will vary.
7. J; Explanations will vary.
8. $\frac{2}{8}$; Explanations will vary.
9. Number line should be separated into four equal parts with $\frac{3}{4}$ labeled at the third part. Explanations will vary.

Part A Focus: 3.NF.A.1. Understand a fraction 1/*b*, with denominators 2, 3, 4, 6, and 8, 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*.

<table>
<tr><td colspan="3">Why this is important for current grade level work:
As the Grade 4 work with fractions progresses towards addition and subtraction of fractions, it is imperative that students have a solid understanding of fractions as a number and the connections between fractions as numbers and the models they can represent. Most of the work in Module 5 is grounded in visual models, helping students move from the concrete to the abstract, and many problems will expect students to create their own models (see Problem 3). Mastery of this standard will not only help students access the content in Topic A but the entire Module.</td><td rowspan="2">Acceleration Resources for Targeted Instruction:

<u>3rd Grade, Module 5, Topic B, Lesson(s) 5 – 7</u>

Use the Concept Development portion of each Lesson and a sampling of problems from the Problem Set focused on conceptual understanding.</td></tr>
<tr><td colspan="3">Using the Diagnostic Assessment to identify gaps:</td></tr>
<tr><td>Problem 1:
Students should include the idea of “equal parts” in their explanation.</td><td>Problem 2:
Students should include the idea of “equal parts” in their explanation, and 2/4 is the preferred answer as 2 of the four equal parts are not shaded. If a student uses ½, their explanation must match to demonstrate readiness.</td><td>Problem 3:
This problem is open-ended to assess whether students can draw their own fraction model. The most important look-for here is equal parts (to the best of their ability).</td></tr>
</table>

Part B Focus: 3.NF.A.2a Understand a fraction with denominators 2, 3, 4, 6, and 8 as a number 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.

<table>
<tr><td colspan="3">Why this is important for current grade level work:
Before students can truly understand a fraction a/b, they must deeply understand a fraction 1/b using visual models as well as the number line. The number line moves students forward in their understanding of fractions from representing parts of a partitioned shape to parts of a whole number, namely 1. The number line also reinforces the idea of equal parts, which will transfer to the new learning of the target Topic in Lessons 1 and 2 where students decompose fractions into a sum of equal parts (i.e., unit fractions). The most important look-fors here are the accuracy of their answers and the mentioning of equal parts in their explanations.</td><td rowspan="2">Acceleration Resources for Targeted Instruction:

<u>3rd Grade, Module 5, Topic D, Lesson 14</u>

Use the Concept Development portion of each Lesson and a sampling of problems from the Problem Set focused on conceptual understanding.</td></tr>
<tr><td colspan="3">Using the Diagnostic Assessment to identify gaps:</td></tr>
<tr><td>Problem 4:
Look for students who use a denominator of either 7 or 9, both incorrect, as this shows they do not understand how to move from a number line to a fraction.</td><td>Problem 5:
Listen for students to understand that distance between every two consecutive letters is the same. If a student uses a unit fraction with an incorrect denominator (consistent with their response to Problem 1), he/she likely understands that each part is equal.</td><td>Problem 6:
Look for students to correctly make 3 marks to divide the number line into fourths, then mark the distance from 0 to the 1st mark as ¼.</td></tr>
</table>

Part C Focus: 3.NF.A.2b Understand a fraction as a number on the number line; represent fractions on a number line diagram.

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.

Why this is important for current grade level work:
This foundational standard builds the exact understanding needed to master the target grade-level expectation of decomposing a fraction into a sum of fractions. For students to truly understand decomposition of non-unit fractions, they must first see on the number line how a non-unit fraction is formed and what it represents. It is possible that a student may not demonstrate full mastery of this standard prior to engaging with the grade-level work but still be considered ready based on the previous foundational standards. You might view this as an opportunity for unfinished learning, helping students continue their pursuit of mastery of this standard as they pursue mastery of the target grade-level standards.

Using the Diagnostic Assessment to identify gaps:

Problem 7:
Look for students who use a denominator of either 7 or 9, both incorrect, as this shows they do not understand how to move from a number line to a fraction.

Problem 8:
Listen for students to understand that distance between every two consecutive letters is the same. If a student uses a unit fraction with an incorrect denominator (consistent with their response to Problem 1), he/she likely understands that each part is equal. This problem extends beyond Problem 5 in that the distance is more than a single unit/part.

Problem 9:
Look for students to correctly make 3 marks to divide the number line into fourths, then mark the distance from 0 to the 3rd mark as ¾.

Acceleration Resources for Targeted Instruction:

3rd Grade, Module 5, Topic D, Lesson(s) 15 - 16

Use the Concept Development portion of each Lesson and a sampling of problems from the Problem Set focused on conceptual understanding.