Inspect
CCR Performance Tasks

Math Grade 5: Construct Viable Arguments About Adding Fractions

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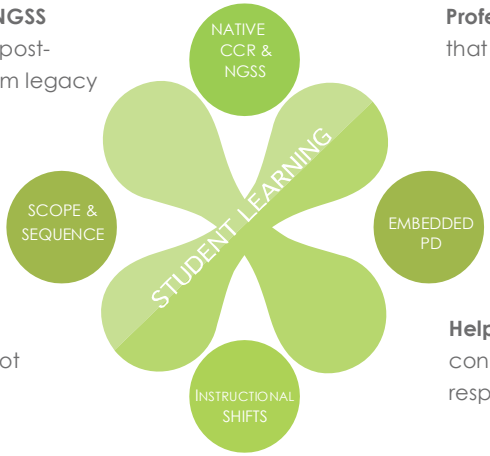
Inspect offers the following assessment products:

Content Bank for English/Language Arts and Math Grades 2 – High School	▪ More than 36,000 items ▪ More 1500 complex texts, including authentic permissioned texts ▪ Includes Literacy in History, Social Science, Science, and Technical Subjects
Quick Checks for English/Language Arts and Math Grades 2 – High School	▪ Fixed-form assessments with five to seven items including constructed response ▪ Key instructional concepts embedded in standards (clusters for Math, staircase of text complexity for ELA)
Focused Interim Assessments for English/Language Arts and Math Grades 3 – High School	▪ Prebuilt assessments with up to 15 items that focus on groups of related standards within a Claim or domain ▪ More focused than summative assessments ▪ Flexible and customizable ▪ Mirrors SBAC IAB blueprints
NGSS Formative Assessments Grades 5 – High School	▪ Prebuilt assessments with items linked to experimental contexts that assess the three dimensions of science learning ▪ Flexible and customizable ▪ Addresses the California Course Models and NGSS Bundles
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

Help for teachers addressing the instructional shifts with content that elicits evidence of learning from each response

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CCR Performance Tasks

Math Grade 5: Construct Viable Arguments About Adding Fractions

Student Test Booklet

Name:

Student Rubric

This problem is meant to test if you can:
• Explain why someone else's work is incorrect;
• Show work and explain why your work is correct;

Your teacher will rate your answer as a level 4, 3, 2, 1, or 0. The descriptions below explain the types of answers expected at each level.

Level 4:
Your answer is correct and complete.
Your answer includes:
• A correct and complete explanation of why the work and explanation shown in the problem does not make sense.
• A correct answer to the problem and complete work that shows how you got your answer.
• A correct and complete explanation of why your answer is correct and makes sense.

Level 3:
Your answer is correct but one or two of your explanations are incomplete.
Your answer includes:
• A correct but maybe incomplete explanation of why the work and explanation shown in the problem is incorrect and does not make sense.
• A correct answer to the problem and complete work that shows how you got your answer.
• A correct but maybe incomplete explanation of why your answer is correct and makes sense.

Level 2:
You have answered one part correctly but your explanations are missing or weak.
Your answer includes:
• A missing or very weak explanation of why the work and explanation shown in the problem are incorrect.
• A correct answer to the problem with some work shown.
• A missing or very weak explanation of why your answer is correct and makes sense.

Level 1:
Your answers are incorrect.
Your answer includes:
• A missing or incorrect explanation of why the work and explanation shown in the problem are incorrect.
• An incorrect answer to the problem with missing or incorrect work shown.
• A missing or incorrect explanation of why your answer is correct and makes sense.

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

Name:_____

Math Grade 5: Construct Viable Arguments About Adding Fractions

Complete all the tasks in the test booklet.

1 **Carl's teacher gave him the following problem to solve.**

$$\frac{2}{5} + \frac{3}{10}$$

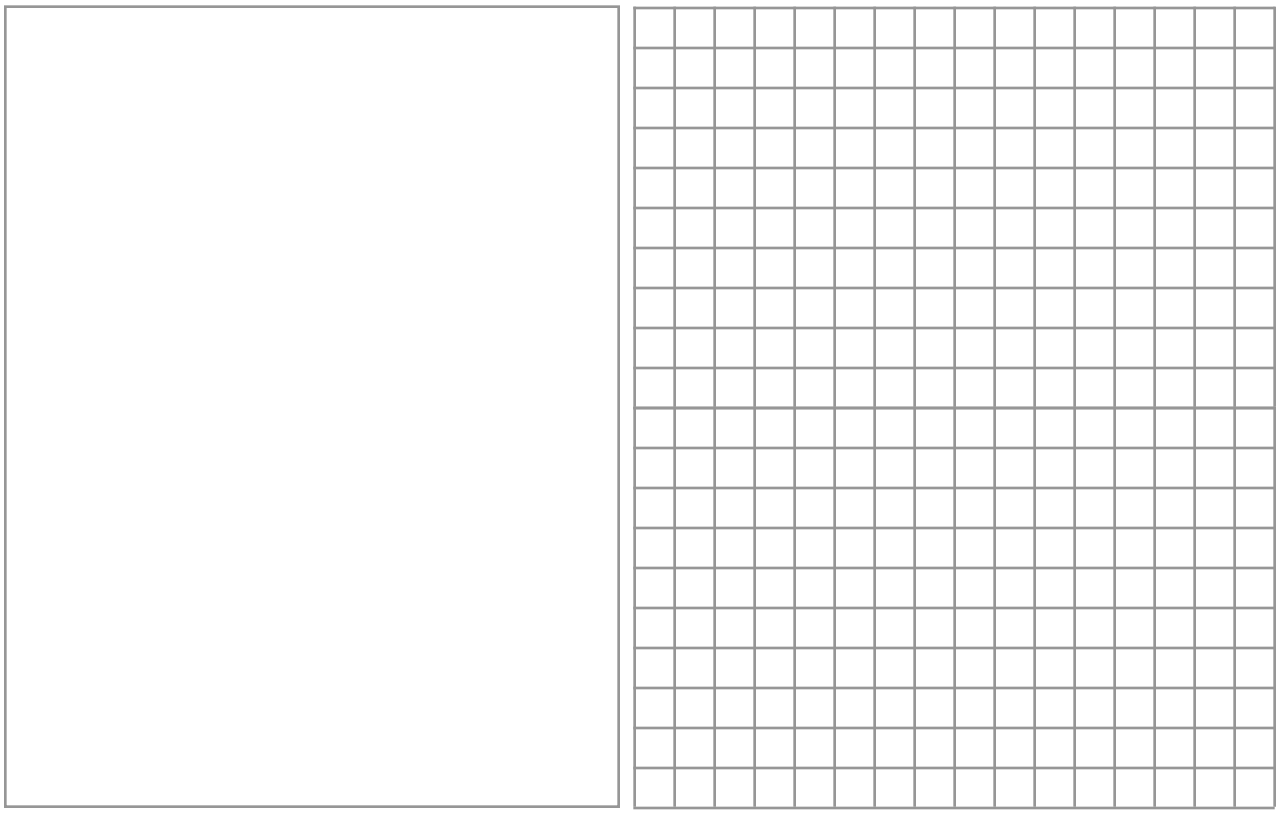
Carl solved the problem and explained his reasoning. His work is shown below.

$\frac{2}{5} + \frac{3}{10} = \frac{5}{15}$

because $2 + 3 = 5$

and $5 + 10 = 15$

A. Explain why Carl's answer, $\frac{5}{15}$, does not make sense. Use words, numbers and/or pictures in your answer. The grid space below is included to help you draw any pictures you choose to include.



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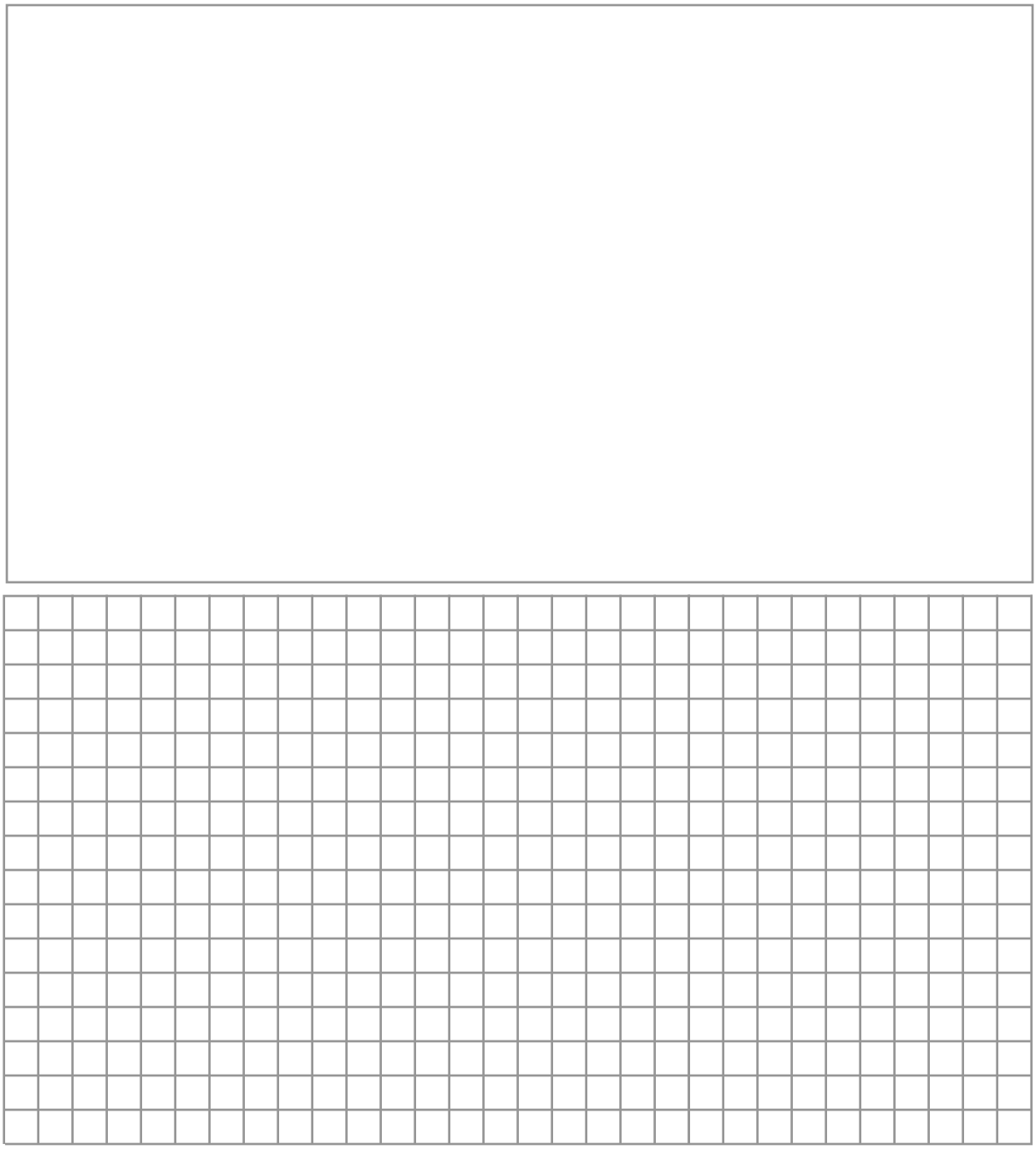
Name:_____

Math Grade 5: Construct Viable Arguments About Adding Fractions

B. Solve the problem correctly. Show your work, using words, numbers and/or pictures. Explain why your answer makes sense.

$$\frac{2}{5} + \frac{3}{10}$$



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CCR Performance Tasks

Math Grade 5: Construct Viable Arguments About Adding Fractions

Teacher Guide

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About the Teacher Guide

This document contains support materials for “Math Grade 5: Construct Viable Arguments About Adding 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 3	5.NF.1

SBAC Claims	PARCC Sub-Claims
1 and 3	A and C

Performance Task

Carl's teacher gave him the following problem to solve.

$$\frac{2}{5} + \frac{3}{10}$$

Carl solved the problem and explained his reasoning. His work is shown below.

$\frac{2}{5} + \frac{3}{10} = \frac{5}{15}$

because $2 + 3 = 5$

and $5 + 10 = 15$

A. Explain why Carl's answer, $\frac{5}{15}$, does not make sense. Use words, numbers and/or pictures in your answer. The grid space below is included to help you draw any pictures you choose to include.

B. Solve the problem correctly. Show your work, using words, numbers and/or pictures. Explain why your answer makes sense.

Standards Alignment

Practice Standards

MP3 > DOK 3

Construct viable arguments and critique the reasoning of others. -- Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counter examples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and--if there is a flaw in an argument--explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Content Standards

5.NF.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.

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 #3:
Communicating Reasoning. Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

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 C:
Highlighted Practices MP.3, 6 with Connections to Content: expressing mathematical reasoning. The student expresses grade/course-level appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and/or attending to precision when making mathematical statements.

Scoring Rubric

4 Point Response:
The student response demonstrates:

- The ability to analyze an argument and explain why the argument does not make sense (part A);
- A strong understanding of fractions and how to add fractions with unlike denominators (part B);
- The ability to construct an argument using words, drawings, or diagrams (part B).

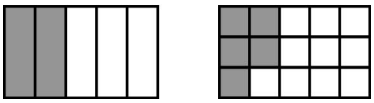
A level 4 response should include:

- A correct and complete explanation of why $\frac{5}{15}$ does not make sense as an answer to the problem shown;
- A correct answer to the problem $\frac{2}{5} + \frac{3}{10}$, with the correct and complete work shown;
- A correct and complete explanation of why the solution strategy or the answer makes sense.

A sample level 4 response follows.

Part A, sample 1: "I drew a picture and I noticed that 5/15 is less than 2/5.

$\frac{2}{5}$ $\frac{5}{15}$



If you are starting with $\frac{2}{5}$ and adding something to it, you should end up with something bigger than $\frac{2}{5}$.

So $\frac{5}{15}$ can't be the right answer."

Part A, sample 2: "Carl's explanation shows that he added across the top and then added across the bottom. This method doesn't work. The 5 and the 10 in the bottom of the fractions tells you the size of the pieces you are adding together. You need to make them the same size so you can tell how many pieces of the same size you have altogether. You can't add fifths and tenths and say you have fifteenths."

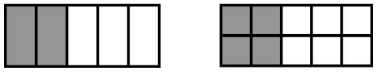
Part B:

$$\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$$

"I had to find a common denominator so that I could add the fractions. I can't add them when they have different denominators because then I am adding pieces of different sizes. So I would have 5 pieces altogether, but some of the pieces are fifths and some are tenths.

I drew this picture to show that $\frac{2}{5} = \frac{4}{10}$.

$\frac{2}{5}$ $\frac{4}{10}$



Then I just added $\frac{4}{10}$ and $\frac{3}{10}$ so I have $\frac{7}{10}$ altogether."

3 Point Response:
The student response demonstrates:

- The ability to analyze an argument and explain why the argument does not make sense, but the explanation may be incomplete;
- A strong understanding of fractions and how to add fractions with unlike denominators;
- The ability to construct an argument using words, drawings, or diagrams, but the argument may be incomplete.

2 Point Response:
The student response demonstrates:

- A weak ability to analyze an argument. The explanation of why the answer does not make sense is missing or vague;
- An understanding of fractions and how to add fractions with unlike denominators;
- A weak ability to construct an argument. The explanation of why the student's own work makes sense is missing or vague.

1 Point Response:
The student response demonstrates:

- A weak ability to analyze an argument. The analysis contains incorrect statements and demonstrates misconceptions about fractions;
- Errors in adding fractions with unlike denominators;
- A weak ability to construct an argument. The explanation of the student's own work contains incorrect statements, or steps that do not logically follow from each other.

0 Point Response:
Student provides no response, or response is off topic.

Discussion Questions

Use the following questions to stimulate discussion:

1. Suppose Josh gives an answer of $\frac{5}{10}$, with no work shown. Can you figure out what thought process Josh used to come up with this answer? How could you explain to Josh why his reasoning was incorrect?

Possible Response: *Josh might have realized that the correct common denominator is 10, but then forgot to rewrite $\frac{2}{5}$ in terms of tenths, as $\frac{4}{10}$, before adding the numerators. If this was simply a process error this explanation could suffice; if greater understanding is needed the explanation could follow the lines of the one in the rubric.*

2. Can you imagine other incorrect answers students might give for this problem? Are there other correct answers?

Possible Response: *A student might make an error in the conversion of $\frac{2}{5}$ to tenths, for example adding the same amount to the numerator and denominator (5) to obtain $\frac{7}{10}$. This would result in an answer to the original problem of $\frac{10}{10}$ or 1. Other correct answers are fractions equivalent to seven tenths, such as $\frac{70}{100}$, or the decimal form of the fraction, 0.7.*

3. Can you think of an alternate explanation for Carl? For example, if you analyzed Carl's work using words, can you translate your analysis into pictures (or vice versa)?

Possible Response: *Answers can vary here; a comparison of the explanations given in the rubric will illustrate the differences between explanations using words vs. using pictures.*

4. What are some of the issues/difficulties you might encounter when using pictures to solve this problem or explain reasoning? Why is there a grid included in the workspace?

Possible Response: *When using pictures to illustrate fractions, it is very important to show pieces of the whole that are the same size. The visual explanation in part A of the rubric is useless if the two figures do not use the same scale, or are drawn carelessly with sections that are not the same size. The grid is intended to give students a scale base to use to create appropriate figures.*

Extension Activities

1. Developing number sense about fractions – using estimation as a tool for analyzing the problem

- Develop a list of the most common fractions and/or the ones students feel most comfortable with.

  Sample: $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$

- Go back to the original problem and have students find the closest "common" fraction to the ones given, in order to easily estimate the sum.

  Sample: $\frac{2}{5}$ is a little more than $\frac{1}{3}$, and $\frac{3}{10}$ is a little less than $\frac{1}{3}$, so the sum is close to $\frac{2}{3}$.

- Discuss how close the students' estimated sum is to the actual sum of $\frac{7}{10}$. Also have the students examine Carl's response of $\frac{5}{15}$ using this reasoning.

  Sample: $\frac{2}{3}$ is only slightly less than $\frac{7}{10}$, so it is a good estimate of the sum. Carl's response of $\frac{5}{15}$ is equivalent to $\frac{1}{3}$, which is not close to $\frac{2}{3}$ and so it is clearly not correct.

2. Extending the process to include:

a. A sum that exceeds 1

Sample: $\frac{5}{8} + \frac{3}{4}$

b. A sum of mixed numbers

Sample: $1\frac{2}{3} + 4\frac{5}{6}$

c. A sum with denominators that are not multiples of each other

Sample: $\frac{2}{5} + \frac{1}{3}$