

Study Guide

Field 222: Multi-Subject: Teachers of Childhood (Grade 1–Grade 6) Part Two: Mathematics

Sample Constructed-Response Item

Competency 0005

Analysis, Synthesis, and Application

Use the data provided to complete the task that follows.

Using the data provided, prepare a response of approximately 400–600 words in which you:

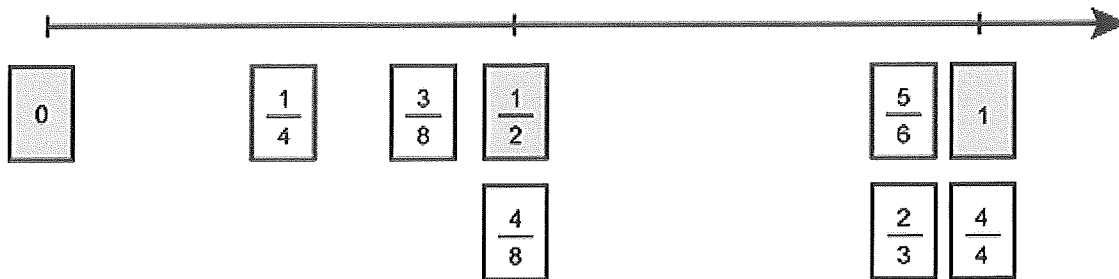
- identify a significant mathematical strength related to the given standard that is demonstrated by the student, citing specific evidence from the exhibits to support your assessment;
- identify a significant area of need related to the given standard that is demonstrated by the student, citing specific evidence from the exhibits to support your assessment; and
- describe an instructional intervention that builds on the student's strengths and that would help the student improve in the identified area of need. Include a strategy for helping the student build a viable argument related to the given standard.

Background Information

Fourth-grade students have been developing an understanding of fractions. The class has reviewed representing numbers on a number line, worked with equivalent fractions in special cases, and compared fractions by reasoning about their size. The class is currently working on the following standard from the New York State P–12 Common Core Learning Standards for Mathematics.

Excerpt of Interview with Student

As students work, the teacher moves among them and asks questions that require students to explain their reasoning about comparing and ordering fractions. The teacher stops to observe one group's work in progress and asks one of the students several questions. The group's work is shown below, followed by a short excerpt of the discussion between the teacher and the student.



Teacher: How did you and your partner decide where $\frac{3}{8}$ would go on your number line?

Student: Well, we put $\frac{4}{8}$ under $\frac{1}{2}$ because we know they are equal. So then we knew that $\frac{3}{8}$ must be less than one-half because you need one more piece to make it $\frac{1}{2}$. We also know that $\frac{3}{8}$ is larger than $\frac{1}{4}$ because $\frac{1}{4}$ is the same as $\frac{2}{8}$.

Teacher: How did you decide where to place $\frac{5}{6}$ and $\frac{2}{3}$ on your number line?

Student: We know that $\frac{5}{6}$ is more than one-half because it only takes $\frac{3}{6}$ to equal $\frac{1}{2}$. And $\frac{2}{3}$ is the same as $\frac{5}{6}$ because you just need one more piece to make them both a whole.

Teacher: Can you show me what you mean when you say, "you just need one more piece"?

Student: Well, if I think about a pie, I know I only need one more piece to make the whole.

Teacher: Can you show me what you are thinking of with a drawing?

Student: That's easy! I'll make two pies. One shows $\frac{5}{6}$ and one shows $\frac{2}{3}$.

Instructional intervention should start with the student using strips of paper to fold and create fraction strips for a variety of fractions (thirds, fourths, sixths, eighths) and to compare $\frac{2}{3}$ to $\frac{3}{4}$ and to $\frac{5}{6}$. The teacher would ask are they all equal? Which of the three is closest to one whole? Compare the amount left to make one whole. Are $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$ equal? Why not? What is the meaning of the denominator in a fraction? What does it tell you?

Using fraction strips, the student could then be asked to compare several fractions that have the same numerator but different denominators, such as $\frac{2}{6}$ and $\frac{2}{4}$, or $\frac{5}{8}$ and $\frac{5}{6}$. Because the student appears to have some understanding of equivalent fractions, the next step would be to do work converting $\frac{2}{3}$ and $\frac{5}{6}$ to fractions with common denominators. The teacher would ask for a comparison of the new fractions, written with common denominators, to each other. Then the student should compare several other pairs of fractions "with one piece missing" in the same manner, finding common denominators. As he works, he should explain his process and his thinking to the teacher.

Students using symbolic notation for fractions may get lost in the symbols and fail to remember that denominators define the size of the fractional part and numerators represent the number of this part. The use of a visual model (the strips) coupled with teacher questioning and student explanations, would help a student to understand key concepts, thus enabling him to build a viable argument regarding equivalent fractions, and allowing him to progress to new ideas.

Performance Characteristics for Constructed-Response Item

The following characteristics guide the scoring of responses to the constructed-response assignment.

Completeness	The degree to which the response addresses all parts of the assignment
Accuracy	The degree to which the response demonstrates the relevant knowledge and skills accurately and effectively
Depth of Support	The degree to which the response provides appropriate examples and details that demonstrate sound reasoning

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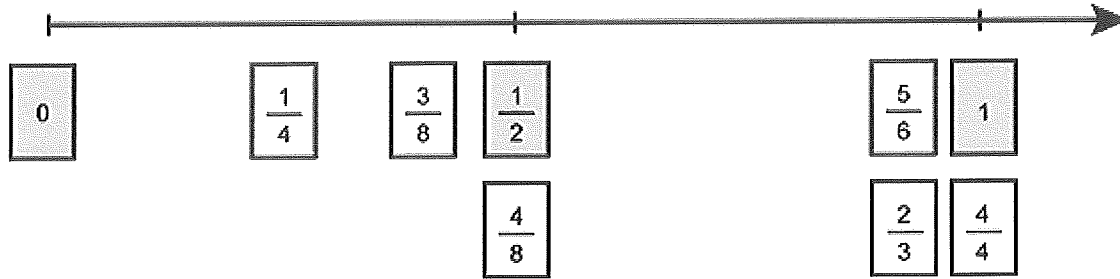
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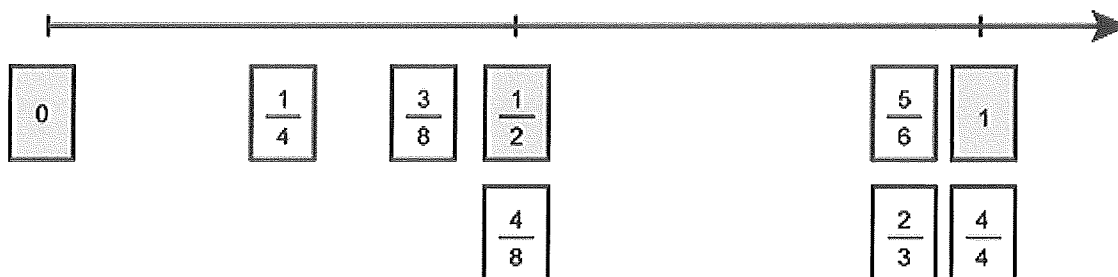
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