Inspect
CCR Performance Tasks

Math Grade 4: Use Models to Compare Fractions

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Inspect offers the following assessment products:

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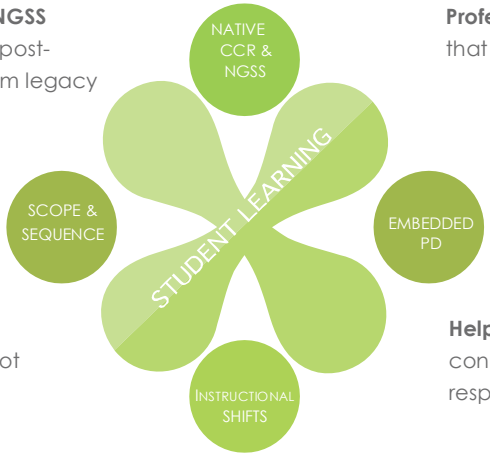
Observational Tasks for English/Language Arts and Math Grades K - 1	▪ Developmentally appropriate for individual students and small groups

Inspect Assessment Content is available through a variety of assessment administration and data analysis platforms.

Inspect assessment content offers these benefits:

Native college- and career-ready and NGSS content prepares students to meet their post-secondary goals. Content re-aligned from legacy standards cannot do this.



Professional development embedded within content that

- shows the relationship between specific skills and higher-order thinking
- includes authentic, permissioned texts of appropriate complexity
- and documents student progress using DOK and learning progressions

Content that addresses your scope and sequence so that your assessments do not waste valuable instruction time

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CCR Performance Tasks

Math Grade 4: Use Models to Compare Fractions

Student Test Booklet

Name:

Student Rubric

This problem tests if you can:
• Compare fractions;
• Explain your answers using more than one visual model.

Your teacher will give your answer a 4, 3, 2, 1, or 0.

This is how you get a 4:
Your answer is correct and complete.
• You show the correct locations of fractions on a number line.
• You write an explanation that helps your teacher understand how you located the fractions on the number line and why the locations are correct.
• You make drawings to represent three fractions, and you write an explanation that helps your teacher understand how to use your drawings to compare the fractions.

This is how you get a 3:
Your answer is correct but one or two of your explanations are incomplete or you make a small mistake.
• You show the correct locations of fractions on a number line.
• You write an explanation that helps your teacher understand how you located the fractions on the number line and why the locations are correct, but your explanation may be incomplete.
• You make drawings to represent three fractions, and you write an explanation that helps your teacher understand how to use your drawings to compare the fractions, but your explanation may be incomplete.

This is how you get a 2:
You answered only one part or you make some big mistakes.
• You show the correct location of at least one fraction on a number line.
• You explain how to locate fractions on a number line, but your explanation has mistakes.
• You make drawings to represent fractions, but one or two of your drawings are not correct. You write an explanation to help your teacher understand your drawings but your explanation is not correct or is hard to understand.

This is how you get a 1:
Your answers are incorrect.
• You do not show the correct locations of any fractions on a number line.
• You do not explain how you located the fractions on the number line or your explanation shows that you do not understand how to locate fractions on the number line.
• You make drawings that do not correctly represent all three fractions and you do not write an explanation of your drawings or your explanation shows that you do not understand how to represent fractions by making drawings.

This is how you get a 0:
Your answer is not related to the question, the teacher cannot understand your answer, or you do not write anything.

Name:_____

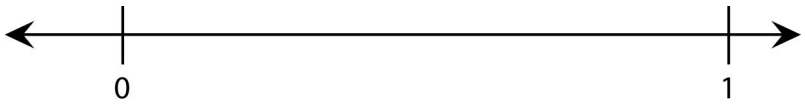
Math Grade 4: Use Models to Compare Fractions

Complete all the tasks in the test booklet.

1 Emily's mother buys two one-pound bags of bread from the bakery. One bag contains a regular rectangular loaf and the other bag contains five round rolls. Emily's mother cuts the rectangular loaf into 8 equal slices.

Emily uses 3 of the rolls and 2 of the slices to make sandwiches. She calculates that the 3 rolls make up $\frac{3}{5}$ of all the bread in one bag and the slices make up $\frac{2}{8}$ of all the bread in the other bag. Emily wants to know if she is using a greater fraction of the rolls or the rectangular loaf.

A. On the number line below, show where $\frac{3}{5}$ and $\frac{2}{8}$ are located. Explain how you know where to place the fraction on the number line.



B. Find a fraction that lies between $\frac{3}{5}$ and $\frac{2}{8}$, and show the location of that fraction on the number line. Explain how you know that it lies between $\frac{3}{5}$ and $\frac{2}{8}$.

Name:_____

Math Grade 4: Use Models to Compare Fractions

C. Using the rectangles below, draw a picture for $\frac{3}{5}$, for $\frac{2}{8}$, and for your fraction. Explain how your picture shows that your fraction is between $\frac{3}{5}$ and $\frac{2}{8}$.

$\frac{3}{5}$

$\frac{2}{8}$

Your fraction: —

D. Emily's mother buys another one-pound rectangular loaf of bread. She cuts this loaf into 10 equal slices. Emily uses 6 of these slices and calculates that this is $\frac{6}{10}$ of the loaf. She wants to know how this compares with how much she used from the first two bags of bread. Where is the fraction $\frac{6}{10}$ located on the number line in part A? Explain how you know.

CCR Performance Tasks

Math Grade 4: Use Models to Compare Fractions

Teacher Guide

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About the Teacher Guide

This document contains support materials for “Math Grade 4: Use Models to Compare Fractions.” This includes:

(a) The task
(b) The standards and depth of knowledge level of the task
(c) The scoring rubric
(d) Discussion questions
(e) Extension activities

These specifications have been included to help you connect the task to the Common Core content standards and the standards for mathematical practice. The rubric is designed to help you look for the development of mathematical practices in student work. It is also here to help you look for consistencies in student content errors that can help guide intervention and reteach strategies.

Test Definition File

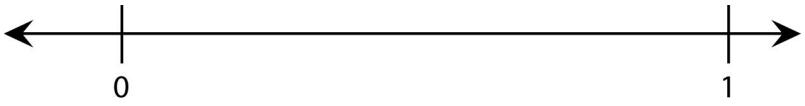
Item #	Correct Answer	Practice Standard	Content Standards
1	See Scoring Rubric	Mathematical Practice 4	4.NF.1, 4.NF.2

SBAC Claims	PARCC Sub-Claims
1 and 4	A and D

Performance Task

Emily's mother buys two one-pound bags of bread from the bakery. One bag contains a regular rectangular loaf and the other bag contains five round rolls. Emily's mother cuts the rectangular loaf into 8 equal slices. Emily uses 3 of the rolls and 2 of the slices to make sandwiches. She calculates that the 3 rolls make up $\frac{3}{5}$ of all the bread in one bag and the slices make up $\frac{2}{8}$ of all the bread in the other bag. Emily wants to know if she is using a greater fraction of the rolls or the rectangular loaf.

A. On the number line below, show where $\frac{3}{5}$ and $\frac{2}{8}$ are located. Explain how you know where to place the fraction on the number line.



B. Find a fraction that lies between $\frac{3}{5}$ and $\frac{2}{8}$, and show the location of that fraction on the number line. Explain how you know that it lies between $\frac{3}{5}$ and $\frac{2}{8}$.

C. Using the rectangles below, draw a picture for $\frac{3}{5}$, for $\frac{2}{8}$, and for your fraction. Explain how your picture shows that your fraction is between $\frac{3}{5}$ and $\frac{2}{8}$.

$\frac{3}{5}$

$\frac{2}{8}$

Your fraction: —

D. Emily's mother buys another one-pound rectangular loaf of bread. She cuts this loaf into 10 equal slices. Emily uses 6 of these slices and calculates that this is $\frac{6}{10}$ of the loaf. She wants to know how this compares with how much she used from the first two bags of bread. Where is the fraction $\frac{6}{10}$ located on the number line in part A? Explain how you know.

Standards Alignment

Practice Standards

MP4 > DOK 3

Model with mathematics. -- Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Content Standards

4.NF.1

Explain why a fraction a/b is equivalent to a fraction $\frac{(n \times a)}{(n \times b)}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.2

Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

SBAC Claims

Mathematics Claim #1:

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

Mathematics Claim #4:

Modeling and Data Analysis. Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

PARCC Sub-Claims

Sub-Claim A:

Major Content with Connections to Practices. The student solves problems involving the Major Content for her grade/course with connections to the Standards for Mathematical Practice.

Sub-Claim D:

Highlighted Practice MP.4 with Connections to Content: modeling/application. The student solves real-world problems with a degree of difficulty appropriate to the grade/course by applying knowledge and skills articulated in the standards for the current grade/course (or, for more complex problems, knowledge and skills articulated in the standards for previous grades/courses), engaging particularly in the Modeling practice, and where helpful making sense of problems and persevering to solve them (MP.1), reasoning abstractly and quantitatively (MP.2), using appropriate tools strategically (MP.5), looking for and making use of structure (MP.7), and/or looking for and expressing regularity in repeated reasoning (MP.8).

Scoring Rubric

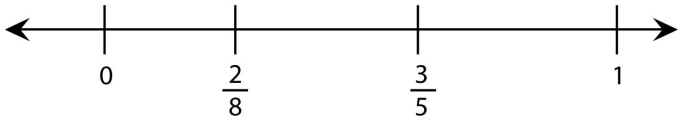
4 Point Response:
The response demonstrates a high level of understanding. A level 4 response is characterized by:

- A strong understanding of how fractional values correspond to locations on the number line.
- The ability to use visual fraction models and other representations to compare fractions.
- An ability to recognize equivalent fractions and provide a valid explanation for why two fractions are equivalent.

A level 4 response should include:

- A correct placement of $\frac{3}{5}$ and $\frac{2}{8}$ on the number line, with a valid explanation of their locations.
- An identification of a fraction that lies between $\frac{3}{5}$ and $\frac{2}{8}$, with a correct justification for the choice of the fraction.
- Correct representations for each of the three fractions, and an explanation that correctly describes how the pictures indicate the relative locations of the fractions on the number line.
- A valid explanation for where the fraction $\frac{6}{10}$ occurs on the number line, with a justification explaining that $\frac{6}{10} = \frac{3}{5}$.

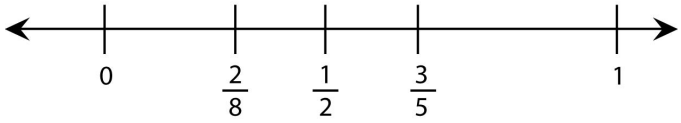
Sample response for part A: "In $\frac{3}{5}$, 3 is more than half of 5, so $\frac{3}{5}$ is to the right of $\frac{1}{2}$ on the number line. The fraction $\frac{2}{8}$ is the same as $\frac{1}{4}$, so it is halfway between 0 and $\frac{1}{2}$."



Answers for part B will vary. There are many fractions between $\frac{3}{5}$ and $\frac{2}{8}$.

Sample responses for part B:

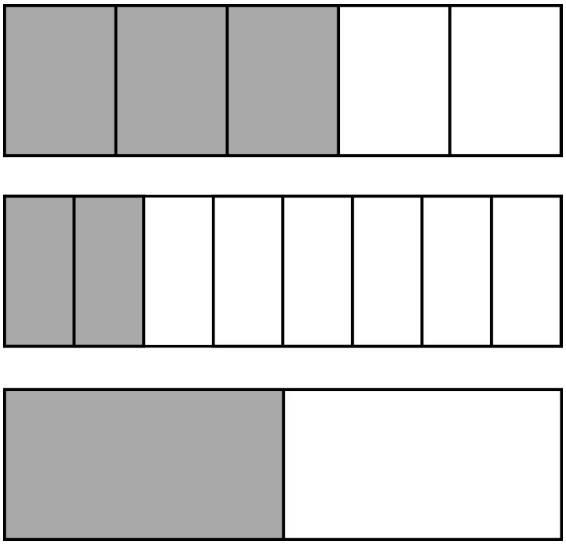
- "Since $\frac{3}{5} = \frac{12}{20}$ and $\frac{2}{8} = \frac{5}{20}$, $\frac{10}{20} = \frac{1}{2}$ is between them."



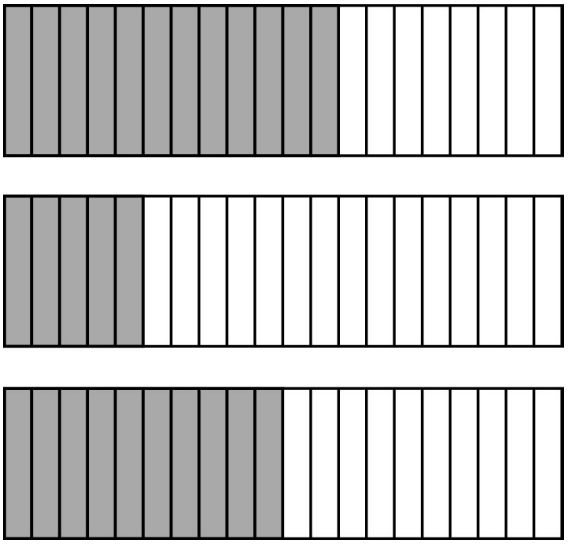
- "The fraction $\frac{2}{5}$ occurs between $\frac{3}{5}$ and $\frac{2}{8}$. Since $\frac{2}{5}$ and $\frac{3}{5}$ have the same denominator but $2 < 3$, then $\frac{2}{5} < \frac{3}{5}$. Since $\frac{2}{5}$ and $\frac{2}{8}$ have the same numerator but $5 < 8$, then $\frac{2}{5} > \frac{2}{8}$. Therefore, the fraction $\frac{2}{5}$ occurs between $\frac{3}{5}$ and $\frac{2}{8}$ on the number line."

Sample responses for part C:

- "In the pictures below, more of the rectangle is shaded for $\frac{3}{5}$ than for $\frac{1}{2}$, but less of the rectangle is shaded for $\frac{2}{8}$ than $\frac{1}{2}$. That means that $\frac{3}{5} > \frac{1}{2} > \frac{2}{8}$, so $\frac{1}{2}$ occurs between $\frac{3}{5}$ and $\frac{2}{8}$ on the number line."



- "The fraction $\frac{3}{5} = \frac{12}{20}$, and the fraction $\frac{2}{8} = \frac{1}{4} = \frac{5}{20}$, so I divided each rectangle into 20 sections. The fraction $\frac{1}{2} = \frac{10}{20}$, so I shaded 10 of the sections for my fraction. Since 12 > 10 > 5, then $\frac{12}{20} > \frac{10}{20} > \frac{5}{20}$, so $\frac{3}{5} > \frac{1}{2} > \frac{2}{8}$, which means that $\frac{1}{2}$ must occur between $\frac{3}{5}$ and $\frac{2}{8}$ on the number line."



Sample responses for part D:

- "Since 6 ÷ 2 = 3 and 10 ÷ 2 = 5, then $\frac{6}{10}$ and $\frac{3}{5}$ are equivalent fractions. So they occur at the same point on the number line."
- "The pictures below show that $\frac{3}{5}$ and $\frac{6}{10}$ fill the same portion of the rectangle, so they are equivalent fractions. They occur at the same place on the number line."

3 Point Response
The response demonstrates a strong understanding of fractions, but the argument is incomplete. A level 3 response is characterized by:

- A strong understanding of how fractional values correspond to locations on the number line.
- The ability to use visual fraction models and other representations to compare fractions.
- An ability to recognize equivalent fractions and provide a valid explanation for why two fractions are equivalent, although the explanation is incomplete.

2 Point Response
The response demonstrates a basic understanding of fractions but a weak ability to construct a viable argument. A level 2 response is characterized by:

- An understanding of how fractional values correspond to locations on the number line.
- A basic ability to use visual fraction models to represent fractions.
- A weak ability to provide a valid explanation for why one fraction is greater or less than another and why two fractions are equivalent. The explanations may be vague or missing.

1 Point Response
The response demonstrates minimal understanding. A level 1 response is characterized by:

- A weak understanding of how fractional values correspond to locations on the number line, with obvious misconceptions about the relationship.
- A weak ability to use visual fraction models and other representations to compare fractions, as evidenced by major errors.
- A weak ability to recognize equivalent fractions and provide a valid explanation for why two fractions are equivalent. The explanation contains incorrect statements or is otherwise flawed.

0 Point Response
There is no response, or the response is off topic.

Discussion Questions

Use the following questions to stimulate discussion:

1. How can you tell if the value of one fraction is greater than another?

Possible Response: *There are three ways. One way is to find equivalent fractions with common denominators; then the fraction with the larger numerator is greater. Another way is to find equivalent fractions with common numerators; then the fraction with the smaller denominator is greater. A third way is to compare both fractions to a benchmark fraction, such as* $\frac{1}{2}$*; for instance, since* $\frac{3}{5} > \frac{1}{2}$ *but* $\frac{2}{8} < \frac{1}{2}$ *then* $\frac{3}{5}$ *must be greater than* $\frac{2}{8}$*.*

2. How many fractions occur between $\frac{3}{5}$ and $\frac{2}{8}$?

Possible Response: *An infinite number, so there are many to choose from. For instance,* $\frac{3}{5} = \frac{24}{40}$ *and* $\frac{2}{8} = \frac{10}{40}$*, so any of the fractions* $\frac{11}{40}, \frac{12}{40}, \frac{13}{40}, \ldots, \frac{23}{40}$ *would work. But you don't even have to use such nice denominators. For instance,* $\frac{3}{5} = \frac{16.2}{27}$ *and* $\frac{2}{8} = \frac{6.75}{27}$ *so any of the fractions* $\frac{7}{27}, \frac{8}{27}, \ldots, \frac{16}{27}$ *would also work.*

3. How do visual models of fractions help you find their locations on a number line?

Possible Response: *One way to represent a fraction with a visual model is to divide a rectangle into equal pieces so that the total number of pieces is equal to the denominator. Then, color in a number of pieces equal to the numerator. Similarly, to find the location of a fraction on a number line, divide the line between 0 and 1 into equal sections so that the total number of sections is equal to the denominator. Then, find the section equal to the numerator. They're the same process, just in two different representations.*

Extension Activities

1. Developing number sense using benchmark fractions.

   A. Construct a set of benchmark fractions and create a number line that shows the location of the benchmark fractions. Compare other fractions to the benchmark fractions using a number line, area models or other visual models.
   Sample: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or $\frac{1}{3}$, $\frac{2}{3}$

2. Compare fractions with common denominators, common numerators, and unlike denominators and numerators, using a number line, area models, or other visual models.

   A. Compare fractions with common denominators

   Sample: $\frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \ldots, \frac{11}{12}$

   B. Compare fractions with common numerators

   Sample: $\frac{3}{4}, \frac{3}{5}, \frac{3}{6}, \ldots, \frac{3}{20}$

   C. Extend the idea to fractions with unlike denominators and unlike numerators.

   Sample: Compare $\frac{5}{6}$ and $\frac{14}{15}$ using common denominators; compare $\frac{4}{11}$ and $\frac{8}{21}$ using common numerators.

3. Extend the ideas of comparing numerators and denominators to fractions greater than 1, using a number line, area models, or other visual models.

   A. Compare mixed numbers to mixed numbers or improper fractions to improper fractions, using common denominators or numerators.

   Sample: $\frac{5}{2}$ and $\frac{5}{3}$; $2\frac{8}{13}$ and $2\frac{9}{13}$

   B. Compare mixed numbers with improper fractions, using fractions that are not multiples of each other.

   Sample: $\frac{3}{2}$ and $1\frac{2}{3}$